



U.S. Department
of Transportation
**Federal Aviation
Administration**

U.S. Department of Transportation

Federal Aviation Administration

Standard Practice

**PREPARATION
OF
SPECIFICATIONS**

FOREWORD

1. This standard is approved for use by all departments of the Federal Aviation Administration (FAA).

2. This standard covers the format and content requirements for developing FAA specifications. This standard supersedes FAA-STD-005E. Replacement of FAA-STD-005E became necessary when: the description of how to build Specifications, Standards and Handbooks became too confusing to define within one standard. An updated series of documents was necessary to encourage use and improve user friendliness.

3. This revision includes the requirement to provide Internet addresses in order to obtain referenced documents from contact organizations.

4. Specifications provide a basis for obtaining a product or service that will satisfy a particular need, at an economical cost, by inviting maximum reasonable competition. By definition, a specification sets limits and thereby eliminates, or potentially eliminates, items that are outside the boundaries drawn. A specification should be written to encourage competition consistent with seeking overall economy for the purpose intended. Specifications should do four things: (1) identify minimum requirements, (2) list reproducible test methods to be used in testing for compliance with specifications, (3) allow for a competitive bid, and (4) provide for an equitable award at the lowest possible cost. There exists a variety of automated tools available to maintain specifications across multiple documents, and multiple levels of documents, such as the IBM Telelogic DOORS tool, and these are recommended for use.

5. The following points are some helpful reminders for consideration when developing a specification:

- a. The specification preparing activity should maintain a carefully documented, permanent record of the source and reason behind particular requirements and changes to requirements. Issues and controversial areas during the coordination process should be noted, and it may be desirable to summarize these issues and areas in the "Notes" section of the document. This record should provide a basis for related application guidance and a history useful in future document revisions.
- b. State requirements in terms of performance or form, fit, and function, as opposed to providing details on "how to" achieve the desired result or manage a program.
- c. Avoid unnecessary reference to other documents. If only a small portion of another document is needed, it is better to extract that portion and include it in the specification, standard, or handbook rather than reference the entire document. When referencing another document, try to limit the extent of its application by citing specific requirements or tests. Do not cite paragraph

numbers in referenced documents since these are likely to change in future updates.

- d. Try to make use of commercial products, processes, or practices when setting requirements or tests.
- e. Make a distinction between requirements portions and guidance portions of documents. Careful attention to use of the words "should" (guidance language) and "shall" (requirement language) is important.
- f. Use Section 6 "Notes" to provide users with guidance information that should be considered for inclusion in the contract, how to apply the document to different contract types and different program phases, lessons learned, relationship to other documents, tailoring guidance, and any other information that is not suitable for inclusion as a requirement or test.
- g. Procedures for functions performed only by FAA personnel should be covered by documents such as regulations, directives, instructions, handbooks, technical manuals, or standard operating procedures.

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1 SCOPE

This standard establishes the format and content requirements for the preparation of FAA specifications prepared either by the FAA or by contractors of the FAA.

2 APPLICABLE DOCUMENTS

2.1 General

The documents listed in this section are specified in sections 3, 4, or 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this standard, whether or not they are listed.

2.2 Government documents

The following citations are government documents that are used as references in this standard.

2.2.1 Specifications, standards, and handbooks

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

2.2.1.1 STANDARDS

2.2.1.1.1 Military

MIL-STD-961E Department of Defense, Standard Practice Defense and Program-Unique Specifications Format and Content, 1 August 2003

2.2.1.2 SPECIFICATIONS

2.2.1.2.1 FAA

FAA-D-2494B Technical Instruction Book Manuscript: Electronic, Electrical and
Mechanical Equipment, Requirements for Preparation of Manuscript and
Production of Books. 14 March 1984

Order 1800.66 U.S. Department of Transportation Federal Aviation Administration
National Policy, Configuration Management Policy, 19 September 2007,
with Changes 1 and 2

2.2.1.3 UNITED STATES GOVERNMENT PRINTING OFFICE

United States Government Printing Office (GPO) Style Manual

(Copies of this document are available online from the U.S. Government Printing Office at www.access.gpo.gov.)

2.3 Non-Government publications

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

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME Y14.5M - Dimensioning and Tolerancing
ASME Y14.38 - Abbreviations and Acronyms

(Copies of these documents are available from ASME Information Central at www.asme.org)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 260.1 - Standard Letter Symbols for Units of Measurement (SI Units, Customary
Inch-Pound Units, and Certain Other Units)

(Copies of this document are available online at www.ieee.org.)

IEEE/ASTM INTERNATIONAL

IEEE/ASTM SI 10 - American National Standard for Use of the International System of
Units (SI): The Modern Metric System

(IEEE and ASTM International publish this standard jointly. Copies are available from www.ieee.org or www.astm.org.)

2.4 Order of precedence

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3 DEFINITIONS

Analysis. An element of verification that uses established technical or mathematical models or simulations, algorithms, charts, graphs, circuit diagrams, or other scientific principles and procedures to provide evidence that stated requirements were met.

Configuration Control Board. A Configuration Control Board is necessary when developing and maintaining a product since changes are inevitable. People make mistakes, customers require changes, and the environment in which the product operates evolves. In addition, people constantly develop their knowledge of the problem and their ability to solve it. In software development, it's generally said that the solution of a problem will create new problems. In other words, we get wiser all the time. The purpose of change control is to be fully in control of all change requests for a product and of all implemented changes. For any configuration item, it must be possible to identify changes in it relative to its predecessor. Any change should be traceable to the item where the change was implemented.

Configuration management. Configuration management (CM) is a field of management that focuses on establishing and maintaining consistency of a system's or product's performance and its functional and physical attributes with its requirements, design, and operational information throughout its life.

Data. Recorded information, regardless of form or method of recording.

Demonstration. This is an element of verification involving the actual operation of an item to provide evidence that the required functions were accomplished under specific scenarios. The items may be instrumented and performance-monitored.

Entity. As a general term to denote the system, item, software, process, or material that is the subject of a specification.

FAA Standard. A standard used to satisfy FAA applications. FAA standards typically fall into two categories: interface, and performance.

General specification. A specification prepared in the six-section format, which covers requirements and test procedures that are common to a group of parts, materials, or equipment, and is used with specification sheets.

Item specification. This denotes a type of specification that describes the form, fit, function, and method for acceptance of parts, components, and other items that are elements of a system.

Non-Government standard. A national or international standardization document developed by a private sector association, organization, or technical society that plans, develops, establishes, or coordinates standards, specifications, handbooks, or related documents. The term does not include standards of individual companies.

Performance specification. This denotes a specification that states requirements in terms of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. A performance specification defines the functional requirements for the item, the environment in which it must operate, and interface and interchangeability characteristics.

Service Organization. The organization that prepares a standard, or has a standard prepared for it.

Software specification. A type of specification that describes the requirements and verification of requirements for the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information.

Specification. A document prepared to support acquisition that describes essential technical requirements for materiel, and the criteria for determining whether those requirements are met.

Standard. A document that establishes uniform engineering or technical criteria, methods, processes, and practices.

Standard practice. It is a standard that specifies procedures on how to conduct certain non-manufacturing functions. Standard practices are developed for functions that, at least some of the time, are obtained via contractor from private sector firms.

Style. A term used to denote differences in design or appearance.

Supplement. A listing of specification sheets associated with a general specification.

System specification. A type of specification that describes the requirements and verification of the requirements for a combination of elements that must function together to produce the capabilities required to fulfill a mission need, including hardware, equipment, software, or any combination thereof.

Tailoring. A process where individual requirements (sections, paragraphs, or sentences) of selected specifications, standards, and related documents are evaluated to determine which are most suitable for a specific system acquisition or modification. This will ensure that each achieves an optimal balance between operational needs and cost.

Test. It is an element of verification in which scientific principles and procedures are applied to determine the properties or functional capabilities of items.

4 GENERAL REQUIREMENTS

This section covers general aspects of style, format, and requirements that are applicable to Specifications.

4.1 Common General Requirements

This subsection describes the General Requirements that are common to Specifications.

4.1.1 Use of copyright or patent material

Copyright or patent material shall not be included in a specification without the prior consent of the copyright or patent owner. When such consent is obtainable, a line citing the reference source, if requested by the copyright or patent owner, shall be placed in the specification close to the material involved.

4.1.2 Classified material

Classified and sensitive material consists of working documents and shall be designed to avoid unnecessary restrictions in their dissemination. Specifications containing classified or sensitive information shall be appropriately marked and handled in accordance with security regulations. The title of specifications shall not be labeled classified or sensitive. If only a limited amount of classified or sensitive information is found in a specification, consider including such information in an annex or reference document to keep the main document unclassified or non-sensitive. The Computer Security Act of 1987 defines sensitive information as follows: The term 'sensitive information' means any information, the loss, misuse, or unauthorized access to or modification of which could adversely affect the national interest or the conduct of Federal programs, or the privacy to which individuals are entitled under section 552a of title 5, United States Code (the Privacy Act), but which has not been specifically authorized under criteria established by an Executive order or an Act of Congress to be kept secret in the interest of national defense or foreign policy. Classified information is defined by the Department of Defense (DoD) in DoD Regulation 5200.1-R. Under this regulation information may be classified as "Top Secret", "Secret", or "Confidential". These terms are further defined as follows: Top Secret shall be applied to information the unauthorized disclosure of which reasonably could be expected to cause exceptionally grave damage to the national security that the original classification authority is able to identify or describe. Secret shall be applied to information the unauthorized disclosure of which reasonably could be expected to cause serious damage to the national security that the original classification authority is able to identify or describe. Confidential shall be applied to information the unauthorized disclosure of which reasonably could be expected to cause damage to the national security that the original classification authority is able to identify or describe.

4.1.3 Text

The text shall be written in clear and simple language, free of vague terms, or those subject to misinterpretation. All sentences shall be complete and in accordance with the rules of grammar.

4.1.3.1 Grammar and style

The United States Government Printing Office Style Manual shall be used as a guide for capitalization, spelling, punctuation, syllabification, compounding words, tabular work, and other elements of grammar and style.

4.1.3.2 Abbreviations

Abbreviations shall be in accordance with ASME Y14.38. Abbreviations not covered by ASME Y14.38 shall be in accordance with the GPO Style Manual. The first time an abbreviation is used in text, it shall be placed in parentheses and shall be preceded by the word or term spelled out in full (for example, circuit (ckt) and frequency converter (freq conv)). The rule does not apply to abbreviations used for the first time in tables and equations. Abbreviations used on figures and in tables, but not referenced in the text or in any other portion of the specification, shall be spelled out in a footnote to the applicable figure or table.

4.1.3.3 Acronyms

The first time an acronym is used in text, it shall be placed in parentheses and shall be preceded by the word or term spelled out in full (for example, International Civil Aviation Organization (ICAO)). The rule does not apply to acronyms used for the first time in tables and equations. Acronyms used on figures and in tables, but not referenced in the text or in any other portion of the specification, shall be spelled out in a footnote to the applicable figure or table. A complete list of acronyms shall be included in an appendix of the specification.

