

INTERNATIONAL
STANDARD

ISO/IEC/
IEEE
24748-8

First edition
2019-02

Systems and software engineering — Life cycle management —

Part 8: Technical reviews and audits on defense programs

*Ingénierie des systèmes et du logiciel — Gestion du cycle de vie —
Partie 8: Revues techniques et audits des programmes de défense*



Reference number
ISO/IEC/IEEE 24748-8:2019(E)
Documents
© IEEE 2015
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 25, 2026 at 05:35:33 UTC from IEEE Xplore. Restrictions apply.

Full document details: ISO/IEC/IEEE 24748-8-2019



COPYRIGHT PROTECTED DOCUMENT

© IEEE 2015

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO or IEEE at the respective address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Institute of Electrical and Electronics Engineers, Inc
3 Park Avenue, New York
NY 10016-5997, USA

Email: stds.ipr@ieee.org
Website: www.ieee.org

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted (see www.iso.org/directives).

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

ISO/IEC/IEEE 24748-8 was prepared by the Software & Systems Engineering Standards Committee of the IEEE Computer Society (as IEEE Std 15288.2) and drafted in accordance with its editorial rules. It was adopted, under the “fast-track procedure” defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

IEEE Standard for Technical Reviews and Audits on Defense Programs

Sponsor

Software & Systems Engineering Standards Committee
of the
IEEE Computer Society

Approved 10 December 2014

IEEE-SA Standards Board

Abstract: The requirements for technical reviews and audits to be performed throughout the acquisition life cycle for the US Department of Defense (DoD) and other defense agencies are established in this standard. This standard provides the definition, description, and intent, as well as the entry/exit/success criteria, for each technical review and audit. It is to be used to establish agreement between acquirers and suppliers on the technical reviews and audits that are needed for the project, as well as the focus and expectations of each.

Keywords: 15288, acquirer-supplier agreement, alternative systems review, critical design review, defense acquisition program, defense acquisition program life cycle, flight readiness review, functional configuration audit, IEEE 15288.2™, integration readiness review, physical configuration audit, preliminary design review, production readiness review, software requirements and architecture review, software specification review, system functional review, system requirements review, system verification review, technical audit, technical review, test readiness review

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2015 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 15 May 2015. Printed in the United States of America.

IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

PDF: ISBN 978-0-7381-9535-3 STD20106
Print: ISBN 978-0-7381-9536-0 STDPD20106

IEEE prohibits discrimination, harassment, and bullying.

For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

vi
Copyright © 2015 IEEE. All rights reserved.

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notice” or “Important Notices and Disclaimers Concerning IEEE Standards Documents.”

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (“IEEE-SA”) Standards Board. IEEE (“the Institute”) develops its standards through a consensus development process, approved by the American National Standards Institute (“ANSI”), which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854 USA

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate fee, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE-SA Website at <http://ieeexplore.ieee.org/xpl/standards.jsp> or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: <http://standards.ieee.org/findstds/errata/index.html>. Users are encouraged to check this URL for errata periodically.

Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at <http://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patent Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Participants

At the time this IEEE standard was completed, the DoD Systems Engineering Standardization Joint Working Group had the following membership:

Garry Roedler, *Chair*
David Davis, *Vice Chair*

Bill Bearden
 Dave Berwald
 Tom Channell
 Dan Christensen
 Stephen Christensen
 Luke Daniels
 Geoff Draper

John Evers
 Ronald Fradenburg
 Mark Henley
 Theresa Hunt
 Cheryl Jones
 Ed Matheson
 Revis Napier

Larry Pennell
 Chris Ptachik
 Bob Scheurer
 John Schnackenberg
 Brian Shaw
 Zachary Taylor
 Gan Wang

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Bill Bearden
 Bill Brown
 Susan Burgess
 William Byrd
 Tom Channell
 Dan Christensen
 Stephen Christensen
 Luke Daniels
 David Davis
 Robert Epps
 Alan Fitzmorris
 Ronald Fradenburg
 Randall Groves
 Denise Haskins
 Mark Henley
 Theresa Hunt
 Noriyuki Ikeuchi

Hannibal Iyob
 Cheryl Jones
 Piotr Karocki
 Yuri Khersonsky
 Dewitt Latimer
 James Moore
 Edward Moshinsky
 Revis Napier
 Olileanya Ogbonna
 Larry Pennell
 Chris Ptachik
 Annette Reilly
 William Riski
 Garry Roedler
 Bartien Sayogo
 Bob Scheurer
 John Schnackenberg

Brian Shaw
 Carl Singer
 David Singleton
 John Snoderly
 Eugene Stoudenmire
 Walter Struppler
 Marcy Stutzman
 Michael Swearingen
 Zachary Taylor
 David Walden
 Gan Wang
 Nancy Weaver
 Clifford Whitcomb
 Michael Yokell
 Matthew Young
 Kenneth Zemrowski
 David Zhong

When the IEEE-SA Standards Board approved this standard on 10 December 2014, it had the following membership:

John Kulick, *Chair*
Jon Walter Rosdahl, *Vice Chair*
Richard H. Hulett, *Past Chair*
Konstantinos Karachalios, *Secretary*

Peter Balma
 Farooq Bari
 Ted Burse
 Clint Chaplain
 Stephen Dukes
 Jean-Phillippe Faure
 Gary Hoffman

Michael Janezic
 Jeffrey Katz
 Joseph L. Koepfinger*
 David J. Law
 Hung Ling
 Oleg Logvinov
 T. W. Olsen
 Glenn Parsons

Ron Peterson
 Adrian Stephens
 Peter Sutherland
 Yatin Trivedi
 Phil Winston
 Don Wright
 Yu Yuan

*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

Richard DeBlasio, *DOE Representative*
 Michael Janezic, *NIST Representative*

Catherine Berger
IEEE-SA Content Production and Management

Malia Zaman
IEEE-SA Technical Program Operations

Introduction

This introduction is not part of IEEE Std 15288.2-2014, IEEE Standard for Technical Reviews and Audits on Defense Programs.

For effective and efficient application of ISO/IEC/IEEE 15288 on defense programs, additional requirements are needed for the assessment of those programs. ISO/IEC/IEEE 15288 is written in a general manner to address all types of systems and different modes of application. Thus, it does not have requirements specific to the use by defense projects that facilitate effective implementation of an acquirer-supplier agreement, such as use in DoD contracts. This standard responds to the needs of DoD and other defense agencies to have more specific and detailed requirements for technical reviews and audits as part of the assessment of projects during the life cycle.

The requirements and guidance in this standard have been written at the most general level possible so that they might meet not only DoD's needs but also those of other defense agencies, either by direct application or by tailoring for an agency's specific needs.

This standard was developed with input from government and non-government resources. This standard does not supersede or supplant any other law, regulation, directive, contractual provision, or requirement. Accordingly, users of this standard must verify, conform and complete the technical review and audit of any governmental programs to meet the requirements specified by the government at the time of the technical review and audit. The user is instructed to consult the governmental contact or commissioning party for specific instructions and requirements, which may be different from this standard. Users may also have to comply with other applicable laws, regulations, and agency requirements in the undertaking and completion of any such technical reviews and audits, including but not limited to confidentiality, security clearance, access to protected areas, and document management. It is the user's responsibility to determine all applicable laws and requirements.

Contents

1. Overview	1
1.1 Scope	1
1.2 Purpose	1
1.3 Field of application	2
1.4 Organization of this standard	2
1.5 Conformance	3
2. Normative references	4
3. Definitions, acronyms, and abbreviations	4
3.1 Definitions	4
3.2 Acronyms and abbreviations	5
4. Overview of technical reviews and audits	9
4.1 Technical reviews and audits defined	9
4.2 The role of technical reviews and audits in the US DoD acquisition life cycle	9
4.3 Technical reviews and audits in the context of Technical Management processes	9
4.4 Key participants for technical reviews and audits	10
4.5 Program considerations for technical reviews and audits	11
4.6 Media selection for products discussed in this standard	17
5. Requirements for technical reviews and audits	17
5.1 General	17
5.2 Alternative systems review (ASR)	19
5.3 System requirements review (SRR)	21
5.4 System functional review (SFR)	24
5.5 Preliminary design review (PDR)	26
5.6 Critical design review (CDR)	29
5.7 Test readiness review (TRR)	32
5.8 Functional configuration audit (FCA)	34
5.9 System verification review (SVR)	36
5.10 Production readiness review (PRR)	38
5.11 Physical configuration audit (PCA)	40
6. Detailed criteria to be addressed for each technical review and audit	43
6.1 General	43
6.2 Alternative systems review (ASR) detailed criteria	43
6.3 System requirements review (SRR) detailed criteria	48
6.4 System functional review (SFR) detailed criteria	55
6.5 Preliminary design review (PDR) detailed criteria	60
6.6 Critical design review (CDR) detailed criteria	69
6.7 Test readiness review (TRR) detailed criteria	77
6.8 Functional configuration audit (FCA) detailed criteria	83
6.9 System verification review (SVR) detailed criteria	87
6.10 Production readiness review (PRR) detailed criteria	92
6.11 Physical configuration audit (PCA) detailed criteria	98
7. Technical review and audit application guidance for defense programs	103
7.1 General	103
7.2 Alternative systems review (ASR) application guidance	103
7.3 System requirements review (SRR) application guidance	104

7.4 System functional review (SFR) application guidance	105
7.5 Preliminary design review (PDR) application guidance	105
7.6 Critical design review (CDR) application guidance	106
7.7 Test readiness review (TRR) application guidance	107
7.8 Functional configuration audit (FCA) application guidance	110
7.9 System verification review (SVR) application guidance	111
7.10 Production readiness review (PRR) application guidance	112
7.11 Physical configuration audit (PCA) application guidance	113
Annex A (informative) Software requirements and architecture review (SAR)	115
A.1 General	115
A.2 Annex A purpose	115
A.3 Annex A tailoring	115
A.4 Application of Annex A content	115
A.5 Requirements for a SAR	115
A.6 SAR detailed criteria	118
A.7 SAR application guidance	124
Annex B (informative) Software specification review (SSR)	126
B.1 General	126
B.2 Annex B purpose	126
B.3 Annex B tailoring	126
B.4 Application of Annex B content	126
B.5 Requirements for an SSR	126
B.6 SSR detailed criteria	129
B.7 SSR application guidance	134
Annex C (informative) Integration readiness review (IRR)	135
C.1 General	135
C.2 Annex C purpose	135
C.3 Annex C tailoring	135
C.4 Application of Annex C content	135
C.5 Requirements for an IRR	135
C.6 IRR detailed criteria	138
C.7 IRR application guidance	143
Annex D (informative) Flight readiness review (FRR)	145
D.1 General	145
D.2 Annex D purpose	145
D.3 Annex D tailoring	145
D.4 Application of annex D content	145
D.5 Requirements for an FRR	145
D.6 FRR detailed criteria	148
D.7 FRR application guidance	152
Annex E (informative) Bibliography	154

IEEE Standard for Technical Reviews and Audits on Defense Programs

IMPORTANT NOTICE: IEEE Standards documents are not intended to ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

This IEEE document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading “Important Notice” or “Important Notices and Disclaimers Concerning IEEE Documents.” They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/IPR/disclaimers.html>.

