IEEE RS Standards Status and Descriptions, and Collaboration Efforts

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Summary

- IEEE Reliability Standards Status
- Collaboration with IEEE Computer Society Standards
- Collaboration with military and other standards bodies

IEEE RS Status

- IEEE 1624-2008 (Standard for Organizational Reliability Capability) - Initially Published in 2009
- IEEE 1633-2008 (Recommended Practice on Software Reliability) - Initially Published in 2009
- IEEE 1413-2010 (Standard for Reliability Predictions)
  - Approved by the Standards Board in March 2010
- IEEE 1332 (Standard Reliability Program For The Development And Production Of Electronic Systems And Equipment)
  - PAR approved by NesCom on 26 March, 2008
  - held working group kick-off meeting on January 31, 2008
  - Planning to complete by 2010
- IEEE 1413.1 (Guide for Selection and Using Reliability Predictions Based on IEEE)
  - PAR approved by NesCom on 26 March, 2008
  - Activity on 1413.1 will begin when 1413 is done.

What is IEEE 1624?

- Standard for Organizational Reliability Capability
- Sponsored by the IEEE Reliability Society
- A method to assist designers in the selection of suppliers that includes assessment of the suppliers' capability to design and manufacture products meeting the customers' reliability requirements.
- A method to identify the shortcomings in reliability programs which can be rectified by subsequent improvement actions
- Developed in cooperation with Carnegie Mellon University (CMU) Software Engineering Institute (SEI)

Purpose of IEEE 1624

- The purpose for assessing the reliability capability of an organization is to facilitate improvement of the product reliability.
- This document does not define an audit process, but rather an assessment process that is suitable for providing data and results as input into an audit process.
- Reliability capability is defined by key practices and associated metrics.
- This Standard does not seek to create or propose creation of certifying bodies that assess whether an organization meets the definitions of reliability capability.
- This Standard can be used for self-assessment by organizations or for supplier/customer relationship development between members of supply chain.

Scope of IEEE 1624

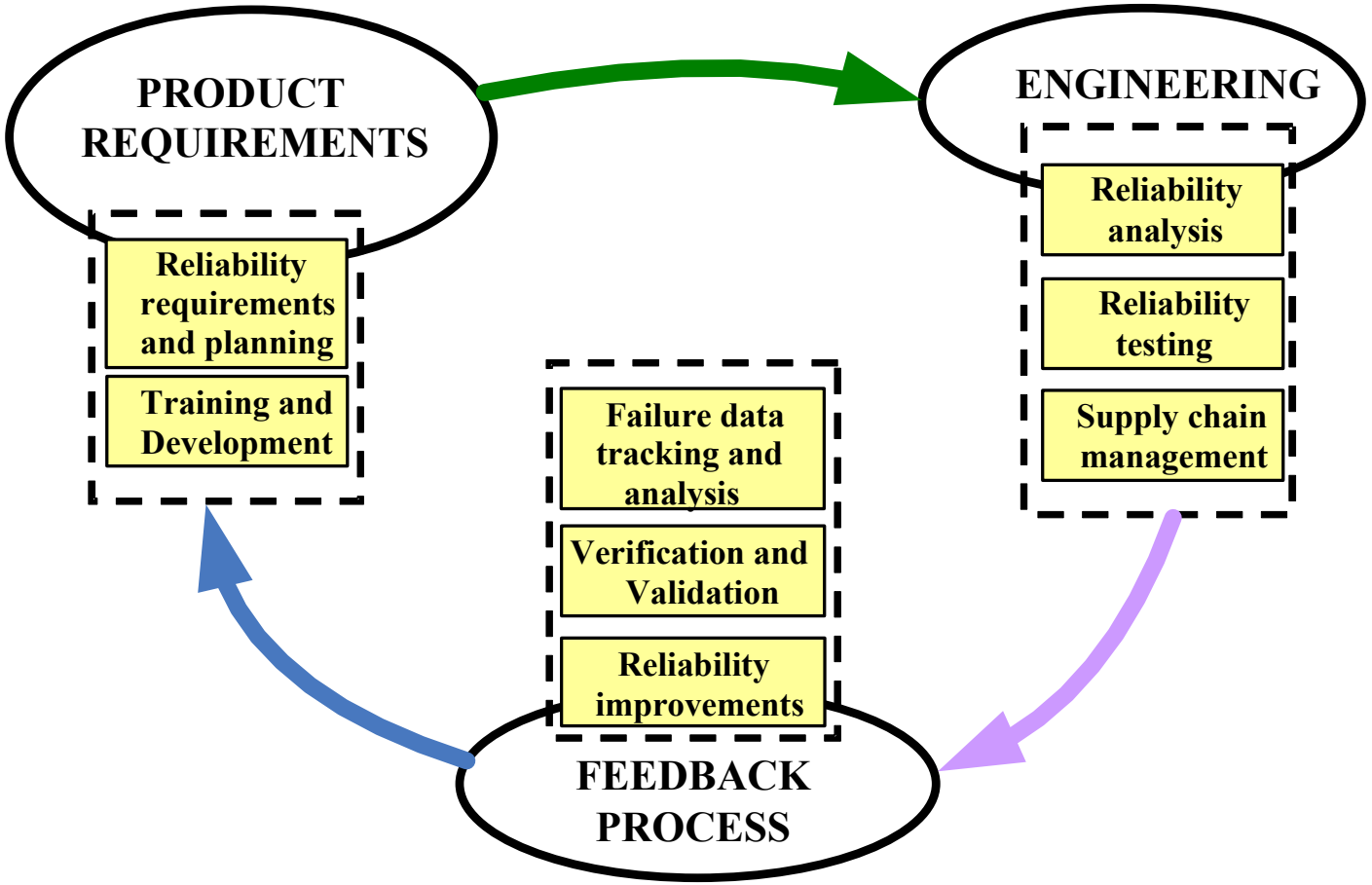
- A standard which defines the reliability capability of organizations and identifies the criteria for assessing the reliability capability of an organization.
- A standard that is intended for organizations that design, manufacture or procure electrical/ electronics components or products.
- Although the concepts described in this Standard could be applied to both hardware and software products, the focus of the standard is on hardware products.