4.1.3.4 Symbols

Symbols shall be in accordance with IEEE 260.1. Symbols not covered by IEEE 260.1 shall be in accordance with the GPO Style Manual.

4.1.3.5 Commonly used words and phrases

The following rules shall apply for these commonly used words and phrases:

- a. Referenced documents shall be cited in the following manner:

- (1) “conforming to ...”
- (2) “as specified in ...”
- (3) “in accordance with ...”

In any case, use the same wording throughout a given document and a series of directly related documents.

- b. “Unless otherwise specified” shall be used to indicate an alternative course of action. The phrase shall always come at the beginning of the sentence, and, if possible, at the beginning of the paragraph. This phrase shall be used only when it is possible to clarify its meaning by providing a reference, such as to section 6 of the specification, for further clarification in the contract or reference to another paragraph in the specification.
- c. The phrase “as specified herein” may be used when making reference to a requirement in a specification that is rather obvious or not difficult to locate.
- d. The phrase “to determine compliance with” or “to determine conformance to” should be used in place of “to determine compliance to.” In any case, use the same wording throughout.

- e. The words “drawing” and “bulletin” shall be capitalized only when they are used immediately preceding the document identifier. However, specifications, standards, and handbooks shall be identified in the text only by their document identifier; thus, FAA-E-000 (not: “specification FAA-E-000”).
- f. The following prepositional phrases shall be used when referencing figure and table information: “on a figure” or “in a table”.
- g. The emphatic form of the verb “shall” is to be used throughout sections 3, 4, and 5 of this standard whenever a requirement is intended to express a provision that is binding. “Shall” is not to be used in Sections 1, 2, or 6 of the standard.
- h. “Will” may be used to express a declaration of purpose on the part of the Government. It may be necessary to use “will” in cases when simple futurity is required.
- i. Use “should” and “may” to express non-mandatory provisions.
- j. “Must” shall not be used to express a mandatory provision; use the term “shall.”
- k. Indefinite terms, such as “and/or,” “suitable,” “adequate,” “first rate,” “best possible,” “and others,” and “the like” shall not be used. Use of “e.g.,” “etc.,” and “i.e.,” should be avoided.

4.1.4 Measurements

Decimals shall be used in documents instead of fractions wherever possible. Measurements such as length, time, or weight shall be stated as a limit or with a tolerance.

4.1.5 Dual dimensions

When preference is given to English units, acceptable metric units may be shown in parentheses. When preference is given to metric units, English units may be omitted or included in parentheses. The mixed use of both metric and English as primary measurements should be avoided.

4.1.6 Paragraph numbering

Each paragraph and subparagraph shall be numbered consecutively within each section of the specification, using a period to separate the number representing each breakdown. Lowercase letters followed by a period shall be used to identify listings within a paragraph or subparagraph. Bullets shall not be used. For clarity of text, paragraph numbering should be limited to three sublevels, unless additional sublevels are unavoidable. Paragraphs in this standard are an example of how to number paragraphs.

4.1.7 Paragraph identification

Each paragraph and subparagraph shall be given subject identification. The first letter of the first word in the paragraph and subparagraph identification shall be capitalized. Paragraph and subparagraph identifications shall be underlined, italicized, or bold type.

4.1.8 Page number

The cover page shall not be numbered. Pages between the cover and the first section shall be numbered consecutively in the bottom center of each page with lower-case Roman numerals, omitting number i (for example, ii, iii, and iv). The first page of the first section shall be numbered with an Arabic numeral 1. All

following pages, including appendixes and the index, shall be numbered consecutively in the bottom center of the page with sequential Arabic numerals.

4.1.9 Tables

A table shall be used when information can be presented more clearly than in text. The tables shall be placed immediately following or within the paragraph containing the first reference. If space does not permit, the table may be placed on the following page. If tables are numerous or their location would interfere with correct sequencing of paragraphs and cause difficulty in understanding or interpretation, they may be placed in numerical order at the end of the specification and before any figures, appendix, or index. Information included in tables shall not be repeated in the text.

4.1.9.1 Table numbering

All tables shall be numbered consecutively throughout the document with Roman numerals in the order of their reference in the text. The word “TABLE” shall be in full capitalization, followed by the Roman numeral and a period, centered above the table.

4.1.9.2 Table title

All tables shall have a title. The title shall be underlined, italicized, or boldfaced. Only the first letter of the title shall be capitalized. Table titles shall be centered above the table on the same line with the table number. If the title is too long to fit on one line, the second line shall be aligned with the first letter of the title. If a listing or tabulation appears within a paragraph as an integral part of that paragraph, and obviously does not require a title, the listing or tabulation need not be titled.

4.1.9.3 Table format

Tables shall be boxed in and ruled horizontally and vertically as necessary to ensure clarity of the table contents. If a table is of such width that it would be impractical to place it in a vertical position, it may be rotated counterclockwise 90 degrees. Large tables may be divided and, if possible, printed on facing pages.

4.1.9.4 Continuation of tables

If a table is continued to additional page(s), a horizontal line shall not be drawn at the end of the page, unless the table is a group or method type that requires a line of separation between the groups. When the table is continued to the next page, the title shall be repeated and a dash followed by the word “Continued” at the end of the title; for example, “TABLE II. Qualification inspection - Continued.” The column headings shall be repeated at the top of the page on which the continuation is presented. The table shall be closed with a horizontal line when all information has been entered.

4.1.10 Figures

Dimensioning practices for outline drawings shall comply with ASME Y14.5M. Figures should be placed immediately following or within the paragraph containing the first reference to the figure. If figures are numerous or their location would interfere with correct sequencing of paragraphs and cause difficulty in understanding or interpretation, they may be placed in numerical order at the end of the specification following any tables and before any appendix or

index. If the figure is of such width that it would be impractical to place it in a vertical position, it may be rotated counterclockwise 90 degrees.

4.1.10.1 Figure numbering

All figures shall be numbered consecutively throughout the document with Arabic numerals in the order of their reference in the text. The word “FIGURE” shall be in full capitalization, followed by the Arabic numeral and a period, centered below the figure.

4.1.10.2 Figure title

All figures shall have a title. The title shall be underlined, italicized, or boldfaced. Only the first letter of the title shall be capitalized. Figure titles shall be centered below the figure on the same line with the figure number. If the title is too long to fit on one line, the second line shall be aligned with the first letter of the title.

4.1.10.3 Continuation of figures

Large figures may be broken, and, if possible, printed on facing pages. When a figure is continued on the next page, the number and title shall be repeated below the figure with a dash followed by the word “Continued” at the end of the title.

4.1.11 Footnotes and notes

Footnotes and notes may be used as indicated below.

4.1.11.1 Footnotes to text

Footnotes may be used to convey additional information that is not properly a part of the text. A footnote to the text shall be placed at the bottom of the page containing the reference to it. Footnotes shall be consecutively numbered throughout the specification with Arabic numerals.

4.1.11.2 Footnotes to tables

Footnotes shall be numbered separately for each table as they appear in the table. Footnote numbers or symbols shall be placed immediately following a word and preceding a numeric value requiring the footnote. Numbered footnotes shall be listed in order immediately below the table. When numbered footnotes may lead to ambiguity (for example, in connection with a chemical formula), superscript letters, daggers, and other symbols may be used.

4.1.11.3 Notes to figures

Notes to figures are numbered separately from textual footnotes within the document. Drafting or dimensional notes shall be numbered consecutively and placed below the figure and above the title. The word “NOTES:” shall be placed below the figure at the left margin of the figure followed by the explanatory information in Arabic numeral sequence under “NOTES”. For example:

“NOTES:

1. Dimensions are in inches.
2. English unit equivalents are given for information only.”

4.1.12 Foldouts

Foldouts should be avoided since their use will require special printing and handling procedures. Whenever possible, lengthy tables should be reformatted as multiple, single-page tables. When foldouts are required, they shall be grouped in one place, preferably at the end of the document (in the same location as figures) and suitable reference to their location shall be included in the text.

4.1.13 Definitions

Definitions shall be listed in alphabetical order in section 3. A parenthetical phrase referring to the applicable paragraph in section 6 shall follow the terms to indicate the existence of a definition, for example, “(see 6)”. When a standard definition exists, the definition should be quoted word for word and the source cited.

4.1.14 Cross-reference

Cross-reference shall be used only to clarify the relationship of requirements within the specification and to avoid inconsistencies and unnecessary repetition. When the cross-reference is to a paragraph or subparagraph within the specification, the cross-reference shall be only to the specific paragraph number. The word “paragraph” shall not appear; for example, “(see 3.1.1)”.

4.1.15 References to other documents

Judicious referencing of other documents in specifications is a valuable tool that eliminates the repetition of requirements and tests adequately set forth elsewhere. However, unnecessary or untailored referencing of other documents can lead to increased costs, excessive stratification, ambiguities, and compliance with unneeded requirements. The following rules shall apply when referencing another document as a requirement in a specification and listing it in Section 2 as an applicable document:

1. If the information is less than a page and if it is not a violation of copyright provisions, it should be included directly into the specification without referencing another document.
2. Referenced documents shall be current (not canceled or superseded), approved for use (not drafts), and readily available.
3. Unless the entire referenced document applies, it shall not be cited in total, but shall be tailored by citing the appropriate sections of the document, such as specific types, grades, or classes; test methods; or definitive descriptions (for example, “the painting requirements of FAA-STD-XXX”). Do not reference specific paragraph, table, or figure numbers from another document since these may change when the document is revised.
4. References to policy-type documents, such as directives, instructions, and regulations shall be avoided. Many Government regulatory agencies, such as the Environmental Protection Agency or the Occupational Safety and Health Administration, issue directives and regulations that serve as technical standards. It is acceptable to reference these types of directives and regulations.
5. Documents that define management and manufacturing practices and processes shall not be cited in performance specifications, and should be avoided in all specifications.
6. Specifications, standards, drawings, or other documents that contain proprietary or unique design solutions that would restrict competition or not be readily available shall not be referenced.

4.1.16 Approved document format

The approved and dated document shall have one-inch margins. Hyperlinks may be inserted into the document to facilitate electronic viewing of the document. Hyperlinks are encouraged for a table of contents and index.

4.2 General Requirements for Specifications

This chapter describes the general requirements that are unique to Specifications.

4.2.1 Coverage

A specification shall be prepared to describe essential technical requirements for products, materials, and services. Similar items shall be covered in a single specification to the maximum extent practical. Specifications shall describe the item in a manner that encourages maximum competition. To the greatest extent possible, specification requirements shall be written so that commercial products or processes may be used to meet the requirements. Performance specifications shall be developed instead of detail specifications, whenever possible.

4.2.1.1 Tailoring of requirements

Specifications shall be written and structured so that referenced documents, requirements, and verification provisions can be readily tailored to suit different applications.

4.2.2 Data requirements

Data can only be required in the contract. Specifications shall not contain requirements for the development, preparation, acquisition of rights, submission, delivery, maintenance, updating, approval, or distribution of plans, reports, drawings, manuals, and other data products.