1. Overview

1.1 Scope

This standard establishes the requirements for technical reviews and audits to be performed throughout the acquisition life cycle for the US Department of Defense (DoD) and other defense agencies. This standard provides the definition, description, and intent, as well as the entry, exit and success criteria, for each technical review and audit. It is to be used to establish agreement between acquirers and suppliers on the technical reviews and audits that are needed for the project, as well as the focus and expectations of each technical review and audit.

1.2 Purpose

This standard is intended to elaborate the technical review and audit clause of ISO/IEC/IEEE 15288, System life-cycle processes, for use by the DoD and other defense agencies in acquiring systems (and parts thereof) or services. It amplifies ISO/IEC/IEEE 15288, subclause 6.3.2.3.a, for selection, negotiation, agreement, and performance of the necessary technical reviews and audits, while allowing tailoring flexibility for the variety of acquisition situations/environments when the technical reviews or audits are conducted. While primarily supporting the acquirer-supplier agreement mode, this standard also can be used to support the other modes such as use by organizations, projects, and process assessors.

NOTE—The acquirer-supplier mode is not necessarily limited to a government acquirer and corporate prime contractor supplier situation. For example, a service component program executive officer (PEO) might be considered the acquirer, and the applicable government program office/manager the supplier for internal government reviews. Depending on how a given service or other DoD agency operates, the government might be the acquirer and their systems engineering and technical assistance (SETA) contractor might be responsible for the conduct of a subset of the reviews in this standard. Similarly, a defense contractor could be the acquirer and a key subcontractor could be the supplier. In the case of a contractor's internal research and development (R&D), corporate management could be the acquirer and the company's R&D organization could be the supplier.¹

1.3 Field of application

This standard addresses the needs of the defense community with respect to the incorporation, implementation, and execution of technical reviews and audits. IEEE Std 15288.1-2014, the standard that implements ISO/IEC/IEEE 15288 for application on defense programs, provides the defense-specific language and terminology to ensure the correct application of acquirer-supplier requirements for technical reviews and audits on a defense program, while this standard provides the implementation details to fulfill those requirements.²

1.4 Organization of this standard

Subclause 1.5 defines what it means for an organization, project, or other users such as process authors and assessors to claim conformance with this standard.

Clause 2 defines normative references, i.e., documents that are indispensable in the application of this standard.

Clause 3 provides definitions of terms peculiar to this standard, as well as acronyms and abbreviations used in this standard.

Clause 4 provides an overview of technical reviews and audits. It defines them, discusses their role in the US DoD acquisition life cycle, and their support of specific ISO/IEC/IEEE 15288 processes. It answers questions such as: “What are technical reviews and audits?” “Why perform them?” “Is there a standard set of them, and if so, what are they?”

Clause 5 specifies the minimum set of required properties for each technical review and audit that form the basis for agreement between defense program acquirers and suppliers.

Clause 6 provides the detailed criteria to be addressed for each technical review and audit contained in Clause 5.

Clause 7 provides, for each technical review and audit contained in Clause 5 of this standard, detailed, best-practice guidance for applying the detailed criteria of the corresponding portion of Clause 6 of this standard to various kinds of defense programs.

Annex A, Annex B, Annex C, and Annex D contain examples of other technical reviews that DoD acquisition programs may find useful, based on the complexity, nature, and domain of the systems that are being developed or acquired by those programs.

Annex E contains a bibliography.

¹ Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

² ISO/IEC publications are available from the ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland (<http://www.iso.org/>). ISO/IEC publications are available in the United States from the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (<http://www.ansi.org/>).

1.5 Conformance

1.5.1 General

The requirements in this standard are contained in Clause 5 and Clause 6. This standard provides requirements for a number of technical reviews and audits to be conducted throughout the acquisition life cycle of a system. Since particular projects or organizations may not need to use all of the reviews and audits provided by this standard, implementation of this standard may involve selecting a set of reviews and audits suitable to the project or organization. There are two ways that an implementation can be claimed to conform to the requirements of this standard. Any claim of conformance is cited in only one of the two forms below.

NOTE—Evidence of conformance can be as simple as including traceability from the requirements in this standard to the conforming policies, processes, and procedures. This could be provided by various means, including as a separate section in the traceability documentation for the system requirements or in the Systems Engineering Management Plan (SEMP).

1.5.2 Full conformance

A claim of full conformance declares the set of technical reviews and audits for which conformance is claimed. Full conformance is achieved by providing evidence that all of the mandatory requirements of the declared set of reviews and audits have been satisfied.

1.5.3 Tailored conformance

When this standard is used as a basis for establishing a set of technical reviews and audits that do not qualify for full conformance, the reviews and audits in this standard are selected or modified in accordance with the tailoring process defined in 5.1.1.2.

NOTE 1—In this document, the word *shall* is used to indicate a mandatory requirement. The word *should* is used to indicate a recommendation. The word *may* is used to indicate a permissible action. The word *can* is used for statements of possibility and capability.

NOTE 2—When this standard is used to help develop an agreement between an acquirer and a supplier, the contents of Clause 5 and Clause 6 can be selected for incorporation in the agreement with or without modification. In this case, it is more appropriate for the acquirer and supplier to claim compliance with the agreement than conformance with this standard.

NOTE 3—The acquirer request for proposal includes the intended tailoring of the requirements in this standard. However, the supplier may propose additional changes or alternatives during the steps to finalize the agreement.

Conformance to this standard can be claimed by a project or organization independent of a claim of compliance to a specific agreement.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ISO/IEC/IEEE 15288:2015(E), Systems & software engineering—System life cycle processes.³

IEEE Std 15288.1™-2014, IEEE Standard for Application of Systems Engineering on Defense Programs.^{4, 5}

3. Definitions, acronyms, and abbreviations

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* and the *Department of Defense Dictionary of Military and Associated Terms* (Joint Publication 1-02) [B4] should be consulted for terms not defined in this clause.⁶

3.1 Definitions

acceptability criteria: A documented set of characteristics of a program's work products that if satisfied, forms a sufficient basis for judging each product's content to be acceptable to support a successful review or audit.

configuration audit: A detailed review of processes, product definition information, documented verification of compliance with requirements, and an inspection of products to confirm that products have achieved their required attributes or conform to released product configuration definition information.

entry criteria: Artifacts and other review or audit elements that must be completed before the review or audit can be conducted.

exit criteria: Review or audit elements that must be assessed, completed, and action items closed before successful completion of the technical review or audit can be declared.

review/audit outputs: Review or audit artifacts that are expected through conduct of the technical review or audit and that may be considered elements of exit criteria.

system: The product of an acquisition process that is delivered to the user.

NOTE—Although the term *system* can apply to any level of complexity or detail, when this standard is applied to a specific acquisition, the term *system* will refer to a given solution that satisfies the requirements of a particular acquirer-supplier agreement and may apply equally to the acquisition of a completely new system or to the addition or upgrade to an existing system.

system specification: The documented set of mandatory requirements for a system.

³ This publication is available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, Piscataway, NJ 08854, USA (<http://standards.ieee.org/>).

⁴ IEEE publications are available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, Piscataway, NJ 08854, USA (<http://standards.ieee.org/>).

⁵ Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

⁶ *IEEE Standards Dictionary Online* subscription is available at:
http://www.ieee.org/portal/innovate/products/standard/standards_dictionary.html.

NOTE—The more generic term is used for consistent terminology within this standard and includes terms such as System Performance Specification (SPS), System Requirements Document (SRD), and System/Subsystem Specification (SSS).

technical reviews: A series of systems engineering activities conducted at logical transition points in a system life cycle, by which the progress of a program is assessed relative to its technical requirements using a mutually agreed-upon set of criteria.

NOTE—Includes both incremental and system perspectives, as applicable, and considers technical maturity amidst programmatic constraints (cost/schedule), to ascertain readiness to proceed to subsequent activities with acceptable risk.