How Will IEEE1624 Serve The Military and Industry?

- Provides a set of ***key practices*** that should be present in an organization involved with development of a reliable product.
- Assess the ***maturity*** of all these key practices to determine the reliability capability level of an organization.
- Select ***process improvement strategies*** by determining the current maturity levels of their reliability practices and identifying the most critical areas for reliability capability improvement.

The Process identifies “What is Needed”, “How to Rate” and “How to Improve”

Key Reliability Practices



This process follows IEEE 1332

Purpose of IEEE1633

- 1633 is a type of “standard” document called a “recommended practice”
- 1633 promotes a systems approach to Software Reliability (SR) predictions and assessments
- Joint development with AIAA
- Leverages CMU SEI CMM/CMMI

Scope of IEEE 1633

- Software Reliability (SR) models have been evaluated and ranked for their applicability to various situations.
- Many improvements have been made in SR modeling and prediction since 1992.
- This Recommended Practice revision reflects those advances in SR since 1992, including modeling and prediction for distributed and network systems.
- The methodologies and tools included in this Recommended Practice are extended over the software life cycle (SLC).

1633 Highlights

- Keene model – CMMI Processes vs size
- SWEEP Tool – STRs and ECOs over time
- CASRE Tool – Failures over time and curve fits to disributions

IEEE 1413

- **New title: Standard Framework for Reliability Prediction of Hardware**
- Purpose: To identify the required elements for an understandable and useful reliability prediction.
- Scope: This standard provides the framework for performing and reporting reliability predictions. It applies to hardware products including electronic, electrical and mechanical devices and assemblies.
- A reliability prediction made according to this standard shall have sufficient information concerning inputs, assumptions, and uncertainty so the risk associated with using the prediction results can be understood.

Uses of a Reliability Prediction

- Establishment of reliability requirements for preliminary design specifications, planning documents, and requests for proposals;
- Allocation of reliability requirements at various levels;
- Comparison of competing designs and products;
- For potential reliability improvement opportunities;
- Inputs to logistics support planning, including forecast of warranty and life cycle costs, spare parts provisioning, availability, and end item availability estimation;
- Verification that reliability requirements have been satisfied and implemented in the design;
- As inputs to safety analysis, including input to failure modes, effects, and criticality analysis (FMECA) and fault tree analysis (FTA);
- Mission reliability estimation;
- Inputs to business and program management planning, including warranty planning, spares provisioning, budget allocation, scheduling, etc;
- Regulatory and certificatory compliance;
- As inputs to the development of a reliability growth planning

RAMS WEBCAST

- Produced and directed the RAMS 2010 Panel on Practical Applications of Empirical Handbook and PoF Methods

IEEE 1332

- **Title: Reliability Program for the Development and Production of Electronic Products**
- Purpose: The purpose of this document is to establish a standard set of objectives which provide an effective structure for the life-cycle activities needed to design, manufacture and utilize reliable electronic products and systems across the supply chain.
- Scope: This document provides a standard set of reliability program objectives for use between customers and producers, or within product development teams, to express reliability program requirements early in the development phase of electronic

IEEE 1332

- Originally published in 1998
- Replacement for MIL-STD-785
- Similar to GEIA 0009 and SAE JA2000
- New project authorized in March 2008
- Planning to complete in 2010

IEEE 1413.1

- **Title:** Guide for Developing and Assessing Reliability Predictions Based on IEEE Standard 1413
- Purpose: The purpose of this guide is to assist in the selection, performance, and comparison of the various reliability prediction processes and methodologies, and prediction results and outputs complying with IEEE 1413 standard.
- Scope: The scope of this guide is to provide processes and methodologies for conducting and assessing reliability predictions for electronic systems or products.
- This Guide will facilitate the understanding of reliability prediction processes and methodologies, and help users to determine how to use the different processes and methodologies during the life cycle of systems and products.

References MIL-HDBK-217 as well as other handbooks and methods

Collaboration Opportunities that were discussed at the IEEE S2ESC Plenary Session in July 2009

- IEEE CS
  - IEEE P982.1 (Standard Dictionary of Measures to Produce Reliable Software)
  - IEEE 15288 (Systems and Software Engineering - System Life Cycle Processes)
  - IEEE 12207 (Systems and Software Engineering - Software Life Cycle Processes)
  - IEEE 1228 – ISO/IEC15026 (Standard for Software Safety Plans)
- IEEE RS
  - IEEE 1332 (Standard Reliability Program)

IEEE 982.1

- IEEE 982.1 is the “IEEE Standard Dictionary of Measures of the Software Aspects of Dependability”.
- As a part of collaboration activities amongst other IEEE Societies, the IEEE-RS-SC began preliminary planning for a new revision to the IEEE 982.1 standard under the auspices of the IEEE Computer Societies committee, Software and Systems Engineering Standards Committee (S2ESC).
- The IEEE-RS-SC identified a new chair for the working group, Kadir Demir
  - Kadir was instrumental in the development of IEEE 1633.
- Project Authorization Request (PAR) is being written for IEEE Standards Board approval
- Members of the IEEE 1633 working group may be available to join the IEEE 982.1 working group in 2010.