4.2.2.1 Qualification data

Specifications shall not contain data required for qualification or qualification retention. The qualifying activity shall request data associated with qualification or qualification retention from contractors upon application for qualification or qualification retention.

4.2.3 Contractual and administrative requirements

A specification shall not include requirements that are properly part of a contract, such as:

- cost
- quantity required
- time or place of delivery
- methods of payment
- liquidated damages
- rework or repair
- re-submittal
- packaging
- preparation
- submission
- delivery
- approval

- distribution of data
- record keeping

In addition, a specification shall not include contract quality requirements, such as responsibility for inspection, establishment of quality or inspection program requirements, warranties, instruction for nonconforming items, and contractor liability for nonconformance. Contractual and administrative provisions considered essential for acquisition may be included in section 6 of the specification for information. The specification also shall not prescribe mandatory requirements or instructions for the Government Contract Administration Office. These include directions relating to quality assurance functions such as inspections, audits, reviews, certifications, and technical approvals.

5 DETAILED REQUIREMENTS

This section describes the detailed requirements for preparing Specifications within the scope of this Standard.

5.1 Specifications

This section contains detailed format requirements for preparing the sections of a specification and associated documents, namely – supplements, amendments, notices, and specification sheets. For guidance purposes, Section 5.1.4 provides a Sectional arrangement for specification, Sections 5.1.5 - 5.1.8 provides a narrative on the content of the Specification by subject matter, and Appendix B provides a template for a Specification. MIL-STD-961E is available for more examples of Specifications.

5.1.1 Draft Note

Drafts of proposed specifications shall carry one of the following notes at the top of the first page, as applicable:

"NOTE: This draft, dated (date) prepared by (preparing activity), has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL."

"NOTE: This draft, dated (date) prepared by (name of agent), as agent for (preparing activity), has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL."

This note shall be removed from the approved document prior to publication.

5.1.2 Cover Page

Specifications may include a cover page as the first page. The cover page shall include the information specified in the following subsections.

5.1.2.1 Specification identifier

The identifier shall be placed in the upper right corner of the cover page. The identifier as assigned by ATO-W Enterprise CM shall include the letters "FAA" followed by a hyphen, then any combination of numbers, letters, or dashes. It shall not include any other symbols.

5.1.2.2 Date of specification

The specification approval date by the CCB shall appear in the upper right corner of the cover page.

5.1.2.3 Superseding document indicator

When applicable, a superseding document indicator shall appear in the upper right corner of the first page, below the specification identifier and date, to identify those documents that have been replaced by the issuance. A line shall separate the specification identifier and date of the superseding document from the superseding data. The word "SUPERSEDING" shall be entered below the separation line, followed by the number and date of the superseded document(s).

5.1.2.4 Superseding revisions

When a specification is revised, the superseding information shall indicate that the revision supersedes the prior issuance of the specification, as well as any interim specifications, if applicable. Only revisions shall be listed. Amendments and notices, which are included in the superseding revision, shall not be listed.

a. Example of revision superseding another revision

FAA-E-123B
11 August 2006
SUPERSEDING
FAA-E-123A
5 May 2006

5.1.2.4.1 Superseding other documents

A specification may supersede other documents totally or in part. When this happens, an explanatory note shall be included in section 6 of the specification to clarify cross-referencing information, identify applications, state what parts of document are superseded, and provide any other information that contributes to understanding how to apply the superseding document.

a. Example of document superseding a different document

FAA-E-567
11 August 2002
SUPERSEDING
DRAWING 123456C
5 May 2006
(See 6.)

b. Example of document superseding two documents

FAA-E-890B
11 August 2005
SUPERSEDING
FAA-E-890A
6 June 1996
FAA-C-123
18 July 2002
(See 6.)

c. Example of document superseding a document in part

FAA-E-567
11 August 2005
SUPERSEDING
MIL-A-123 D (IN PART)
5 May 2002

5.1.2.5 Heading

Specifications shall have centered above the title:

- a. "PERFORMANCE SPECIFICATION"
- b. "SYSTEM SPECIFICATION"
- c. "DETAILED SPECIFICATION"

- d. "SOFTWARE SPECIFICATION"
- e. "ITEM SPECIFICATION"
- f. "MATERIAL SPECIFICATION"
- g. "PROCESS SPECIFICATION"
- h. "DEVELOPMENT SPECIFICATION"
- i. "SYSTEM SEGMENT SPECIFICATION"
- j. "INTERFACE REQUIREMENTS SPECIFICATION"

5.1.2.6 Specification title

The specification title shall be the name by which the entity (system, item, and software) will be known. In most cases, it will consist of the approved item name and type designator issued by the activity authorized to assign the nomenclature name. Specification titles shall not be duplicated within a program. References to major assemblies, end items, computer software units, processes, or materials shall be included in a title only to the extent necessary to distinguish between similar systems, items, and software. When an approved item name is not required, the title requirements in [5.1.3.6](#) shall be used as applicable.

5.1.2.7 FAA specifications

An FAA specification shall have a cover page.

- a. The FAA seal shall be in the upper left hand side of the cover page.
- b. The specification shall include a table of contents page. The table of contents page shall follow the cover page. The single phrase "TABLE OF CONTENTS" in capital letters shall head the table of contents page. The table of contents page shall include section, paragraph, figure, table, and appendix numbers or letters and titles, as appropriate; and an index, if used, and the page numbers to locate them. See the table of contents page of this standard for an example.

5.1.2.8 Preambles for specifications

The following preamble shall appear immediately under the title to show promulgation by the Department of Transportation for specifications where more than one Department or Agency has registered an interest as a custodian or review activity:

"This specification is approved for use by all Departments of the Federal Aviation Administration (FAA)."

5.1.2.9 Specification numbering.

FAA specifications are assigned traceability numbers by Enterprise Configuration Management organization following endorsement by the Systems Engineering organization. This alphanumeric designator will utilize the following format: FAA-(1)(XXX), where "XXX" equals a three digit number and the "1" is one of the following alpha characters:

- `C' Construction, (buildings, towers and other fixtures)
- `D' Documentation, (Technical Instruction Books (TIB's)), but does not include software documentation whose treatment is described in other FAA documents.

`E' Old "A" level specifications (functional performance specifications or subsystem specifications designated "item level" specifications) which were previously referred to as "B" and "C" specifications.

`G' General engineering or electronic requirements applicable to a wide range of processes as in a standard specification.

`P' Purchase descriptions, are used for small items or COTS and Non-developmental Items (NDI's) where little or no development is required. These specifications are subject to the SRB process.

`S' Leased services, such as telephone lines.

`O' Used when the operational requirements are written in performance based terms and the system solution will be unique.

The specification number is placed in the uppermost right corner of the cover page. Specification numbers will not be issued until the draft specification has been endorsed by Systems Engineering organization. Specification numbers are issued to the authoring organization following completion of the case file that will baseline the draft (endorsed) specification at the respective CCB.

5.1.2.10 Contact information

Specifications shall include contact information at the bottom center of the first page. The information shall include a mailing address and an email address. This information may be omitted for specifications with classified or sensitive information if there are security concerns. The note shall be boxed for emphasis.

Comments, suggestions, or questions on this document should be addressed to:

Federal Aviation Administration
ATO-P/SE
800 Independence Avenue, SW.
Washington, DC 20591

Otherwise help can be found through:

http://www.faa.gov/air_traffic/nas/system_standards/

5.1.3 Sectional arrangement of specifications

Specifications may contain five numbered sections, titled and numbered as shown below:

1. Scope
2. Applicable Documents
3. Requirements
4. Quality Assurance Provisions
5. Preparation for delivery

If there is no information pertinent to one of the above sections, the words "This section is not applicable to this specification." shall appear below the section heading. A complete list of acronyms shall be included in an Appendix of the specification.

5.1.4 Section 1 – Scope

The statement of the scope shall repeat the item name and its modifiers and consist of a clear, concise abstract of the coverage of the specification. The scope may include information as to the use of the item other than specific detailed applications covered

under "Intended use" (section 6). This brief statement shall be the first paragraph in section 1 of the six-section specification. The scope shall not contain requirements. Figures shall not be included in the scope. Additional information that shall be included in the scope is defined in the subsections below, as applicable.

5.1.4.1 Entity type description

When applicable, this paragraph shall provide a brief description of the entity covered by the specification and identify all immediately subordinate functional elements of the entity, including, as applicable, their names and identifiers. If the specification covers items or materials, this paragraph shall list the assigned part number(s), and when applicable, the parameters which differentiate them.

5.1.4.2 System software overview

For software, this paragraph shall briefly state the purpose of the system and the software to which the specification applies. It shall describe the general nature of the system and software; summarize the history of system development, operation, and maintenance; identify the project sponsor, acquirer, user, developer, and support agencies; identify current and planned operating sites; and list other relevant documents.

5.1.5 Section 2 – Applicable Documents

Section 2 shall list only those documents referenced in sections 3, 4, or 5 of the specification that are needed to meet requirements or provide useful information for meeting requirements. If a document is only cited as an example or for background information, it does not have to be listed in section 2. For the types of documents that may be referenced in specifications, see [4.1.15](#). The first paragraph in section 2 shall be as follows:

"2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed."

5.1.5.1 Government documents

The second paragraph in section 2 shall be titled as:

"2.2 Government documents" This paragraph shall identify all types of Government documents required in sections 3, 4, or 5, if applicable. The first subparagraph under this heading shall identify Government specifications, standards, and handbooks, if applicable. The second subparagraph under this heading shall identify other types of Government documents, drawings, and publications, if applicable.

5.1.5.1.1 Government specifications, standards, and handbooks

Government specifications, standards, and handbooks shall be listed by document identifier and title. Titles shall be taken from the documents rather than an index. Government specifications, standards, and handbooks shall be listed numerically (except

federal specifications, which shall be listed alphanumerically) under the following headings in the order shown, as appropriate:

FEDERAL SPECIFICATIONS
FEDERAL STANDARDS
FEDERAL HANDBOOKS

5.1.5.1.1.1 Inclusion of specifications, standards, and handbooks

FAA specifications shall include the following paragraph as 2.2.1 if specifications, standards, and handbooks are to be listed as Applicable Documents:

“2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.”

5.1.5.1.1.2 Ordering of Cited Specifications

Specifications shall be listed in numerical sequence by the exact title of the included specification sheets.

5.1.5.1.2 Other Government documents, drawings, and publications

The following types of documents shall be listed after the paragraph 2.2.1 described above, in appropriate order (numerically or alphanumerically), under the headings of the issuing Government agency. If applicable, document(s) shall be listed by identifier and title. Titles shall be taken from the document rather than from an index.

- a. Other types of FAA publications, which might include technical manuals, design guides, cataloging handbooks, or reports
- b. Drawings. When detailed drawings referred to in a specification are listed in an assembly drawing, it is only necessary to list the assembly drawing. Figures bound integrally with the specification are not considered drawings and shall not be listed in section 2, unless they are reduced-size copies of drawings provided in the specification for information only and use of the full-size drawings is normally required with the specification.
- c. Government documents issued by DoD and other agencies, such as the Environmental Protection Agency, National Aeronautics and Space Administration, and the Occupational Safety and Health Administration.