3.2 Acronyms and abbreviations

AoA	analysis of alternatives
ASR	alternative systems review
BIT	built-in test
C4I	command, control, communications, computer, and intelligence
CAI	critical application item
CAIV	cost as an independent variable
CARD	cost analysis requirements description
CCB	configuration control board
CDD	capability development document
CDR	critical design review
CDRL	contract data requirements list
CI	configuration item
CM	configuration management
CMP	configuration management plan
COMSEC	communications security
CONOPS	concept of operations
COTS	commercial off-the-shelf
CPD	capability production document
CPI	critical program information
CSC	computer software component
CSI	critical safety item
CSU	computer software unit
DMS	diminishing manufacturing sources
DoD	Department of Defense
DoDAF	Department of Defense architecture framework
DR	decision review
DSP	digital signal processor

DT	development test
DT&E	development test and evaluation
ECP	engineering change proposal
EDRAP	engineering data requirements agreement plan
EMC	electromagnetic compatibility
EMD	engineering and manufacturing development
EMI	electromagnetic interference
ESOH	environment, safety, and occupational health
EVM	earned value management
FCA	functional configuration audit
FD	full deployment
FMECA	failure modes, effects, and criticality analysis
FOC	full operational capability
FPGA	field programmable gate array
FRACAS	failure reporting and corrective action system
FRP	full-rate production
FRR	flight readiness review
HALT	highly accelerated life testing
HSI	human systems integration
HWCI	hardware configuration item
ICD	initial capabilities document
IEC	International Electrotechnical Committee
IEEE	The Institute of Electrical and Electronics Engineers
IMP	integrated master plan
IMS	integrated master schedule
IOC	initial operational capability
IOT&E	initial operational test and evaluation
IPT	integrated product team
IRR	integration readiness review
IRS	interface requirements specification
ISO	International Organization for Standardization
KPP	key performance parameter
KSA	key system attribute
LCC	life-cycle cost
LCCE	life-cycle cost estimate
LCSP	life-cycle sustainment plan
LFT&E	live fire test and evaluation

IEEE Std 15288.2-2014
IEEE Standard for Technical Reviews and Audits on Defense Programs

LRIP	low-rate initial production
M&S	modeling and simulation
MOE	measure of effectiveness
MOP	measure of performance
NDI	non-developmental item
NIST	National Institute of Standards and Technology
O&S	operations and support
OT	operational test
OTE	operational test and evaluation
OTA	operational test agency
OTRR	operational test readiness review
P&D	production and deployment
PCA	physical configuration audit
PDR	preliminary design review
PEO	Program Executive Office
PM&P	parts, materials, and processes
PMO	program management office
PP	program protection
PPP	program protection plan
PPSL	program parts selection list
PRR	production readiness review
PSP	product support plan
QA	quality assurance
R&D	research and development
R&M	reliability and maintainability
RAM-C	reliability, availability, maintainability, and cost
RTCA	real time casualty assessment
SAD	software architecture description
SAR	software requirements and architecture review
SCRM	supply chain risk management
SDP	software development plan
SE	systems engineering
SEE	software engineering environment
SEMP	Systems Engineering Management Plan
SEP	Systems Engineering Plan
SETA	systems engineering and technical assistance
SETR	systems engineering technical review

SFR	system functional review
SIL	system integration laboratory
SME	subject matter expert
SoS	system of systems
SPS	system performance specification
SRD	system requirements document
SRR	system requirements review
SRS	software requirements specification
SSE	system security engineering
SSR	software specification review
SSS	system/subsystem specification
STP	software test plan
SVD	software version description
SVR	system verification review
SWCI	software configuration item [(synonymous with computer software configuration item (CSCI))]

NOTE—The state of hardware technology progression has resulted in the functionality of software code being realized by its execution while embedded in devices that are not properly described as computers (e.g., DSPs, FPGAs). This standard uses SWCI to encompass the broader execution environment of software code.

T&E	test and evaluation
TBD	to be determined
TDP	technical data package
TEMP	Test and Evaluation Master Plan
TIM	technical interchange meeting
TMRR	technology maturation and risk reduction
TOC	total ownership cost
TPM	technical performance measure
TR	technical report
TRR	test readiness review
US	United States
V&V	verification and validation
VCRM	verification cross-reference matrix
WBS	work breakdown structure

4. Overview of technical reviews and audits

4.1 Technical reviews and audits defined

Technical reviews and audits are a foundation element of an effective systems engineering (SE) approach and form the backbone of a robust technical assessment process. Technical reviews and audits provide a venue for baselining technical requirements, evaluating the system's technical maturity, and identifying and assessing risks to system performance, cost, and schedule.

4.2 The role of technical reviews and audits in the US DoD acquisition life cycle

The ISO/IEC/IEEE 15288 Life Cycle Concepts subclause points out that every system has a life cycle and that per ISO/IEC/IEEE TR 24748-1 [B6], the typical system life-cycle stages include concept, development, production, utilization, support and retirement.⁷ The stages describe the major progress and achievement milestones of the system through its life cycle and give rise to the primary decision gates of the life cycle. Organizations, in turn, use these decision gates to understand and manage the inherent uncertainties and risks associated with costs, schedule, and functionality when creating or utilizing a system.

Phases of the DoD acquisition life cycle include materiel solution analysis, technology maturation, and risk reduction (TMRR), engineering and manufacturing development (EMD), production and deployment (P&D), and operations and support (O&S). Technical reviews and audits are assessment tools that the DoD program organization uses to provide decision-makers sufficient information on the program's technical readiness to proceed to the next phase or to the next decision point within a phase.

Program affordability is and will be for the foreseeable future a major consideration in DoD programs. In that regard, all technical reviews should place some focus on affordability, address compliance with affordability goals, and assess the impact of affordability constraints.

NOTE—The Technical Reviews and Audits Overview section of the Defense Acquisition Guidebook [B2], Chapter 4, Systems Engineering, provides an illustration of the integration of the technical reviews and audits across the US DoD acquisition life cycle.

4.3 Technical reviews and audits in the context of Technical Management processes

ISO/IEC/IEEE 15288's Technical Management processes are concerned with managing the resources and assets allocated by an organization's management and with applying them to fulfill the agreements into which the organization enters. They are applied to the technical effort of projects, particularly to the planning in terms of cost, timescales and achievements; to the checking of actions that helps ensure they comply with plans and performance criteria; and to the identification and selection of corrective actions that recover shortfalls in progress and achievement.

Technical reviews and audits are system engineering activities that support the "assess the project" activity of the ISO/IEC/IEEE 15288 Project Assessment and Control process. The purpose of the Project Assessment and Control process is to help ensure that the program plans are aligned and feasible, to determine project status, technical and process performance, and to direct program execution to help ensure

⁷ The numbers in brackets correspond to those of the bibliography in Annex E.

that performance is according to plans and schedules, within projected budgets and satisfies technical objectives.

During the DoD acquisition life cycle, a properly tailored series of technical reviews and audits provides key points throughout the life cycle to evaluate significant achievements and to assess technical maturity and risk. Project assessment is performed at major project decision points by means of these reviews and audits, and the results inform a project's technical management to enable any required project control actions that might include redirecting project activities and tasks as appropriate to correct identified deficiencies. Redirection may include re-planning as appropriate.

In order for a project's technical management to have a balanced information basis on which to base any required project control actions, each technical review or audit should be conducted from an integrated program viewpoint, including technical status and progress, cost and schedule status, and impacts and risk assessment, to help ensure that technical review decisions do not create unrecognized and unacceptable future program impacts.

4.4 Key participants for technical reviews and audits

4.4.1 General

Each technical review or audit should include knowledgeable participants as well as participants with sufficient objectivity to assess satisfaction of the pre-established review criteria. Based on the purpose and level of the review, the participants may include representatives from the acquirer or supplier organizations, or from both. A description of possible participants is provided in the paragraphs below.

4.4.2 Program manager

The program manager is the person responsible for the overall planning, budgeting, scheduling, execution, and control of all technical and management tasks required to produce and deliver a system. This includes oversight and management of the corresponding tasks of any suppliers with whom the acquirer has established agreements for delivery of products.

4.4.3 Systems engineer

The *Systems Engineer* (SE) refers to the program lead systems engineer, the chief engineer, or lead engineer with SE responsibility, and the SE staff responsible for SE processes and who plan, conduct, or manage SE activities in the program.

4.4.4 Review or audit chair

The chair is the person appointed in accordance with the policies and guidance of the acquirer (i.e., service or defense agency) to oversee and approve the technical review or audit preparatory actions, chair the technical review meeting(s) and manage the technical review or audit members, and coordinate and approve the closure actions and summary report.

4.4.5 Recorder

The recorder is the person charged with capturing the minutes of the technical review or audit meeting(s) and any other formal records directed by the chair.

4.4.6 Supplier

The supplier role is fulfilled by one or more people from the supplier's organization whose selection is dependent on the actions described in the specific Clause 6 table.

4.4.7 Program test lead

The program test lead is the person responsible for the overall program test and evaluation effort for development and operational tests. The program test lead for government organizations is typically called the chief developmental tester.

4.4.8 Program technical leads

The program technical leads for all relevant functional and specialty engineering areas are the people responsible for the overall program technical development effort for the system to be developed.

4.5 Program considerations for technical reviews and audits

4.5.1 Requirements for technical reviews and audits

Part of the defined content of the Systems Engineering Plan (SEP) that is required of all acquisition programs is a description of the program's overall technical approach, including the timing and criteria for the conduct of technical reviews and audits.

4.5.2 Technical reviews and audits across the program life cycle

The acquirer's SEP, and the supplier's Systems Engineering Management Plan (SEMP) where applicable, should define the technical reviews and audits selected for the program and their specific phasing across the program's life cycle. This standard provides application content for the following technical reviews and audits:

- Alternative systems review (ASR)
- System requirements review (SRR)
- System functional review (SFR)
- Preliminary design review (PDR)
- Critical design review (CDR)
- Test readiness review (TRR) [contained within the program's Test and Evaluation Master Plan (TEMP)]
- Functional configuration audit (FCA)
- System verification review (SVR)
- Production readiness review (PRR)
- Physical configuration audit (PCA)

Figure 1 depicts the relationship between these reviews and audits and the technical baselines across the acquisition life cycle.