Collaboration with Others

- Military and IEEE – MIL-HDBK-217
- Military - GEIA
- ISO/IEC JTC 1/SC 7 (IEEE with ISO/IEC)
- IEEE P1467 (IEEE with IEC TC56)
- VITA51
- AVSI

MIL-HBDK-217

- The IEEE-RS-SC is contributing to the development of other standards outside of the IEEE, such as MIL-HDBK-217 which is sponsored by the Defense Standardization Program Office (DSPO) and Naval Surface Warfare Center (NSWC) Crane Division, NAVSEA.
- MIL-HDBK-217 is the Military Handbook for the Reliability Prediction of Electronic Equipment.
- A working group was formed in early 2009 and began work immediately on drafting a revision to MIL-HBDK-217F, Notice 2.
- On November 12, 2009, the working group submitted a draft to NAVSEA to begin document formatting and final editing.
- NSWC Crane is planning to release a draft of MIL-HBDK-217 Rev G by the middle of 2010 for public review.
- Rev H proposal to include PoF models and Systems Approach

GEIA/TechAmerica

- G-41 Reliability Working Group
  - GEIA-STD-0009 – Reliability Standard
  - HB0009 - the companion handbook to GEIA 0009
- G-48 Systems Safety Working Group
  - GEIA-STD-0010 – Safety Standard

Vision, Mission, Guiding Principles

G41 Reliability Committee

Vision:

Consistent affordable, reliable and maintainable products that satisfy the user's requirements and expectations.

Mission:

Provide ample "how to" guidance to industry and government, for the four Objectives of ANSI/GEIA-STD-0009-2008 in developing reliable products and systems, successfully demonstrate them during test and evaluation, and sustain them throughout the system/product life cycle.

Guiding Principles:

- Industry and government shall be provided tangible, high value added products, with visible benefits.
- Individual committee members shall, at all times, conduct themselves in a highly ethical manner in all activities and relationships with other committee members, companies, and government entities.
- Maximum advantage shall be taken of similar or related materials developed by other associations, societies, and functions to minimize or preclude similar or duplicative activities.

Information Flow Between Objectives

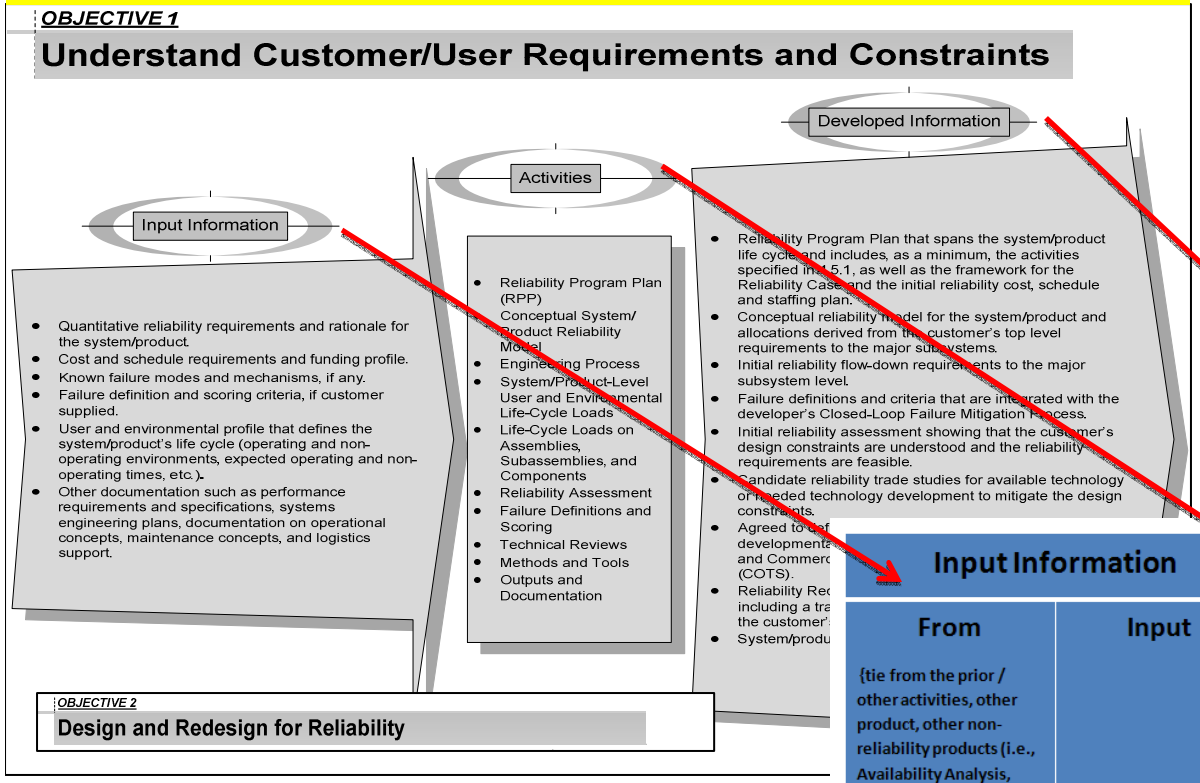
GEIA-STD-0009

Engineering, Operations & Technology | **Boeing Research & Technology**

Figure 1 — Information Flow Between Objectives

Handbook Content Approach

ANSI/GEIA-STD-0009



Input Information		Activities	Developed Information	
From	Input		Product	Goes To
{tie from the prior / other activities, other product, other non-reliability products (i.e., Availability Analysis, Maintainability Analysis) pointer can be self referential}				{tie to the next / other activities, other product, other non-reliability products (i.e., Availability Analysis, Maintainability Analysis) pointer can be self referential}
{Source that is directing the input }	{Inputs needed for the Activity (source)}	4.5.1.3 Engineering Process	{What is the output of the Activity }	{Where is this output used }

HB0009

ISO/IEC JTC 1/SC 7

- The IEEE Standards Association and ISO Central Secretariat have concluded a PSDO – Partner Standards Development Organization – agreement.
- The agreement provides uniform procedures for joint development and maintenance of standards by IEEE and ISO and IEC JTC 1.
- The standards worked by IEEE under Category A liaison with SC7 are grouped into 3 project sets.

Why Collaborate?

- The IEEE Computer Society is undertaking efforts to make the Society the “go to” place for software engineering.
- One of their strengths is the standards collection of the Software and Systems Engineering Standards Committee (S2ESC).
- One of their weaknesses is inconsistency between these standards and international standards (from ISO/IEC JTC 1/SC 7) on the same subject. This handicaps the global appeal of their standards.
- The IEEE has undertaken a program to make the two collections (IEEE and ISO/IEC) completely consistent.
- Several methods:
  - Sometimes SC 7 adopts an IEEE standard.
  - Sometimes IEEE adopts an SC 7 standard.
  - Sometimes they merge respective standards.
  - Sometimes they perform “joint development” of a new standard or a revision.