5.1.5.1.2.1 Inclusion of additional Government documents, drawings, or publications

Specifications shall include one of the following paragraphs as 2.2.2 if Government documents, drawings, and publications not listed under 2.2.1 are to be listed as applicable documents:

- a. “2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications of the exact revision level shown form a part of this document to the extent specified herein.”
- b. “2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.”

5.1.5.1.2.2 Source identification

A parenthetical source statement shall follow each individual document, or each group of related documents, providing the name and address of the source. If possible, an Internet source for viewing or obtaining the documents shall be provided.

5.1.5.2 Non-Government standards and other publications

Non-Government standards and other publications not normally furnished by the Government shall be listed in appropriate order (numerically or alphanumerically) under the headings of the respective non-Government standards organization. The document(s) shall be listed by identifier and title, if applicable. Titles shall be taken from the document rather than from an index.

5.1.5.2.1 Inclusion of non-Government standards

FAA specifications shall include the following paragraph as 2.3 if non-Government standards are to be listed as Applicable Documents:

“2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.”

5.1.5.2.2 Source identification

A parenthetical source statement shall follow each respective issuing non-Government standards organization listing of documents, providing the name and address of the source. If possible, an Internet source for viewing or obtaining the documents shall be provided.

5.1.5.3 Order of precedence

In order to avoid confusion in the possible conflict between the requirements of the specification and the documents referenced therein, the following statement shall be included:

"2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained."

5.1.6 Section 3 – Requirements

This section shall define the requirements that the entity must meet to be acceptable. The following criteria shall apply for stating requirements:

- a. Each requirement shall be stated in such a way that an objective verification can be defined for it.
- b. Each requirement should be cross-referenced to the associated verification.
- c. Only requirements that are necessary, measurable, achievable, and verifiable shall be included.
- d. Requirements shall be worded to provide a definitive basis for acceptance or rejection.
- e. Requirements shall be described in a manner to encourage competition.

- f. Requirements shall be worded such that each paragraph only addresses one requirement or topic.

5.1.6.1 General specifications

When preparing a general specification, section 3 shall contain all the requirements that are common to the item or entity being specified. Those requirements shall be included in the general specification.

5.1.6.1.1 Performance specifications

The parameters specified in performance specifications shall prescribe Operating requirements, operational environment, required performance, interfaces, and interoperability requirements. Performance specifications shall not prescribe how a performance requirement is to be achieved by requiring the use of specific materials or parts or detailed requirements for the design or construction of the item beyond those needed to ensure interchangeability with existing items. For a general specification to be designated as a "Performance Specification," the requirements in its specification sheets shall also be stated as performance requirements.

5.1.6.2 Government-furnished property

All property to be furnished by the Government as part of the specification shall be listed and identified by PIN or stock number. Each item entry shall be numbered in order to provide ready reference. The specifications or drawings covering Government-furnished property need not be listed in section 2. Documents listed in section 2 are not considered Government-furnished property. This should be noted in the statement of work.

5.1.6.3 Government-loaned property

Property that the Government loans to the contractor for testing or any other purpose and which does not lose its identity by becoming part of the commodity shall be listed under this heading. This should be noted in the statement of work.

5.1.7 Section 4 – Quality Assurance Provisions

Section 4 shall include all inspections to be performed to determine that the item to be offered for acceptance conforms to the requirements in section 3 of the specification. QA may be accomplished by analysis, demonstration, examination, testing, or any combination thereof. This section shall not include quality requirements that belong in the contract, such as responsibility for inspection, establishment of quality or inspection program requirements, warranties, instructions for nonconforming items, and contractor liability for nonconformance. Reference the template in the Appendix.

5.1.7.1 Classification of inspections

If section 4 of the specification includes more than one type of inspection, a classification of inspections shall be included as the first paragraph of section 4, as illustrated in the following examples:

Exam ple A:

“4.1 Classification of inspections. The inspection requirements specified herein are contained in the statement of work and are classified as follows:

- a. Conformance inspection (see 4.X).”

5.1.7.2 Inspection conditions

When applicable, the environmental conditions under which all inspections are performed shall be specified as follows:

“4.X Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in (applicable test method document or applicable paragraph(s) in the specification).”

5.1.7.3 Types of inspection

The following subsections describe the various types of inspections that may be specified in section 4 of the Specification.

5.1.7.3.1 First article inspection

When section 3 specifies a first article inspection, section 4 shall include a description of the inspection procedure, sequence of the inspections, number of units to be inspected, and the criteria for determining conformance to the requirement specified. It is recommended that a table be included that cross-references the requirements with the appropriate first article examinations and tests.

5.1.7.3.2 Qualification inspection

When section 3 specifies a qualification requirement, section 4 shall include a description of the inspection procedure, sequence of inspections, number of units to be inspected, and the criteria for determining conformance to the qualification requirement. It is recommended that a table be included that cross-references the requirements with the appropriate qualification examinations and tests. In general, a specification that has first article inspection shall not also have qualification inspection, unless it can be shown that the item is so critical that failure would likely result in death or injury.

5.1.7.3.3 Conformance inspection

Conformance inspection shall ensure that production items meet specification requirements prior to acceptance by the Government. Conformance inspection shall include a description of the inspection procedure, sequence of inspections, number of units to be inspected, and the criteria for determining conformance to the requirement specified. Conformance examinations and tests may be the same as those specified for first article inspection, but they shall not duplicate any long-term or special tests that were used to justify inclusion of qualification in a specification. It is recommended that a table be included that cross-references requirements with the appropriate conformance examinations and tests.

5.1.7.4 Sampling.

Sampling is a valuable tool for verification of compliance with specification requirements. Specifications may include sampling, but shall not include any fixed acceptable quality levels, lot tolerance percent defectives, or other types of fixed levels of

defects. Such provisions may be included in the quality assurance section of the contract, but shall not be in the specification.

5.1.8 Section 5 - Preparation for Delivery

This section shall provide instructions related to preservation and packaging as well as marking requirements. Preservation and packaging of each item covered by the specification shall be specified by the procuring activity at the time of delivery. This should include information about reusable shipping containers, or handling of replacement spares or individual parts. This will include labeling (or marking) and handling requirements. For software this should include requirements for both hard and soft copies (numbers of copies and format). These statements may also be in the SOW.

5.2 Quality System Requirements

Quality Assurance concepts shall be considered in all aspects of the acquisition process. A quality system shall be defined, implemented and maintained in accordance with the requirements of the appropriate ISO-9000 Quality Management and Quality Assurance Standards.

5.2.1 Material Evaluation

Material evaluations normally consist of certification by the manufacturer and are supported by verifying data that all materials that become part of the finished product are in accordance with the specified requirements.

5.2.2 Quality Conformance Evaluation

Quality conformance evaluations verify that the product/equipment is in accordance with the specified requirements. Quality conformance evaluations may include, but not be limited to, visual inspections, and functional testing.

5.3 Verification/Compliance to Requirements

5.3.1 Requirements Verification Matrix

The requirements in section 3 shall be verified by demonstration, inspection, testing, or analysis and listed in a Requirements Verification Matrix table. Certified documentation of previous activities may be an acceptable substitute for performing any of the verifications listed. The following definitions apply to the table entries:

- (1) Demonstration (denoted by “D” in table): Verifying the presence of a function or capability in an item by displaying the results of the function being performed. This activity is similar to testing, as it requires a formal procedure, but no quantitative data recorded.
- (2) Inspection (denoted by “I” in the table): Verifying the required characteristics by means of observation. Observation includes seeing with the aid of tools that magnify.
- (3) Test (denoted by “T” in table): Verifying the presence of a function or capability in an item by performing a formal procedure to collect quantitative data in a controlled environment.

(4) Analysis (denoted by “A” in the table): Verifying the presence of a function or capability in an item by examining the action performed using mathematical, physical, or chemical principles.

6 NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use

Specifications covered by this standard are intended for use in acquisition to obtain FAA-unique items. Non-Government standards or commercial item descriptions should be used to describe the requirements for commercially available item.

6.2 Tailoring guidance

To ensure proper application of this standard, invitation for bids, requests for proposals, and contractual statements of work should tailor the requirements in sections 4 and 5 of this standard to exclude any unnecessary requirements. For example, if the statement of work requires a revision to a stand-alone specification, then all the paragraphs in this standard related to amendments, notices, supplements, and specification sheets should be excluded.

APPENDIX A. ACRONYM LIST

A	analysis
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATO-P/SE	Air Traffic Organization-P/System Engineering
ATO-W	Air Traffic Organization-W
CCB	Configuration Control Board
ckt	circuit
CM	Configuration Management
COTS	commercial of the shelf
D	demonstration
DoD	Department of Defense
DOORS Data	Object Oriented Requirements
FAA	Federal Aviation Administration
freq conv	frequency converter
GPO	Government Printing Office
I	inspection
IBM	International Business Machines, Corporation
ICAO	International Civil Aviation Organization
IEEE	Institute of Electrical and Electronics Engineers
MIL	Military
NDI's	Non-Developmental items
STD	Standard
T	test
TIB	Technical Instruction Book

APPENDIX B. FAA SPECIFICATION TEMPLATE

This Appendix is not a mandatory part of the specification. The information contained herein is intended for guidance only. The following template is offered to show what is expected in terms of format and content. When combined with the preceding information (sections 1-6) the user should have considerable guidance in generating their own specification.

B.1 Example Template of FAA Specification Sections

Foreword. This should contain a preamble about the intended group for guidance. This should contain statements of approval authority. This should contain a statement as to purpose of the Specification. This should contain a statement related to where comments or questions on the Specification should be addressed.

Table of Contents. The document shall contain a table of contents listing the title and page number of each titled paragraph and subparagraph. The table of contents shall then list the title and page number of each figure, table, and appendix, in that order.

1. Scope. This section has no content, only title.

1.1 Scope. This section should contain statements of intended content, purpose, and applicability. This section can define the boundary of a project which can include performance, design, and verification requirements.

1.2 Change Record - Indicates any modifications made to the document.

1.3 Overview/Definitions –Defines the product to be delivered and operational setting within the NAS. This section should contain a paragraph that briefly describes the general nature of the system; summarizes the history of the system development, operation, and maintenance; identify the project sponsor, acquirer, user, developer, and support agencies; identify current and planned operating sites; and list other relevant documents.

2. Applicable Documents. Includes documents used for reference within the body of the specification. Should contain only lists of Government documents and Non-Government documents used in the Specification and order of precedence. Included herein should be referenced specifications, standards, and handbooks as well as documents from special authorities, i.e. IEEE or ASME.

2.1 FAA Documents. Title only followed by a listing.

2.2 Non-FAA Government Documents. This may include Military documents.

2.3 Non-Government Documents. This may include documents like industry standards.

3. Definitions. Title only followed by a listing. All key and/or unique terms used in the Specification should be listed and defined in this section.