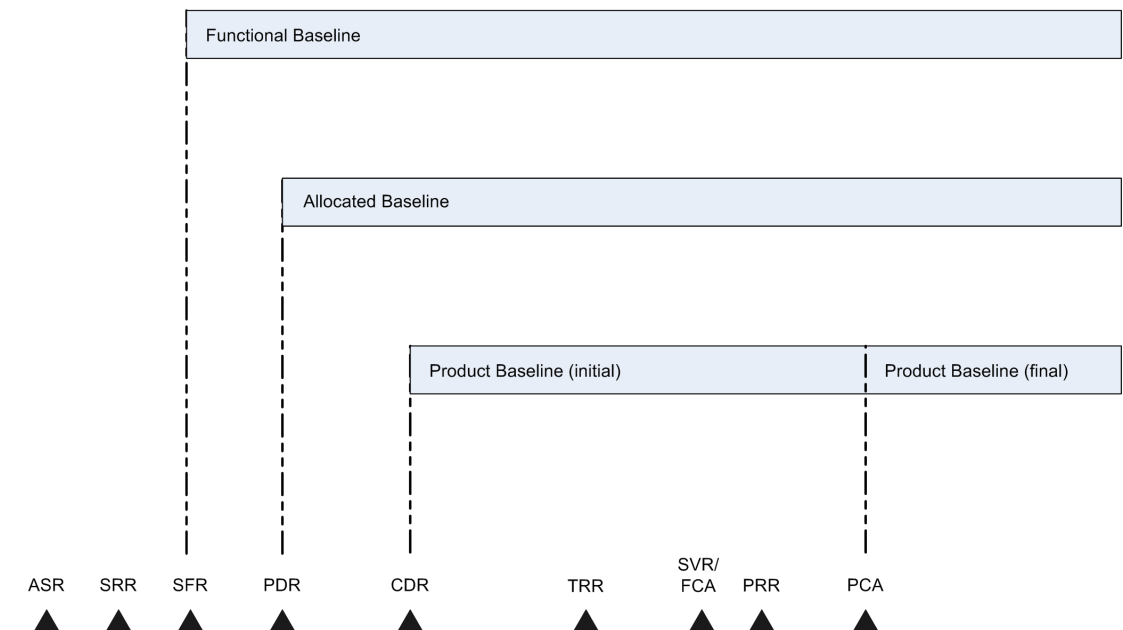


Figure 1 — Relationship between technical reviews and audits and the technical baselines across the acquisition life cycle

Additionally, there are four annexes that contain examples of other technical reviews that DoD acquisition programs may find useful, based on the complexity, nature, and domain of the systems being developed or acquired by those programs. These annexes are as follows:

- Annex A: Software requirements and architecture review (SAR)
- Annex B: Software specification review (SSR)
- Annex C: Integration readiness review (IRR)
- Annex D: Flight readiness review (FRR)

4.5.3 Application of technical reviews and audits

The systems engineer for any given program should coordinate with the program manager and with the various program functional area experts (configuration manager, test manager, logistics manager, etc.) to ensure that planning for the program's technical reviews and audits is fully integrated with the overall program plans. Additionally, the systems engineer should coordinate this planning with the appropriate program executive office (PEO) personnel as applicable.

4.5.4 Multiple instances of technical reviews and audits

For complex systems, the acquirer may choose to conduct certain reviews and audits for one or more system elements depending on the interdependencies involved. These incremental system-element-level reviews or audits lead to an overall system-level technical review or audit.

This standard takes a minimalistic approach to defining the content of each technical review and audit such that the content for any given technical review or audit is intended to be sufficient to support each instance of that technical review or audit conducted by a given program.

4.5.5 Event-driven technical reviews and audits

Technical reviews of program progress should be event driven, and should be conducted when the system under development meets the review entrance criteria as documented in the SEP.

Technical reviews and audits are structured to be a comprehensive review (and in some instances approval) of the program's technical and cost baselines, and to provide confidence that each technical or cost baseline is mature enough to progress to the next stage of the program. Each technical review or audit should have defined entry and exit criteria tied to the required level of design/development maturity and applied across all requirements and technical disciplines.

In addition to entrance criteria, the program SEP should detail the specific chronology for the program's technical reviews and audits. This is especially important for evolutionary acquisition strategies using incremental development processes, or, for multi-component programs, i.e., joint service, interagency, or integration efforts with multiple independent contracts where the government is the integrator. The SEP's chronology should provide the planned sequence of technical reviews and audits and a notional placement of each one in the program's Integrated Master Schedule (IMS). The actual date for conducting any given technical review or audit will depend on satisfaction of the SEP's entrance criteria.

One good method for scheduling technical reviews or audits is to relate them to the documentation requirements for the specific technical review or audit. For example, schedule a PDR after the required system and hardware development specifications or software logical architecture, preliminary design and draft test plans are available, since the essence of the PDR is to assess the supplier's approach to meeting the requirements in these documents.

4.5.6 Systems engineering technical review team

The technical review team is the body responsible for conducting the technical review or audit. Under direction of the chair, the review team ensures the entrance criteria are met, evaluates the technical products under review, and documents action items as required to correct deficiencies found during the technical review or audit.

The review team is typically appointed by the program manager and normally includes the chair, systems engineer, various program functional and specialty engineering area experts (engineering, configuration manager, test manager, logistics manager, financial manager, contracting officer, etc.), system users and maintainers, certification authorities, and legal counsel as required.

The review team conducts the technical review or audit and assesses the review products according to the tailored acceptability criteria, in concert with the focus of the specific technical review or audit.

NOTE—The TRR will be documented within the program TEMP and chaired by the chief developmental tester.

4.5.7 Technical review or audit desired outcomes

A properly tailored series of technical reviews and audits provides key points throughout a program's acquisition life cycle to evaluate significant achievements and to assess technical maturity and risk. Successful completion of this series of reviews and audits provides the PEOs and program management offices (PMO) with several major desired outcomes:

- a) A disciplined sequence of activities to define, assess, and control the maturity of the system's design and technical baseline, reducing risk over time
- b) Confidence that the acquired system will meet all of its specification requirements
- c) Confidence that the acquired system will be validated operationally effective and operationally suitable when deployed
- d) Assessment results that support successful achievement of the outcomes listed for the ISO/IEC/IEEE 15288 Project Assessment and Control process

4.5.8 Elimination or combination of technical reviews and audits

Programs should not conduct technical reviews or audits that are unnecessary given the structure of the program's acquisition life cycle, e.g., where in the acquisition cycle the program will enter, or one-of-a-kind programs without a production requirement.

Eliminating or combining reviews or audits within the program's acquisition life cycle should be coordinated with the PEO and should be approved by the Milestone Decision Authority as documented in the program's approved SEP and acquisition strategy. The SEP should document when the acquirer will approve the critical work elements, products, and maturity metrics associated with the combined or deleted reviews or audits.

4.5.9 Technical review and audit risk assessment checklists

In order to help ensure the highest probability of success in conducting the selected list of technical reviews and audits for a given program, the systems engineer, in collaboration with the program's functional area experts, should document the following risk assessment checklists that help assess the risk of conducting any of the program's reviews or audits:

- a) A "BEFORE" risk assessment checklist that documents the entry criteria necessary to start the technical review and the activities necessary to prepare for the review.
- b) A "DURING" risk assessment checklist that documents the items to be addressed in the technical review agenda and the exit criteria necessary to close the review.
- c) An "AFTER" risk assessment checklist that documents the follow-up actions after technical review completion.

4.5.10 Technical review and audit action items

All action items generated at a technical review or audit should be captured. Suggested action item categories are discussed below. Any action item that is satisfied prior to the conclusion of the review should be captured in the appropriate category below with a disposition of "Closed" with the appropriate supporting information.

- a) *Request for action:* Critical action item required to close the technical review or audit.
- b) *Request for information:* Action item to provide only information/data in support of the current technical review. Not required to close the technical review or audit.
- c) *Action to minutes:* Action items that are not required to close each technical review or audit. Planned close-out date should be tied as an entry or completion criterion to a future milestone.

- d) *Not accepted*: Category used to document any action items generated at a technical review or audit that were duplicates of other accepted action items or otherwise declined by the technical review or audit chair. A clear statement should be included in the action item database to indicate why each action item was categorized as “not accepted.” This category should not be used to capture action items that were satisfied or closed prior to conclusion of the technical review.

4.5.11 Technical review and audit approval

At any given technical review or audit, the chair oversees and manages the review or audit. The technical review or audit itself is conducted by the technical review team and approved by the chair. Chair approval of any given technical review or audit should include the following:

- a) Satisfying the exit criteria agreed upon for the technical review or audit
- b) Approval of the disposition of the action items generated during the technical review or audit
- c) Approval of the technical baseline, and cost baseline as applicable, evaluated during the technical review or audit
- d) Confidence that the maturity of the technical baseline (and cost baseline as applicable) is sufficient to proceed to the next stage of the program
- e) Assessment that the risks associated with the system are documented, have resourced and funded mitigation plans, and are at an acceptable level to support completing the technical review or audit
- f) Chair approval in the formal closure documentation

4.5.12 Technical review and audit planning/conduct/reporting

4.5.12.1 General

In order to help provide sufficient quality in the assessment results that support successfully achieving the desired outcomes of a program’s series of technical reviews and audits, the acquirer should ensure that certain tasks are accomplished across the planning, conduct, and reporting stages of that series of reviews and audits.

The program’s systems engineer, as the person responsible for the overall program technical effort and performance, should coordinate the content and performance of the suggested tasks listed below with the assistance of the program’s various functional area experts and subject matter experts (SME).

4.5.12.2 Technical review and audit planning

During technical review and audit planning, the acquirer should

- a) Ensure that program acquisition plans and strategies provide for the conduct of the applicable technical reviews and audits, and that they are integrated into the milestone decision-making process.
- b) Ensure that the program SEP contains the required content for the tailored series of technical reviews and audits. The TRR will be documented within the program TEMP.
- c) Ensure that the required support from suppliers, including documentation and other applicable data, for each technical review or audit is incorporated in the applicable acquirer-supplier agreement(s).
- d) Ensure that each technical review and audit is addressed in the IMS.

4.5.12.3 Technical review and audit conduct

During technical review and audit conduct, the acquirer should

- a) Ensure that the applicable acquirer-organization SMEs and other applicable stakeholders are identified and notified with sufficient lead time to attend and contribute to the reviews and audits.
- b) Ensure that the supplier provides the required supporting data in sufficient time prior to the reviews and audits for SME review prior to conducting the technical review session(s).
- c) Develop, coordinate, and execute, in cooperation with the supplier, individual technical review and audit content agendas, exit criteria, and arrangements for the conduct of each technical review and audit.
- d) Ensure that the preparation of appropriate technical review or audit material is coordinated with all review contributors and participants.
- e) Organize and supervise the documentation of action items.
- f) Ensure that the acquirer-supplier team satisfies the exit criteria for the technical review or audit.