Current Projects - 1

WG	Project	POC	Notes
2	15839, LC data	Annette Reilly, editor	Joint revision is underway with IEEE.
2	2651x, User documentation	Annette Reilly, editor	IEEE contributed base document. IEEE is adopting 2651x series.
4	14102, 14471, CASE tools		IEEE is adopting 14102 and 14471.
6	SQUARE series		IEEE uses 9126-1 as its product quality model and will consider 25010 for adoption when completed.
6	14143-1, FSM concepts		IEEE is withdrawing its older edition.
6	25051, SW product quality		IEEE withdrew its older edition (which was an adoption of ISO/IEC 12119).

Current Projects - 2

WG	Project	POC	Notes
7	15288 and 12207, LC Processes		Published joint with IEEE
7	14764, Maintenance; 15939, Measurement; 16085, Risk management; 16326, Project management		Published joint with IEEE
7	15026-x, Systems and software assurance	Sam Redwine, editor	IEEE is adopting each part as it becomes available.
7	26702, Systems engineering process	Terry Doran, editor	Fast-track of IEEE 1220. Joint revision is planned.
7	29148, Requirements management	Mark Henley, co-editor	IEEE contributed documents. Joint development underway.
7	IEEE 828, Configuration management	Alastair Walker, rapporteur	IEEE is revising in anticipation of fast-track submission
7	24748-x, LC management guides		IEEE is adopting each part as it becomes available.
7	24774, Process description		IEEE uses it to describe their processes.

Current Projects - 3

WG	Project	POC	Notes
20	19759, SWEBOK Guide	Juan Garbojosa, Gargi Keeni, editors	Published joint with IEEE CS. SC 7 expert review for revision is underway.
20	24773, Certification of SW professional		IEEE CS has two conforming certifications
22	24765, Vocabulary	Annette Reilly, editor	Published joint with IEEE. IEEE CS hosts web site for public, free access.
23	90003, SW quality management		IEEE adopted and is planning to adopt revision.
24	29110-x, LC profiles for VSE	Claude Laporte, editor	IEEE will consider publishing derivative documents to suit end-user needs.
26	29119, Testing	Ursula Parker, editor	IEEE contributed base documents. Joint development is underway.
42	42010, Architecture description	Rich Hilliard, editor	Fast-track of IEEE 1471. Joint revision is underway.
	23026, Internet practices		Fast-track of IEEE 2001.

IEEE S2ESC Standards (1/5)

IEEE Standard Number/Date	ISO/IEC No.	Standard Name
IEEE Std 610.12-1990 (Sep 28) Reaffirmed Sept 2002 See P24765	24765	IEEE Standard Glossary of Software Engineering Terminology
IEEE Std 730-2002 (Sept)		IEEE Standard for Software Quality Assurance
IEEE Std 828-1998 (Jun 25) IEEE Std 828-2005 (Feb 14)		IEEE Standard for Software Configuration Management
IEEE Std 829-1998 (Sep 16) IEEE Std 829-2008 (March 27)		IEEE Standard for Software and System Test Documentation
IEEE Std 830-1998 (Jun 25) Reaffirmed December 2009 See P29148.	29148	IEEE Recommended Practice for Software Requirements Specifications
IEEE Std 982.1-1988 (Jun 9) IEEE Std 982.1-2005 (Nov 8)		IEEE Standard Dictionary of Measures to Produce Reliable Software
IEEE Std 1008-1987(R1993) (App Dec 11 '86, Reaff Dec 2 '93) Reaffirmed Dec. 2002, also Dec. 2009	29119	IEEE Standard for Software Unit Testing
IEEE Std 1012-1998 (Mar 9) IEEE Std 1012-2004 (Dec 7)		IEEE Standard for System and Software Verification and Validation
IEEE Std 1016-2009 (March 18) IEEE Std 1016-1998 (Sep 23)		IEEE Recommended Practice for Software Design Descriptions
IEEE Std 1028-2008 (June 11)		IEEE Standard for Software Reviews
IEEE Std 1044-2009 (Nov 9) Previously reaffirmed Sept. 2002		IEEE Standard Classification for Software Anomalies
IEEE Std 1045-1992 (Sep 17) Reaffirmed Dec. 2002 Administratively withdrawn Dec. 2007		IEEE Standard for Software Productivity Metrics
IEEE Std 1061-1998 (Dec 8) Reaffirmed June 2004, Dec. 2009		IEEE Standard for a Software Quality Metrics Methodology
IEEE Std 1062-1998 (Dec 2) Reaffirmed Sept 2002		IEEE Recommended Practice for Software Acquisition
IEEE Std 1063-2001 (Dec 5) Reaffirmed Sept. 26 2007 See new entry under P26514	26514	IEEE Standard for Software User Documentation
IEEE Std 1074-1997 (Dec 9) IEEE Std 1074-2006 (March 30)		IEEE Standard for Developing a Software Project Life Cycle Process
IEEE Std 1175-1991 (Dec 5)		IEEE Standard Reference Model for Computing System Tool Interconnections
IEEE Std 1175.1-2002 (Nov. 11) Reaffirmed Sept. 26, 2007		IEEE Guide for CASE Tool Interconnections - Classification and Description

IEEE S2ESC Standards (2/5)