4. General Requirements. Title only.

4.1 General requirements. Many different types of specifications exist. The following is a list of some of them:

- “PERFORMANCE SPECIFICATION”
- “SYSTEM SPECIFICATION”
- “DETAILED SPECIFICATION”
- “SOFTWARE SPECIFICATION”
- “ITEM SPECIFICATION”
- “MATERIAL SPECIFICATION”
- “PROCESS SPECIFICATION”
- “DEVELOPMENT SPECIFICATION”
- “SYSTEM SEGMENT SPECIFICATION”
- “INTERFACE REQUIREMENTS SPECIFICATION”

With respect to the FAA and the NAS this section for each specification should contain conformance requirements that shall cover general requirements for the article being specified (separate subsections for each). These specifications should contain sections for requirements for preparation for delivery, transition, and verification and validation. These specifications should contain paragraphs that define the packaging requirements, if any, for packaging and marking copies of the CSCI. These specifications should contain paragraphs that state the Qualification provisions or method(s) to be used to demonstrate that a given body of software is a valid copy of the CSCI. For example, the method for executable files might be to establish that each executable file has an identically-named counterpart in the software in question and that each such counterpart can be shown, via bit-for-bit comparison, check sum, or other method, to be identical to the corresponding executable file.

5. Detailed Requirements. Title only.

5.1 Detailed requirements. This section should contain specific requirements including (separate subsections for each). Each individual specification shall have unique sections that complete their function. In general specifications shall contain requirements (as applicable to the individual subject specification) for design and construction, human engineering, design ranges (including test values, environmental values, etc.), power requirements, locations, protection, grounding, bonding, shielding, lightning protection, mechanical, performance (i.e. RM&A), safety, EMC, parts selection, materials selection, manufacturing processes, markings, and nameplates. Also specifications should contain requirements for Quality Assurance and a Requirements Verification Matrix. There should be a section to provide Requirements traceability:

- a. Traceability from each CSCI source file to the software unit(s) that it implements.
- b. Traceability from each software unit to the source files that implement it.

- c. Traceability from each computer hardware resource utilization measurement given to the CSCI requirements it addresses.
- d. Traceability from each CSCI requirement regarding computer hardware resource utilization to the utilization measurements given.

The Performance Specification shall provide:

- 1) System (or article being specified) Definition:
 - a) Functional Layouts: This section provides a functional block diagram of the article being specified, its major components and external interfacing items. This functional layout/schematic needs to show the major components. The diagram must be functional in nature. Only the details necessary should be provided.
 - b) Interfaces: The format for this section is as follows: The article being specified has functional and physical interfaces with the items listed below: List the items with which the element will interface and the exact characteristic of the interface. These interfacing items should appear on the functional block diagram. Only identify the inputs to article in this section. The details listed here must match the Interface Requirements Document and Interface Control Document for the program. Provide a matrix that shows the specified article and the item in the interface and the IRD/ICD being satisfied. If the failure mode of the interface is unique then it should be defined. There may be different interface figures for different states and modes. Break this into two major subheadings (external and internal).
 - c) Major Components: Provide a name list of the major components if these exist. This section should only exist if it is in our best interest and technically justifiable to dictate the architecture at the next level. If FAA supplied equipment is used this section must be used and call out the FAA supplied equipment as a major component. If a Commercial off the Shelf (COTS) item is used it must also be considered a major component unless it is a thing like a resistor or nut or screw. There must be enough items in this list such that it is totally defined by the items on the list. If this section is used then internal interfaces must be defined.
 - d) FAA/Government Furnished Equipment: List all equipment supplied to the contractor producing the item in this specification that will be included as a part of that end item. The detailed characteristics of these items must be included in the interface definitions.
 - e) States and Modes: The only states or modes which must be listed are those that impact/change the requirements expected from the product to be delivered. Each state and mode must be defined as to when that state or mode stops and starts. All modes must be identified as to which state it occurs in unless there is only one state. This section defines how the article being specified will recognize a state or mod, such as power applied to a given pin. If there are other procurement specifications on a single program they must use a common definition for a state or a mode. This should define the relation to any higher-level state or mode. A change in requirements must be documented in this section or in the following sections. A mode is a selected condition, which changes the requirements on the product. States and modes must also contain the duty cycle and timelines for system or equipment operation. These must include maintenance, training and

operational testing activities. It will also include anything like a mission profile. This section will include details about the element life (life time in modes and states, shelf life, operating life). This section includes the number of changes of modes and states as well as the time between changes.

- 2) Performance: No requirement should appear in more than one location. If states and modes are used then a performance matrix should be included here that state. Those requirements not listed apply during all states and modes."
 - a) Operational Performance: All requirements in this section shall be measurable, verifiable, listed in a singular statement (there are no compound requirements), positive, traceable, without the use of adjectives or adverbs, not a specific solution. This section defines the operating performance that is needed from the product. Each requirement will state interdependency with a state or a mode if interdependency exists, if not stated it is assumed that the requirement must be met during all states and modes. This section includes the derived requirements that are necessary to satisfy top level safety, human factors and security requirements that don't fall into categories of physical, reliability/availability and maintainability listed below. Included should be noise requirements and specify the relative location of measurement. These requirements may include attenuation requirements for other items physically located nearby. This section will include levels of transients, memory requirements, timing consumption requirements. This section will contain the requirements for element life, which will factor in the life definitions.
 - b) Physical. This paragraph defines all physical limitations placed on the delivered product. The limitations include such things as weight, physical dimensions, mass property, material usage/compatibility, handle or other item locations, color, unit production cost, etc.
 - c) Reliability/Availability: Availability of the performance items is the primary driver in this area. Availability of specific elements of that performance may force out requirements in the predominant mode of failure. Safety analysis is also used in the development of availability requirements and the higher level availability may impact the quantity of this element procured. Reliability values required directly reflect the availability requirements and the "time to repair". This will also be impacted by operational cost budgets as well as cost to repair or replace. The terms "mean time to failure", "mean time to removal", "mean time to unnecessary removal", "mean time to remove and replace", etc. may all surface in this section. Item, wire or component isolation requirements show up in this section. This section also states the requirements as to the minimum acceptable percentage of proper failure indications.
 - d) Maintainability: This section defines allowable maintenance actions. It defines people and skill level limitations. It defines the limitations on preventive/scheduled maintenance frequency and access time. It defines maintenance cost per operating or life hour. It defines the variety and types of support equipment. It defines the maximum down times. It defines the maintenance type man -hours per specific type of maintenance. Derived requirements from this and the reliability/availability requirements are the fault isolation time and success rate requirements. Built-in-Test (BIT) should not be a

requirement. If BIT is used or could be a potential solution then in this section add the requirements for types of actions, indications and direction. This section includes testing access and type limitations as well as tool use limitations. This section specifies the requirements related to the type of maintenance to be performed.

- e) Environments: Typically this is title only.
 - i) Natural Environments: The article being specified shall meet the requirements specified for exposure to the non-operating natural environments and during and after exposure to the operating natural environments. This section applies only to items exposed to the natural environments during some phase of the program life. In most cases all items must survive the non-operating environment as a result of shipping or storage. Locating the items within some type of enclosure (a building, etc.) may mitigate the operating environment. In the case that the environment is mitigated it will be found in the induced environment section. Proper selection of the environment listed herein will provide a cost-effective solution. Based on availability requirements, item costs, safety implications, redundancy of function and other solution characteristics determine the environment to be used.
 - (a) Operating: This section lists those environmental requirements that can physically exist in nature must be done to avoid unnecessary product cost. Ambient Pressure; Ambient Air Temperature: In this area always consider duration of exposure and the thermal mass of the element exposed to the temperature. Always provide a short duration maximum and minimum but in the case of a product with high thermal mass develop realistic exposure profiles which will provide realistic product cost. Include: Humidity, Fungus and Lightning. Include Surface precipitation. Include Rain (droplet size and accumulation rates for short medium and long term), snow (include maximum loads), hail and ice accumulation. Also include Sand and Dust and Wind. A paragraph concerning Solar Radiation is needed to provide the details of how this occurs in conjunction with the maximum temperatures. Also include the spectral distribution. Other paragraphs are needed to cover: Corrosive Atmosphere, Magnetic, Fog, and Seismic.
 - (b) Non-Operating: This section should include requirements for: Ambient Pressure, Ambient Air Temperature, Humidity, Fungus, Lightning, Surface Precipitation, Sand and Dust, Wind, Solar Radiation, Corrosive Atmosphere, Magnetic, Fog and Seismic.
 - ii) Induced Environments: This section should include the requirements for after exposure to the non-operating induced environments and during and after exposure to the operating induced environments. The items listed for induced environments must be reviewed and specific items that may impact function that are not listed in the guidelines must be added for the specific items.
 - (a) Operating: This should include requirements for: Pressure, Temperature, Humidity (dew point should always be listed and free

moisture may also be present and if so needs to be listed.), Shock and Vibration, Air Velocity, Acoustic and EMI/EMC.

(b) Non-Operating: This should include requirements for: Pressure, Temperature, Humidity (dew point should always be listed and free moisture may also be present and if so needs to be listed.), Shock and Vibration, Air Velocity, Acoustic and EMI/EMC.

- 3) System Characteristics: This section should include:
 - a) Safety: All safety performance requirements should be included. This section also includes personnel safety relative to the handling and operations of the product. This section also includes fail-safe requirements, dormant failures, safety factors and specific criteria relative to the type of product.
 - b) Security. This section defines specific requirements relative to the product and the necessary constraints to be placed on the product such that NAS security is maintained with the deployment of the product. Include: Physical Security, Information Security, and Personnel Security.
 - c) Interchangeability: This section should be used with caution and all the cost impacts and performance requirements for must be understood for interchangeable items. This can be a solution and as such defines the product beyond basic performance. This section may also be used to demand internal interchangeability of elements within the product. This is also a solution and must be approached as such.
 - d) Human Factors: This section defines the constraints that will be placed on the product such that it will meet standards established for human interface. These can be for maintenance, operation or other personnel accommodation. If reference documents are used specific sections must be applied and tailored to the specific application.
- 4) Logistics: This section contains the definition of the categories of maintenance as well as what is needed for supply support and tools and test equipment to be used.
- 5) Personnel and Training: This section defines the nature of the individuals that will provide operation of the equipment as well as the various types of maintenance. It also provides definition of the allowance for training that will be applied to both operation and maintenance.
- 6) Documentation: This section specifies specific documentation to be delivered with the product to support operation and maintenance. The format for the documentation can be flexible.
- 7) Major Component Characteristics: The contents of the paragraphs for each of the major components are the functions/requirements that are being allocated to that major component from article being specified. Each function/requirement listed must be traceable to the performance sections of this specification. All functions must be allocated.
- 8) Precedence and Combined Characteristics: The precedence section is used to define the relationships of various documents, which may be used or referenced. It is best handled by using a minimum of other documents or references. And in all cases the contents in this document should supersede any other document that is present. The "combined characteristics" section is similar to that which is defined in the "environments" section. This section defines in detail how characteristics can occur in

combination with or independent of other characteristics. This section defines combinations that are not to be considered. This becomes an important consideration for verification.