NOTE—Although some of the actions in the list above typically are associated with the planning aspect for each technical review or audit in this standard, conduct of the technical review or audit includes some of the planning leading up to the review, not just the meeting that many associate with the term *conduct*.

4.5.12.4 Technical review and audit reporting

As part of technical review and audit reporting, the acquirer should

- a) Ensure that the technical review or audit closure and approval (including the applicable content) are documented.
- b) Ensure that the technical review or audit summary report is approved and distributed.

4.5.13 Technical reviews and audits in acquirer-supplier agreements

The required supplier support tasks for all program technical reviews and audits should be defined in the acquirer-supplier agreement. Careful consideration should be given before using the conduct of individual reviews or audits as a basis for progress or performance-based payments contained in the agreement. However, payments for successful closure of specific reviews or audits as part of the established award fee criteria may be considered.

Unless specifically provided for in the acquirer-supplier agreements, successful completion of technical reviews or audits does not affect the requirements, terms, and conditions set forth in those agreement(s).

Technical reviews and audits should not be used to

- a) Constitute official acquirer acceptance of the design according to the acquirer-supplier agreement
- b) Change responsibility as set forth in the acquirer-supplier agreement(s)
- c) Change or affect ownership of the design
- d) Relieve the supplier from meeting specification requirements as set forth in the acquirer-supplier agreement

The Technical Review and Audit process depends on objective documentation, analysis, and process plans. These documents are inherently part of the engineering process and are prepared to document the progress of a configuration managed design and historical design decisions. The correctness and completeness of these documents should be measured against clearly stated objective criteria defined in the acquirer-supplier agreement(s).

The program manager and systems engineer with assistance of the various program functional area experts should ensure that statements of work and contract data requirements list(s) (CDRL) in the acquirer-supplier agreements contain the required plans, specifications and analyses to support the Technical Review and Audit process.

A key technical plan that the acquirer should include in the supplier's CDRL is the supplier's SEMP. The SEMP documents the supplier's planning to implement and support each of the program's technical reviews and audits. The acquirer should ensure provisions are included in the acquirer-supplier agreement for the supplier to update the SEMP as required to ensure it remains aligned with the program SEP.

The SEP and SEMP should document the method and timing of the documentation delivery required for each technical review and audit such that they provide for acquirer SME review and adjudication of comments prior to the specific technical review or audit.

4.6 Media selection for products discussed in this standard

Various portions of this standard discuss specifications or the requirement to document other results. The focus of this standard in these cases is on content objectives and does not require any specific media (e.g., paper document) or any specific format.

5. Requirements for technical reviews and audits

5.1 General

This clause specifies the minimum normative properties for each technical review and audit to which defense program acquirers and suppliers shall agree. These properties are as follows:

- a) Review or audit name
- b) Purpose (why perform this technical review or audit?)
- c) Description (what system properties does it address?)
- d) Timing (when in the system life cycle or contract performance does it occur?)
- e) Entry, content, and exit criteria

5.1.1 Clause 5 tailoring

5.1.1.1 Tailoring for a claim of full conformance

When claiming full conformance with the requirements of this standard, the acquirer shall tailor the contents of this clause only by deleting each technical review and audit not needed for the scope defined in a specific acquirer-supplier agreement.

5.1.1.2 Tailoring for a claim of tailored conformance

When claiming tailored conformance with the requirements of this standard, the acquirer shall tailor the contents of this clause by deleting each technical review and audit not needed for the scope defined in a specific acquirer-supplier agreement, and modifying as required the contents of the mandatory requirements in the remaining reviews and audits.

NOTE—Although certain technical reviews may be defined as mandatory, those definitions are beyond the scope of this standard since this standard is intended to be applicable to the largest possible domain of defense programs.

5.1.2 Accompanying detailed criteria

Each technical review and audit specified in this clause has a corresponding subclause in Clause 6 of this standard that contains detailed criteria for technical review or audit product acceptability, for technical review or audit preparation actions, for technical review or audit conduct and content, and for technical review or audit closure actions.

5.1.3 Detailed criteria tailoring

The acquirer and supplier shall achieve a tailored consensus on the content and criteria for each technical review or audit in this clause that is selected for a specific contract or other agreement during the agreement negotiations by deleting, modifying, or adding items in the tables of the four subordinate paragraphs for the corresponding subclause in Clause 6.

5.1.4 Detailed criteria normative content

The content of the subclause in Clause 6 corresponding to each technical review and audit specified in this clause shall become part of the normative content of that technical review or audit when tailoring is completed.

5.1.5 Detailed tailoring based on program type

Some programs may find the need to tailor the content of this standard at the program level to add numerous other reviews, based on program characteristics such as complexity, risk posture, nature, or specific domain. Some examples include Operational Readiness Review, System Readiness Review, and Transition Readiness Review. Tailoring at this level of detail is beyond the scope of this standard. Any tailoring required due to program type should be accomplished by service-level governance or acquirer PMOs or domains.

5.1.6 Clause 5 content application

5.1.6.1 Multiple instances of reviews and audits

Specific reviews or audits in this clause may be performed multiple times during the complete scope of work for a specific program. Multiple instances of a specific technical review or audit usually are performed to support an incremental approach that examines all the details of lower-level subsets of a complex system's hierarchy prior to a summary system-level technical review or audit. The content of this clause has been developed to state *what* actions and content should be included in each technical review or audit rather than the details of *how* those actions or content should be implemented so that the normative content of each subclause in this clause might be applied equally to each instance of its use.

5.1.6.2 Sequencing of multiple technical review or audit instances

If multiple instances of a given technical review or audit are incrementally performed for a system, the system-level technical review or audit shall be conducted only after all lower-level instances of that technical review or audit have been successfully performed and closed.

5.2 Alternative systems review (ASR)**5.2.1 ASR purpose**

The ASR shall be conducted to help ensure the preferred materiel solution has the potential to affordably meet the user's needs and expectations, and that there is sufficient understanding of the technical maturity, feasibility, and risk of the proposed materiel solution.

5.2.2 ASR description

The ASR shall confirm that

- a) The ASR-supported dialog between the end-user and the acquisition community leads to draft documentation of the preferred materiel solution's functional and performance requirements.
- b) The candidate materiel solutions considered in the analysis of alternatives (AoA) provide a broad and balanced evaluation of cost, schedule, performance, concepts of operations, and risk.
- c) The preferred materiel solution resulting from the AoA has the best potential to be cost effective, affordable, operationally effective and suitable, and can be developed to provide a timely solution to the need at an acceptable level of risk.
- d) Threshold requirements derived from the key performance parameters (KPP) and key system attributes (KSA) included in the draft capability development document (CDD) have been captured as threshold requirements in the system requirements documentation.
- e) The decisions based on AoA recommendations, and additional constraints placed on the next phase of development are captured and documented.

5.2.3 ASR timing

The ASR shall be held after the system parameters for the preferred materiel solution are defined and that solution is balanced with cost, schedule, and risk.

5.2.4 ASR entry criteria

The ASR shall be conducted only after the following events have been successfully completed:

- a) The acceptability criteria for each of the ASR technical review products have been established for the specific program by tailoring the contents of Clause 6, Table 1.
- b) All preparatory actions in Clause 6, Table 2 as tailored for the specific program have been successfully accomplished to support conducting the technical review.

- c) The acquirer and supplier concur that the preferred materiel solution, draft concept of operations (CONOPS), and technical plans support the case for a successful ASR as judged against the tailored product acceptance criteria.
- d) Any prior technical reviews have been completed and their action items closed.

5.2.5 ASR content

5.2.5.1 Products to be reviewed at ASR

The following work products at a minimum shall be reviewed by the ASR team. Other products may be added as necessary during tailoring of Clause 6, Table 1 for the specific program.

- a) Refined joint requirements
- b) Initial architecture for the preferred materiel solution(s)
- c) System functional and performance requirements documentation
- d) Preferred materiel solution(s) documentation
- e) Program risk assessment

5.2.5.2 Conduct of the ASR

ASR participants shall assess the ASR work products and judge the products' acceptability according to the applicable criteria in Clause 6, Table 1 as tailored for the specific program.

5.2.5.3 ASR outputs

- a) The review team shall document sufficient assessment results to show the program has produced the following:
 - 1) An agreement on the preferred materiel solution to take forward into development
 - 2) Logical architectural constraints and drivers to address external interface requirements, standards, and system extensibility requirements
 - 3) A comprehensive rationale for the preferred materiel solution, including the results of the AoA that evaluated the relative cost, schedule, performance (hardware, human, software), and technology risks
 - 4) An updated (if necessary) risk and opportunity assessment and associated risk mitigation and opportunity handling plans
 - 5) Draft system requirements derived from the KPPs and KSAs
 - 6) Identification of critical technologies that will be prototyped
- b) The ASR technical review summary report shall be distributed containing the following attachments:
 - 1) List of attendees
 - 2) Final copies of all presentations

- 3) Updated (if necessary) risk assessment, mitigation plans, and opportunity handling plans
- 4) Documented action items including those required for closure
- 5) The tailored Clause 6, Table 1 through Table 4 as completed following the technical review
- 6) Meeting minutes

5.2.6 ASR exit criteria

The ASR shall be deemed completed only after the following events have been successfully completed:

- a) All action items submitted during the technical review have been appropriately addressed.
- b) All actions listed in the action items required for review closure have been completed and approved by the required parties.
- c) The preferred materiel solution documentation is complete and acceptable according to the pre-defined acceptance criteria, and the solution has the potential to meet user needs.
- d) Each of the technical review products listed in Clause 6, Table 1 as tailored for the specific program meets all of its acceptability criteria, or has a corrective action plan documenting the corrective actions required to achieve acceptability.
- e) The acquirer and supplier concur that the program risk level is acceptable.
- f) The ASR chair formally closes the review.

5.3 System requirements review (SRR)

5.3.1 SRR purpose

The SRR shall be conducted to help ensure the level of understanding of top-level system requirements is adequate to support further requirements analysis and design activities, and that the system can proceed into initial system design with acceptable risk.