IEEE Standard Number/Date	ISO/IEC No.	Standard Name
IEEE Std 1175.2-2006 (Sept. 14)		IEEE Guide for CASE Tool Interconnection - Characterization of Interconnections
IEEE Std 1175.3-2004 (March 24) Reaffirmed Sept. 10, 2009		IEEE Guide for CASE Tool Interconnections - Reference Model for Specifying Software Behavior
IEEE Std 1175.4-2008 (December 9)		IEEE Standard for CASE Tool Interconnections - Reference Model for Specifying System Behavior
P1175.5		Standard for Computer-Aided Software Engineering (CASE) Tool Interconnections - Reference Data Metamodel for System Behavior Specifications
IEEE Std 1220-1998 (Dec 8) IEEE Std 1220-2005 (Mar 19)	26702	IEEE Standard for the Application and Management of the Systems Engineering Process
IEEE Std 1228-1994 (Mar 17) Reaffirmed Dec. 2002 Extended to March 2010		IEEE Standard for Software Safety Plans
IEEE Std 1233-1998 (Apr 17) Reaffirmed Sept. 2002, Dec. 2009 See P29148.	29148	IEEE Guide for Developing System Requirements Specifications
IEEE Std 1320.1-1998 (Jun 25) Reaffirmed March 24 2004		IEEE Standard for Functional Modeling Language—Syntax and Semantics for IDEF0
IEEE Std 1320.2-1998 (Jun 25) Reaffirmed March 24 2004 IEEE Std 1320.2a		IEEE Standard for Conceptual Modeling Language Syntax and Semantics for IDEF1X 97 (IDEF object)
IEEE Std 1362-1998 (Mar 19) Reaffirmed Dec. 2007	29148?	IEEE Guide for Information Technology-System Definition-Concept of Operations (ConOps) Document
IEEE Std 1362a-1998 (June 26) Reaffirmed Dec. 2007		Supplement to IEEE Guide for Information Technology -- System Definition -- Concept of Operations Document: Content Map for 12207.1-1997
IEEE Std 1420.1-1995 (Dec 12) Reaffirmed June 2002 Administratively withdrawn Dec. 2007		IEEE Standard for Information Technology—Software Reuse—Data Model for Reuse Library Interoperability: Basic Interoperability Data Model (BIDM)
IEEE Std 1420.1a-1996 (Dec 10) Reaffirmed June 2002 Administratively withdrawn Dec. 2007		IEEE Standard for Information Technology—Software Reuse—Data Model for Reuse Library Interoperability: Asset Certification Framework
IEEE Std 1420.1b-1999 (Jun 26) Reaffirmed June 2002 Administratively withdrawn Dec. 2007		IEEE Standard for Information Technology-Software Reuse- Data Model for Reuse Library Interoperability: Intellectual property Rights Framework
IEEE Std 1462-1998 (Mar 19) Reaffirmed December 2004 See P14102	14102	IEEE Standard - Adoption of International Standard ISO/IEC 14102: 1995 - Information Technology - Guideline for the evaluation and selection of CASE tools
IEEE Std 1465-1998 (Jun 25) Reaffirmed December 2004 This std will be allowed to expire See new entry under 25051.	12119	IEEE Standard - Adoption of International Standard ISO/IEC 12119: 1994(E) - Information Technology - Software packages - Quality requirements and testing

IEEE S2ESC Standards (3/5)

IEEE Standard Number/Date	ISO/IEC No.	Standard Name
IEEE Std 1471-2000 (Sep 21) To be renumbered as ISO/IEEE 42010. See new entry under 42010.	42010 (formerly 25961)	IEEE Recommended Practice for Architectural Description of Software Intensive Systems
IEEE Std 1490-2003 (Dec 10) Replaces 1490-1998 (Jun 25) Administratively withdrawn Dec. 2008		IEEE Guide - Adoption of PMI Standard - A Guide to the Project Management Body of Knowledge
IEEE Std 1498-1995 (Sep 21)		EIA/IEEE Interim Standard for Information Technology -- Software Life Cycle Processes -- Software Development: Acquirer-Supplier Agreement
IEEE Std 1517-1999 (Jun 26) Reaffirmed March 24, 2004		IEEE Standard for Information Technology—Software Life Cycle Processes—Reuse Processes
IEEE Std 1633-2009 (December 9)		IEEE/AIAA Recommended Practice for Software Reliability
P1648		IEEE Recommended Practice for the Customer/Supplier Relationship in Agile Software Development Previous title (before 2009 PAR revision): "IEEE Recommended Practice for Establishing and Managing Software Development Efforts Using Agile Methods"
P1723		IEEE Standard for a Service Oriented Architecture (SOA) Solution Reference Architecture
P1805		Requirements Capture Language
IEEE Std 2001-2002 (Jan 21, 2003) Adopted by ISO, 2006 See P23026. Reaffirmed Dec. 2009	23026	IEEE Recommended Practice for Internet Practices -- Web Page Engineering -- Intranet/Extranet Applications
P2063 (Merging of Stds 830 and 1233) This project has been withdrawn; see P29148.	29148	IEEE Standard for Software and System -- Life Cycle Processes -- Requirements Engineering
P9126.1 To be renumbered as ISO/IEEE 25010. See new entry under 25010.	25010	ISO/IEC 9126-1:2001 Software engineering -- Product quality -- Part 1: Quality Model
ISO/IEC/IEEE Std. 12207-2008 (January 2008)	12207	Industry Implementation of International Standard ISO/IEC 12207:1995 Standard for Information Technology-Software life cycle processes – Software Life Cycle Processes
IEEE/EIA 12207.1-1996 (April) (Redesignated P15289)	15289	Systems and Software Engineering -- Content of systems and software life cycle process information products (Documentation)
IEEE/EIA 12207.2-1997 (Apr 1998) Also see P24748 below. Extended to Dec. 2009	24748	Industry Implementation of International Standard ISO/IEC 12207:1995 Standard for Information Technology-Software life cycle processes – Software Life Cycle Processes- Implementation considerations
P14102 Replacement for IEEE Std 1462-1998 (Mar 19) Reaffirmed December 2004	14102	IEEE Standard - Adoption of International Standard ISO/IEC 14102: 1995 - Information Technology - Guideline for the evaluation and selection of CASE tools

IEEE S2ESC Standards (4/5)