The Software Product Specification (SPS) contains or references the executable software, source files, and software support information, including "as built" design information and compilation, build, and modification procedures, for a Computer Software Configuration Item (CSCI). The SPS can be used to order the executable software and/or source files for a CSCI and is the primary software support document for the CSCI.

- 1) Executable software. This paragraph shall provide, by reference to enclosed or otherwise provided electronic media, the executable software for the CSCI, including any batch files, command files, data files, or other software files needed to install and operate the software on its target computer(s). In order for a body of software to be considered a valid copy of the CSCI's executable software, it must be shown to match these files exactly.
- 2) Source files. This paragraph shall provide, by reference to enclosed or otherwise provided electronic media, the source files for the CSCI, including any batch files, command files, data files, or other files needed to regenerate the executable software for the CSCI. In order for a body of software to be considered a valid copy of the CSCI's source files, it must be shown to match these files exactly.
- 3) Software support information. This section shall be divided into the following paragraphs to provide information needed to support the CSCI:
 - a) "As built" software design. This paragraph shall contain, or reference an appendix or other deliverable document that contains, information describing the design of the "as built" CSCI. The information shall be the same as that required in a Software Design Description (SDD), Interface Design Description (IDD), and Database Design Description (DBDD), as applicable. If these documents or their equivalents are to be delivered for the "as built" CSCI, this paragraph shall reference them. If not, the information shall be provided in this document. Information provided in the headers, comments, and code of the source code listings may be referenced and need not be repeated in this section. If the SDD, IDD, or DBDD is included in an appendix, the paragraph numbers and page numbers need not be changed.
 - b) Compilation/build procedures. This paragraph shall describe, or reference an appendix that describes, the compilation/build process to be used to create the executable files from the source files and to prepare the executable files to be loaded into firmware or other distribution media. It shall specify the compiler(s)/assembler(s) to be used, including version numbers; other hardware and software needed, including version numbers; any settings, options, or conventions to be used; and procedures for compiling/assembling, linking, and building the CSCI and the software system/subsystem containing the CSCI, including variations for different sites, configurations, versions, etc. Build procedures above the CSCI level may be presented in one SPS and referenced from the others.

- c) Modification procedures. This paragraph shall describe procedures that must be followed to modify the CSCI. It shall include or reference information on the following, as applicable:
 - i) Support facilities, equipment, and software, and procedures for their use
 - ii) Databases/data files used by the CSCI and procedures for using and modifying them
 - iii) Design, coding, and other conventions to be followed
 - iv) Compilation/build procedures if different from those above
 - v) Integration and testing procedures to be followed
- d) Computer hardware resource utilization. This paragraph shall describe the "as built" CSCI's measured utilization of computer hardware resources (such as processor capacity, memory capacity, input/output device capacity, auxiliary storage capacity, and communications/ network equipment capacity). It shall cover all computer hardware resources included in utilization requirements for the CSCI, in system-level resource allocations affecting the CSCI, or in the software development plan. If all utilization data for a given computer hardware resource is presented in a single location, such as in one SPS, this paragraph may reference that source. Included for each computer hardware resource shall be:
 - i) The CSCI requirements or system-level resource allocations being satisfied.
 - ii) The assumptions and conditions on which the utilization data are based (for example, typical usage, worst-case usage, assumption of certain events)
 - iii) Any special considerations affecting the utilization (such as use of virtual memory, overlays, or multiprocessors or the impacts of operating system overhead, library software, or other implementation overhead)
 - iv) The units of measure used (such as percentage of processor capacity, cycles per second, bytes of memory, kilobytes per second)
 - v) The level(s) at which the estimates or measures have been made (such as software unit, CSCI, or executable program)

The System/Subsystem Specification (SSS) specifies the requirements to be met by a system or subsystem. The SSS is used as the basis for design and qualification testing of a system or subsystem.

- 1) Requirements. The SSS shall contain sections divided into paragraphs to specify the system requirements, that is, those characteristics of the system that are conditions for its acceptance. Each requirement shall be assigned a project-unique identifier to support testing and traceability and shall be stated in such a way that an objective test can be defined for it. Each requirement shall be annotated with associated qualification method(s) and, for subsystems, traceability to system requirements, if not provided in those sections. The degree of detail to be provided shall be guided by the following rule: Include those characteristics of the system that are conditions for system acceptance; defer to design descriptions those characteristics that the acquirer is willing to leave up to the developer. If there are no requirements in a given paragraph, the paragraph shall so state. If a given requirement fits into more than one paragraph, it may be stated once and referenced from the other paragraphs.
- 2) Required states and modes. If the system is required to operate in more than one state or mode having requirements distinct from other states or modes, paragraphs in this

section shall identify and define each state and mode. Examples of states and modes include: idle, ready, active, post-use analysis, training, degraded, emergency, backup, wartime, and peacetime. The distinction between states and modes is arbitrary. A system may be described in terms of states only, modes only, states within modes, modes within states, or any other scheme that is useful. If no states or modes are required, this paragraph shall so state, without the need to create artificial distinctions. If states and/or modes are required, each requirement or group of requirements in this specification shall be correlated to the states and modes. The correlation may be indicated by a table or other method in this paragraph, in an appendix referenced, or by annotation of the requirements in the paragraphs where they appear.

- 3) System capability requirements. This paragraph shall be divided into subparagraphs to itemize the requirements associated with each capability of the system. A "capability" is defined as a group of related requirements. The word "capability" may be replaced with "function," "subject," "object," or other term useful for presenting the requirements.
- 4) System capability. This paragraph shall identify a required system capability and shall itemize the requirements associated with the capability. If the capability can be more clearly specified by dividing it into constituent capabilities, the constituent capabilities shall be specified in subparagraphs. The requirements shall specify required behavior of the system and shall include applicable parameters, such as response times, throughput times, other timing constraints, sequencing, accuracy, capacities (how much/how many), priorities, continuous operation requirements, and allowable deviations based on operating conditions. The requirements shall include, as applicable, required behavior under unexpected, not allowed, or "out of bounds" conditions, requirements for error handling, and any provisions to be incorporated into the system to provide continuity of operations in the event of emergencies.
- 5) Interface identification and diagrams. This paragraph shall identify the required external interfaces of the system. The identification of each interface shall include a project-unique identifier and shall designate the interfacing entities (systems, configuration items, users, etc.) by name, number, version, and documentation references, as applicable. The identification shall state which entities have fixed interface characteristics (and therefore impose interface requirements on interfacing entities) and which are being developed or modified (thus having interface requirements imposed on them). One or more interface diagrams shall be provided to depict the interfaces
- 6) Project unique identifier of interface. This paragraph shall identify a system external interface by project unique identifier, shall briefly identify the interfacing entities, and shall be divided into subparagraphs as needed to state the requirements imposed on the system to achieve the interface. Interface characteristics of the other entities involved in the interface shall be stated as assumptions or as "When [the entity not covered] does this, the system shall..." not as requirements on the other entities. This paragraph may reference other documents (such as data dictionaries, standards for communication protocols, and standards for user interfaces) in place of stating the information here. The requirements shall include the following, as applicable, presented in any order suited to the requirements, and shall note any differences in these characteristics from the point of view of the interfacing entities (such as

- different expectations about the size, frequency, or other characteristics of data elements). With regard to a project unique interface the SSS shall include:
- 7) Priority that the system must assign the interface
 - 8) Requirements on the type of interface (such as real-time data transfer, storage and retrieval of data, etc) to be implemented
 - 9) Required characteristics of individual data elements that the system must provide, store, send, access, receive, etc
 - 10) Names/identifiers
 - a) Project-unique identifier
 - b) Non-technical (natural-language) name
 - c) DoD standard data element name
 - d) Technical name (e.g., variable or field name in code or database)
 - e) Abbreviation or synonymous names
 - 11) Data type (alphanumeric, integer, etc.)
 - 12) Size and format (such as length and punctuation of a character string)
 - 13) Units of measurement (such as meters, dollars, nanoseconds)
 - 14) Range or enumeration of possible values (such as 0-99)
 - 15) Accuracy (how correct) and precision (number of significant digits)
 - 16) Priority, timing, frequency, volume, sequencing, and other constraints, such as whether the data element may be updated and whether business rules apply
 - 17) Security and privacy constraints
 - 18) Sources (setting/sending entities) and recipients (using/receiving entities)
 - 19) Required characteristics of data element assemblies (records, messages, files, arrays, displays, reports, etc) that the system must provide, store, send, access receive, etc
 - 20) Names/identifiers
 - a) Project-unique identifier
 - b) Non-technical (natural language) name
 - c) Technical name (e.g., record or data structure name in code or database)
 - d) Abbreviations or synonymous names
 - 21) Data elements in the assembly and their structure (number, order, grouping)
 - 22) Medium (such as disk) and structure of data elements/assemblies on the medium
 - 23) Visual and auditory characteristics of displays and other outputs (such as colors, layouts, fonts, icons and other display elements, beeps, lights)
 - 24) Relationships among assemblies, such as sorting/access characteristics
 - 25) Priority, timing, frequency, volume, sequencing, and other constraints, such as whether the assembly may be updated and whether business rules apply
 - 26) Security and privacy constraints
 - 27) Sources (setting/sending entities) and recipients (using/receiving entities)
 - 28) Required characteristics of communication methods that the system must use for the interface
 - 29) Project-unique identifier(s)
 - 30) Communication links/bands/frequencies/media and their characteristics
 - 31) Message formatting
 - 32) Flow control (such as sequence numbering and buffer allocation)
 - 33) Data transfer rate, whether periodic/non-periodic, and interval between transfers
 - 34) Routing, addressing, and naming conventions

- 35) Transmission services, including priority and grade
- 36) Safety/security/privacy considerations, such as encryption, user authentication, compartmentalization, and auditing
- 37) Required characteristics of protocols the system must use for the interface
- 38) Project-unique identifier(s)
- 39) Priority/layer of the protocol
- 40) Packeting, including fragmentation and reassembly, routing, and addressing
- 41) Legality checks, error control, and recovery procedures
- 42) Synchronization, including connection establishment, maintenance, termination
- 43) Status, identification, and any other reporting features
- 44) System internal interface requirements. This paragraph shall specify the requirements, if any, imposed on interfaces internal to the system. If all internal interfaces are left to the design or to requirement specifications for system components, this fact shall be so stated.
- 45) System internal data requirements. This paragraph shall specify the requirements, if any, imposed on data internal to the system. Included shall be requirements, if any, on databases and data files to be included in the system. If all decisions about internal data are left to the design or to requirements specifications for system components, this fact shall be so stated.
- 46) Adaptation requirements. This paragraph shall specify the requirements, if any, concerning installation-dependent data that the system is required to provide (such as site-dependent latitude and longitude or site-dependent state tax codes) and operational parameters that the system is required to use that may vary according to operational needs (such as parameters indicating operation-dependent targeting constants or data recording).
- 47) Safety requirements. This paragraph shall specify the system requirements, if any, concerned with preventing or minimizing unintended hazards to personnel, property, and the physical environment. Examples include restricting the use of dangerous materials; classifying explosives for purposes of shipping, handling, and storing; abort/escape provisions from enclosures; gas detection and warning devices; grounding of electrical systems; decontamination; and explosion proofing.
- 48) Security and privacy requirements. This paragraph shall specify the system requirements, if any, concerned with maintaining security and privacy. The requirements shall include, as applicable, the security/privacy environment in which the system must operate, the type and degree of security or privacy to be provided, the security/privacy risks the system must withstand, required safeguards to reduce those risks, the security/privacy policy that must be met, the security/privacy accountability the system must provide, and the criteria that must be met for security/privacy certification/accreditation.
- 49) System environment requirements. This paragraph shall specify the requirements, if any, regarding the environment in which the system must operate. Examples for a software system are the computer hardware and operating system on which the software must run. (Additional requirements concerning computer resources are given in the next paragraph). Examples for a hardware-software system include the environmental conditions that the system must withstand during transportation, storage, and operation, such as conditions in the natural environment (wind, rain,

temperature, geographic location), the induced environment (motion, shock, noise, electromagnetic radiation), and environments due to enemy action (explosions, radiation).