5.3.2 SRR description

The SRR shall confirm that

- a) The acquirer and supplier mutually understand the system requirements and performance requirements as captured in the system specification documentation, and that those requirements
 - 1) Are consistent with the preferred materiel solution (including its support concept)
 - 2) Are consistent with program budget, schedule, risk, user and other program-specific constraints
 - 3) Are feasible given available technologies for the preferred system solution
 - 4) Adequately consider the maturity of interdependent system elements
 - 5) Have bi-directional traceability with the set of source documents
 - 6) Have verification methods that are defined and agreed upon
 - 7) Can meet the program's objectives with manageable risk
- b) All system requirements and performance requirements derived from the initial capabilities document (ICD), draft CDD, other acquirer source documentation, and acquirer-accepted requirements previously provided by suppliers' mission analysis or other supplier in-house

requirements definition are documented; and consistent with budget, schedule, risk, other program and system constraints, and with end-user expectations.

- c) Technical requirements from all acquisition documentation [e.g., program protection plan (PPP), TEMP, reliability, availability, maintainability, and cost (RAM-C) rationale report] are allocated to specifications.
- d) The technical requirements, including statutory and regulatory requirements, have been correctly and completely represented in the set of system requirements and can be developed within program budget and schedule constraints.
- e) The level of understanding of top-level system requirements is adequate to support further requirements analysis, decomposition, allocation, and design activities.
- f) Tailorable, derived, and correlated requirements are established within the framework of a candidate system logical architecture and fully derived functional segments.
- g) System performance requirements, non-tailorable design requirements, tailorable design requirements, available technology, and program resources (funding, schedule, staffing, and processes) are understood and will support further definition of the system logical architecture.

5.3.3 SRR timing

The SRR shall be held when the level of understanding of top-level system requirements is adequate to support further requirements analysis and design activities.

5.3.4 SRR entry criteria

The SRR shall be conducted only after the following events have been successfully completed:

- a) The acceptability criteria for each of the SRR technical review products have been established for the specific program by tailoring the contents of Clause 6, Table 5.
- b) All preparatory actions in Clause 6, Table 6 as tailored for the specific program have been successfully accomplished to support conducting the technical review.
- c) The acquirer and supplier have received evidence that the system specification, technical plans, and program budget estimate are sufficiently mature to support the case for a successful SRR as judged against the tailored product acceptance criteria.
- d) Any prior technical reviews have been completed and its action items closed.

5.3.5 SRR content

5.3.5.1 Products to be reviewed at SRR

The following work products at a minimum shall be reviewed by the SRR team. Other products may be added as necessary during tailoring of Clause 6, Table 5 for the specific program.

- a) System specification
- b) Technical plans
- c) Program risk assessment
- d) Program life-cycle cost estimate

5.3.5.2 Conduct of the SRR

SRR participants shall assess the SRR work products and judge the products' acceptability according to the applicable criteria in Clause 6, Table 5 as tailored for the specific program.

5.3.5.3 SRR outputs

- a) The review team shall document sufficient assessment results to show the program has produced the following:
 - 1) An approved preliminary system specification
 - 2) A preliminary allocation of system requirements to hardware, human, and software subsystems, with bi-directional traceability between the allocated requirements and the source documents
 - 3) Documented external interface requirements
 - 4) An approved product support plan (PSP) with updates
 - 5) Technical plans that are current and address the full scope of work
 - 6) A software development plan (SDP) that adequately addresses the software-specific acceptability criteria in the tailored Clause 6, Table 5 technical plans section
 - 7) An updated (if necessary) risk and opportunity assessment and associated risk mitigation and opportunity handling plans
 - 8) A determination that the system requirements, preferred system solution, available technology, and program resources form a satisfactory basis for proceeding
- b) The SRR technical review summary report shall be distributed containing the following attachments:
 - 1) List of attendees
 - 2) Final copies of all presentations
 - 3) Updated (if necessary) risk assessment, mitigation plans, and opportunity handling plans
 - 4) Documented action items including those required for closure
 - 5) The tailored Clause 6, Table 5 through Table 8 as completed following the technical review
 - 6) Meeting minutes

5.3.6 SRR exit criteria

The SRR shall be deemed completed only after the following events have been successfully completed:

- a) All action items submitted during the technical review have been appropriately addressed.
- b) All actions listed in the action items required for review closure have been completed and approved by the required parties.
- c) Each of the technical review products listed in Clause 6, Table 5 as tailored for the specific program meets all of its acceptability criteria, or has a corrective action plan documenting the corrective actions required to achieve acceptability.
- d) The acquirer and supplier concur that the program risk level is acceptable.
- e) All affected baselines have been updated in the applicable configuration management (CM) system(s).
- f) The SRR chair formally closes the review.

5.4 System functional review (SFR)

5.4.1 SFR purpose

The SFR shall be conducted to help ensure that the system under review can proceed into preliminary design with acceptable risk and that all system requirements and functional performance requirements derived from the approved preliminary system specification are defined and are consistent with the program budget, program schedule, risk, and other program and system constraints.

5.4.2 SFR description

The SFR shall confirm that

- a) The system performance requirements, lower-level performance requirements, and plans for design and development form a satisfactory basis for proceeding to preliminary design.
- b) Design decisions and supporting rationale are documented to support bi-directional traceability from the source of the requirement to the functional baseline and preliminary allocated baseline.
- c) The lower-level performance requirements are fully defined and are consistent with the mature system concept.
- d) The requirements analysis has progressed to the point that the proposed requirements baseline is accurate, comprehensive, and fulfills the user-specified performance requirements contained in the draft CDD.
- e) Verification criteria and methods have been identified for all requirements, to be used during the SVR.
- f) The preliminary allocated baseline reflects the proposed requirements baseline and is balanced with respect to performance, cost, schedule, risk, and potential for evolutionary growth.
- g) The system functional baseline is technically achievable with regard to cost, schedule, and performance.
- h) The life-cycle cost (LCC) for the evolving design is consistent with the program affordability constraints.
- i) The preliminary physical architecture, program work breakdown structure, and contract work breakdown structure to be used subsequent to the SFR are all consistent.
- j) Risks have been identified and mitigation plans are in place.

5.4.3 SFR timing

The SFR shall be held after the system functionality has been fully defined and all functional baseline documentation is complete.

5.4.4 SFR entry criteria

The SFR shall be conducted only after the following events have been successfully completed:

- a) The acceptability criteria for each of the SFR technical review products have been established for the specific program by tailoring the contents of Clause 6, Table 9.
- b) All preparatory actions in Clause 6, Table 10 as tailored for the specific program have been successfully accomplished to support conducting the technical review.

- c) The acquirer program manager and systems engineer have received evidence that the system functional baseline is fully defined and sufficiently documented to support the case for a successful SFR as judged against the tailored product acceptance criteria.
- d) Any prior technical review has been completed and its action items closed.

5.4.5 SFR content

5.4.5.1 Products to be reviewed at SFR

The following work products at a minimum shall be reviewed by the SFR team. Other products may be added as necessary during tailoring of Clause 6, Table 9 for the specific program.

- a) System functional baseline documentation
- b) Major system elements definition
- c) Program risk assessment
- d) Technical plans

5.4.5.2 Conduct of the SFR

SFR participants shall assess the SFR work products and judge the products' acceptability according to the applicable criteria in Clause 6, Table 9 as tailored for the specific program.

5.4.5.3 SFR outputs

- a) The review team shall document sufficient assessment results to show the program has produced the following:
 - 1) An established system design traceable to the approved system specification (functional baseline).
 - 2) An updated (if necessary) risk and opportunity assessment and associated risk mitigation and opportunity handling plans.
 - 3) Current data to update the cost analysis requirements description (CARD) document, based on the supplier's proposed system functional baseline.
 - 4) An updated program development schedule including system and software critical path drivers.
 - 5) Initial requirement allocations to hardware configuration items (HWCI), software configuration items (SWCI), and humans.
- b) The SFR technical review summary report shall be distributed containing the following attachments:
 - 1) List of attendees
 - 2) Final copies of all presentations
 - 3) Requirements compliance assessment to determine the degree to which each requirement in the system functional baseline documentation satisfies one or more of the requirements in the draft CDD
 - 4) Updated (if necessary) risk assessment, mitigation plans, and opportunity handling plans
 - 5) Documented action items including those required for closure

- 6) The tailored Clause 6, Table 9 through Table 12 as completed following the technical meeting minutes

5.4.6 SFR exit criteria

The SFR shall be deemed completed only after the following events have been successfully completed:

- a) All action items submitted during the technical review have been appropriately addressed.
- b) All actions listed in the action items required for review closure have been completed and approved by the required parties.
- c) Each of the technical review products listed in Clause 6, Table 9 as tailored for the specific program meets all of its acceptability criteria, or has a corrective action plan documenting the corrective actions required to achieve acceptability.
- d) The acquirer and supplier concur that the program risk level is acceptable.
- e) All affected baselines have been updated in the applicable CM system(s).
- f) The SFR chair formally closes the review.

5.5 Preliminary design review (PDR)

5.5.1 PDR purpose

The PDR shall be conducted to help ensure the preliminary design for the system under review is sufficiently mature and ready to proceed into detailed design and can meet the stated performance requirements within program budget, schedule, risk, and other program and system constraints.

5.5.2 PDR description

The PDR shall confirm that

- a) All system-level functional and performance requirements baselined at SRR and SFR have been correctly decomposed or directly allocated to the lowest level of the specification tree for all system elements uniquely identified.
- b) Sufficient requirements trades have been conducted, supported by systems engineering trade-off analyses, to influence the system physical architecture and allocated requirements.
- c) The allocated baseline is complete.
- d) The design as disclosed satisfies all requirements in the approved system specification.
- e) All external interfaces to the system, as defined at the SRR, have been documented in interface control documents.
- f) All system internal interfaces (system element to system element) have been documented in interface control documents.
- g) The verification approach to demonstrate achievement of all allocated performance requirements has been documented.
- h) All design constraints have been captured and incorporated into the allocated requirements and the design.
- i) Bi-directional traceability exists between the source requirements and the design elements for all decomposed and allocated requirements.