IEEE Standard Number/Date	ISO/IEC No.	Standard Name
IEEE Std 14143.1-2000 (Jan 30) Reaffirmed Mar 19, 2005	14143-1	Implementation Note for IEEE Adoption of ISO/IEC 14143-1:1998 Information Technology—Software Measurement—Functional Size Measurement— Part 1: Definition of Concepts
P14471		ISO/IEC TR 14471:1999 Information technology -- Software engineering -- Guidelines for the adoption of CASE tools
ISO/IEC/IEEE Std. 14764-2006 (March 30)	14764	ISO/IEC/IEEE Standard for Software Engineering -- Software Life Cycle Processes -- Maintenance (Replaces IEEE Std IEEE 1219-1998)
P15026 (To replace IEEE 1228) Withdrawn on March 24, 2010 -- is being replaced by four new PARs	15026	System and Software Engineering -- System and Software Assurance
P15026-1 (To replace IEEE 1228)	15026-1	System and Software Engineering -- System and Software Assurance -- Part 1: Concepts and vocabulary
P15026-2 (To replace IEEE 1228)	15026-2	System and Software Engineering -- System and Software Assurance -- Part 2: Asssurance case
ISO/IEC/IEEE Std. 15288-2008 (October 2007)	15288	System Engineering -- System Life Cycle Processes
P15289	15289	Systems and Software Engineering -- Content of systems and software life cycle process information products (Documentation)
IEEE Std 15939-2008 (Dec 9, 2008 -- Adoption of ISO/IEC 15939:2007)	15939	ISO/IEC 15939:2002 Software and systems engineering -- Measurement process
IEEE 16085-2006 (formerly IEEE 1540)	16085	Standard for System and Software Life Cycle Processes - Risk Management (previously IEEE 1540-2001)
IEEE Std. 16326-2009 (SC7 adoption of IEEE 1058) (Published Nov. 9, 2009) Replaces IEEE Std 1058-1998	16326	Standard for Software Engineering -- Project Management
P20000.1 (IEEE adoption of ISO/IEC 20000-1:2005)	20000-1	Information Technology -- Service Management -- Part 1: Specification
P20000.2 (IEEE adoption of ISO/IEC 20000-2:2005)	20000-2	Information Technology -- Service Management -- Part 2: Code of Practice
IEEE 23026-2006 (IEEE adoption of ISO/IEC 23026:2006) Replaces IEEE 2001-2002, which has been reaffirmed	23026	IEEE Recommended Practice for Internet Practices -- Web Page Engineering -- Intranet/Extranet Applications
P24748 Replacement for IEEE/EIA 12207.2-1997 (Apr 1998) Withdrawn on March 24, 2010 -- is being replaced by three new PARs	24748	Adoption of International Standard ISO/IEC TR 24748-3, Systems and Software Engineering -- Guide for Life Cycle Management -- Part 3: Guide for the application of ISO/IEC 12207 (Software Life Cycle Processes)
P24748.1 Replacement for IEEE/EIA 12207.2-1997 (Apr 1998)	24748-1	Adoption of International Standard ISO/IEC TR 24748-1, Systems and Software Engineering -- Guide for Life Cycle Management

IEEE S2ESC Standards (5/5)

IEEE Standard Number/Date	ISO/IEC No.	Standard Name
P24748.2 Replacement for IEEE/EIA 12207.2-1997 (Apr 1998)	24748-2	Adoption of International Standard ISO/IEC TR 24748-2, Systems and Software Engineering -- Guide for Life Cycle Management -- Part 2: Guide for the application of ISO/IEC 15288 (System Life Cycle Processes)
P24748.3 Replacement for IEEE/EIA 12207.2-1997 (Apr 1998)	24748-3	Adoption of International Standard ISO/IEC TR 24748-3, Systems and Software Engineering -- Guide for Life Cycle Management -- Part 3: Guide for the application of ISO/IEC 12207 (Software Life Cycle Processes)
24765-2010 (January 22) ISO replacement for IEEE Std 610.12-1990 (Sep 28) 610.12 was reaffirmed Sept 2002	24765	IEEE Standard Glossary of Software Engineering Terminology
P25010 Previously IEEE 9126.1. Renumbered to correspond to ISO numbering.	25010	ISO/IEC 9126-1:2001 Software engineering -- Product quality -- Part 1: Quality Model
P25051 Previously IEEE 1465-1998	25051	Standard for Software Engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Requirements for quality of Commercial Off-the-Shelf (COTS) software product and instructions for testing
P26512	26512	Systems and software engineering - Requirements for acquirers and suppliers of user documentation
P26513 (IEEE adoption of ISO/IEC 26513:2009)	26513	Systems and software engineering - Requirements for testers and reviewers of user documentation
P26514 Previously IEEE Std 1063-2001 (Dec 5) 1063 reaffirmed Sept. 26 2007	26514	Systems and software engineering - Requirements for designers and developers of user documentation
P29119	29119	System and Software Engineering -- Software Testing
P29148 (Merging of Stds 830 and 1233) Formerly designated as P2063	29148	IEEE Standard for Software and System -- Life Cycle Processes -- Requirements Engineering
P42010 ISO/IEC adoption of IEEE Std 1471-2000 (Sep 21)	42010 (formerly 25961)	IEEE Standard for Architectural Descriptions
90003-2008 (September 25), IEEE/ASQ adoption of ISO/IEC 90003)	90003	Software and Systems Engineering - Guidelines for the Application of ISO 9001:2000 to Computer Software
IEEE Std 1448		Guide for Information Technology -- Software Life Cycle Proceesses

IEEE 1467

- Standard on Reliability Growth
- Recent emphasis by the DoD community placed on reliability growth
- The international community already has an existing standard that could be leveraged for IEEE use and suppliers to the DoD, without creating a new and redundant standard.
- Collaboration on a new joint IEEE/IEC standard for Reliability Growth based on existing International IEC standard 61014:
  - IEC 61014: “Programmes for reliability growth”.
- A preliminary draft PAR (IEEE P1467) was written for this new project, and submitted to NesCom for approval in March 2010.
- Potential to change the document number to IEEE/IEC 61014

IEEE and IEC TC-56

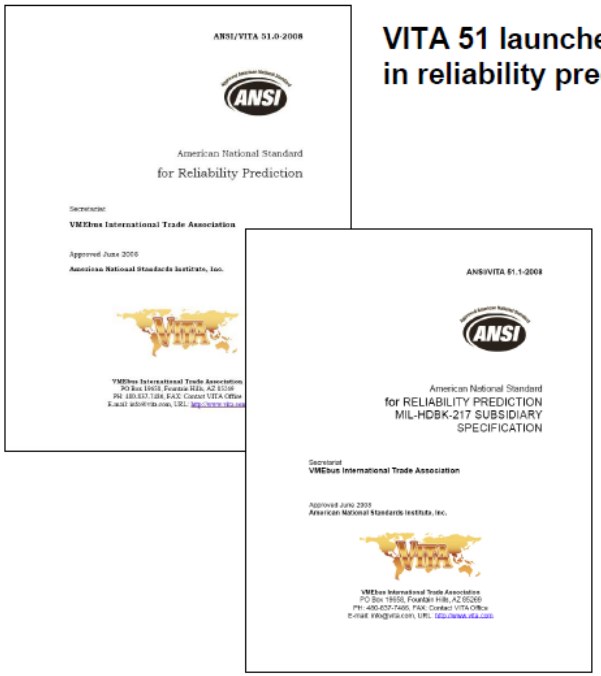
- Considering an agreement to work together on future projects
- Leverage existing agreement between the IEEE Standards Association and ISO Central Secretariat PSDO for ISO/IEC Joint Technical Committee (JTC 1) /SC 7

VITA51

- VITA 51.0
- VITA 51.1
- VITA 51.2
- VITA 51.3

VITA 51 Reliability Predictions – Past Activity

Engineering, Operations & Technology | **Boeing Research & Technology**



VITA 51 launched in 2004 to address shortcomings in reliability prediction methods, esp. MIL-HDBK-217

51.0 – Base Specification
- Provides overview of reliability prediction methods
- Requires disclosure of deviation from standards
- Established a Community of Practice

51.1 – MIL-HDBK-217 Subsidiary Specification
- Provides specific rules for using MIL-HDBK-217F Notice 2
- Required to bring consistency to industry modification factors
- Provides links to backup data, where needed

Both achieved ANSI recognition in June 2008

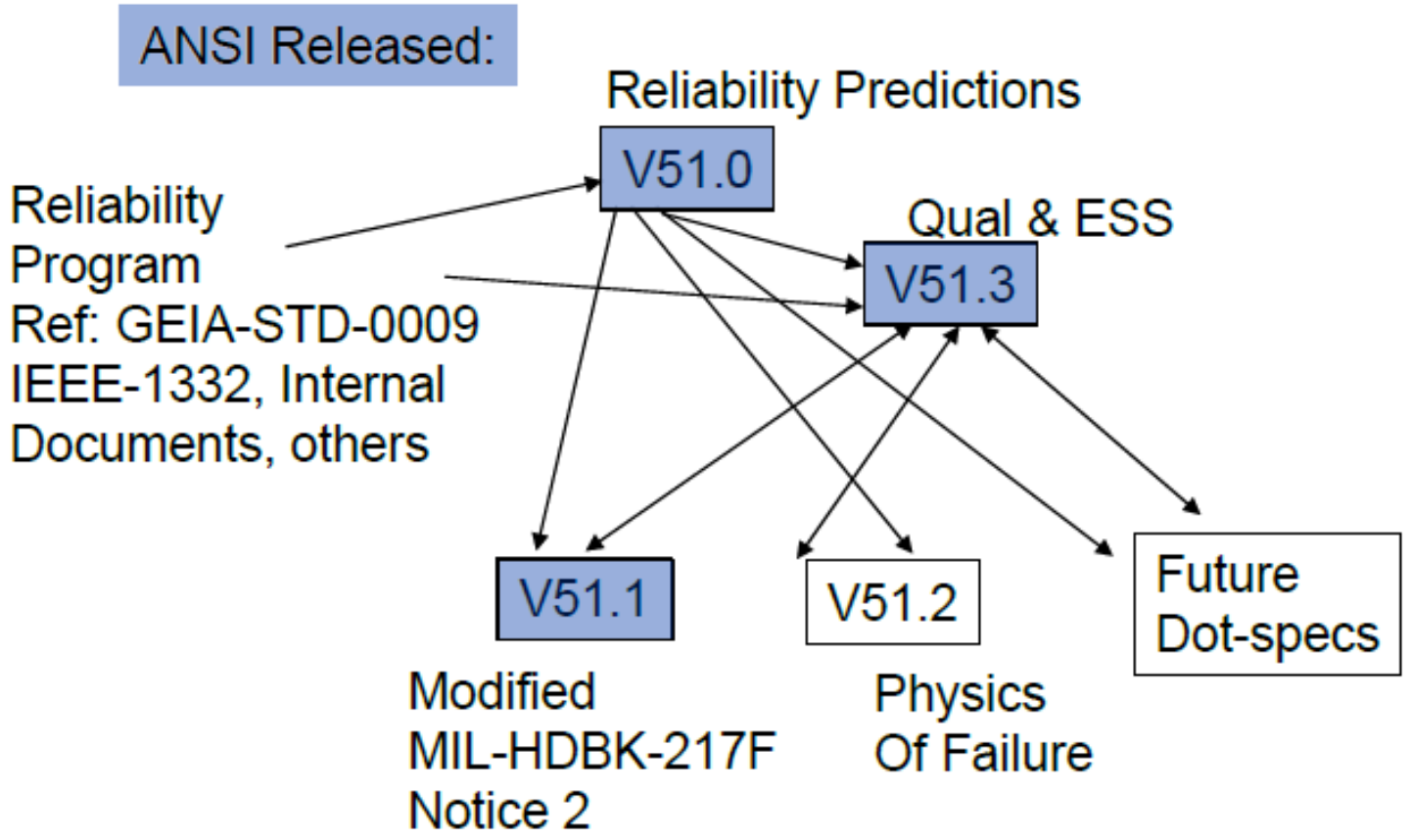
VITA 51.0 and 51.1

- VITA 51.0 Reliability Prediction
  - Provides guidance on best practices to improve the reliability of electronic modules.
  - Addresses the limitations of existing prediction practices
  - Initial focus on creating a daughter standard for MIL-HDBK-217.
- VITA 51.1 Reliability Prediction - MIL-HDBK-217 Daughter Standard
  - Provides a standard method of performing reliability predictions on COTS modules using MIL-HDBK-217F Notice 2 stress analysis method.
  - Provides standardized inputs to the MIL-HDBK-217F N2 calculations to give more consistent MTBF numbers.
  - This is not a revision or modification of MIL-HDBK-217F N2

VITA 51.2 and 51.3

- **VITA 51.2 Physics of Failure Reliability Predictions subsidiary specification**
  - Establish uniform practices for VITA members
  - Utilizes current industry development (AVSI, CALCE)
  - Clarify expectations of reliability prediction customers
- **VITA 51.3 Qualification and Environmental Stress Screening (ESS) in Reliability Predictions**
  - Establish the systems engineering approach
  - Correlate Qualification levels with ESS and reliability
  - Provide context for choice of appropriate reliability prediction methods, based on hazard rate characteristics (bathtub curve)

VITA 51 Document Roadmap



Roadmap of VITA 51 family of specifications

AVSI

- AVSI is a cooperative of Aerospace industries and government agencies, administered by the Texas Engineering Experiment station located on the Texas A&M University campus.
- AVSI began 1997 with a vision of linking industry members, government, and academia to do cooperative research and development.
- AVSI is working with VITA 51, MIL-HDBK-217 WG (Government and Industry) and IEEE to define a roadmap for reliability modeling
- Authority for Expenditure (AFE) has been approved (AFE 74)
  - **AVSI AFE 74 – Defining roadmap for reliability modeling**

Objectives

- Chart the future of reliability research
- Integrate the wisdom and experience of a large number of industry reliability experts
- Focus the discussions around the common goal to improve electronics reliability assessment practices
- Critically analyze findings, and organize analysis process using the Quality Function Deployment (QFD)
- Develop a reliability roadmap with broad support

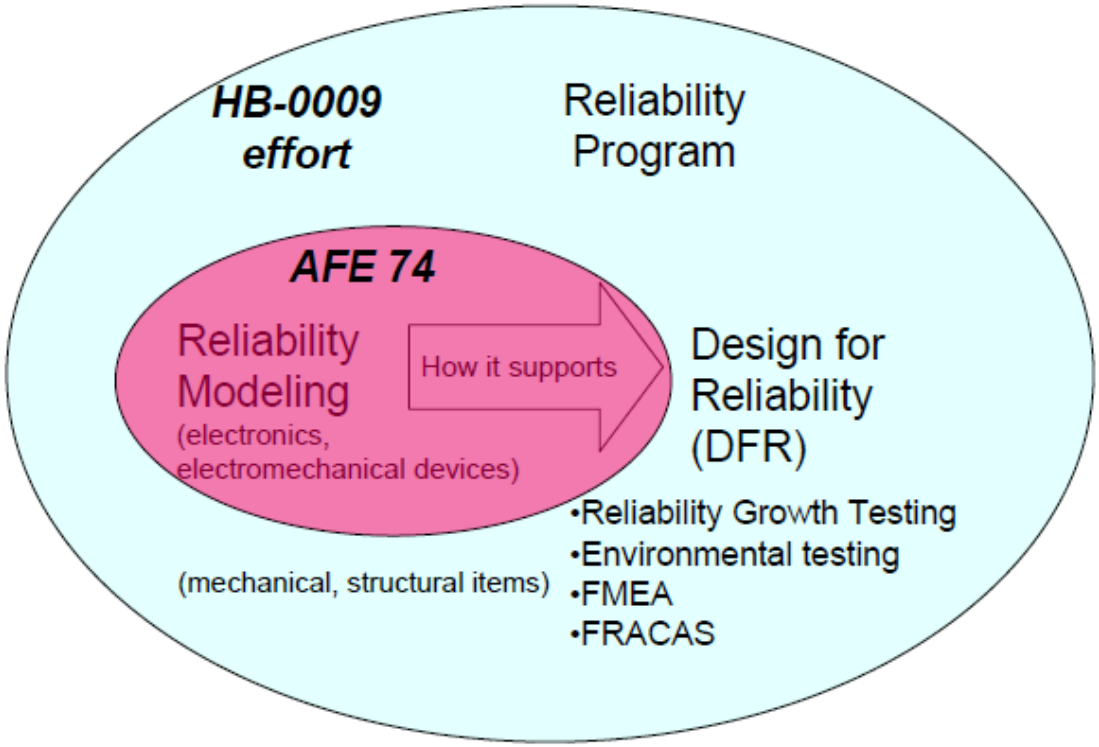
Within the scope of AFE 74's charter to investigate electronic and electromechanical failure rate modeling

AFE 74 – Integrated Reliability

AFE 74 (2010 Project) will build on framework and roadmap developed under AFE 70 (2008-2009 Project):

- Quality Function Deployment (QFD) will be conducted with broad participation from multiple branches of the DoD, subject matter experts and industry stakeholders, to build a reliability roadmap.
- This project will develop additional capabilities and a prediction module (Module A) for the reliability prediction framework developed in project AFE 70.
- This new reliability module (Module A) will be provided to the Naval Surface Warfare Center (NSWC) Crane to be added to a future update to MIL-HDBK-217.

Scope of this study and other efforts



Reliability modeling provides information for the DFR process, but is not the only activity in the reliability program