- 50) Computer resource requirements. This paragraph shall be divided into the following subparagraphs. Depending upon the nature of the system, the computer resources covered in these subparagraphs may constitute the environment of the system (as for a software system) or components of the system (as for a hardware-software system).
- 51) Computer hardware requirements. This paragraph shall specify the requirements, if any, regarding computer hardware that must be used by, or incorporated into, the system. The requirements shall include, as applicable, number of each type of equipment, type, size, capacity, and other required characteristics of processors, memory, input/output devices, auxiliary storage, communications/network equipment, and other required equipment.
- 52) Computer hardware resource utilization requirements. This paragraph shall specify the requirements, if any, on the system's computer hardware resource utilization, such as maximum allowable use of processor capacity, memory capacity, input/output device capacity, auxiliary storage device capacity, and communications/network equipment capacity. The requirements (stated, for example, as percentages of the capacity of each computer hardware resource) shall include the conditions, if any, under which the resource utilization is to be measured.
- 53) Computer software requirements. This paragraph shall specify the requirements, if any, regarding computer software that must be used by, or incorporated into, the system. Examples include operating systems, database management systems, communications/ network software, utility software, input and equipment simulators, test software, and manufacturing software. The correct nomenclature, version, and documentation references of each such software item shall be provided.
- 54) Computer communications requirements. This paragraph shall specify the additional requirements, if any, concerning the computer communications that must be used by, or incorporated into, the system. Examples include geographic locations to be linked; configuration and network topology; transmission techniques; data transfer rates; gateways; required system use times; type and volume of data to be transmitted/received; time boundaries for transmission/reception/response; peak volumes of data; and diagnostic features.
- 55) System quality factors. This paragraph shall specify the requirements, if any, pertaining to system quality factors. Examples include quantitative requirements concerning system functionality (the ability to perform all required functions), reliability (the ability to perform with correct, consistent results -- such as mean time between failure for equipment), maintainability (the ability to be easily serviced, repaired, or corrected), availability (the ability to be accessed and operated when needed), flexibility (the ability to be easily adapted to changing requirements), portability of software (the ability to be easily modified for a new environment), reusability (the ability to be used in multiple applications), testability (the ability to be easily and thoroughly tested), usability (the ability to be easily learned and used), and other attributes.
- 56) Design and construction constraints. This paragraph shall specify the requirements, if any, that constrain the design and construction of the system. For hardware-software

systems, this paragraph shall include the physical requirements imposed on the system. These requirements may be specified by reference to appropriate commercial or military standards and specifications. Examples include requirements concerning:

- a) Use of a particular system architecture or requirements on the architecture, such as required subsystems; use of standard, military, or existing components; or use of Government/acquirer-furnished property (equipment, information, or software)
- b) Use of particular design or construction standards; use of particular data standards; use of a particular programming language; workmanship requirements and production techniques
- c) Physical characteristics of the system (such as weight limits, dimensional limits, color, protective coatings); interchangeability of parts; ability to be transported from one location to another; ability to be carried or set up by one, or a given number of, persons
- d) Materials that can and cannot be used; requirements on the handling of toxic materials; limits on the electromagnetic radiation that the system is permitted to generate
- e) Use of nameplates, part marking, serial and lot number marking, and other identifying markings
- f) Flexibility and expandability that must be provided to support anticipated areas of growth or changes in technology, threat, or mission

57) Personnel-related requirements. This paragraph shall specify the system requirements, if any, included to accommodate the number, skill levels, duty cycles, training needs, or other information about the personnel who will use or support the system. Examples include requirements for the number of work stations to be provided and for built-in help and training features. Also included shall be the human factors engineering requirements, if any, imposed on the system. These requirements shall include, as applicable, considerations for the capabilities and limitations of humans, foreseeable human errors under both normal and extreme conditions, and specific areas where the effects of human error would be particularly serious. Examples include requirements for adjustable-height work stations, color and duration of error messages, physical placement of critical indicators or buttons, and use of auditory signals.

58) Training-related requirements. This paragraph shall specify the system requirements, if any, pertaining to training. Examples include training devices and training materials to be included in the system.

59) Logistics-related requirements. This paragraph shall specify the system requirements, if any, concerned with logistics considerations. These considerations may include: system maintenance, software support, system transportation modes, supply system requirements, impact on existing facilities, and impact on existing equipment.

60) Other requirements. This paragraph shall specify additional system requirements, if any, not covered in the previous paragraphs. Examples include requirements for system documentation, such as specifications, drawings, technical manuals, test plans and procedures, and installation instruction data, if not covered in other contractual documents.

61) Packaging requirements. This section shall specify the requirements, if any, for packaging, labeling, and handling the system and its components for delivery.

- 62) Precedence and criticality of requirements. This paragraph shall specify, if applicable, the order of precedence, criticality, or assigned weights indicating the relative importance of the requirements in this specification. Examples include identifying those requirements deemed critical to safety, to security, or to privacy for purposes of singling them out for special treatment. If all requirements have equal weight, this paragraph shall so state.

The Software Requirements Specification (SRS) specifies the requirements for a Computer Software Configuration Item (CSCI) and the methods to be used to ensure that each requirement has been met. Requirements pertaining to the CSCI's external interfaces may be presented in the SRS or in one or more Interface Requirements Specifications (IRSs) referenced from the SRS. The SRS, possibly supplemented by IRSs, is used as the basis for design and qualification testing of a CSCI.

This section shall be divided into the following paragraphs to specify the CSCI requirements, that is, those characteristics of the CSCI that are conditions for its acceptance. CSCI requirements are software requirements generated to satisfy the system requirements allocated to this CSCI. Each requirement shall be assigned a project-unique identifier to support testing and traceability and shall be stated in such a way that an objective test can be defined for it. Each requirement shall be annotated with associated qualification method(s) and traceability to system (or subsystem, if applicable) requirements if not provided in those sections. The degree of detail to be provided shall be guided by the following rule: Include those characteristics of the CSCI that are conditions for CSCI acceptance; defer to design descriptions those characteristics that the acquirer is willing to leave up to the developer. If there are no requirements in a given paragraph, the paragraph shall so state. If a given requirement fits into more than one paragraph, it may be stated once and referenced from the other paragraphs.

- 1) Required states and modes. If the CSCI is required to operate in more than one state or mode having requirements distinct from other states or modes, this paragraph shall identify and define each state and mode. Examples of states and modes include: idle, ready, active, post use analysis, training, degraded, emergency, backup, wartime, peacetime. The distinction between states and modes is arbitrary. A CSCI may be described in terms of states only, modes only, states within modes, modes within states, or any other scheme that is useful. If no states or modes are required, this paragraph shall so state, without the need to create artificial distinctions. If states and/or modes are required, each requirement or group of requirements in this specification shall be correlated to the states and modes. The correlation may be indicated by a table or other method in this paragraph, or in an appendix referenced from this paragraph, or by annotation of the requirements in the paragraphs where they appear.
- 2) CSCI capability requirements. This paragraph shall be divided into subparagraphs to itemize the requirements associated with each capability of the CSCI. A "capability" is defined as a group of related requirements. The word "capability" may be replaced with "function," "subject," "object," or other term useful for presenting the requirements.
- 3) CSCI capability. This paragraph shall identify a required CSCI capability and shall itemize the requirements associated with the capability. If the capability can be more

clearly specified by dividing it into constituent capabilities, the constituent capabilities shall be specified in subparagraphs. The requirements shall specify required behavior of the CSCI and shall include applicable parameters, such as response times, throughput times, other timing constraints, sequencing, accuracy, capacities (how much/how many), priorities, continuous operation requirements, and allowable deviations based on operating conditions. The requirements shall include, as applicable, required behavior under unexpected, not allowed, or "out of bounds" conditions, requirements for error handling, and any provisions to be incorporated into the CSCI to provide continuity of operations in the event of emergencies.

Paragraph 3.3.x of this DID provides a list of topics to be considered when specifying requirements regarding inputs the CSCI must accept and outputs it must produce.

- 4) CSCI external interface requirements. This paragraph shall be divided into subparagraphs to specify the requirements, if any, for the CSCI's external interfaces. This paragraph may reference one or more Interface Requirements Specifications (IRSs) or other documents containing these requirements.
- 5) Interface identification and diagrams. This paragraph shall identify the required external interfaces of the CSCI (that is, relationships with other entities that involve sharing, providing or exchanging data). The identification of each interface shall include a project-unique identifier and shall designate the interfacing entities (systems, configuration items, users, etc.) by name, number, version, and documentation references, as applicable. The identification shall state which entities have fixed interface characteristics (and therefore impose interface requirements on interfacing entities) and which are being developed or modified (thus having interface requirements imposed on them). One or more interface diagrams shall be provided to depict the interfaces.
- 6) Project-unique identifier of interface. This paragraph shall identify a CSCI external interface by project-unique identifier, shall briefly identify the interfacing entities, and shall be divided into subparagraphs as needed to state the requirements imposed on the CSCI to achieve the interface. Interface characteristics of the other entities involved in the interface shall be stated as assumptions or as "When [the entity not covered] does this, the CSCI shall...", not as requirements on the other entities. This paragraph may reference other documents (such as data dictionaries, standards for communication protocols, and standards for user interfaces) in place of stating the information here. The requirements shall include the following, as applicable, presented in any order suited to the requirements, and shall note any differences in these characteristics from the point of view of the interfacing entities (such as different expectations about the size, frequency, or other characteristics of data elements):
 - a) Priority that the CSCI must assign the interface
 - b) Requirements on the type of interface (such as real-time data transfer, storage-and retrieval of data, etc.) to be implemented
 - c) Required characteristics of individual data elements that the CSCI must provide, store, send, access, receive, etc., such as:
 - i) Names/identifiers
 - (1) Project-unique identifier
 - (2) Non-technical (natural-language) name

- (3) DoD standard data element name
 - (4) Technical name (e.g., variable or field name in code or database)
 - (5) Abbreviation or synonymous names
- ii) Data type (alphanumeric, integer, etc.)
- iii) Size and format (such as length and punctuation of a character string)
- iv) Units of measurement (such as meters, dollars, nanoseconds)
- v) Range or enumeration of possible values (such as 0-99)
- vi) Accuracy (how correct) and precision (number of significant digits)
- vii) Priority, timing, frequency, volume, sequencing, and other constraints, such as whether the data element may be updated and whether business rules apply
- viii) Security and privacy constraints
- ix) Sources (setting/sending entities) and recipients (using/receiving entities)
- d) Required characteristics of data element assemblies (records, messages, files, arrays, displays, reports, etc.) that the CSCI must provide, store, send, access, receive, etc., such as:
 - i) Names/identifiers
 - (1) Project-unique identifier
 - (2) Non-technical (natural language) name
 - (3) Technical name (e.g., record or data structure name in code or database)
 - (4) Abbreviations or synonymous names
 - ii) Data elements in the assembly and their structure (number, order, grouping)
 - iii) Medium (such as disk) and structure of data elements/assemblies on the medium
 - iv) Visual and auditory characteristics of displays and other outputs (such as colors, layouts, fonts, icons and other display elements, beeps, lights)
 - v) Relationships among assemblies, such as sorting/access characteristics
 - vi) Priority, timing, frequency, volume, sequencing, and other constraints, such as whether the assembly may be updated and whether business rules apply
 - vii) Security and privacy constraints
 - viii) Sources (setting/sending entities) and recipients (using/receiving entities)
- e) Required characteristics of communication methods that the CSCI must use for the interface, such as:
 - i) Project-unique identifier(s)
 - ii) Communication links/bands/frequencies/media and their characteristics
 - iii) Message formatting
 - iv) Flow control (such as sequence numbering and buffer allocation)
 - v) Data transfer rate, whether periodic/non-periodic, and interval between transfers
 - vi) Routing, addressing, and naming conventions
 - vii) Transmission services, including priority and grade
 - viii) Safety/security/privacy considerations, such as encryption, user authentication, compartmentalization, and auditing
- f) Required characteristics of protocols the CSCI must use for the interface, such as:
 - i) Project-unique identifier(s)
 - ii) Priority/layer of the protocol
 - iii) Packeting, including fragmentation and reassembly, routing, and addressing

- iv) Legality checks, error control, and recovery procedures
 - v) Synchronization, including connection establishment, maintenance, termination
 - vi) Status, identification, and any other reporting features
 - g) Other required characteristics, such as physical compatibility of the interfacing entities (dimensions, tolerances, loads, plug compatibility, etc.), voltages, etc.
- 7) CSCI internal interface requirements. This paragraph shall specify the requirements, if any, imposed on interfaces internal to the CSCI. If all internal interfaces are left to the design, this fact shall be so stated.
 - 8) CSCI internal data requirements. This paragraph shall specify the requirements, if any, imposed on data internal to the CSCI. Included shall be requirements, if any, on databases and data files to be included in the CSCI. If all decisions about internal data are left to the design, this fact shall be so stated.
 - 9) Adaptation requirements. This paragraph shall specify the requirements, if any, concerning installation-dependent data to be provided by the CSCI (such as site-dependent latitude and longitude or site-dependent state tax codes) and operational parameters that the CSCI is required to use that may vary according to operational needs (such as parameters indicating operation-dependent targeting constants or data recording).
 - 10) Safety requirements. This paragraph shall specify the CSCI requirements, if any, concerned with preventing or minimizing unintended hazards to personnel, property, and the physical environment. Examples include safeguards the CSCI must provide to prevent inadvertent actions (such as accidentally issuing an "auto pilot off" command) and non-actions (such as failure to issue an intended "auto pilot off" command). This paragraph shall include the CSCI requirements, if any, regarding nuclear components of the system, including, as applicable, prevention of inadvertent detonation and compliance with nuclear safety rules.
 - 11) Security and privacy requirements. This paragraph shall specify the CSCI requirements, if any, concerned with maintaining security and privacy. These requirements shall include, as applicable, the security/privacy environment in which the CSCI must operate, the type and degree of security or privacy to be provided, the security/privacy risks the CSCI must withstand, required safeguards to reduce those risks, the security/privacy policy that must be met, the security/privacy accountability the CSCI must provide, and the criteria that must be met for security/privacy certification/accreditation.
 - 12) CSCI environment requirements. This paragraph shall specify the requirements, if any, regarding the environment in which the CSCI must operate. Examples include the computer hardware and operating system on which the CSCI must run. (Additional requirements concerning computer resources are given in the next paragraph.)
 - 13) Computer resource requirements. This paragraph shall be divided into the following subparagraphs.
 - a) Computer hardware requirements. This paragraph shall specify the requirements, if any, regarding computer hardware that must be used by the CSCI. The requirements shall include, as applicable, number of each type of equipment, type, size, capacity, and other required characteristics of processors, memory,

- input/output devices, auxiliary storage, communications/network equipment, and other required equipment.
- b) Computer hardware resource utilization requirements. This paragraph shall specify the requirements, if any, on the CSCI's computer hardware resource utilization, such as maximum allowable use of processor capacity, memory capacity, input/output device capacity, auxiliary storage device capacity, and communications/network equipment capacity. The requirements (stated, for example, as percentages of the capacity of each computer hardware resource) shall include the conditions, if any, under which the resource utilization is to be measured.
 - c) Computer software requirements. This paragraph shall specify the requirements, if any, regarding computer software that must be used by, or incorporated into, the CSCI. Examples include operating systems, database management systems, communications/ network software, utility software, input and equipment simulators, test software, and manufacturing software. The correct nomenclature, version, and documentation references of each such software item shall be provided.
 - d) Computer communications requirements. This paragraph shall specify the additional requirements, if any, concerning the computer communications that must be used by the CSCI. Examples include geographic locations to be linked; configuration and network topology; transmission techniques; data transfer rates; gateways; required system use times; type and volume of data to be transmitted/received; time boundaries for transmission/reception/response; peak volumes of data; and diagnostic features.
- 14) Software quality factors. This paragraph shall specify the CSCI requirements, if any, concerned with software quality factors identified in the contract or derived from a higher level specification. Examples include quantitative requirements regarding CSCI functionality (the ability to perform all required functions), reliability (the ability to perform with correct, consistent results), maintainability (the ability to be easily corrected), availability (the ability to be accessed and operated when needed), flexibility (the ability to be easily adapted to changing requirements), portability (the ability to be easily modified for a new environment), reusability (the ability to be used in multiple applications), testability (the ability to be easily and thoroughly tested), usability (the ability to be easily learned and used), and other attributes.
- 15) Design and implementation constraints. This paragraph shall specify the requirements, if any, that constrain the design and implementation of the CSCI. These requirements may be specified by reference to appropriate commercial or military standards and specifications. Examples include requirements concerning:
- a) Use of a particular CSCI architecture or requirements on the architecture, such as required databases or other software units; use of standard, military, or existing components; or use of Government/acquirer-furnished property (equipment, information, or software)
 - b) Use of particular design or implementation standards; use of particular data standards; use of a particular programming language
 - c) Flexibility and expandability that must be provided to support anticipated areas of growth or changes in technology, threat, or mission

- 16) Personnel-related requirements. This paragraph shall specify the CSCI requirements, if any, included to accommodate the number, skill levels, duty cycles, training needs, or other information about the personnel who will use or support the CSCI. Examples include requirements for number of simultaneous users and for built-in help or training features. Also included shall be the human factors engineering requirements, if any, imposed on the CSCI. These requirements shall include, as applicable, considerations for the capabilities and limitations of humans; foreseeable human errors under both normal and extreme conditions; and specific areas where the effects of human error would be particularly serious. Examples include requirements for color and duration of error messages, physical placement of critical indicators or keys, and use of auditory signals.
- 17) Training-related requirements. This paragraph shall specify the CSCI requirements, if any, pertaining to training. Examples include training software to be included in the CSCI.
- 18) Logistics-related requirements. This paragraph shall specify the CSCI requirements, if any, concerned with logistics considerations. These considerations may include: system maintenance, software support, system transportation modes, supply-system requirements, impact on existing facilities, and impact on existing equipment.
- 19) Other requirements. This paragraph shall specify additional CSCI requirements, if any, not covered in the previous paragraphs.

The Interface Requirements Specification (IRS) specifies the requirements for the interface(s) and enables the Government to assess whether the implementation of the interface(s) complies with those requirements. Upon Government approval and authentication, the IRS becomes the joint configuration control device for the interface(s) and becomes part of the Allocated Baseline. The IRS is used by the contractor(s) as the basis for development of the interface(s). The IRS shall include:

- 1) Interface diagrams showing all hardware, software, and critical items to which the specification applies. One or more interface diagrams, as appropriate, shall be provided to depict the interfaces. Each interface shall be identified by name and project-unique identifier.
- 2) Interface name and project-unique identifier. This paragraph shall identify an interface by name and project-unique identifier, and shall state its purpose. This paragraph shall be divided into subparagraphs to specify the requirements for the interface and for the data transmitted across the interface.
- 3) Interface requirements. This paragraph shall contain statements of:
 - a) Whether the interfacing Computer Software Configuration Items (CSCIs) are to execute concurrently or sequentially. If concurrently, the method of inter-CSCI synchronization to be used.
 - b) Which communication protocol to be used for the interface
 - c) The priority level of the interface
- 4) Data requirements. This paragraph shall include a standard data element definition table which shall have:
 - a) the project unique identifiers for the data element
 - b) brief description of the data element
 - c) the hardware, software or critical item associated with the data element

- d) the hardware, software or critical items that are the users of the data element
- e) the units of measure required for the data element
- f) the limits and/or range of values required for the data element
- g) accuracy required for the data element
- h) and the precision or resolution required for the data element in terms of significant digits

5.2 Quality System Requirements

The requirements for Quality including material evaluation and quality conformance evaluations should be included.

5.3 Verification/Compliance to Requirements

The requirements verification matrix should be included along with an explanation as to its defined categories and uses.

6. Notes. This section is available for special definitions, tables, definitions of existing hardware, special considerations or a glossary.

6.1 Intended use.

This section shall include a statement as the intention for use within the FAA.

6.2 Tailoring guidance.

This section shall include statements that ensure proper application of this standard. In the event that a paragraph or subparagraph has been tailored out, a statement to that effect shall be added directly following the heading of each such (sub)paragraph. If a paragraph and all of its subparagraphs are tailored out, only the highest level paragraph heading need be included.

Appendices

This section may include anything that offers back up data, examples, special figures, tables of numerical data to support the recommendations. A list of acronyms is usually found here.