- j) All system hardware element physical architectures are complete.
- k) All system hardware element development specifications are complete.
- l) The software logical and physical architectures are complete to the extent specified in the SDP for the point in its life cycle at which PDR occurs, based on the selected life-cycle model(s).
- m) The set of system elements comprising the preliminary system design can achieve the complete set of allocated system baseline requirements, and forms a satisfactory basis for proceeding into detailed design with acceptable risk.
- n) All critical technologies have been demonstrated in a relevant environment and can be integrated into a system with acceptable risk.
- o) Risks have been identified and mitigation plans are in place.

5.5.3 PDR timing

The PDR shall be held when the acquirer and supplier concur that the system-level preliminary design and allocated baseline documentation are complete, and prior to the beginning of detailed design.

5.5.4 PDR entry criteria

The PDR shall be conducted only after the following events have been successfully completed:

- a) The acceptability criteria for each of the PDR technical review products have been established for the specific program by tailoring the contents of Clause 6, Table 13.
- b) All preparatory actions in Clause 6, Table 14 as tailored for the specific program have been successfully accomplished to support conducting the technical review.
- c) The acquirer and supplier concur that the allocated baseline and the program budget estimate are sufficiently mature to support the case for a successful PDR as judged against the tailored product acceptance criteria.
- d) Any prior system element level or incremental PDRs on which this PDR is dependent have been completed and their action items closed, or documented action items required for closure are acknowledged.

5.5.5 PDR content

5.5.5.1 Products to be reviewed at PDR

The following work products at a minimum shall be reviewed by the PDR team. Other products may be added as necessary during tailoring of Clause 6, Table 13 for the specific program.

- a) System allocated baseline documentation
- b) System functional or allocated baseline documentation
- c) Technical plans
- d) Program risk assessment
- e) Program life-cycle cost estimate

5.5.5.2 Conduct of the PDR

PDR participants shall assess the PDR work products and judge the products' acceptability according to the acceptability criteria in Clause 6, Table 13 as tailored for the specific program.

5.5.5.3 PDR outputs

- a) The review team shall document sufficient assessment results to show the program has produced
 - 1) Technical data for the allocated baseline that are complete, satisfy the system specification, and provide a sufficient foundation for detailed design to proceed.
 - 2) Bi-directional traceability between all decomposed and allocated requirements to the lowest level of the specification tree, demonstrating that each and every function in the functional baseline has been allocated to one or more of the system elements, that the physical hierarchy is consistent with the functional baseline, and that there are no orphan system elements.
 - 3) Technical plans that are current and address the full scope of work.
 - 4) An updated (if necessary) risk and opportunity assessment, and associated risk mitigation and opportunity handling plans.
 - 5) Feasibility, budget, and schedule that are determined to be within acceptable risk margins.
 - 6) A program IMS that has been updated (including systems and software critical path drivers) and includes all activities required to complete CDR (assuming same developer responsible for PDR and CDR).
 - 7) Updates to the CARD that reflect the design in the allocated baseline.
 - 8) Evidence to inform realistic requirements for EMD contract specifications.
 - 9) Interface requirements contained in system external interface control documentation and internal interface control documentation.
- b) The PDR technical review summary report shall be distributed containing the following attachments:
 - 1) List of attendees
 - 2) Final copies of all presentations
 - 3) Updated (if necessary) risk assessment, mitigation plans, and opportunity handling plans
 - 4) Documented action items including those required for closure
 - 5) The tailored Clause 6, Table 13 through Table 16 as completed following the technical review
 - 6) Meeting minutes

5.5.6 PDR exit criteria

The PDR shall be deemed completed only after the following events have been successfully completed:

- a) All action items submitted during the technical review have been appropriately addressed.
- b) All actions listed in the action items required for review closure have been completed and approved by the required parties.
- c) The content of corrective action plans for issues identified in the PDR is sufficiently complete and unambiguous to enable successful completion of all corrective actions.
- d) Each of the technical review products listed in Clause 6, Table 13 as tailored for the specific program meets all of its acceptability criteria, or has a corrective action plan documenting the corrective actions required to achieve acceptability.
- e) The acquirer and supplier concur that the program risk level is acceptable.
- f) All affected baselines have been updated in the applicable CM system(s).
- g) The PDR chair formally closes the review.

5.6 Critical design review (CDR)

5.6.1 CDR purpose

The CDR shall be conducted to help ensure that the detailed design for the system under review is adequate to proceed into fabrication, system integration, demonstration and test and can meet stated performance requirements within budget, schedule, risk, and other system constraints.

5.6.2 CDR description

The CDR shall confirm that

- a) The initial product baseline is complete and describes the detailed design for production, fielding/deployment, and operations and support.
- b) The system detailed design, down to the lowest system element level, is expected to satisfy the requirements of the system specification as derived from the CDD within current budget and schedule constraints.
- c) The set of system elements comprising the detailed system design, including all internal and external interfaces, forms a satisfactory basis for proceeding into fabrication, integration and testing of pre-production versions of the system's HWCIs and SWCI(s) with acceptable risk.
- d) The detailed design of each individual configuration item (CI) that is an integral part of the system under review can meet the stated performance and engineering specialty requirements of the CI development specifications within program budget, schedule, risk, and other program and system constraints.
- e) The flowdown of requirements from the functional baseline to the lowest-level system detailed design element for each end item in the specification tree is complete and captured in each CI detailed design.
- f) Bi-directional traceability exists between the source of the functional and allocated baselines and the lowest-level detailed design baselines.
- g) The detailed designs for all external interfaces to the system satisfy the interface requirements contained in the system external interface control documentation defined at the PDR.
- h) The detailed designs for all interfaces internal to the system elements satisfy the interface requirements contained in the system internal interface control documentation defined at the PDR.
- i) Verification requirements to demonstrate achievement of all specified allocated performance characteristics have been documented.
- j) All design constraints and considerations have been captured and incorporated into the allocated requirements and the detailed design.
- k) All design items incorporate technologies that have been demonstrated in a relevant environment and can be integrated into a system with acceptable risk.
- l) Critical manufacturing processes that affect the system's key characteristics have been identified and their capability to meet design tolerances has been demonstrated in a production-representative environment.
- m) All system hardware element physical architectures and most detailed designs are complete.
- n) Detailed designs are complete for all critical safety items (CSI) and critical application items (CAI).
- o) Most system hardware element development specifications are complete.
- p) Development specifications are complete for all CSIs and CAIs.

- q) The software logical and physical architectures and detailed design are complete to the extent specified in the SDP for the point in its life cycle at which CDR occurs, based on the selected life-cycle model(s).
- r) The program's decision management process documentation shows that key decisions are fully documented, executable and accompanied by sufficient rationale that supports each decision.

5.6.3 CDR timing

The CDR shall be held when the acquirer and supplier concur that the initial product baseline is complete, and when the system design is stable and is expected to meet system performance requirements and affordability goals.

5.6.4 CDR entry criteria

The CDR shall be conducted only after the following events have been successfully completed:

- a) The acceptability criteria for each of the CDR technical review products have been established for the specific program by tailoring the contents of Clause 6, Table 17.
- b) All preparatory actions in Clause 6, Table 18 as tailored for the specific program have been successfully accomplished to support conducting the technical review.
- c) The acquirer and supplier concur that the initial product baseline and the program budget estimate is sufficiently mature to support the case for a successful CDR as judged against the tailored product acceptance criteria.
- d) For the final CDR, any prior system element level or incremental CDRs have been completed and their action items closed.

5.6.5 CDR content

5.6.5.1 Products to be reviewed at CDR

The following work products at a minimum shall be reviewed by the CDR team. Other products may be added as necessary during tailoring of Clause 6, Table 17 for the specific program.

- a) System product baseline documentation
- b) System functional or allocated or product baseline documentation
- c) Technical plans
- d) Program risk assessment
- e) Program life-cycle cost estimate

5.6.5.2 Conduct of the CDR

CDR participants shall assess the CDR work products and judge the products' acceptability according to the acceptability criteria in Clause 6, Table 17 as tailored for the specific program.

5.6.5.3 CDR outputs

- a) The review team shall document sufficient assessment results to show the program has produced
 - 1) A documented system initial product baseline with approved HWCIs and SWCI(s).

- 2) Detailed design data for the initial product baseline that satisfy the system specification and that are sufficiently complete to support hardware fabrication and continued software implementation.
 - 3) A documented and approved analysis with rationale supporting the conclusion that the initial product baseline satisfies the CDD.
 - 4) Bi-directional traceability between all decomposed and allocated requirements to the lowest level of the specification tree and the system detailed design elements, demonstrating that each and every function in the functional baseline has been allocated to one or more of the system elements and that there are no orphan system elements in the detailed design.
 - 5) Technical plans that are current and that address the full scope of work.
 - 6) Corrective action plans for issues identified in the CDR.
 - 7) An updated (if necessary) risk and opportunity assessment and associated risk mitigation and opportunity handling plans.
 - 8) Feasibility, budget, and schedule that are determined to be within acceptable risk margins.
 - 9) A program IMS that has been updated including fabrication, software implementation, test and evaluation, and critical path drivers.
 - 10) Updates to the CARD based on the system initial product baseline.
 - 11) An updated life-cycle sustainment plan (LCSP) including program sustainment development efforts and schedules based on current budgets, test evaluation results and firm supportability design features.
- b) The CDR technical review summary report shall be distributed containing the following attachments:
- 1) List of attendees
 - 2) Final copies of all presentations
 - 3) Updated (if necessary) risk assessment, mitigation plans, and opportunity handling plans
 - 4) Documented action items including those required for closure
 - 5) The tailored Clause 6, Table 17 through Table 20 as completed following the technical review
 - 6) Meeting minutes

5.6.6 CDR exit criteria

The CDR shall be deemed completed only after the following events have been successfully completed:

- a) All action items submitted during the technical review have been appropriately addressed.
- b) All actions listed in the action items required for review closure have been completed and approved by the required parties.
- c) The content of corrective action plans for issues identified in the CDR is sufficiently complete and unambiguous to enable successful completion of all corrective actions.
- d) Each of the technical review products listed in Clause 6, Table 17 as tailored for the specific program meets all of its acceptability criteria, or has a corrective action plan documenting the corrective actions required to achieve acceptability.
- e) The acquirer and supplier concur that the program risk level is acceptable.
- f) All affected baselines have been updated in the applicable CM system(s).
- g) The CDR chair formally closes the review.

5.7 Test readiness review (TRR)

5.7.1 TRR purpose

The TRR shall be conducted to assess test objectives, test methods and procedures, test scope, safety, readiness for acquirer and supplier development test and evaluation (DT&E), and whether test resources have been properly identified and obtained.

5.7.2 TRR description

The TRR shall confirm that

- a) The system or system element(s) are sufficiently mature and stable in configuration to begin testing.
- b) The test procedures together with the planned test data to be collected are sufficiently robust to verify satisfaction of the requirements set for which the test is intended to address.
- c) Disciplined test processes are in place and the test procedures have been validated prior to use.
- d) Sufficient test personnel and their collective skill sets are available, and their roles and responsibilities have been clearly defined.
- e) The test team understands the system or system element capabilities to be tested and any vulnerabilities and limitations of the system element(s) under test sufficiently well to conduct the testing accurately.
- f) Sufficient test facilities, data collection systems, calibrated test support equipment, and logistics support necessary to perform the planned test is available and assigned to the task.
- g) Risks to equipment and human safety have been identified, analyzed, and addressed to mitigate potential hazardous outcomes.

5.7.3 TRR timing

The TRR shall be held prior to any formal testing for the record, when the acquirer and supplier agree that all applicable documentation for the system elements under test are sufficiently complete and that all planning for personnel, test facilities, logistics and support equipment is sufficiently robust to support a successful test.

5.7.4 TRR entry criteria

The TRR shall be conducted only after the following events have been successfully completed:

- a) The acceptability criteria for each of the TRR technical review products have been established for the specific program by tailoring the contents of Clause 6, Table 21.
- b) All preparatory actions in Clause 6, Table 22 as tailored for the specific program have been successfully accomplished to support conducting the technical review.
- c) All applicable test procedures have been validated for use in formal testing for the record, by dry runs or alternative methods.
- d) The acquirer and supplier concur that the results of any preliminary functional or pre-qualification testing form a satisfactory basis for proceeding with the TRR.
- e) Any prior system element level or incremental readiness reviews have been completed and their action items closed.

5.7.5 TRR conduct**5.7.5.1 Products to be reviewed at TRR**

The following work products at a minimum shall be reviewed by the TRR team. Other products may be added as necessary during tailoring of Clause 6, Table 21 for the specific program.

- a) System technical documentation
- b) Test environment
- c) Program execution and process control
- d) Risk assessment
- e) Program life-cycle cost estimate and schedules

5.7.5.2 Conduct of the TRR

TRR participants shall assess the TRR work products and judge the products' acceptability according to the acceptability criteria in Clause 6, Table 21 as tailored for the specific program.

5.7.5.3 TRR outputs

- a) The review team shall document sufficient assessment results to show the program has produced the following:
 - 1) A documented plan for addressing technical issues and obstacles that might occur during conduct of the test
 - 2) An updated (if necessary) risk and opportunity assessment and associated risk mitigation and opportunity handling plans
 - 3) Lists of potential anomalies, limitations and system vulnerabilities for the planned test event
 - 4) Verification that all planned preliminary or informal tests have been conducted and that the results satisfactorily indicate that the formal test event can begin
 - 5) Verification that the system elements under test are sufficiently mature, defined and representative to accomplish the planned test objectives
 - 6) Verification that the necessary safety releases from the program office have been provided to the testers prior to any test activities using personnel
 - 7) Completed and approved test plans and procedures for the planned test event
 - 8) Complete identification and allocation of all required test resources to the planned test
 - 9) A recommendation on readiness to commence testing
- b) The TRR summary shall be distributed containing the following attachments:
 - 1) List of attendees
 - 2) Final copies of all presentations
 - 3) Updated (if necessary) risk assessment, mitigation plans, and opportunity handling plans
 - 4) Documented action items including those required for closure
 - 5) The tailored Clause 6, Table 21 through Table 24 as completed following the technical review
 - 6) Recommendation on readiness to commence the formal test event
 - 7) Meeting minutes

5.7.6 TRR exit criteria

The TRR shall be deemed completed only after the following events have been successfully completed:

- a) All action items submitted during the technical review have been appropriately addressed.
- b) All actions listed in the action items required for review closure have been completed and approved by the required parties.
- c) The content of corrective action plans for issues identified in the TRR is sufficiently complete and unambiguous to enable successful completion of all corrective actions.
- d) Each of the technical review products listed in Clause 6, Table 21 as tailored for the specific program meets all of its acceptability criteria, or has a corrective action plan documenting the corrective actions required to achieve acceptability.
- e) The acquirer and supplier concur that the risk level is acceptable.
- f) The TRR chair formally closes the review.

5.8 Functional configuration audit (FCA)

5.8.1 FCA purpose

The FCA shall be conducted to ascertain that a CI's actual performance meets the requirements stated in the functional and allocated baseline documentation.

5.8.2 FCA description

The FCA shall confirm that

- a) The CI's actual performance based on results of approved verification methods (test, demonstration, analysis, or inspection) satisfies the performance requirements in the functional and allocated baselines.
- b) For those performance requirements that cannot be completely verified during testing, adequate analysis or simulation using approved methods has produced validated data to permit assessment of an acceptable risk level that system performance will satisfy those requirements.
- c) The initial product baseline documentation (drawings, parts lists) accurately reflects the physical configuration for which the test data and any analysis and simulation data are verified.

5.8.3 FCA timing

The FCA shall be held when the acquirer and supplier concur that the CI development is complete and actual CI performance as documented in development test (DT), analysis, and simulation data is sufficient to show satisfaction of the functional and allocated baselines.

NOTE—A system-level FCA may be held concurrently with SVR.

5.8.4 FCA entry criteria

The FCA shall be conducted only after the following events have been successfully completed:

- a) The acquirer has verified that actual CI performance satisfies the functional and allocated baselines.
- b) The acceptability criteria for each of the FCA technical review products have been established for the specific program and CI by tailoring the contents of Clause 6, Table 25.

- c) All preparatory actions in Clause 6, Table 26 as tailored for the specific program and CI have been successfully accomplished to support conducting the audit.
- d) Any prior CI-level or incremental FCAs have been completed and their action items closed.

5.8.5 FCA content

5.8.5.1 Products to be reviewed at FCA

The following work products at a minimum shall be reviewed by the FCA team. Other products may be added as necessary during tailoring of Clause 6, Table 25 for the specific program and CI.

- a) Functional, allocated and product baseline documentation
- b) Program execution and process control
- c) Verification results

5.8.5.2 Conduct of the FCA

FCA participants shall assess the FCA work products and judge the products' acceptability according to the acceptability criteria in Clause 6, Table 25 as tailored for the specific program and CI.

5.8.5.3 FCA outputs

- a) The review team shall document sufficient assessment results to show the program has produced the following:
 - 1) Official, approved FCA minutes incorporating at a minimum the following items as part of the official record:
 - i) All test plans, specifications, descriptions, procedures, reports, and test data that were reviewed by the FCA team
 - ii) A complete list of successfully accomplished functional tests
 - iii) A complete list of any functional tests required by the system specification or other test plans that have not yet been performed
 - iv) Partial FCA completion status for any CIs whose functional test completion is contingent on higher-level integration testing
 - v) Audit results for each of the work product categories assessed during the audit
 - vi) Configuration identification documentation that comprehensively defines the system product baseline configuration that is the object of the FCA work products
 - 2) An FCA team assessment of the CI's satisfaction of its functional and allocated requirements
- b) The FCA technical audit summary report shall be distributed containing the following attachments:
 - 1) List of attendees
 - 2) Final copies of any presentations given to the FCA team
 - 3) FCA minutes
 - 4) The FCA team's assessment of the CI's satisfaction of its functional and allocated requirements

5.8.6 FCA exit criteria

The FCA shall be deemed completed only after the following events have been successfully completed:

- a) All action items submitted during the audit have been appropriately addressed.
- b) All actions listed in the action items required for review closure have been completed and approved by the required parties.
- c) The content of corrective action plans, if any, for issues identified in the FCA is sufficiently complete and unambiguous to enable successful completion of all corrective actions.
- d) Each of the technical review products listed in Clause 6, Table 25 as tailored for the specific program and CI meets all of its acceptability criteria, or has a corrective action plan documenting the corrective actions required to achieve acceptability.
- e) All baselines in the applicable CM system(s) are current and consistent with the audited FCA work products.
- f) The FCA chair formally closes the audit.

5.9 System verification review (SVR)

5.9.1 SVR purpose

The SVR shall be conducted to verify that the as-tested system meets the requirements in the system functional baseline and is ready to proceed to the next phase with acceptable risk.

5.9.2 SVR description

The SVR shall confirm that

- a) The system correctly and completely implements the system requirements, and system development and applicable implementation and integration are complete.
- b) The system satisfies the requirements in the functional baseline and therefore has a high likelihood of meeting the user's requirements documented in the CDD or capability production document (CPD).
- c) The product baseline documentation (drawings, parts lists) accurately reflects the physical configuration for which the test data and any analysis and simulation data are verified.
- d) Complete, detailed, bi-directional traceability has been maintained between the system requirements and the current approved version of the product baseline.
- e) System specification requirements allocated to commercial off-the-shelf (COTS) or government-furnished equipment items that do not have development specifications are satisfied with test results.

5.9.3 SVR timing

The SVR shall be held following completion of system-level DT&E, and CI-level FCAs.

NOTE—The SVR may be held concurrently with system-level FCA.

5.9.4 SVR entry criteria

The SVR shall be conducted only after the following events have been successfully completed: