

Table of contents

15 User documentation.....	15-1
15.1 General	15-1
15.1.1 Matching documentation to users	15-2
15.1.2 Making documentation appear easy to use	15-3
15.2 Writing user documentation.....	15-4
15.2.1 Organization	15-4
15.2.1.1 Titles and headings	15-4
15.2.1.2 Numbering of sections and subsections	15-5
15.2.1.3 Advance organizers.....	15-6
15.2.1.4 Internal cross references	15-7
15.2.1.5 Task versus list orientation	15-7
15.2.2 Paragraphs	15-7
15.2.3 Sentences	15-8
15.2.3.1 Choice of wording.....	15-8
15.2.3.2 Writing level, readability	15-8
15.2.3.3 Length.....	15-9
15.2.3.4 Complexity.....	15-9
15.2.3.5 Word order.....	15-9
15.2.3.6 Voice.....	15-10
15.2.3.7 Person and mood.....	15-10
15.2.3.8 Positive, not negative wording.....	15-10
15.2.3.9 Standard phrases	15-11
15.2.3.10 Capitalization, punctuation, and hyphenation	15-11
15.2.4 Words and symbols.....	15-12
15.2.4.1 Consistency.....	15-12
15.2.4.2 Short, high-frequency words.....	15-12
15.2.4.3 Concrete, non-ambiguous words	15-13
15.2.4.4 Standard words	15-13
15.2.4.5 Pronouns	15-14
15.2.4.6 Definitions	15-14
15.2.4.7 Abbreviations and acronyms	15-14
15.2.4.8 Spelling	15-16
15.2.4.9 Numbers.....	15-16
15.2.4.10 Units of measurement	15-17
15.2.4.11 Letter symbols and mathematical signs.....	15-17
15.2.4.12 Graphic symbols	15-17
15.2.4.13 Other symbols	15-18
15.3 Layout and formatting	15-18
15.3.1 Document-level considerations.....	15-18
15.3.1.1 Size	15-18
15.3.1.2 Binding	15-19
15.3.2 Page-level considerations	15-19
15.3.2.1 Margins	15-19
15.3.2.2 Headers and footers	15-20
15.3.2.3 White space	15-21
15.3.2.4 Right-and left-hand pages	15-22
15.3.2.5 Page numbering	15-23
15.3.2.6 Columns	15-24
15.3.2.7 Foldout pages.....	15-24
15.3.3 Typographic issues	15-25
15.3.3.1 Type size	15-25
15.3.3.2 Line length	15-26
15.3.3.3 Line spacing.....	15-26
15.3.3.4 Justification.....	15-27
15.3.3.5 Type style (font).....	15-28
15.3.3.6 Upper versus mixed case text.....	15-28

15.3.3.7 Typographic emphasis	15-29
15.3.3.8 Print contrast, quality	15-30
15.3.3.9 Color and shading	15-31
15.4 Components of documents.....	15-31
15.4.1 Cover page	15-34
15.4.2 Table of contents.....	15-34
15.4.3 Lists of exhibits	15-35
15.4.4 Figures	15-36
15.4.4.1 General.....	15-36
15.4.4.2 Identification.....	15-36
15.4.4.3 Location	15-36
15.4.4.4 Style	15-37
15.4.4.5 Content.....	15-38
15.4.4.6 Orientation	15-38
15.4.4.7 Oversize figures	15-38
15.4.5 Tables	15-39
15.4.5.1 General.....	15-39
15.4.5.2 Identification.....	15-39
15.4.5.3 Location	15-40
15.4.5.4 Formatting.....	15-40
15.4.5.5 Content.....	15-40
15.4.5.6 Orientation	15-41
15.4.5.7 Oversize tables	15-41
15.4.6 Lists	15-41
15.4.7 Formulas and equations	15-42
15.4.8 Warnings, cautions, and notes	15-43
15.4.9 Appendixes	15-44
15.4.10 Glossary	15-45
15.4.11 Index	15-45
15.4.12 User feedback forms	15-46
15.4.13 Tabs	15-49
15.4.14 Footnotes	15-49
15.4.15 Copyright and patent issues	15-50
15.4.16 Publication date	15-50
15.5 Specific user document contents.....	15-50
15.5.1 Proceduralized instructions.....	15-50
15.5.1.1 General.....	15-51
15.5.1.2 Organization and content	15-51
15.5.1.3 Format.....	15-53
15.5.1.4 Wording of steps	15-53
15.5.1.5 Branching and cross-references	15-55
15.5.1.6 Miscellaneous	15-55
15.5.2 Interactive electronic technical manuals	15-56
15.5.2.1 General.....	15-56
15.5.2.2 Text	15-58
15.5.2.3 Graphics	15-59
15.5.2.4 Audio	15-61
15.5.2.5 Warnings, cautions, and notes.....	15-62
15.5.2.6 Interaction style	15-63
15.5.2.7 User interface.....	15-65
15.5.2.8 Special requirements for proceduralized instructions	15-65
15.5.2.9 Special requirements for troubleshooting information	15-66
15.5.2.10 Presentation of parts information	15-67
15.5.2.11 Descriptive information	15-68
15.6 Accommodating people with disabilities	15-68
15.6.1 Document readability and handling	15-69
15.6.2 Cognitive or language disabilities.....	15-70
Glossary	15-71

References	15-74
Index	15-77

List of exhibits

Exhibit 15.4 FAA directives and order of document components	15-33
Exhibit 15.4.1.2 Type sizes for cover page elements.....	15-34
Exhibit 15.4.12.3 (a) User Feedback form - Front.....	15-47
Exhibit 15.4.12.3 (b) User feedback form - Back.....	15-48

15 User documentation

This section provides criteria and rules for the development of documents that will be used by operators and maintainers in the performance of routine and corrective use of systems and equipment. User documentation includes user guides and manuals, user handbooks and technical instructions, job performance aids, quick reference guides, and instruction placards.

To be successful, a document must be appropriate to the knowledge and skills of its users, to the tasks they will perform using the document, and to the environment in which the users will perform these tasks. To ensure success, document development might include the following steps: (a) determine the relevant characteristics of the users of the document, in particular, their existing knowledge and skills, (b) determine the environment in which the document will be used, (c) determine the tasks to be covered by the document, (d) determine the users' information requirements, (e) determine the appropriate types of documentation, (f) create draft documents, (g) perform technical review(s), (h) perform usability tests, and (i) prepare documentation for release.

User documentation is part of the interface between the users and other system components. It contributes to the user's cognitive understanding of the hardware, software, and human interactions with these other components of the system. It can serve as a job aid and as a supplement to (but not a substitute for) system training. Thus, this section contributes to the usability and effectiveness of the operational system and is to be applied to new systems and equipment acquisitions and modifications as a part of development and procurement.

The first part of this section is devoted to criteria and rules for the development of printed user documentation in general. These general topics include organizing the document, writing the text, and laying out the page. These topics are followed by criteria and rules for the individual components that comprise a user document, such as the title page, figures, instructions, and indexes.

15.1 General

The users of a document want the document to help them perform their tasks quickly and efficiently. However, these users differ from each other in many ways in level of expertise, in motivation, in time constraints, in work styles, in reading abilities, in attitudes, in personal preferences, in age, and so on. The more these differences are accommodated, the more effective a document will be to its individual users. This section recommends some ways to match documentation to users and ways to make the documentation appear easy to use.

15.1.1 Matching documentation to users

- **15.1.1.1 Description of expected users.** The procuring agency shall provide a description of the expected users of the document to the document contractor. The description would include the following sorts of information: (a) aptitude profile, (b) reading level, (c) time in job, (d) job-related training, (e) job-related work experience, and (f) job-related skills, knowledge and duties. This description could be iterated between the procuring agency and the technical writers until they mutually agree that it is sufficient. [Source: Joyce, R.P., Chenzoff, Mulligan, & Mallory (AFHRL-TR-73), 1973; Department of Transportation (FAA-D-2494/b), 1984]

Example. FAA-D-2494/b, Technical Instruction Book Manuscript: Electronic, Electrical, and Mechanical Equipment, Requirements for Preparation of Manuscript and Production of Books, provides a general level description of some of these user characteristics, as well as instruction and maintenance environments.

- **15.1.1.2 Documentation for people at different skill levels.** If the users of a document are expected to vary widely in their skills and levels of experience, the document shall permit use in different ways by people at different levels, or different versions of the document shall be prepared for people at different levels. If a single document is designed for use by people with different skill levels, use by people at one level shall not be hindered by the material relevant to a different level. [Source: FAA-D-2494/b, 1984, Department of Defense (MIL-M-87268), 1995]

Examples. Beginning users can be guided to a tutorial, help process, or an entry-level document. Separate reference documents can be written for beginners, advanced users, and experts. A document intended for "novices" and "power users" of computer applications programs may give a procedure to select a sequence of windows for the novices and keyboard codes for direct control selection by the power users. Novice users might be given detailed, step-by step instructions to complete a procedure, while expert users might simply be given the name of the procedure to be completed -- a sort of checklist.

Another approach is to code information for different skill levels. Font size and type, opposite or alternative pages or paragraphs, shaded or color-coded boxes or borders, and position location on a page can be used to indicate applicable skill levels. For instance, location coding is typically used when multiple languages are presented for identical instructions.

15.1.2 Making documentation appear easy to use

Some components of a document affect users' perceptions of its attractiveness and its apparent ease of use. These components are listed here in their order of importance to users' perceptions.

- **15.1.2.1 Tabs.** If a document has many divisions (5 or more), it should have tabs for each major division or for each frequently used division. [Source: Angiolillo and Roberts, 1991; Simpson and Casey, 1988]
- **Examples.** This document uses an edge tab on the side of the insert page. A bleed-through marking at the same edge location on each page in a section, chapter, or topic can mark and divide topics.
- **15.1.2.2 Guides to organization.** User documents should have informative titles and, if applicable, a discernable, hierarchical system of section headings. Different levels of headings should be differentiated with typographic cuing, for example, size and boldness of the type (see Sections 15.2.1.1 and 15.3.3). White space, color, font type, and font sizes can be used judiciously if they aid in locating and categorizing information and contribute to readability and appearance of the document. They then result in a usable and friendly document. [Source: Angiolillo and Roberts, 1991]
- **15.1.2.3 Table of contents.** A user document shall have a table of contents unless it has fewer than three divisions or fewer than six pages. The table of contents shall not appear crowded, that is, it shall have a liberal amount of white space, and it shall use typographic cuing to differentiate among levels of headings. [Source: Angiolillo and Roberts, 1991; FAA-D-2494/b, 1984; Simpson and Casey, 1988]
- **15.1.2.4 Figures and examples.** User documents should be generous in providing figures and examples. Information that can be effectively presented as a figure or exhibit, should be. [Source: Angiolillo and Roberts, 1991]

15.2 Writing user documentation

This section contains criteria and rules for organizing a document, for writing and presenting paragraphs and sentences, and for choosing and using words and symbols, including abbreviations and acronyms.

15.2.1 Organization

Good documentation has a clear conceptual organization. The organization needs to be compatible with its purpose and understandable to its users. The organization helps the users find relevant information in order to carry out their functions and tasks. There are three major ways to help the user understand the conceptual organization: (a) the use of titles and headings, (b) the visual appearance of the document, and (c) a hierarchical numbering system.

Discussion. The features of the document can be reviewed for input by a user group early in its development. These users can contribute to its conceptual organization.

This section includes rules on the use of a variety of techniques that can help users use a document more effectively.

15.2.1.1 Titles and headings

Titles and headings are of major importance to users; they help users find relevant information, understand the organization of the document, and maintain awareness of their location in the document.

Definitions. A **title** is a word or phrase that describes or identifies the contents of a document or a portion of a document. A **heading** is the title of an organizational subdivision of a document, that is, a title that has hierarchical significance.

Discussion. Headings are usually set apart from the text to which they refer in a way that indicates the hierarchical structure of the document. This may be accomplished with the use of horizontal and vertical spacing. In addition, headings are usually differentiated from text typographically, for example, by the use of larger type size or increased boldness, or both.

- **15.2.1.1.1 Titles.** A document shall have a title, and its major subdivisions shall have headings. These titles and headings shall be brief, descriptive, and distinctive. That is, within the constraint of being as brief as possible, a title or heading shall identify the contents of the document or division with sufficient detail to distinguish it from similar documents or divisions. [Source: FAA-D-2494/b, 1984; MIL-STD-962B, 1988]
- **15.2.1.1.2 Paragraph titles.** If practical, each paragraph shall have a title that identifies its contents. Paragraph titles are practical if they help users in finding relevant information, if they contribute to understanding the paragraph contents, or if the users desire them. [Source: FAA-D-2494/b, 1984; Department of Defense (MIL-STD-962B), 1988; Department of Defense (MIL-STD-490A), 1985]
- **15.2.1.1.3 Uniqueness of titles.** Titles and headings shall not be repeated within a major division of a document. [Source: FAA-D-2494/b, 1984; MIL-STD-490A, 1985]

15.2.1.2 Numbering of sections and subsections

- **15.2.1.2.1 Decimal numbering.** The subdivisions of a document should be numbered in a way that reflects the organization of the document. This can be accomplished by: (a) assigning consecutive numbers to the major divisions of the document, beginning with 1 for the first, 2 for the second, and so on, (b) following this number with a period, (c) assigning consecutive numbers beginning with one to each subdivision, if any, of each major division and appending this number to that of the preceding division, (d) following this number with a period, and (e) continuing this process with any additional subdivisions until the paragraph level is reached. The final number should not be followed with a period. [Source: FAA-D-2494/b, 1984; MIL-STD-490A, 1985]
- **15.2.1.2.2 Itemization within a paragraph.** If it is necessary to identify individual items within a paragraph, they should be identified with lower case letters in parentheses so that they are not confused with the decimal numbering system. [Source: MIL-STD-962B, 1988; MIL-STD-490A, 1985]

- **15.2.1.2.3 Number of levels.** If possible, the numbering system should not exceed five levels, that is, the number of subdivisions from the document as a whole to its numbered paragraphs should not exceed five. When the material and its potential organization lend itself to fewer levels, four or three would be preferable. [Source: MIL-STD-962B, 1988; MIL-STD-490A, 1985]

Discussion. There is no "right" number of subdivisions for a document; whatever makes sense to the user is right as long as he or she can use it without difficulty. However, any numbering system becomes increasingly unwieldy as the number of subdivisions increases. Five levels is considered a reasonable limit. A rule of thumb from memory research is that people can generally remember five plus or minus two items or chunks of information. From a design point of view, the preference is to accommodate many people, thus, use fewer categories.

15.2.1.3 Advance organizers

Advance organizers have been shown to improve comprehension and retention of material that is unfamiliar to readers.

Definition. An **advance organizer** is supplementary information that is presented prior to the main body of information in which a user is interested.

Examples. Tables of contents, introductory summaries, flow charts, and adjunct questions are all advance organizers as long as they occur before the targeted information.

- **15.2.1.3.1 When to provide advance organizers.** If users are likely to be relatively unfamiliar with the contents of a document, one or more advance organizers should be included. [Source: MIL-STD-962B, 1988; MIL-STD-490A, 1985]

Examples. An introductory summary that states the main points or provides a framework for a document or a division of a document can be an effective advance organizer. A bulleted, advanced summary provides the user with a list of topics that can be easily scanned. Headings in the form of questions are also effective advance organizers. Any document of more than a few pages will probably benefit from a table of contents.

In this document, introductory textual information, and in some instances even exhibit information, is given in the right hand column and is associated with high level (first and second section level) headings. This introductory information is presented to give some advanced organization, orientation, or usage limitations for the section contents. Such information is optional for lower level headings.

15.2.1.4 Internal cross references

- **15.2.1.4.1 Minimize internal cross referencing.** Internal cross referencing should be minimized. Ways to do this include: (a) repetition of material, (b) sequential organization of the document, and (c) use of foldout pages so that needed material is visible simultaneously with any preceding material. [Source: MIL-STD-490A, 1985; Simpson and Casey, 1988]
- **15.2.1.4.2 Form of internal cross references.** Internal cross-references shall refer to subdivision or paragraph numbers, or, if numbering is not used, to the title of the subdivision or paragraph. Cross-references shall not be made to page numbers. [Source: MIL-STD-490A, 1985; MIL-STD-962B, 1988; Zaneski, 1982]

15.2.1.5 Task versus list orientation

Most user documents will probably be organized to facilitate the performance of one or more tasks. Others might be intended to provide quick access to specific information, and thus might be organized as ordered lists. For some documents, a hybrid of the two organizations might be appropriate (see Section 15.5.1).

- **15.2.1.5.1 Task orientation.** If a task orientation is appropriate for a user document, the organization of the document should reflect the steps of the task as determined by a task analysis. If the document covers more than one task, the sequence of coverage should reflect the sequence in which the tasks are performed to the extent possible (see Section 15.5.1 for procedural instructions). [Source: Simpson and Casey, 1988]
- **15.2.1.5.2 List orientation.** If a list orientation is appropriate for a user document, the document should be organized in a meaningful way, such as listing the topics in sequential, logical, or alphabetic order. [Source: Gribbons, 1992]

15.2.2 Paragraphs

- **15.2.2.1 Content of paragraphs.** In general, the content of a paragraph should be limited to a single idea. All of the material in the paragraph should relate to and develop that idea. [Source: MIL-M-87268, 1995]
- **15.2.2.2 Topic sentences.** In general, a paragraph should have a topic sentence, that is, a sentence that announces the topic of the paragraph. If present, a topic sentence should follow an initial linking sentence if there is one; otherwise, it should be the first sentence of the paragraph. [Source: Spyridakis & Wenger, 1992]

Definition. A **linking sentence** is a sentence that connects the paragraph it is in to the paragraph that precedes or follows it. The connection is usually accomplished by repeating a word or phrase or referring to a concept.

- **15.2.2.3 Length of paragraphs.** The average length of paragraphs in technical writing should not exceed six sentences. [Source: MIL-M-87268, 1995]

Discussion. The preferred length of paragraphs is three or four sentences, but five or six sentences are acceptable.

15.2.3 Sentences

The ideal sentence states directly what is meant, using familiar words, and without using any excess words; it states explicitly all information that is to be communicated, leaving nothing to be inferred. [Source: Simpson and Casey, 1988]

15.2.3.1 Choice of wording

- **15.2.3.1.1 Clear, simple language.** The text of a document shall be written in clear, simple language, free of vague, ambiguous, unfamiliar, and unnecessary words. [Source: FAA-D-2494/b, 1984; MIL-STD-490A, 1985; MIL-STD-962B, 1988]
- **15.2.3.1.2 Technical terms.** The text of a document should contain a minimum number of technical terms that require specialized knowledge to be understood unless those terms are needed to convey precise meaning. See Section 15.2.4.6.1 for rules regarding the definition of such terms when they are used. [Source: FAA-D-2494/b, 1984]

15.2.3.2 Writing level, readability

There are a number of formulas that derive a measure of the readability of text from word difficulty (usually based on word length and familiarity) and sentence complexity (usually based on sentence length). These summary metrics are useful in categorizing and evaluating reading levels of instructional materials. They do not provide specific suggestions to help in the writing of a unique technical document as they are usually calculated after the writing is done. Unfortunately, comprehensibility metrics are not yet available.

Discussion. These summary metrics include the Flesch formula for reading ease, the Dale-Chall formula, the Devereaux formula, The US Army FORECAST readability formula, and the Gunning Fog Index. Readability is usually expressed as a reading grade level. For example, a text might be said to be readable at the eighth grade level.

- **15.2.3.2.1 Writing level.** The writing level of a document should be appropriate to the users of that document. In addition to editorial review, draft review by a user group will provide insight into a document's readability and ability to be comprehended. [Source: FAA-D-2494/b, 1984, Boff and Lincoln, 1988]

15.2.3.3 Length

The typical sentence in user documentation expresses a single thought. The length of the sentence will be whatever is appropriate to the adequate expression of the thought. In some literary styles and subjects, very long sentences that maintain clarity are acceptable.

- **15.2.3.3.1 Average length.** Generally speaking, in technical writing, the length of sentences (without lists) should not, on the average, exceed 20 words. [Source: MIL-M-87268, 1995]

Discussion. The preferred average sentence length is 17 words or less, but up to 20 is acceptable. Shorter sentences are desirable if they express the intended message clearly and completely and comply with grammar rules.

Very long sentences often include lists; these lists can usually be presented vertically, that is, with each item on a separate line, greatly reducing the apparent difficulty of such sentences. Lists are especially appropriate for ordered series of items such as the sequential steps needed to perform a task.

15.2.3.4 Complexity

Complex and compound sentences are more difficult for users to comprehend than are simple sentences.

- **15.2.3.4.1 Single thought.** In general, a sentence should express a single thought. [Source: MIL-M-87268, 1992]
- **15.2.3.4.2 Subordinate clauses.** A user document should contain relatively few sentences that have more than one or two subordinate clauses. In general, short, simple sentences should be substituted for complex and compound sentences. [Source: MIL-STD-490A, 1985; Hartley, 1978]

15.2.3.5 Word order

- **15.2.3.5.1 Normal order.** In general, the elements of a sentence should be arranged in the following order: (a) subject, (b) verb, (c) object, (d) predicate object, and (e) indirect object. [Source: AFHRL-TR-73, 1973]

Example. "Human factors specialists want well-written documentation for the system users."

15.2.3.6 Voice

- **15.2.3.6.1 Active, not passive voice.** In general, sentences should be written in the active, not the passive voice. That is, the subject acts upon the predicate rather than the more complex arrangement where the subject is acted upon by the predicate. [Source: FAA-D-2494/b, 1984; Department of Defense (MIL-HDBK-761A), 1989; Simpson and Casey, 1988; Spyridakis & Wenger, 1992]

Examples. "Lively sentences move readers" (active) versus "The readers are moved by lively sentences" (passive).

15.2.3.7 Person and mood

- **15.2.3.7.1 Second person imperative.** The second person verb form and the imperative mood shall be used in all sentences that direct the reader to do something. Examples are: "Remove test set from carrying case," and "Turn R15 fully clockwise." [Source: AFHRL-TR-73, 1973; FAA-D-2494/b, 1984]

15.2.3.8 Positive, not negative wording

- **15.2.3.8.1 When to use positive wording.** Most of the time, positively worded sentences should be used because they are more definitive, less confusing, and less evasive than negatively worded statements. [Source: Hartley, 1978; Simpson and Casey, 1988; Spyridakis & Wenger, 1992]

Examples. "Often writers will not use negative sentences since these statements may not always be correctly interpreted" (negative) versus "Writers often choose the clarity of the positive over the confusion of the negative" (positive). Consider: "The operator monitoring for errors did not see the alarm nor solve the problem" (negative) versus "The operator failed to see the alarm or to act upon the problem" (positive).

- **15.2.3.8.2 When to use negative wording.** Negative wording should be used to state prohibitions and to correct existing or potential misconceptions. [Source: Hartley, 1978]

Examples. An example of a prohibition is: "Do not remove the cover until the power cord has been unplugged." An example of correcting a potential misconception is: "The highest voltage is not present in the largest wire; it is present in the red wire." Also consider: "The alarm display was beyond the visual envelopes of the operators, thus the problem could not be detected by the operational system."

15.2.3.9 Standard phrases

- **15.2.3.9.1 Consistent phrases.** The same phrase should be used to express the same meaning throughout a document. For example, the phrase "conforming to" should not be used in one place and "in accordance with" in another if the same meaning is intended. [Source: MIL-STD-490A, 1985; MIL-STD-962B, 1988]
- **15.2.3.9.2 Task steps.** If a task step occurs more than once in a user document, the same words shall be used in all occurrences, except for any unique variables that need to be included in the different occurrences. [Source: AFHRL-TR-73, 1973]

15.2.3.10 Capitalization and punctuation

- **15.2.3.10.1 Capitalization.** The United States Government Printing Office *Style Manual* shall be used as a guide for capitalization. If the *Style Manual* does not provide the guidance needed, Merriam-Webster's *New International Dictionary* shall be used. [Source: MIL-STD-490A, 1985; MIL-STD-962B, 1988]
- **15.2.3.10.2 Capitalization of phrases for emphasis.** Capitalization shall not be used to emphasize phrases (see Section 15.3.3.7 for the recommended way to emphasize text). [Source: MIL-STD-490A, 1985]

Discussion. Text other than single words is easiest to read and comprehend when it is presented in mixed case letters. Single words are recognized better when printed in all upper case letters.

- **15.2.3.10.3 Punctuation.** The United States Government Printing Office *Style Manual* shall be used as a guide for punctuation. If the *Style Manual* does not provide the guidance needed, Merriam-Webster's *New International Dictionary* shall be used. [Source: MIL-STD-490A, 1985; MIL-STD-962B, 1988; FAA-D-2494/b, 1984]

Discussion. Punctuation is an aid to accurate reading. Well-planned sentences need little punctuation. If a sentence seems to need extensive punctuation, it may need to be rewritten.

15.2.4 Words and symbols

15.2.4.1 Consistency

- **15.2.4.1.1 Terminology.** Technical lexicons should be developed within and between system and subsystems acquisition programs that include common human components (individual users or work groups). This terminology should reflect user inputs and shall be consistently used in system design and in user document development. Consistency of nomenclature, operational, and maintenance terminology is necessary to ensure that human communication is feasible, straight forward, and clear. Lexicon development should be done as early as possible in an acquisition. It is best done before the writing of the user documentation has begun. Terminology should be consistent throughout a user document and among related documents. For example, the name of a part, including any modifying words, should be the same in explanatory text, in procedural steps, and in parts lists. [Source: FAA-D-2494/b, 1984; MIL-STD-490A, 1985; Simpson and Casey, 1988]

Discussion. Variations in words and phrases, whether they occur intentionally for stylistic reasons or unintentionally through carelessness, incur a strong risk of confusing the reader. Consistent use of words and phrases may incur a slight risk of boredom, but it is not likely to cause confusion. If consistency is ensured in design, it is more likely to be reflected in the documentation. However, inconsistent use of lexicon among design components is likely to result in confusion and increase training burden for the users. This is particularly problematic when standard and accepted practice is not used in NDI or COTS subsystems and components. Such consistency needs to be considered as a criterion in the selection of COTS subsystems and in evaluating its hidden human and monetary costs for operations and maintenance. This consideration argues for closer relationships between the production and selection of user documentation and component selection and design and development.

15.2.4.2 Short, high-frequency words

Short, simple, and frequently used words are easier for readers to recognize and comprehend than are long, complex, and infrequently used words. [Source: Spyridakis & Wenger, 1992]

- **15.2.4.2.1 High-frequency words.** If equivalent high frequency (familiar) and low-frequency (unfamiliar) words exist for a desired use, the high-frequency word should be used. For example, use would be a better choice than employ. [Source: Spyridakis & Wenger, 1992]

- **15.2.4.2.2 Short words.** If equivalent short and long words exist for a desired use, the short word should be used. For example, use would be a better choice than utilize. [Source: Spyridakis & Wenger, 1992]
- **15.2.4.2.3 Simple words.** If equivalent simple and complex words or terms exist for a desired use, the simple word or term should be used. [Source: Spyridakis & Wenger, 1992]

15.2.4.3 Concrete, non-ambiguous words

- **15.2.4.3.1 Concrete versus abstract words.** Concrete words and terms should be used rather than abstract words and terms. [Source: Spyridakis & Wenger, 1992; Hartley, 1978]

Examples. Consider: "Maintenance for this system is poor" (abstract) versus "Maintenance records show that four computer components fail to meet reliability standards and the depot can not repair them. Expensive replacement components remain on back order. The system has been down for three weeks" (concrete).

- **15.2.4.3.2 Ambiguous words.** Ambiguous words and terms shall be avoided. [Source: FAA-D-2494/b, 1984]

Example. The word replace could mean either "remove an existing item and install a different one" or "reinstall an item." Thus replace by itself is ambiguous and must have additional or different words to make the meaning clear.

- **15.2.4.3.3 Indefinite words and terms.** Indefinite words and terms such as and/or, suitable, appropriate, and etc. should not be used. [Source: MIL-STD-962B, 1988]
- **15.2.4.3.4 Variations on flammable.** The words inflammable and uninflammable shall not be used. Flammable shall be used to describe a combustible object, and nonflammable shall be used to describe a noncombustible object. [Source: MIL-STD-490A, 1985; MIL-STD-962B, 1988]

15.2.4.4 Standard words

- **15.2.4.4.1 If, when, and where.** The word if should be used at the beginning of phrases that state conditions in which the passage of time and spatial location are not important, for example, "If a fuse is blown, perform the tests prescribed for the circuit it protects." The word when should be used at the beginning of phrases in which the passage of time is important, for example, "When the motor reaches a speed of 200 RPM." The word where should probably not be used to introduce a conditional phrase unless spatial location is important. [Source: MIL-M-87268, 1995]

- **15.2.4.4.2 Shall, should, may, and will.** If the sentence structure permits, the word "shall" shall be used in sentences that state something the user must do. The word "should" shall not be used in instructions to users. The word "may" shall be used to express permission or non-mandatory options. The word "will" shall not be used for any of these purposes. [Source: FAA-D-2494/b, 1984; MIL-STD-490A, 1985; MIL-STD-962B, 1988]

15.2.4.5 Pronouns

- **15.2.4.5.1 Unambiguous referents.** Whenever a pronoun is used, the noun to which it refers shall be clear and unambiguous. [Source: FAA-D-2494/b, 1984]

Example. The following demonstrates an ambiguous sentence: "Whenever the author knows the reader, he or she benefits." The following statement is clearer: "Whenever the author knows the readers, he or she can write to meet their needs."

15.2.4.6 Definitions

- **15.2.4.6.1 What to define.** Technical terms, uncommon words, and common words that are used in unusual or special ways shall be defined in the text and also in an alphabetically-ordered glossary, if one exists. Using one such section assists the user in navigating to this reference information. [Source: FAA Order 1700.8D, 1992]

Discussion. In FAA technical document practice, when several (about 10) new terms or abbreviations are used a glossary or, as applicable, a list of acronyms would be included.

- **15.2.4.6.2 When to define.** Words or terms that must be defined shall be defined immediately following their first occurrence in the text. [Source: FAA Order 1700.8D, 1992]

15.2.4.7 Abbreviations and acronyms

The benefit of abbreviations and acronyms is the saving of space; they are shorter, more compact versions of the words or phrases they represent. The cost of abbreviations and acronyms is a reduction in reader comprehension and an increase in reader effort. [Source: Simpson and Casey, 1988]

Definitions. An **abbreviation** is a shortened version of a word or group of words formed by omitting one or more letters. An **acronym** is a word formed from the initial letter or letters of a group of words.

Examples. "ft" is an abbreviation of foot and "CAM" is the acronym for Computer-Aided Manufacturing.

- **15.2.4.7.1 Keep abbreviations and acronyms to a minimum.** Abbreviations and acronyms shall be kept to a minimum that is

appropriate to the technical understanding and usage of the intended users. After its initial definition, an abbreviation or acronym shall be used whenever the term occurs. [Source: FAA-D-2494/b, 1984]

Discussion. Judgment is necessary to determine the technical understanding and when to use the technical vernacular appropriate to the target users. For example, if a technical document for maintenance personnel used the terms "very high frequency omni-directional radio" and "baby N connector" instead of VOR and BNC, the full names would be inappropriate. The full names may be appropriate for a lay audience, but they would be gibberish and distracting to the target users. There is no substitute for knowing or finding the users.

- **15.2.4.7.2 Definition of abbreviations and acronyms.** Abbreviations and acronyms shall be defined immediately following their first occurrence in the text. Their definitions shall consist of presenting the word or term fully spelled out, followed by the abbreviation or acronym enclosed in parentheses. Examples are: "...abbreviation (abbr)...", and "...Government Printing Office (GPO)...." [Source: FAA-D-2494/b, 1984]
- **15.2.4.7.3 Glossary.** The abbreviations and acronyms used in a document shall be listed alphabetically and defined in a glossary. [Source: FAA-D-2494/b, 1984]
- **15.2.4.7.4 Standard abbreviations and acronyms.** To the extent possible, abbreviations and acronyms shall be those given in:
 - a. FAA Order 1000.15A, Glossary,
 - b. FAA Order 7340.1H, Contractions, and
 - c. ASME Y1.1, Abbreviations for Use on Drawings and in Text. [Source: FAA-D-2494/b, 1984; Department of Transportation (FAA Order 1000.15A), 1975; FAA Order 1700.8D, 1992; Federal Aviation Administration (FAA Order 7340.1H), 2000]
- **15.2.4.7.5 Nonstandard abbreviations.** If a word or term to be abbreviated does not appear in any of the sources listed in paragraph 15.2.4.7.5, the word or term should be abbreviated in accordance with the United States Government Printing Office *Style Manual*. In specific specialized technical areas, technical sources, standards, and practice should be followed. [Source: MIL-STD-962B, 1988]

Discussion. In certain operating systems, upper and lower case letters can mean different things. For example, grep, Grep, and GREP have a different meaning in the UNIX operating system.

- **15.2.4.7.6 Units of measurement.** The abbreviation and punctuation of units shall conform to ANSI/IEEE Standard 260 for standard letters and symbols for units on measurement. For additional abbreviation guidance conform to the United States Government Printing Office *Style Manual*. [Source: FAA Order 1700.8D, 1992]

15.2.4.8 Spelling

- **15.2.4.8.1 Spelling.** The United States Government Printing Office *Style Manual* shall be used as a guide for spelling. If the *Style Manual* does not provide the guidance needed, Merriam Webster's *New International Dictionary* shall be used. In equivalent spelling, the first citation shall be used. [Source: FAA-D-2494/b, 1984; MIL-STD-490A, 1985; MIL-STD-962B, 1988]

15.2.4.9 Numbers

- **15.2.4.9.1 Numerals versus words.** Numbers representing measurements or time shall be expressed in numerals. Numbers (both cardinal and ordinal) representing quantities of 10 or more shall be expressed in numerals; those representing quantities less than 10 shall be expressed in words. If a number is the first word in a sentence, it shall be expressed in words. Other cases and exceptions to these rules shall conform to the United States Government Printing Office *Style Manual*. [Source: FAA-D-2494/b, 1984; U.S. Government Printing Office (USGPO Style Manual), 1984]

Discussion. This rule pertains to the decimal (base 10) numbering system, but in specific industry and technical areas other base systems may be used (for example: binary, hexadecimal, and octal systems).

- **15.2.4.9.2 Arabic numerals.** In general, Arabic numerals should be used, not Roman numerals. [Source: USGPO Style Manual, 1984]

Exception. Roman numerals are recommended for numbering the pages of any front matter a document might contain (see Paragraph 15.3.2.6.3).

- **15.2.4.9.3 Decimals versus fractions.** Non-whole numbers should be expressed as decimals, not fractions. [Source: MIL-STD-962B, 1988]

- **15.2.4.9.4 Decimals and leading and trailing zeroes.** Decimals of less than one shall be written with a zero preceding the decimal point. Zeroes following a decimal shall be omitted unless they indicate exact measurement. [Source: USGPO Style Manual, 1984]

15.2.4.10 Units of measurement

- **15.2.4.10.1 Dual units.** Both the International System of Units (the Metric system) and the customary inch-pound units of measurement shall be included in text and exhibits. The customary units shall be given first, followed by the International System units in parentheses, for example, 36 in (91 cm). This document follows the accepted style for metric standards, which places metric values first. The abbreviation and punctuation of units shall conform to ANSI/IEEE Standard 260 and to the United States Government Printing Office *Style Manual*. [Source: FAA Order 1700.8D, 1992]
- **15.2.4.10.2 Conversion of units.** The conversion of units between the International System and the customary inch-pound system shall conform to ANSI/IEEE Standard 268, Metric Practice, and to FED-STD-376. [Source: MIL-STD-962B, 1988]

15.2.4.11 Letter symbols and mathematical signs

- **15.2.4.11.1 Letter symbols and mathematical signs.** Letters used as symbols for objects and mathematical signs shall be in accordance with ANSI/IEE 260. [Source: FAA-D-2494/b, 1984]

15.2.4.12 Graphic symbols

- **15.2.4.12.1 Standard graphic symbols.** Graphic symbols used for circuit elements shall be those contained in ANSI Y32.2 and ANSI/IEEE 315A with the following additional provisions: (a) in those cases in which ANSI Y32.2 gives different symbols for electronic and electrical elements, the symbols for electronic elements shall be used, (b) under items 4.3.1 to 4.3.3, 4.3.5 to 4.3.7, 4.25.3, and 4.30.2, the parallel line contact symbols shall not be used, and (c) under items 11.2.7 and 11.2.7.1, the circular symbol for indicator lights shall not be used. Designations for electrical diagrams, power switches, and controls shall conform to ANSI Y32.16, Reference Designations for Electrical and Electronic Diagrams and MIL-STD-27A, Designations for Electrical Power Switch Devices and Industrial Control Devices. [Source: FAA-D-2494/b, 1984]
- **15.2.4.12.2 Mechanical diagram symbols.** Graphic symbols designating mechanical parts on diagrams and line drawings shall be in accordance with MIL-STD-17B as applicable. [Source: FAA-D-2494/b, 1984]

- **15.2.4.12.3 Logic diagram symbols.** Graphic symbols used in logic diagrams shall be in accordance with ANSI/IEEE 91. Graphic symbols not listed in ANSI/IEEE 91 shall not be used without approval of the acquisition program office. [Source: FAA-D-2494/b, 1984]

15.2.4.13 Other symbols

- **15.2.4.13.1 Flow chart symbols.** Symbols used in flow charts shall be in accordance with ANSI/ISO 5807. [Source: FAA-D-2494/b, 1984]

Discussion. Flow charts are seldom used in present software development which use pseudo code and other charts.

- **15.2.4.13.2 Special symbols.** Special symbols used in diagrams shall be explained as follows: (a) if the use of a special symbol is limited to a diagram, the symbol shall be defined in the diagram in which it appears, (b) if special symbols are used extensively, the symbols shall be defined in a chart on a separate page in a section that provides support data, and (c) preexisting charts that define symbols in addition to those that actually appear in the document shall not be used. [Source: FAA-D-2494/b, 1984]

15.3 Layout and formatting

The most appropriate physical structure for a document depends upon how it will be used. Who will use the document? In what environment will it be used? For what tasks or purposes will it be used? Another important consideration is the handling of updates to the document.

15.3.1 Document-level considerations

15.3.1.1 Size

The optimum size for the pages of a document depends primarily upon the circumstances of its use. For example, a good size for a simple job performance aid might be a size that would fit in a pocket, or a good size for a user's guide to a large, complex system might be 8.5 by 11 inch (21.6 by 27.9 cm) pages.

- **15.3.1.1.1 Basic size.** The basic page size for user documents should be 8.5 inches (21.6 cm) wide by 11 inches (27.9 cm) high. If these pages are trimmed prior to binding, the finished size should be at least 8.25 by 10.75 inches (21.0 by 27.3 cm). [Source: FAA-D-2494/b, 1984]
- **15.3.1.1.2 Avoidance of odd sizes.** Odd sizes and shapes should be avoided, for example, pages that are very large or very small, pages that have extreme height-to-width ratios, and pages that are wider than they are high. [Source: Simpson and Casey, 1988]

15.3.1.2 Binding

The type of binding appropriate for a document depends largely on the user's priorities and on the way in which the document will be used. The primary considerations are whether or not users will want the document to lie flat when opened (see Paragraph 15.3.1.2.2) and whether or not individual pages of the document will be removed and new pages inserted (see Paragraph 15.3.1.2.3).

Definitions. In **mechanical binding**, the pages are punched with either round or slotted holes and then placed in a ring binder or bound with a comb or spiral binder. In **perfect binding**, the pages are assembled, the left side is cut and roughed, glue is applied, and the cover is attached to the pages. In **pamphlet binding**, the pages are stitched or stapled together. There are two types of pamphlet binding, saddle stitched and side stitched. **Saddle stitching** permits the document to lie flat.

- **15.3.1.2.1 Page orientation.** Unless special considerations warrant a different orientation, pages should be bound at the left side, not at the top. [Source: Simpson and Casey, 1988]
- **15.3.1.2.2 Flat-lying.** The binding should permit the document to lie flat when it is open. [Source: Simpson and Casey, 1988]

Discussion. Ring binders and comb or spiral binding are probably the best choices in this respect for large documents; saddle stitching, for small documents. Spiral and comb bindings are cheaper; ring binders permit easy access for copying as well as updates.

- **15.3.1.2.3 Easy updating.** If it is likely that a document will be updated frequently, a ring binder should probably be selected. [Source: Simpson and Casey, 1988]

15.3.2 Page-level considerations

It is desirable that the visual structure of a document, that is, its cues and format, is reflected and complemented by the structure in the table of contents. The primary objective of the text designer is to create a visual hierarchy that distinguishes major concepts from sub-concepts and one category of information from another. Ways to do this include varying the size of type and the position of the material on the page. Visual cues are most effective when used sparingly.

15.3.2.1 Margins

- **15.3.2.1.1 Consistency.** Margins shall be consistent throughout a document, or, conversely, the portion of the page used to present information shall be consistent. [Source: Houghton-Alico, 1985]
- **15.3.2.1.2 Pages 8.5 by 11 inches (21.6 by 27.9 cm) or larger.** On pages 8.5 by 11 inches (21.6 by 27.9 cm) or larger, the

margins shall be at least 1 inch (2.54 cm) on all sides. [Source: FAA-D-2494/b, 1984; FAA Order 1700.8D, 1992; Simpson and Casey, 1988]

Discussion. This margin recommendation permits room for binding or for punched holes for loose-leaf ring binders on all pages without the necessity of special or offset margins for reference documents. FAA Order 1320.1.D sets the text line presentation area as 7 in (18.8 cm) width for directives. FAA-D-2494/b (for instruction books with right and left hand pages) sets margins at .75 in (1.9 cm) on the outside edges and 1 in (2.5 cm) on the inside edges as margins for instruction books.

- **15.3.2.1.3 Offset for binding.** If the pages are to be bound on the left, the left margin shall be increased by 0.5 inch (1.3 cm) for 8.5 by 11 inch (21.6 by 27.9 cm) pages or by an amount proportional to the ratio of the page width to 8.5 inches (21.6 cm) for pages of other sizes. [Source: Simpson and Casey, 1988]

15.3.2.2 Headers and footers

Page headers and footers can be used to present a variety of potentially useful information to the reader, for example, page numbers, the name of the section and possibly also the subsection of the document, and the date of issue of the page or document.

- **15.3.2.2.1 Use of headers and footers.** If only a few elements of information are to be presented, they should probably be presented in a header only; that is, a footer should be omitted. If more elements are to be presented than fit comfortably in a header, then the information should be divided between a header and a footer. [Source: Simpson and Casey, 1988]
- **15.3.2.2.2 Location of information within a header or footer.** The elements of information included in headers and footers should be located in accordance with their importance to the reader. The most important elements should be located at the outside ends. The next most important elements should be located either centered or near the outside end of the header or footer. The least important information should be presented at the inside end. [Source: Simpson and Casey, 1988; Houghton-Alico, 1985]

- **15.3.2.2.3 Headers, footers, and margins.** Headers and footers should be located within the space reserved for top and bottom margins, that is, they should not take space away from that reserved for the body of the document. [Source: FAA-D-2494/b, 1984]

15.3.2.3 White space

The spatial formatting of text can be extremely effective in communicating the structural hierarchy of information. The consistent and logical allocation of vertical and horizontal white space creates a visual hierarchy that separates major headings from minor headings, headings from text, and so forth. The judicious use of spacing can convey information about the structure of a document to users more easily and effectively than can typographic cues. White space can be used in combination with typographical cues. Reduced line lengths and associated horizontal white space can make skimming, searching, and reading easier. [Source: Gribbons, 1992; Hartley, 1978]

- **15.3.2.3.1 Representational vertical spacing.** The vertical space that precedes a text element should indicate that element's level in the document's structural hierarchy, with the amount of space increasing at each level. [Source: Gribbons, 1992]

Example. A logical point to start in determining vertical spacing is the smallest vertical unit, the space between two lines of text. If this space is taken to be one unit of spacing, the resulting representational spacing might be two units between paragraphs, four units between a subheading and a paragraph, and eight units between a major heading and a subheading. This document uses vertical white space to set off text paragraphs in the right-hand text columns. In the left column, white space combines with typographical cues to differentiate subsection heading levels.

- **15.3.2.3.2 Horizontal spacing (indentation).** Horizontal spacing (indentation) is an alternative to vertical spacing as a means for showing the hierarchical structure of a document. If horizontal spacing is used, the left-most position should represent the highest level of the hierarchy, with subsequent indentations representing successively lower levels. [Source: Gribbons, 1992]

Discussion. Horizontal spacing is not as straightforward as vertical in indicating hierarchical levels. While successive indentation would seem to imply successively lower hierarchical levels, readers perceive centered headings to be more important than headings at the left margin.

15.3.2.4 Right-and left-hand pages

The printing of pages on both sides introduces the possibility and desirability of treating the fronts of pages differently from the backs. If offsets for binding are necessary, left- and right-hand pages will have different margins (see Paragraph 15.3.2.1.3).

Definitions. The terms **right-hand page** and **left-hand page** have meaning only if pages are printed on both sides. In that case, a right-hand page is the page printed on the front, and a left-hand page is the page printed on the back. Thus, when the pages are bound, and the document is open, the right-hand page appears on the right, and the left-hand page appears on the left.

- **15.3.2.4.1 Major divisions of the document.** Major divisions of the document should begin on right-hand pages. This will occasionally result in a blank left-hand page. [Source: FAA-D-2494/b, 1984]

Discussion. In large frequently-used reference documents with many pages and divisions, one consistently begins each new major division on a right-hand odd-numbered page. This practice permits one to number pages within each section and to insert tabs between sections.

- **15.3.2.4.2 Page numbering of left and right handed pages.** Right-hand pages shall be odd-numbered pages, and left-hand pages shall be even-numbered pages. [Source: FAA-D-2494/b, 1984]

15.3.2.5 Page numbering

There are two common methods for numbering the pages in a document, (a) numbering the pages sequentially from the beginning to the end of the document, and (b) numbering the pages independently within each major division of the document.

This second method incorporates a designation for the division into the page number, for example, 3-9 would be the number of the ninth page of the third division.

Discussion. Numbering within divisions has two advantages: (a) it provides the reader with an additional location cue as to which division one is looking at, and (b) it makes updating easier in that fewer pages need be renumbered when material is added or deleted.

- **15.3.2.5.1 Arabic numerals.** Arabic numerals shall be used for the page numbers of the main body of a document. [Source: FAA-D-2494/b, 1984; MIL-STD-962B, 1988]
- **15.3.2.5.2 Numbering style - body.** The page numbering style for the main body of documents containing three or more major divisions or having an average division length of six or more pages should be the division designation followed by a dash followed by the number of the page within the division, for example, 4-7 is the divisional page number of the seventh page of the fourth division. [Source: FAA Order 1700.8D, 1992; Simpson and Casey, 1988]
- **15.3.2.5.3 Numbering style - front material.** The pages of material at the beginning of a document, such as a foreword or a table of contents, should be numbered sequentially with lower case Roman numerals. [Source: FAA Order 1700.8D, 1992; FAA-D-2494/b, 1984; MIL-STD-962B, 1988]
- **15.3.2.5.4 Numbering style - Appendixes.** Appendixes should be designated using consecutive letters beginning with A. Pages within an appendix should be numbered using the designation of the appendix followed by a dash followed by the sequential number of the page within the appendix, for example, A-3 would be the third page of Appendix A. [Source: FAA Order 1700.8D, 1992]
- **15.3.2.5.5 Location.** If compatible with other information displayed in headers and footers, page numbers shall be located at the bottom outside edge of the page, that is, at the right edge of right-hand pages and the left edge of left-hand pages. [Source: FAA-D-2494/b, 1984]

15.3.2.6 Columns

- **15.3.2.6.1 Number of columns.** The number of columns of text on a page of user documentation shall not exceed two. [Source: FAA Order 1700.8D, 1992]

Discussion. The use of columns may seem to complicate word processing in certain software packages. However, the benefits of location coding permitted by appropriate white space to the user navigation and readability warrant consideration of columns from a human factors usability standpoint.

Discussion. Since the division of the page into two columns halves the horizontal distance available for successive levels of indentation without affecting the vertical space available, the vertical spacing method will usually work more effectively than the horizontal.

15.3.2.7 Foldout pages

Foldout pages are relatively expensive to produce and relatively difficult to handle. Still, there are advantages to their use; in particular, the larger size may be necessary to display detail legibly. They can also permit a drawing or table to be visible while the user looks at other parts of the document.

- **15.3.2.7.1 Minimize use.** The use of foldout pages should be minimized to those necessary to legible display of the information and necessary to understanding and tracing location and relational information. [Source: MIL-STD-490A, 1985; MIL-STD-962B, 1988]

Discussion. One way to reduce their use is to divide a large figure or table and display it on facing pages rather than printing it on an oversize page. When facing pages or fold out pages are used it may be necessary to aid the reader in tracing lines across the gaps or folds. For instance, when a large number of parallel lines transition across folds or gap, color coding of each continuing line may help a user trace and maintain the identity of the lines. Giving lines number or letter identifiers at places throughout each line may help.

- **15.3.2.7.2 Foldout to the right.** Foldout pages shall fold to the right only; they shall not fold out to the top or bottom. [Source: FAA Order 1700.8D, 1992]
- **15.3.2.7.3 Visibility of page number and caption.** Each foldout page shall be folded so that the page number and the page caption are visible without unfolding. [Source: FAA Order 1700.8D, 1992]
- **15.3.2.7.4 Visibility of entire exhibit.** If it is necessary that a user see an entire exhibit while reading another part of the document, the exhibit shall be printed with a blank area the size of a normal page at the left of the foldout page so that when the

page is unfolded, the entire exhibit will be visible. [Source: FAA Order 1700.8D, 1992]

- **15.3.2.7.5 Location of foldout pages.** If the ratio of text to foldout pages is reasonably balanced, a foldout page should be the next page after the one on which it is mentioned. If doing this would result in an excessive amount of white space on text pages, the foldout pages should be grouped together in a single section immediately preceding any appendixes. [Source: FAA Order 1700.8D, 1992; MIL-STD-490A, 1985; MIL-STD-962B, 1988]

Discussion. If a document contains both foldout and non-foldout exhibits of the same type and the foldout exhibits are grouped at the end of the document, users may have difficulty finding a particular exhibit. Treating the foldout exhibits as a separate category of exhibits will help alleviate the difficulty. For example, exhibits that are integrated into the text might be called "exhibits" and oversize exhibits that are grouped at the end might be called "foldouts."

15.3.3 Typographic issues

Typographic cues are useful for conveying to readers the importance and organization of textual material. Type size is easily the most important cue. The position of material such as headings is another potential cue, as is the use of all capital letters. The use of color and varied intensity (boldness) of printing are additional potential cues.

Definition. A **point** is a measure of the height of type; there are 72 points in an inch (2.54 cm).

15.3.3.1 Type size

- **15.3.3.1.1 Basic size.** The basic size for text should be 10 point type. If the document will be used under dim illumination, the size should be increased to 11 or 12 points. [Source: FAA Order 1700.8D, 1992; FAA-D-2494/b, 1984; Zaneski, 1982]

Discussion. This rule assumes that the document will be composed and reproduced with good quality equipment resulting in sharp, clear images, and that it will be viewed under satisfactory conditions, including illumination, reading distance, and viewing angle.

Examples. The text of this document is 12 point type. Newspaper text is 10 point. Eight point type is often used in car advertisements. Smaller sizes are used in phone book listings and tabular materials.

- **15.3.3.1.2 Minimum size.** The minimum size for text should be 8 point type. This size should be used only when viewing conditions, particularly illumination, are satisfactory. [Source: FAA-D-2494/b, 1984]

- **15.3.3.1.3 Unequal spacing of sizes.** If more than two type sizes are used to indicate the importance of material, for example, the level of a heading, the difference in size from one level to the next should increase as the size of the type increases; that is, the differences should not be equal. [Source: Gribbons, 1992; Williams & Spyridakis, 1992]

Example. If three type sizes are used to indicate three levels of headings, the smallest size might be 12 points; the middle size, 14 points; and the largest size, 18 points, rather than sizes of 12, 14, and 16 points.

15.3.3.2 Line length

Most readers prefer line lengths within the range of 14 to 36 picas for type sizes in the range of 8 to 12 points, and lines varying within this range are approximately equal in legibility. [Source: Simpson and Casey, 1988]

Definition. A **pica** is the unit of measurement used in printing. It is equal to 0.17 inch (4.23 mm).

- **15.3.3.2.1 Line length.** For type sizes in the range of 8 to 12 points, line length should not be less than 14 picas or more than 36 picas. [Source: Simpson and Casey, 1988]

Discussion. Lines longer than 36 picas become increasingly difficult to read.

15.3.3.3 Line spacing

- **15.3.3.3.1 Minimum spacing.** The spacing between lines using type sizes in the range of 8 to 12 points should be at least two points. [Source: Simpson and Casey, 1988]

Discussion. If the space between lines is too small, reading difficulty is increased.

15.3.3.4 Justification

The alignment of the starting point of lines of text is generally agreed to aid reading, probably by providing a predictable place for the eye to move to. Most typeset text and much of the text produced with word processors incorporates variable spacing within and between words so that lines are of equal length and the right ends of the lines are also aligned. In addition to variable spacing, words are often broken (hyphenated) in the process of constructing equal length lines. There is no evidence that the use of equal length lines aids reading, however, hyphenation can cause reading difficulties.

Definitions. In **left-justified text**, lines of text are aligned at the left, but spacing within and between words is not varied, resulting in a ragged right margin. In **right-justified text**, lines of text are aligned at the right, but spacing within and between words is not varied, resulting in a ragged left margin. In **center-justified text**, lines are centered on the page, with both right and left margins ragged. In **fully-justified text**, spacing is added within and between words so that all lines are the same length, resulting in alignment of both right and left margins.

- **15.3.3.4.1 Justification of text.** For extended text, the type of justification used should be either left- or full-justification. Center- and right-justification should not be used for text. [Source: Simpson and Casey, 1988]
- **15.3.3.4.2 Appropriate use of right-justification.** If right-justification is used, its use should be restricted to such items as headings and information in headers and footers. [Source: Simpson and Casey, 1988]
- **15.3.3.4.3 Avoiding hyphenation.** The breaking of words between syllables at the ends of lines should be avoided. The only hyphens at the ends of lines of text should be those that properly signify compound words. [Source: Simpson and Casey, 1988]

15.3.3.5 Type style (font)

Most type fonts fall into one of two categories, those having serifs and those that do not (sans serif fonts). Readers seem to prefer fonts with serifs and seem to read them more easily.
[Source: Cooper, Daglish, and Adams, 1979; Simpson and Casey, 1988]

Definitions. **Serifs** are decorative elements (short lines, knobs, and balls) at the ends of the strokes that form letters. Sans serif fonts do not have these decorative elements. A **type family** is a collection of fonts that are similar in design but vary in size and boldness. A family can include *italic* versions.

Discussion. By far the majority of books and newspapers use fonts with serifs for the body text. Helvetica, Arial, and Univers are common sans serif fonts. Sans serif fonts are often used for labels and headings.

- **15.3.3.5.1 Serifs for basic font.** The basic font for a document body should be a font that has serifs. [Source: Simpson and Casey, 1988]
- **15.3.3.5.2 Minimize different fonts.** The number of different fonts used in a document should be kept to a minimum. [Source: Simpson and Casey, 1988]

Discussion. One family of fonts can be used for text, including different sizes of type, boldface fonts, and italic fonts. Another family might be used to make another type of information stand out from the basic text.

15.3.3.6 Upper versus mixed case text

Text that is written using both upper and lower case letters is both preferred by users and more legible to them. In the case of isolated letters and words, however, capital letters are more legible than lower case letters. Logically this implies that all text, including titles, headings, headers, and footers, would best be printed in mixed case. However, the use of all upper case letters can make individual words stand out and thus aid comprehension. [Source: Gribbons, 1992; Simpson and Casey, 1988]

- **15.3.3.6.1 Words to be typed in upper case letters.** If the following words are used as headings, they shall be displayed in all upper case letters: (a) WARNING, (b) CAUTION, and (c) NOTE. [Source: AFHRL-TR-73, 1973; FAA-D-2494/b, 1984]
- **15.3.3.6.2 Minimize use of upper case letters.** The use of upper case letters for words and phrases in text should be minimized; upper case letters should not be used to emphasize a word or phrase. [Source: MIL-STD-962B, 1988; Hartley, 1978]

15.3.3.7 Typographic emphasis

There are a variety of ways in which portions of text can be emphasized typographically. The use of upper case letters has already been discussed. Other commonly-used ways include: (a) the use of **boldface** type, (b) the use of *italic* type, and (c) the use of underlining. The intent of all of these is to make a portion of text stand out from its surroundings. [Source: Simpson and Casey, 1988]

Judicious use of typographic emphasis can help readers locate and remember things, but emphasis is probably most effective when it is used sparingly. For emphasis to be effective, the reader must (a) be aware of the intent of the emphasis, and (b) know enough about the task to judge the importance of the emphasized words.

- **15.3.3.7.1 Inform the reader.** If typographic emphasis is used, the reader shall be informed of what it is and what it means. [Source: Simpson and Casey, 1988]
- **15.3.3.7.2 Use boldface type for emphasis.** If typographic emphasis is used, it shall be boldface type. [Source: Hartley, 1978; Simpson and Casey, 1988; Zaneski, 1982]
- **15.3.3.7.3 Use typographic emphasis sparingly.** Typographic emphasis shall be used sparingly. [Source: Hartley, 1978; Simpson and Casey, 1988]
- **15.3.3.7.4 Do not use underlining for emphasis.** Underlining should not be used for typographic emphasis. [Source: FAA-D-2494/b, 1984; MIL-STD-490A, 1985; MIL-STD-962B, 1988; Gribbons, 1992; Hartley, 1978; Simpson and Casey, 1988]

Discussion. Underlining actually makes the underlined text more difficult to read, at least for some readers; it reduces the white space between lines, and it disrupts the characteristic shape of the underlined word or words. The same is true for numbers.

Sometimes underlining is used to indicate changes in a document. Other typographical cues such as redlining, asterisks, or vertical lines in the margin may be used to indicate changes. FAA order 1320.1D calls for the use of asterisks or vertical lines in the margins to indicate change. Whatever the method, the notation for change should be explained in the text. In a directive, it is explained in a paragraph entitled explanation of changes.

- **15.3.3.7.5 Do not use italics for emphasis.** Italic type shall not be used for typographic emphasis. [Source: Hartley, 1978]

Discussion. Italic type fonts are usually drawn with relatively thin lines, which tend to make these fonts recede rather than stand out from the surrounding text. This is the opposite of emphasis. Italic type is appropriate for the titles of books when they appear in text and in bibliographic references.

- **15.3.3.7.6 Do not use upper case letters for emphasis.** All upper case letters should not be used for typographic emphasis in text. [Source: MIL-STD-490A, 1985; Simpson and Casey, 1988]

Discussion. The use of all upper case letters in text slows reading and appears to interfere with memory of the unemphasized material. Individual words can be recognized faster when they appear in upper case letters, so, if used sparingly and wisely, upper case letters can be effective for emphasis. However, because boldface type has fewer actual and potential problems, it seems a better choice for typographic emphasis. FAA Order 1320.1D addresses the use of underlining and capital letters when standard typewriting is used for document preparation. It also notes that word processing equipment offers bold and other typographical cues which, when appropriately used, enhance reading and navigation in a document.

15.3.3.8 Print contrast, quality

Typesetting and competent offset printing produce print of adequate quality for documents that may be used in a range of viewing conditions. Modern laser printers can also produce print of this quality. Mechanical or dot matrix printers generally do not produce print of this quality. [Source: Simpson and Casey, 1988]

Definition. **Print contrast** is the ratio of the difference in brightness between the printing and its background to the brightness of the background (assuming dark print on a light background). It is defined by $(B_1 - B_2)/B_1$, where B_1 is the brighter of the two.

- **15.3.3.8.1 Adequate print contrast.** The print contrast of a document shall be high enough so that users can read it without eyestrain under the expected viewing conditions. [Source: Simpson and Casey, 1988]

15.3.3.9 Color and shading

Color can be a very effective cue, especially when it is used to aid users who are searching for something. However, users perceive color as less significant than other types of typographic cuing, particularly size and boldness. In addition, the existence of deficiencies in the color vision of some users limits the applicability of color as an effective cue. [Source: Gribbons, 1992]

- **15.3.3.9.1 Color as a typographic cue.** If color is used as a typographic cue, it shall be redundant with another typographic cue, such as size. [Source: Gribbons, 1992]
- **15.3.3.9.2 Text in color.** If color is used for either print or background, it shall satisfy the print contrast criterion, Paragraph 15.3.3.8.1. [Source: Gribbons, 1992]
- **15.3.3.9.3 Subsequent reproduction.** If a document is likely to be photocopied, colors and shadings shall be selected so that their meanings do not become lost or distorted when photocopied. [Source: Hartley, 1978; FAA-D-2494/b, 1984]

Discussion. Colors that are clearly different in their original reproduction may change during photocopying in black and white in ways that change their meaning. For example, the lighter of two colors may become the darker of two shades of gray. Similarly, gradients of colors or shadings that are clear in the original production may be lost in photocopying.

15.4 Components of documents

This section contains rules for the various components that might be contained in a user document, such as the cover page, table of contents, and figures. Exhibit 15.4 lists FAA directives associated with certain types of documents that are oriented to FAA users and lists the components and the sequence for components, when applicable for each type. These directives and related specifications listed in Exhibit 15.4 also call for mandatory items: forms to identify and control changes and some explicitly required paragraphs and text. These mandatory policies are to be followed for each applicable type of document.

Discussion. FAA Order 1320.1D addresses directives in general and includes long orders (more than 25 pages) which may be called handbooks. The order describes the orders development process and prescribes some formal formatting details for organizational-level orders or supplements. FAA Order 1320.58 addresses Maintenance Technical Handbooks and equipment modification directives. These are exempted from 1320.1D formatting provisions.

There are two kinds of user-oriented documents that apply to the implementation of specific modification programs: modification manuals and modification instructions. The manuals are to have similar components to those listed in the exhibit under Maintenance Technical Handbooks. When either of these modification program documents are manufacturer's documents, they may be treated as technical issuances as is explained later. FAA-D-2494/b, 1984 addresses instruction books for operation and maintenance of new or modified systems and equipment. With FAA permission, instruction books may also be technical issuances. In such cases, writers and publishers may use other formats and organizations. FAA-D-2494/b includes an appendix that addresses a general evaluation of commercial instruction books.

Definition. **Technical Issuances**, according to FAA Order 1320.1D, are publications acquired from non-agency sources or developed within FAA that directly concern installation, maintenance, or modification of equipment, equipment systems, facilities, or aircraft. Manufacturers' instruction books for plants and equipment are included in this category. A basic objective of using this category is to permit the merging of internally-developed and externally-acquired technical manuals and publications into consolidated, single source documents. Because of necessary deviations from standard directive format and issuance procedures, they are designated technical issuances.

The detailed guidance of this user-interface guide represents advisable practice to help design-in and facilitate human performance as a component of new or changed operational systems. Its provisions may be selectively applied to user-documentation of new and modified systems. It may be used to help evaluate user documentation on NDI and COTS procurements.

Exhibit 15.4 FAA directives and order of document components

Source	FAA Order 1320.1D	FAA Order 1320.58	FAA Specification FAA-D-2494/b Appendix 1	
Document types	Generic Long Orders	Maintenance Technical Handbooks, Modification Manuals	Technical Instruction Books	Commercial Instruction Book Contents
Document components	& Instructions			
Cover	x	x	x	
Contractor guarantee			x	
List of modifications to specifications (drafts only)			x	
List of effective pages			x	
Content assurance page			x	
Record or order of changes	x	x	x	
Foreword	x	x	x	
Table of contents	x with tables, figures	x	x	
List of tables		x	x 2nd in order	
List of illustrations, figures		x	x 1st in order	
Family tree chart			x	
General information and requirements	x	x	x	x
Technical characteristics or description		x	x	x
Operations			x	x
Standards and tolerances	x		x	x
Periodic maintenance	x		x	x
Maintenance procedures	x		x	x
Corrective maintenance			x	x
Flight inspection		x		
Parts list			x	x
Installation and checkout			x	x
Computer software			x	x
Troubleshooting			x	x
Miscellaneous	x			
Appendices	x	x	x	
Glossary	x	x		
Index	x	x	x	
Feedback	x	x	x	

15.4.1 Cover page

- **15.4.1.1 Contents of cover page.** The cover page of a user document shall contain the explicit identifying information for the document including a document title, number, and date. [Source: FAA-D-2494/b, 1984]

Example. An instruction book cover has the following elements: (a) the national stock number of the document, (b) the publication number, (c) a phrase specifying the type of document, for example User's Guide, (d) the name of the equipment or system to which the document applies, (e) if applicable, "TYPE" and the type number of the equipment or system, (f) if applicable, "SERIAL NOS." and the range of serial numbers to which the document applies, (g) "U.S. DEPARTMENT OF TRANSPORTATION," and (h) "FEDERAL AVIATION ADMINISTRATION."

- **15.4.1.2 Type style and size, 8.5 by 11 inch (21.6 by 27.9 cm) pages.** The type style used on the cover page shall be bold, and it shall not be italic. The point size for each element for an instruction book is given in Exhibit 15.4.1.2. [Source: FAA-D-2494/b, 1984]

Exhibit 15.4.1.2 Type sizes for cover page elements

Element	Point size
National stock number	14
Publication number	14
Type of document	18
Name of equipment or system	30
"TYPE" and type number	18
"SERIAL NOS" and serial numbers	18
"U.S. DEPARTMENT OF TRANSPORTATION"	18
"FEDERAL AVIATION ADMINISTRATION"	14
All other printing	12

15.4.2 Table of contents

A table of contents serves to reveal the organization of a document as well as to guide the user to a desired topic.

- **15.4.2.1 When to include a table of contents.** A user document shall have a table of contents unless it has fewer than three divisions or fewer than six pages. [Source: FAA-D-2494/b, 1984; Angiolillo and Roberts, 1991; Simpson and Casey, 1988]
- **15.4.2.2 Labeling the table of contents.** The single word "CONTENTS" shall appear at the beginning of the table of contents. [Source: MIL-STD-962B, 1988]

- **15.4.2.3 What to include in the table of contents.** A table of contents shall include: (a) at least two levels of the headings and subheadings of the document, (b) appendixes if they exist, (c) the glossary and index if they exist, (d) lists of exhibits, illustrations, figures, and tables if they exist, and (e) the initial page number of each item listed. [Source: FAA-D-2494/b, 1984; MIL-STD-962B, 1988]
- **15.4.2.4 Right-hand page.** The table of contents shall begin on a right-hand page. [Source: FAA-D-2494/b, 1984]

15.4.3 Lists of exhibits

Lists of exhibits (figures, tables, or any other illustrations) may follow or may be part of the table of contents; this section contains additional rules pertaining to lists.

Discussion. In this guide, exhibits which contain either or both graphics and tabular materials are used. Such exhibits enable the user to have the graphic and tabular data that are used together, located together. This practice aids the user's task performance by eliminating cross referencing between separate table and figure information.

- **15.4.3.1 Lists of exhibits.** If a document contains one or more instances of a type of exhibit, such as a figure or table, all instances shall be listed by type in the table of contents. That is, all figures shall be listed in a list of figures, and all tables shall be listed in a list of tables. [Source: FAA-D-2494/b, 1984]
- **15.4.3.2 Contents of lists of exhibits.** Lists of exhibits shall include: (a) the identification of the exhibit, for example, "Exhibit 6-1," (b) the title of the exhibit, and (c) the page number on which the exhibit appears or begins. [Source: FAA-D-2494/b, 1984]
- **15.4.3.3 Location and precedence of lists.** Lists of exhibits shall be placed at the end of the table of contents. Each type of exhibit shall be listed separately, and the lists shall be placed in the following order: (a) exhibits labeled "exhibit," (b) figures (or other types of illustration), (c) foldout figures, (d) tables, and (e) foldout tables. [Source: Simpson and Casey, 1988]

15.4.4 Figures

This section contains rules for the use, identification, location, style, content, and orientation of figures.

Definition. A **figure** is an exhibit that is primarily graphical or pictorial in nature, as opposed to verbal or numerical.

15.4.4.1 General

- **15.4.4.1.1 When to use.** Figures shall be used when they are likely to increase a reader's understanding in ways that words cannot. [Source: FAA Order 1700.8D, 1992]
- **15.4.4.1.2 Relationship to text.** Figures shall be clearly related to, consistent with, and referred to in the text of the document. [Source: MIL-STD-490A, 1985; Simpson and Casey, 1988]

15.4.4.2 Identification

- **15.4.4.2.1 Number and title.** Each figure shall have a unique identifying number and a title. Numbers shall be assigned consecutively, beginning with one, either for the document as a whole, or within divisions. If they are assigned within divisions, the division's identifying number shall form part of the figure's identifying number. The figure's title shall describe concisely what the figure contains. [Source: FAA Order 1700.8D, 1992; FAA-D-2494/b, 1984; MIL-STD-490A, 1985; MIL-STD-962B, 1988; Simpson and Casey, 1988; Zaneski, 1982]
- **15.4.4.2.2 Caption.** Each figure shall have a caption that consists of the word "Figure" followed by its unique identifying number, two spaces, and its title. The caption shall be centered below the figure. [Source: FAA-D-2494/b, 1984]

15.4.4.3 Location

- **15.4.4.3.1 Preferred location.** A figure that is smaller than a page should be placed on the same page as its first reference, either within or following the paragraph that contains the reference. If the space following the reference is too small, the figure should be located at the top of the following page. A figure that fills a page should be placed on the page following the page containing its reference. [Source: FAA Order 1700.8D, 1992; MIL-STD-490A, 1985; MIL-STD-962B, 1988; Simpson and Casey, 1988]

- **15.4.4.3.2 Consistent location.** The location of a figure relative to its first reference in the text should be consistent. If for some reason the preferred location specified in Paragraph 15.4.4.3.2 is not satisfactory, all the figures should be grouped together near the end of the document. An example of this would be a document in which the space devoted to figures far exceeds the space devoted to text. [Source: FAA Order 1700.8D, 1992; MIL-STD-490A, 1985]

15.4.4.4 Style

- **15.4.4.4.1 Consistent style.** The figures for a document shall be prepared so that in their final state, that is, after any reduction or enlargement, they are consistent in terms of such characteristics as line width, shading, and style and size of type. [Source: Simpson and Casey, 1988; FAA Order 1700.8D, 1992]
- **15.4.4.4.2 Preferred pictorial style.** Pictorial figures should consist of line drawings rather than photographs. [Source: AFHRL-TR-73, 1973]

Discussion. While there may be circumstances in which photographs might be preferable, in general, line drawings have several advantages. In particular, they permit omission of distracting and irrelevant details, and they can be reproduced without significant loss of detail.

- **15.4.4.4.3 Consistent pictorial style.** All the comparable figures in a document should be prepared in the same style, for example, all line drawings, or all photographs. [Source: Simpson and Casey, 1988]
- **15.4.4.4.4 Minimal distraction.** Decorative elements such as borders and background shading shall be avoided. Photographs shall be cropped or masked to remove irrelevant or unimportant portions unless those portions are helpful in orienting the reader. Photo masking with high reproducible quality may be an economical alternative to line drawings. [Source: FAA Order 1700.8D, 1992; Simpson and Casey, 1988]
- **15.4.4.4.5 Alphanumeric information.** All alphanumeric information contained in figures shall be created mechanically or electronically; it shall not be hand drawn. The size shall be at least 8 points in the figure's final size, that is, after any reduction or enlargement. [Source: FAA-D-2494/b, 1984]
- **15.4.4.4.6 Line width.** The width of lines when the figure is in its final size, that is, after reduction or enlargement, shall be at least 0.01 inch (0.25 mm). [Source: FAA-D-2494/b, 1984]
- **15.4.4.4.7 Color.** Color shall not be used in figures unless it is meaningful and authorized by the acquisition program office. [Source: FAA Order 1700.8D, 1992]

Discussion. The use of shadings and patterns is usually as effective as the use of color.

15.4.4.5 Content

- **15.4.4.5.1 Amount of detail.** Figures shall contain only necessary and useful detail, that is, they shall contain the detail necessary to the task being performed and additional detail that provides helpful context. [Source: AFHRL-TR-73, 1973]
- **15.4.4.5.2 Callouts.** Specific features of interest in a figure shall be identified with callouts. The text of a callout may be located adjacent to the feature, or the feature may be identified by a number, and the text located elsewhere. A callout shall consist of: (a) an arrow with its head pointing at the feature and its tail leading to a block of text or to a number, (b) a number that is keyed to a block of text, if applicable, and (c) a block of text that gives information about the feature. Numbered callouts shall be numbered consecutively, starting with one and beginning with the feature nearest "three o'clock" on the figure and proceeding clockwise around the figure. [Source: AFHRL-TR-73, 1973; FAA Order 1700.8D, 1992]
- **15.4.4.5.3 Specific types of diagrams.** If a document contains any of the following specific types of diagrams, the diagrams shall conform to FAA-D-2494/b, 1984: (a) block diagrams, (b) major function diagrams, (c) schematic diagrams, (d) diagrams for analog equipment, (e) diagrams for functional entities, (f) functional circuit diagrams, (g) photographs, (h) continuous-tone illustrations, (i) printed circuit board illustrations, (j) power distribution diagrams, (k) wiring diagrams, (l) cabling diagrams, (m) mechanical drawings, and (n) piping diagrams. For developing directives, FAA 1320.1D recommends that figures which are sample forms should be a filled out as an example to help the user. Rather than dividing form-filling instructions between the figure and the main text or an appendix, the writer should include instructions on the sample form and, where feasible, show variances for completion in marginal notes. [Source: FAA-D-2494/b, 1984]

15.4.4.6 Orientation

- **15.4.4.6.1 Preferred orientation.** Figures should be oriented so that the reader can read them without rotating the page, that is, all text, including the figure's identification and title, should appear horizontally when the page is in its normal orientation. [Source: FAA Order 1700.8D, 1992; MIL-STD-962B, 1988]
- **15.4.4.6.2 Alternate orientation.** If it is not possible to display a figure in the preferred orientation, it shall be oriented so that the top of the figure is at the left side of the page. [Source: FAA Order 1700.8D, 1992; MIL-STD-962B, 1988]

15.4.4.7 Oversize figures

- **15.4.4.7.1 Facing pages.** If a figure is too large to fit on a single page, if possible, it should be divided into two parts that are presented on facing pages. [Source: FAA Order 1700.8D, 1992; MIL-STD-962B, 1988]

- **15.4.4.7.2 Captions for divided figures.** If a figure is divided and displayed on two pages, the figure's caption, that is, its identifying number and title, shall be repeated below each portion, with the word "Continued" in parentheses following the title. [Source: MIL-STD-962B, 1988]
- **15.4.4.7.3 Foldout pages.** If a large figure cannot be divided and displayed on facing pages, it shall be displayed on a foldout page. [Source: FAA-D-2494/b, 1984]

15.4.5 Tables

15.4.5.1 General

- **15.4.5.1.1 Use.** Tables should be used: (a) when data or text can be displayed more clearly than can be done otherwise, or (b) to show large amounts of data or text more compactly than could be done otherwise. [Source: FAA Order 1700.8D, 1992; MIL-STD-490A, 1985; MIL-STD-962B, 1988; FAA-D-2494/b, 1984]

Definition. A **table** is an array of data or text in rows and columns. Usually at least one dimension, either the rows or the columns, is labeled; sometimes both are labeled.

Examples. Some examples of information that might be presented in tables are: (a) performance standards and operating tolerances, (b) functions of controls and indicators, (c) operating parameters, (d) turn-on and checkout procedures, (e) performance checks, and (f) procedures for preventive and corrective maintenance, alignment, and calibration.

15.4.5.2 Identification

- **15.4.5.2.1 Number and title.** Each table shall have a unique identifying number and title. Numbers shall be assigned consecutively, beginning with one, either for the document as a whole, or within divisions. If they are assigned within divisions, the division's identifying number shall form part of the table's identifying number, for example, "Table 2-1" would indicate the first table in division two. The table's title shall describe concisely what the table contains. [Source: FAA-D-2494/b, 1984; FAA Order 1700.8D, 1992; MIL-STD-490A, 1985; MIL-STD-962B, 1988]
- **15.4.5.2.2 Caption.** Each table shall have a caption that consists of the word "Table" followed by its unique identifying number, two spaces, and a title. The caption shall be centered above the table. [Source: FAA-D-2494/b, 1984]

15.4.5.3 Location

- **15.4.5.3.1 Preferred location.** A table should be placed on the same page as its reference, either within or following the paragraph that contains the reference. If the space following the reference is too small, the table should be located at the top of the following page. A table that fills a page should be placed on the page following the page containing its reference. [Source: FAA Order 1700.8D, 1992]
- **15.4.5.3.2 Consistent location.** The relative location of a table to its first reference in the text should be consistent. If for some reason the preferred location specified in Paragraph 15.4.5.3.2 is not satisfactory, all the tables should be grouped together near the end of the document. An example of this would be a document in which the space devoted to tables far exceeds the space devoted to text. [Source: FAA Order 1700.8D, 1992; MIL-STD-490A, 1985]

15.4.5.4 Formatting

- **15.4.5.4.1 Organization.** Tables shall be organized to show the significance and relationships in their contents as clearly and simply as possible. [Source: FAA Order 1700.8D, 1992; MIL-STD-490A, 1985]
- **15.4.5.4.2 Type size.** The size of type used within a table shall be at least 8 points when the table is in its final form, that is, after any reduction or enlargement. [Source: FAA Order 1700.8D, 1992; FAA-D-2494/b, 1984]
- **15.4.5.4.3 Units of measurement.** If the entries in a row or column consist of some sort of quantity, the unit of measurement, such as inches or degrees, shall be given in the row or column label; it shall not be repeated after each quantity. [Source: FAA Order 1700.8D, 1992]
- **15.4.5.4.4 Ease of reading.** It shall be easy for the reader to follow rows and columns visually. [Source: FAA-D-2494/b, 1984, 3.1.7.3; Simpson and Casey, 1988]

Discussion. There are three common ways to help readers follow rows and columns: (a) the use of white space, for example, a blank line after every four or a maximum of five rows and generous spacing between columns, (b) the use of vertical and horizontal lines, and (c) the shading of alternate rows or columns. Contemporary practice is to use white space and shading rather than vertical and horizontal lines.

15.4.5.5 Content

- **15.4.5.5.1 Useful and relevant.** The information presented in a table shall be limited to information that is likely to be used by a reader. Tables shall contain only information that is relevant to the associated text. [Source: FAA-D-2494/b, 1984; MIL-STD-490A, 1985; MIL-STD-962B, 1988]

- **15.4.5.5.2 Non-redundant information.** Tables and text shall not be redundant; that is, tables shall not simply restate information that is presented in the text. [Source: MIL-STD-490A, 1985; MIL-STD-962B, 1988]

Discussion. This rule is not intended to prohibit text from quoting, summarizing, or commenting upon the information in a table. In general, the purpose of the associated text is to make the purpose of the table clear, and the purpose of the table is to present data relevant to the associated text.

15.4.5.6 Orientation

- **15.4.5.6.1 Preferred orientation.** Tables should be oriented so that the reader can read them without rotating the page, that is, all text, including the table's identification and title and any row and column labels, should appear horizontally when the page is in its normal orientation. [Source: FAA Order 1700.8D, 1992]
- **15.4.5.6.2 Alternate orientation.** If it is not possible to display a table in the preferred orientation, it shall be oriented so that the top of the table is at the left side of the page. [Source: FAA Order 1700.8D, 1992; MIL-STD-490A, 1985; MIL-STD-962B, 1988]

15.4.5.7 Oversize tables

- **15.4.5.7.1 Facing pages.** If a table is too large to fit on a single page, if possible, it should be divided into two parts that are presented on facing pages. [Source: FAA Order 1700.8D, 1992; MIL-STD-962B, 1988]
- **15.4.5.7.2 Captions for divided tables.** If a table is divided and displayed on two pages, the table's caption, that is, its identifying number and title shall be repeated above each portion, followed by the word "Continued" in parentheses. [Source: MIL-STD-962B, 1988]
- **15.4.5.7.3 Foldout pages.** If a large table cannot be divided and displayed on facing pages, it shall be displayed on a foldout page. [Source: FAA-D-2494/b, 1984]

15.4.6 Lists

It is often convenient to present information in the form of a list.

Definition. As used in this section, a **list** is a series of similar or related items in which each item is marked and displayed on a separate line or lines. The markings can be graphic symbols, such as bullets (•) or squares (□), or sequential identifiers, such as numbers or letters. An item can be a word, a phrase, a sentence, or a group of sentences.

- **15.4.6.1 Marks.** If the items in a list have no precedence over each other and there is no need to refer to them individually, they should be marked with graphic symbols, such as bullets. If the items do have precedence, for example, if they are sequential steps in a procedure, or if they need to be referred to individually, they should be marked with numbers or letters. [Source: Rubens, 1992]
- **15.4.6.2 Punctuation items.** If an item consists of one or more complete sentences, it should be followed by a period. If an item is not a complete sentence, it should be followed by a comma, with two exceptions: (a) the next to last item should be followed by a comma and either the word "and" or "or," and (b) the last item should be followed by a period. [Source: Rubens, 1992]

15.4.7 Formulas and equations

- **15.4.7.1 Identification.** Formulas and equations that occur in user documents shall be numbered consecutively, in Arabic numerals, beginning with one. The number shall appear in parentheses at the right margin on the last line of the formula or equation. [Source: FAA Order 1700.8D, 1992]
- **15.4.7.2 Location.** Short formulas and equations that are not part of a series should be placed in the text rather than displayed on a separate line. Formulas and equations that are longer or that are part of a series shall be displayed either indented or centered in a line immediately below the text that refers to them. A group of separate but related formulas or equations should be aligned on their equal signs, and the group as a whole should be indented or centered on the page. [Source: FAA Order 1700.8D, 1992]
- **15.4.7.3 Format.** If a formula or equation includes a numerator and denominator, they shall be separated by a line equal to the length of the longer term; both terms shall be centered with respect to the line. [Source: FAA Order 1700.8D]

15.4.8 Warnings, cautions, and notes

This section contains criteria governing the use of warnings, cautions, and notes.

Definitions. A **warning** is a written notice given to a reader when a situation might result in personal injury or loss of life; a **caution** is a written notice given when a situation might result in damage to or destruction of equipment or systems; a **note** a written notice given to draw the reader's attention to something or to supply additional information.

- **15.4.8.1 When to use.** Warnings shall be provided whenever a step or procedure or the failure to perform a step or procedure correctly might result in personal injury to, or loss of life of, the user or anyone else. Cautions shall be provided whenever a step or procedure or the failure to perform a step or procedure correctly might result in damage or destruction of equipment or systems. Notes shall be provided whenever it seems appropriate to call the reader's attention to something or to provide additional information. [Source: FAA-D-2494/b, 1984]
- **15.4.8.2 Warnings.** Warnings shall consist of (a) the word "WARNING" in upper case letters, enclosed in a border, and centered on the page, and (b) the text of the warning, indented from both margins and centered on the page. The text of the warning shall include (a) a brief description of the hazard, (b) the likely result if the warning is ignored, and (c) specific steps to take to avoid the hazard. Warnings shall precede the information to which they apply. [Source: FAA-D-2494/b, 1984; MIL-M-87268, 1995]
- **15.4.8.3 Cautions.** Cautions shall consist of (a) the word "CAUTION" in upper case letters and centered on the page, and (b) the text of the caution, indented from both margins and centered on the page. The text of a caution shall include (a) a brief description of the hazard, (b) the likely result if the hazard is ignored, and (c) specific steps to take to avoid the hazard. Cautions shall precede the information to which they apply. [Source: FAA-D-2494/b, 1984; MIL-M-87268, 1995]
- **15.4.8.4 Notes.** Notes shall consist of (a) the word "NOTE" in upper case letters and centered on the page, and (b) the text of the note, indented from both margins and centered on the page. The text of a note shall include the information that is to be given to the reader. Notes shall either immediately precede or immediately follow the information to which they apply, depending upon the content of the note and the text to which it applies. [Source: FAA-D-2494/b, 1984; MIL-M-87268, 1995]

- **15.4.8.5 Precedence of warnings, cautions, and notes.** If more than one type of notice applies at the same place in a document, for example, if a hazard exists to both people and equipment, the order in which the notices appear shall be warnings, cautions, and notes. [Source: FAA-D-2494/b, 1984; MIL-M-87268, 1995]
- **15.4.8.6 No procedural steps.** Warnings, cautions, and notes shall not contain procedural steps. [Source: FAA-D-2494/b, 1984; MIL-M-87268, 1995]

15.4.9 Appendixes

This section contains rules for appendixes.

Definition. An **appendix** is a body of supplementary information collected, labeled, and placed at the end of a document.

- **15.4.9.1 When to use.** Information that supplements, but is not integral to, the main body of a document should be placed in one or more appendixes. Examples of such information include illustrations, applications, calculations, and formulas. Appendixes should be used only if the information is essential. [Source: FAA Order 1700.8D, 1992]
- **15.4.9.2 Relation to main body.** The content of an appendix shall be within the scope of the document and shall not be inconsistent with the document itself. An appendix shall be referred to in the main body of the document. [Source: FAA Order 1700.8D, 1992; MIL-STD-962B, 1988]
- **15.4.9.3 Identification.** Each appendix in a document should have an identifying letter and a title. Identifying letters shall be assigned consecutively, beginning with "A." The title shall be brief but descriptive. [Source: FAA Order 1700.8D, 1992; MIL-STD-962B, 1988]

Discussion. FAA Order 1320.1D requires that appendixes of directives be identified by an Arabic numeral designator with pages numbered within each appendix (for example 1- page 1, 1- page 2 and so on). FAA-D-2494/b, 1984 for instruction books uses Roman numerals for appendix designators. The present guidance document recommends alphabetic designator for appendixes and page numbering within each appendix (for example, A-1, A-2, ... B-1, B-2, and so forth). This designation helps the users of reference type documents to distinguish between main chapters and appendixes and aids them in navigating through the document.

- **15.4.9.4 Page numbering.** Each page of an appendix shall have a number that consists of the letter that identifies the appendix followed by a dash followed by the number of the page within the appendix. For example, B-2 would indicate the second page of Appendix B. Page numbers shall be located in the same relative position on the page as page numbers in the main body of the document. [Source: FAA Order 1700.8D, 1992]
- **15.4.9.5 Pagination.** Each appendix shall begin on a right-hand (odd-numbered) page. Appendixes shall not have title pages; rather, the title shall appear at the top of the first page of the appendix. [Source: FAA Order 1700.8D, 1992]

15.4.10 Glossary

- **15.4.10.1 Terms.** Special terms and words used in technical or unusual ways shall be defined where they first appear in the text. If there are many such terms, they shall also be collected in a glossary located near the end of the document. [Source: FAA Order 1700.8D, 1992]
- **15.4.10.2 Format.** The glossary shall consist of (a) an alphabetic listing of all the special or unusual terms that appear in the document, and (b) their definitions. The definitions shall be the same as those that appear in the text where the terms are first defined. [Source: Zaneski, 1982]

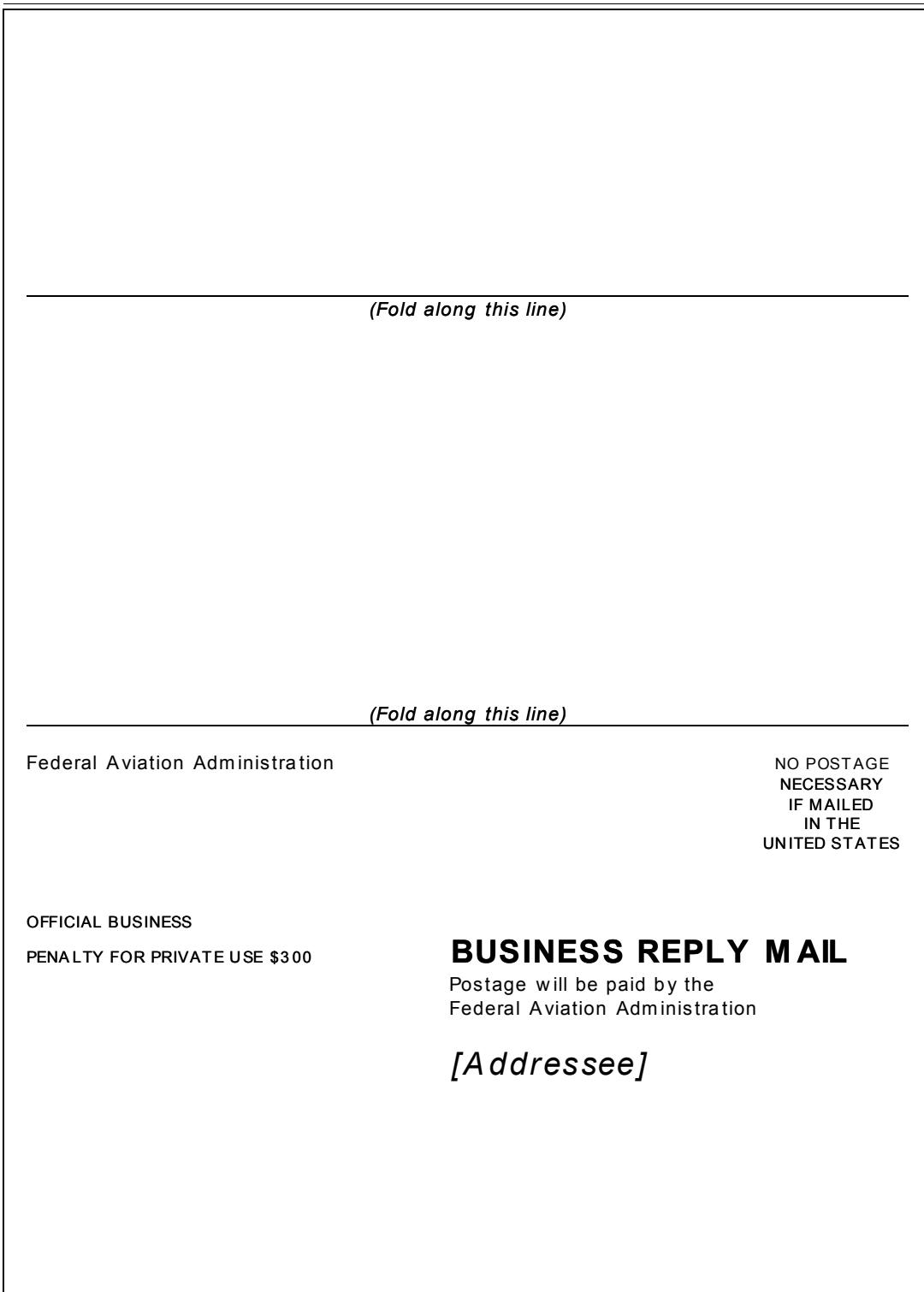
15.4.11 Index

An index can greatly enhance the usability of a document, increasing both the speed and the likelihood of a user's finding the desired information.

- **15.4.11.1 When to use.** Documents that are lengthy or complex shall have indexes. [Source: FAA Order 1700.8D, 1992]
- **15.4.11.2 Format and content.** An index shall consist of an alphabetic listing of the terms and topics that exist in the document and the pages on which they can be found. Each alphabetic group shall be preceded by the initial letter of the group. This letter shall appear in upper case type that is larger and bolder than the entries. [Source: FAA Order 1700.8D, 1992; Zaneski, 1982]
- **15.4.11.3 Level of detail.** An index should contain more levels of detail than does a table of contents. [Source: Simpson and Casey, 1988]
- **15.4.11.4 Location.** An index shall be the last division of a document. [Source: MIL-STD-962B, 1988]

15.4.12 User feedback forms

- **15.4.12.1 When to use.** All user guides and manuals shall include forms inviting feedback from users. [Source: FAA-D-2494/b, 1984]
- **15.4.12.2 Location.** User feedback forms shall be the very last pages in the document, that is, they shall be bound just before the back cover. [Source: FAA-D-2494/b, 1984]
- **15.4.12.3 Content.** The form shall solicit from users of the document at least those categories of information illustrated in Exhibit 15.4.12.3 (a). The fields for the document identifier and title shall be printed on the form, that is, the user shall not have to write them in. The form shall be self-addressed and shall have an "Official Business" postage permit, as illustrated in Exhibit 15.4.12.3 (b). Appendix 15 of FAA Order 1320.1D shows a sample feedback form for users of formal directives. This form encourages users to suggest subject matter for future additions. [Source: FAA-D-2494/b, 1984; MIL-STD-962B, 1988]

Exhibit 15.4.12.3 (a) User Feedback form – Front

The image shows a template for a User Feedback form. It consists of a large rectangular area with two horizontal fold lines near the top. Below these lines, there is space for writing. Further down, there are two more horizontal lines, also intended for writing. At the bottom left, it says "Federal Aviation Administration" and "OFFICIAL BUSINESS/PENALTY FOR PRIVATE USE \$300". In the center, it features the bold text "BUSINESS REPLY MAIL" above the instruction "Postage will be paid by the Federal Aviation Administration". At the bottom right, it says "NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES". The entire form is enclosed in a thick black border.

(Fold along this line)

(Fold along this line)

Federal Aviation Administration

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

BUSINESS REPLY MAIL

Postage will be paid by the
Federal Aviation Administration

[Addressee]

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

Exhibit 15.4.12.3 (b) User feedback form - Back

Instructions. This form is provided as part of the FAA's continuing effort to improve documentation. Users of this document are invited to submit comments and suggestions, especially if they are aware of any difficulty associated with its use. To submit comments or suggestions: (1) remove this form from the document, (2) complete the applicable sections, (3) fold this form in thirds, using the lines on the reverse side as a guide, and (4) mail. No postage is necessary if the form is mailed in the United States.

Document Number:

Document Title:

Your name, address, and telephone number: (optional)

Date:

Please describe any difficulty associated with use of the document and add any comments or suggestions that might be helpful. (Please include the section or paragraph number, recommended changes, and your rationale for the recommendations, as applicable.)

- **15.4.12.4 Number of copies.** Three copies of the user feedback form shall be bound with the document. [Source: FAA-D-2494/b, 1984]

15.4.13 Tabs

- **15.4.13.1 When to use.** Tabs should be provided if a document has many divisions. If a document has tabs, it should have a tab for each major division, for each frequently-used division, or both. [Source: Simpson and Casey, 1988]

Discussion. Some sort of balance is needed between the number of tabs in a document and the number of pages between tabs. If there are a few long divisions, tabs might be used within divisions; on the other hand, if there are many short divisions, one tab might serve several divisions. A rule of thumb might be that three or four tabs is so few that they would not be helpful and that more than 20 or 30 tabs might be so many that they would interfere rather than help.

15.4.14 Footnotes

Footnotes, like appendixes, are used to present information that is not properly a part of the text. The difference is that footnotes tend to be much shorter and more closely related to the specific text than are appendixes.

- **15.4.14.1 Minimize use of footnotes.** The use of footnotes shall be minimized. [Source: MIL-STD-490A, 1985, 3.2.11.1; MIL-STD-962B, 1988; Hartley, 1978]

Discussion. Footnotes may be distracting and often are ignored. If the information is important, it properly belongs in the text; if the information is not important, it is probably not necessary. Extensive supplemental information belongs in an appendix.

- **15.4.14.2 Identification.** Footnotes to text shall be numbered consecutively throughout a document or throughout a division of a document. The reference to a footnote in the text shall consist of the footnote's number in superscript Arabic numerals immediately following the word or phrase to which it applies. The footnote itself shall be preceded by its identifying number, also in superscript. Footnotes to figures or tables shall be numbered consecutively or otherwise identified (see the following Exception) independently for each figure or table. [Source: MIL-STD-962B, 1988]

Exception. If footnotes occur in tables or figures, and the use of numbers to identify them might lead to confusion with numerical data in the table or figure, letters and symbols are acceptable alternatives for identifying footnotes.

- **15.4.14.3 Location.** Footnotes to text shall be located at the bottom of the page on which their reference in the text occurs. Footnotes to figures or tables shall be located immediately following the figure or table. [Source: MIL-STD-490A, 1985; MIL-STD-962B, 1988]

15.4.15 Copyright and patent issues

- **15.4.15.1 Copyrighted documents.** If a user document is or will be copyrighted, the copyright information shall be placed on the back of the title page. [Source: Zaneski, 1982]
- **15.4.15.2 Inclusion of copyrighted or patented material.** Copyrighted or patented material shall not be included in user documents without the prior consent of the owner of the copyright or patent. When such consent has been obtained, and if the owner requests it, an acknowledgment of the permission shall be placed in the document near the material. [Source: MIL-STD-962B, 1988]

15.4.16 Publication date

- **15.4.16.1 Location.** The date of publication shall appear at the center of the bottom of the front cover. [Source: FAA-D-2494/b, 1984]

15.5 Specific user document contents

This section contains rules for two specific types of user document contents, proceduralized instructions and interactive electronic technical manuals.

15.5.1 Proceduralized instructions

Proceduralized instructions tell users how to complete tasks. They may be used for (a) mechanical procedures, such as assembling, servicing, and repairing units of equipment, (b) operating procedures, such as starting, operating, and shutting down systems or units of equipment, and (c) test procedures, such as periodic maintenance tests and alignments. The instructions are presented as a series of steps.

Definition. A **proceduralized instruction** is a set of step-by-step instructions a procedure intended to ensure the successful completion of a task.

15.5.1.1 General

- **15.5.1.1.1 Procedures, tasks, subtasks, and steps.** A proceduralized instruction shall apply to a single task and shall present instructional information as a series of steps. A lengthy or complicated procedure may be divided into a series of related subtasks as long as each subtask accomplishes a distinct, recognizable objective. [Source: Department of Defense (MIL-M-87268, 1995)]
- **15.5.1.1.2 Level of detail.** Proceduralized instructions shall include a level of detail that is appropriate to the intended users. [Source: Wieringa, Moore, & Barnes, 1993]
- **15.5.1.1.3 Completeness.** Each proceduralized instruction shall contain all the steps and supporting information required to successfully complete the task. [Source: AFSC DH 1-3, 1980; MIL-HDBK-761A, 1989]
- **15.5.1.1.4 Safety considerations.** The performance of all procedures shall be made as safe as possible by including all of the following safeguards that apply:
 - a. If possible, actions shall be performed with equipment shut down and isolated.
 - b. At the completion of a task or subtask, no portion of a unit of equipment shall be left in a dangerous state unless the procedure includes the posting of adequate warnings.
 - c. Steps that tell a user to remove voltage or pressure shall also tell the user to label or tag the switches, circuits, or valves involved.
 - d. If components capable of holding a charge are involved, the procedure shall tell the user how to discharge these components safely.
 - e. Procedures shall include steps to restore equipment to a safe operating condition.
 - f. Procedures shall include warnings, cautions, and notes as appropriate. [Source: MIL-HDBK-761A, 1989]
- **15.5.1.1.5 General safety instructions.** A proceduralized instruction shall include a summary of any general safety information that applies throughout the task. [Source: MIL-HDBK-761A, 1989]

15.5.1.2 Organization and content

- **15.5.1.2.1 Hierarchical, logical, and consistent.** A proceduralized instruction shall be organized in a hierarchical, logical, consistent manner that is apparent to the user. [Source: Wieringa, Moore, & Barnes, 1993]

- **15.5.1.2.2 Identifying information.** Information identifying the procedure shall be displayed on the cover page of the procedure and in a header or footer on each page. [Source: Wieringa, Moore, & Barnes, 1993]
- **15.5.1.2.3 Title.** A proceduralized instruction shall have a title that is concrete, specific, and terse, and that uniquely identifies the task to be performed. [Source: MIL-HDBK-761A, 1989]
- **15.5.1.2.4 Headings.** If a proceduralized instruction contains distinct parts, each part shall have a heading. Headings shall conform to the requirements for titles (see Paragraph 15.2.1.1.1). [Source: Wieringa, Moore, & Barnes, 1993]
- **15.5.1.2.5 Numbered steps.** Steps shall be numbered, using Arabic numerals, in a way that provides useful information to users without being overly complex. [Source: MIL-HDBK-761A, 1989; Wieringa, Moore, & Barnes, 1993]

Discussion. A complex step might be divided into a number of substeps, and the numbering might reflect this. For example, if step 6 has three substeps, the substeps might be numbered 6.1, 6.2, and 6.3.
- **15.5.1.2.6 Supporting information.** A proceduralized instruction shall include all of the following supporting information that is applicable:
 - a. An applicability statement that specifies the equipment or systems to which the procedure applies (for example, the applicability statement might list equipment model numbers and a range of serial numbers);
 - b. Any initial setup or input conditions required for the procedure;
 - c. A list of test equipment required;
 - d. A list of tools required;
 - e. A list of materials, consumable or expendable items, and mandatory replacement parts required;
 - f. A list of support equipment required;
 - g. If more than one, the minimum number of personnel required;
 - h. A system preparation checklist; and,
 - i. A list of any special environmental conditions required (for example, ventilation, lighting, temperature, noise level, electromagnetic interference, cleanliness, and humidity). [Source: MIL-HDBK-761A, 1989]

- **15.5.1.2.7 Appendixes and attachments.** Information that is important and useful but not easily incorporated into a procedure should be presented in an appendix or attachment to the procedure. However, the use of appendixes and attachments should be minimized. [Source: Wieringa, Moore, & Barnes, 1993]

Examples. Types of information presented in appendixes or attachments might include contingency actions, actions performed by someone other than the user of the procedure, and periodic steps.

15.5.1.3 Format

- **15.5.1.3.1 Step numbers and text.** The text of a step shall begin on the same line as its number, separated from the number by two spaces. If the text fills more than one line, the additional line or lines shall begin under the first letter of the first line, not under the number. [Source: Department of Defense (MIL-M-38784, 1992)]
 - **15.5.1.3.2 Check off provision.** If appropriate, the proceduralized instruction should provide a line or box adjacent to a step so that a user can check off the step when it has been completed. [Source: Wieringa, Moore, & Barnes, 1993]
- Discussion.** The provision of a check off can serve a variety of functions; it can serve as a placeholder in cases in which a user refers to another part of the procedure or another procedure; it can serve as a record of the completion of the step; and it can be used to identify the applicable condition in a conditional step.
- **15.5.1.3.3 Lists.** If a step contains a sequence of three or more items (for example, actions, conditions, or units of equipment), the items should be presented in a list format (see Section 15.4.6). [Source: Wieringa, Moore, & Barnes, 1993]
 - **15.5.1.3.4 Illustrations.** If a step refers to an illustration, it shall be possible for the user to see both the step and the illustration simultaneously. This may be accomplished by placing the illustration (a) within the step in which it is used, (b) on the same page as the step, (c) on a facing page, or (d) on a foldout page (see Section 15.3.2.7). [Source: AFSC DH 1-3, 1980]

15.5.1.4 Wording of steps

- **15.5.1.4.1 Completeness.** Each step shall contain all the instructions and supporting information required to successfully complete the step. [Source: AFSC DH 1-3, 1980]
- **15.5.1.4.2 Grammar.** The steps in a proceduralized instruction shall be comprised of grammatically correct sentences. [Source: Wieringa, Moore, & Barnes, 1993]

- **15.5.1.4.3 Action statements and indication statements.** If appropriate, a step in a proceduralized instruction shall be comprised of an action statement followed by an indication statement. The indication statement shall include any applicable values or tolerances. [Source: MIL-HDBK-761A, 1989]

Definitions. An **action statement** is an action verb followed by the object or item acted upon. An **indication statement** states the name of an indicator that the user reads or observes and the indication expected to result from the action. The **stated indication** is what is expected if the equipment or system is operating normally.

- **15.5.1.4.4 Standard steps.** If the same (or highly similar) action or indication occurs more than once in a procedure, a standard wording shall be adopted and used consistently throughout the procedure. Such standard wording shall, as appropriate, accommodate different objects and indicators. [Source: MIL-HDBK-761A, 1989]
- **15.5.1.4.5 Conditional steps.** Steps that are to be performed only if a specified condition exists shall begin with the word "if" or "when" and a statement of the condition, followed by the word "then" and the action statement. If and then shall be emphasized typographically (see Section 15.3.3.7). If the condition is negative, the word not shall be used and emphasized. [Source: Wieringa, Moore, & Barnes, 1993]

Examples. Examples of conditional steps are: "If the status light is green, then press the override button," "When engine speed reaches 2000 RPM, then engage the clutch," and "If the status light is not green, then press the power switch."

- **15.5.1.4.6 No calculations.** If possible, no step shall require a user to make a calculation. If a calculation is necessary, the step shall include a calculation aid, for example, a series of step-by-step instructions for carrying out the calculation. [Source: Wieringa, Moore, & Barnes, 1993]
- **15.5.1.4.7 Numerical precision.** If a step contains numerical information that relates to an indicator, the precision of the information in the step should not exceed the precision of the indicator. For example, if an instrument dial can be read only to the nearest five units, the step should not require a reading to the nearest single unit. [Source: Wieringa, Moore, & Barnes, 1993]
- **15.5.1.4.8 Numerical ranges.** If a step specifies a range of numerical values, the range shall be stated as the upper and lower values, not as the middle value plus and minus an increment. For example, a temperature range might be stated as 75-85°F, not as 80°F ±5°. [Source: Wieringa, Moore, & Barnes, 1993]

15.5.1.5 Branching and cross-references

Not every procedure is a simple, sequential series of steps. Some require branching depending upon conditions (for example, "If the condition is *A*, then go to step *X*; if the condition is *B*, then go to step *Y*"), and some require a temporary reference to another step or procedure followed by a return to the current procedure (for example, "If the condition observed in step *N* is *C*, then perform procedure *Z* before performing step *N+I*").

- **15.5.1.5.1 Minimize use.** The use of branching and cross-referencing in proceduralized instructions shall be minimized. [Source: Wieringa, Moore, & Barnes, 1993]
- **15.5.1.5.2 Explicit instructions.** Branching and cross-referencing shall be explicit, not implicit. [Source: Wieringa, Moore, & Barnes, 1993]
- **15.5.1.5.3 Content.** Branching and cross-referencing instructions shall provide all necessary information and shall be worded consistently. [Source: Wieringa, Moore, & Barnes, 1993]

Examples. Branching instructions might be worded: "If ..., then go to step ..." A cross-referencing instruction might be worded: "Refer to steps ... then return to step ..."

15.5.1.6 Miscellaneous

- **15.5.1.6.1 Simultaneous actions or indications.** If a procedure includes actions that must occur simultaneously or indications that occur simultaneously, the actions or indications shall be included in the same step. [Source: MIL-HDBK-761A, 1989]
- **15.5.1.6.2 Format for diagnostic steps.** The format of a diagnostic step should be appropriate to the immediate task. [Source: Wieringa, Moore, & Barnes, 1993]
- **15.5.1.6.3 Nonsequential steps.** Steps that need not be performed in a fixed sequence should be presented in a way that makes clear when they should be performed and that ensures they are not omitted. [Source: Wieringa, Moore, & Barnes, 1993]

Discussion. In some cases, a number of steps must be performed, but the order in which they are performed does not matter. In others, a step must be performed when a condition is met, for example, shutting a valve when a tank becomes full. In still others, a step must be performed at specified intervals or at a specified time after an action has been taken.

- **15.5.1.6.4 Verification steps.** Steps that require a user to verify that a stated condition is met should be presented in an appropriate format, for example, with a check box. If a procedure contains more than one verification step, the verification steps should have a consistent format. [Source: Wieringa, Moore, & Barnes, 1993]

- **15.5.1.6.5 Equally-acceptable steps.** Steps that tell a user to perform one of a number of equally acceptable actions should be presented in a format that makes clear exactly what the user is to do, for example, to select and perform one and only one action. [Source: Wieringa, Moore, & Barnes, 1993]
 - **15.5.1.6.6 Actions performed from memory.** If a procedure includes one or more steps that a user is expected to perform from memory, the written procedure shall include those steps. [Source: Wieringa, Moore, & Barnes, 1993]
- Example.** The first step(s) in an emergency procedure may have to be done from memory. Whenever the total procedure is written out, the memorization steps are assumed to be necessary and are included.
- **15.5.1.6.7 Procedures involving more than one person.** A procedure that involves more than one person shall be presented in a way that assigns actions and observations to individuals and integrates the actions and observations of all the individuals into a single series of steps. [Source: MIL-HDBK-761A, 1989]

15.5.2 Interactive electronic technical manuals

Interactive electronic technical manuals are technical manuals designed for interactive use on an electronic display system. This medium has many advantages, such as (a) tailoring the presentation to the user, for example, presenting highly detailed information to novice users and condensed information to experienced users, (b) tailoring the presentation to the situation, for example, following one branch rather than another based on a user input, (c) permitting the manipulation (such as movement or enlargement) of diagrams, and (d) permitting easy access to information, such as parts information.

15.5.2.1 General

- **15.5.2.1.1 Access to contents.** A user shall be able to access directly any portion of the manual that appears in a list of its contents. [Source: MIL-HDBK-761A, 1989]

- **15.5.2.1.2 Help information.** The system shall provide at the user's request additional information relating to the technical content of all sections of the electronic technical manual. This help shall include both context-sensitive help applicable to the user's current activity and situation, and descriptive information on a specific term, technical point, or process. Help information shall include:
 - a. administrative information about the manual itself, for example, the title and identification, the version number, the date of the latest change, and the preparing organization;
 - b. an easily noticeable applicability statement that specifies precisely the equipment or system to which the manual applies, including model numbers and serial numbers, if applicable;
 - c. an introduction that states the purpose, scope, contents, organization, and range of tasks covered by the manual;
 - d. information on how to use the help information;
 - e. information about the computer system being used to view the manual;
 - f. instructions on the use of any utility functions provided, for example, the automatic preparation and submission of reports;
 - g. information about function keys and other keyboard features;
 - h. general information about the task being performed or the portion of the manual being used;
 - i. specific, context-sensitive help;
 - j. an index of help information; and,
 - k. definitions of abbreviations and unusual terms. [Source: MIL-HDBK-761A, 1989]

Discussion. The above rule does not imply that an electronic technical manual or a help subsystem can merely be a paper manual transposed to a help role by its presentation or availability through a computer system monitor. To the contrary, such a practice may produce a nearly useless help system or electronic technical manual. Help systems and electronic technical manuals need to be designed along with the system, especially along with software systems.

Such systems and electronic manuals need to be based upon human understanding of technical information related to human tasks, processes, interfaces, and other subsystem that they use and maintain to enable their individual and collective purposeful endeavors. Using computer technology to turn pages is a questionable practice. Hypertext help is much more appropriate than a paper manual transposed to be a help system.

- **15.5.2.1.3 Safety summary.** If an interactive electronic technical manual contains one or more warnings or cautions, it shall also include a safety summary. [Source: MIL-HDBK-761A, 1989]

15.5.2.2 Text

- **15.5.2.2.1 Applicable information.** The system shall present to users only information that applies to the specific equipment or system configuration and situation. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.2.2 Level of detail.** An interactive electronic technical manual shall contain all the information necessary for a user (a) to perform the task involved without error or loss of time due to insufficient information, or (b) to comprehend a description. It shall not contain unnecessary detail. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.2.3 Procedures in steps.** If a step includes a procedure that is specific to the equipment or system, the procedure shall be included in the step. If a step includes a general-purpose procedure that is likely to be performed without reference to technical information by an experienced technician, the user shall be given the option of bypassing presentation of the procedure. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.2.4 Accommodating novice and expert skill levels.** If specified by the acquisition program office, an interactive electronic technical manual shall offer two levels of detail, one for a novice skill level, and one for an expert skill level. The novice skill level shall contain all information necessary for an inexperienced user to perform the task involved or to comprehend a description. The expert level shall function as a checklist, presenting only the steps required to complete a task or providing a description in broader terms, requiring a higher level of theoretical knowledge. Both levels shall contain all pertinent warnings and cautions. The expert user shall be able to access information at the novice level, but the novice user shall not be able to access information at the expert level unless otherwise specified by the acquisition program office. [Source: MIL-HDBK-761A, 1989]

15.5.2.3 Graphics

The types of graphic displays that might appear in an interactive electronic technical manual include, but are not limited to, locator diagrams, functional block diagrams, general support graphics, schematics, wiring diagrams, flow diagrams, graphs, and charts.

- **15.5.2.3.1 Minimum quality.** Graphic displays shall meet the general requirements of Paragraph 15.5.2.3.1 when displayed on the least capable device (for example, the smallest screen) on which the manual is intended to be used. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.2 Interaction with graphics.** A displayable graphic may or may not be designed to be used interactively. If a graphic is not interactive, it shall be displayed in full detail; if it is interactive, a user shall be able to (a) manipulate the graphic for a better view, for example, by moving or re-sizing it, (b) choose selectable areas within the graphic, or (c) both. [Source: MIL-HDBK-761A, 1989]

Discussion. An interactive graphic would be appropriate if the graphic is so large or detailed that it cannot be displayed in full detail in the space available, and thus requires the use of scrolling or zooming.

- **15.5.2.3.3 Detail and context.** Graphics shall present only the equipment items to which action statements refer and enough of their surroundings to permit a user to locate and isolate an item without error. Unnecessary details that reduce the comprehensibility and clarity of the graphic shall be omitted. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.4 Citations of equipment nomenclature.** If a graphic contains labels or citations that refer to controls, control positions, test points, and indicating devices that are labeled on the equipment, the graphic labels shall appear exactly as they appear on the equipment (for example, using all capital letters if the equipment label does). [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.5 Angle of view.** Graphics shall be drawn from the same general angle of view that the equipment presents to a user. Cutaways and hidden lines shall be used as necessary in conjunction with details that are accessible but not visible to a user. In situations in which a user is able to view the equipment from more than one angle, the view that provides the most pertinent and necessary information in the simplest fashion shall be used. An item or part removed from the equipment may be rotated to show important features, but, if so, the axis, direction, and degrees of rotation shall be indicated in the graphic. Perspective and isometric projections shall be used rather than orthographic projection, unless the view is head-on. [Source: MIL-HDBK-761A, 1989]

- **15.5.2.3.6 Use of a human figure.** If it is necessary to illustrate an operation or procedure, a graphic shall include a human figure or the relevant body parts. Jewelry shall not appear in graphics. The human figure or part shall not obscure details of the equipment necessary for a complete understanding of its operation. The human figure shall be clothed as specified by the acquisition program office. A cross section of races and sexes shall be used. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.7 Callouts.** Callouts shall be provided to identify specific features of interest on graphics. Callouts shall be in accordance with Paragraph 15.4.4.5.2. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.8 Schematic and wiring diagrams.** Unless specified otherwise by the acquisition program office, a wire list, schematic, or wiring diagram that is displayed in association with text shall be simplified to contain only the information referred to in the text. However, a user shall have access to the entire wire list, schematic, or wiring diagram. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.9 Functional flow diagrams.** Functional flow diagrams shall be drawn as flowcharts indicating the direction of system interaction. The information shall flow from left to right and top to bottom on diagrams. The diagrams shall indicate the detail referenced by the accompanying text. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.10 Locator graphics.** Locator graphics shall enable a user to find specific hardware items (for example, parts, switches, controls, or indicators) referred to in the technical information. A locator graphic shall consist of a labeled graphic together with required callouts. The locator graphic shall show what a particular item looks like and illustrate its relationship to its immediate surroundings on the equipment illustrated. Locator graphics, if used, shall either be included as an option for selection by a user, or as an automated part of the presentation of procedural or descriptive information. [Source: MIL-HDBK-761A, 1989]

- **15.5.2.3.11 Placement of locator graphics.** Locator graphics shall be integrated with their associated technical information as follows:
 - a. Individual equipment items (for example, parts, switches, controls, and indicators) shall be shown in the physical context of major equipment components. The nomenclature of major equipment components shall be shown on the graphic.
 - b. Index numbers on callouts shall be assigned on the equipment item locator graphic either (a) in clockwise sequence, or (b) in the sequence that items are discussed in procedural steps.
 - c. If a procedural step includes a reference to an illustrated equipment item, the reference shall cite either a callout or an index number with a leader line pointing to the referenced item. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.12 Exploded item views.** Exploded views of items shall be used as locator graphics only if further disassembly is required. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.13 Minimum size of a locator graphic.** The minimum size of a locator graphic shall enable a user to quickly identify the surroundings and the item to be located with respect to the surroundings. A callout shall be used to emphasize the item to be located. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.14 Animated information.** The motion of animated information shall be easily discernable by a user and clearly differentiated from its background and from static information on display. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.3.15 Video controls.** If an interactive electronic technical manual includes an animated or motion video sequence, the sequence shall repeat automatically after completion. A user shall be able to pause, repeat, and exit the sequence. [Source: MIL-HDBK-761A, 1989]

15.5.2.4 Audio

- **15.5.2.4.1 Redundant visual information.** Audio information shall always be accompanied by redundant visual information so that the information presentation is effective even if its audio output device is not available. Audio information shall be in accordance with Chapter 7 of this document. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.4.2 When to use nonverbal auditory signals.** Nonverbal auditory signals shall be limited to applications in which immediate discrimination is not critical to personnel safety or system performance. [Source: MIL-HDBK-761A, 1989]

- **15.5.2.4.3 When to use computer-generated and electronically-stored speech.** Computer-generated and electronically-stored speech shall be limited to the presentation of procedural information. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.4.4 Audio controls.** If an interactive electronic technical manual includes either verbal or nonverbal audio signals, it shall provide users the ability to (a) request a repetition of any signal, (b) adjust the volume of the signals, and (c) turn the audio signals on and off. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.4.5 Pronunciation of abbreviations.** Computer-generated and electronically-stored speech shall pronounce the entire word or phrase an abbreviation represents unless the abbreviation is pronounced as individual letters in common usage. Acronyms in common use shall be pronounced as the acronym. [Source: MIL-HDBK-761A, 1989]

Examples. The abbreviation "mm" would be pronounced "millimeter." The abbreviation "SSE" would be pronounced "south south east." The abbreviation SFO (for Sector Field Office) would be pronounced "S" "F" "O." The acronym "TELCO" (for telephone company) would be pronounced "telco."

- **15.5.2.4.6 Pronunciation of alphanumeric strings.** Strings of digits or alphanumeric characters that are not ordinarily pronounced as a unit shall be pronounced as a series of single letters or digits. [Source: MIL-HDBK-761A, 1989]

15.5.2.5 Warnings, cautions, and notes

- **15.5.2.5.1 When to include warnings and cautions.** If it is impossible to avoid the use of or exposure to hazardous materials, conditions, or equipment, the technical information shall be supplemented with a warning or caution designed (a) to attract the user's attention to practices, procedures, and conditions that could lead to injury or equipment damage, (b) to warn the user about the performance of certain hazardous actions, and (c) to state how the procedure can be performed safely. Warnings, cautions, and notes shall be in accordance with Section 15.4.8. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.5.2 Readable and comprehensible.** Warnings, cautions, and notes shall be easy to read and understand in the work environment in which they are likely to appear. [Source: MIL-HDBK-761A, 1989]

Note. If more than one type of danger may be present, or if danger can come from more than one source, or if one type of danger may require more than one remedial action, the dangers and actions may be referred to once in a single, combined warning or caution.

- **15.5.2.5.3 Association of warnings and cautions with text.** A warning or caution shall be directly associated with and precede in logical sequence the text or procedural step to which it applies. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.5.4 Location of warnings, cautions, and notes.** Warnings, cautions, and notes that are presented in dialog boxes shall be displayed in the approximate center of the display area, and normal operation of the system shall not resume until a user acknowledges the message. Upon acknowledgement, the box shall be removed and normal operation resumed. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.5.5 Color in warning, caution, and note displays.** If color is used in interactive electronic technical manuals, the color red shall be associated with warnings, yellow with cautions, and cyan with notes. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.5.6 Borders for warnings, cautions, and notes.** Warnings, cautions, and notes presented in dialog boxes shall be enclosed in borders consisting of diagonal bars, alternating between the background color or white and the designated message color. The text shall be displayed within the border. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.5.7 When to use notes.** Notes shall be used to supply needed information that is not a step in a procedure. Information in notes shall be limited to necessary specifics. Required tolerances and clearances shall not be given in notes; they shall be included in procedural steps. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.5.8 Association of notes with text.** A note shall either directly precede or directly follow the applicable text depending upon the point to be emphasized. A note shall precede a procedural step to which it applies. [Source: MIL-HDBK-761A, 1989]

15.5.2.6 Interaction style

- **15.5.2.6.1 Dialog boxes.** If windowing is used, a dialog box shall be the principal means by which a user interacts with an interactive electronic technical manual. The box shall be displayed in a separate window and shall contain a heading and one or more control push buttons. All boxes shall have an **OK** push button and, if appropriate, a **Cancel** push button. Dialog boxes shall appear in a consistent and prominent part of the display, and shall be easily distinguishable from other types of displayed information. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.6.2 Dialogs.** Dialogs shall be formulated as prompting questions that are presented to the user and that require a response from the user. The system response shall be appropriate to the user's response. [Source: MIL-HDBK-761A, 1989]

- **15.5.2.6.3 Prompts.** A standard symbol or layout shall be used with prompts to indicate to a user that an explicit response is expected. The symbol or layout shall be used exclusively for this purpose. The user's response shall be displayed adjacent to the prompt. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.6.4 Changing responses to prompts.** A user responding to a series of prompts in a single portion of a procedure shall be able to change any previously entered response as long as that change does not alter the logic of the procedure. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.6.5 Navigation operations.** Users shall have at least the following navigation functions:
 - a. **Next.** This operation shall display the next section of information appropriate to the context.
 - b. **Back.** This operation, the opposite of **Next**, shall display the previous section of information appropriate to the context.
 - c. **Return.** If the manual provides branching, this operation shall return the user from a branch to the branching point, resetting any temporary system state information relative to the branch.
 - d. **Browse back, Browse next, and Browse exit.** If the **Next** and **Back** operations set interactive system variables that affect subsequent navigation through the manual, browse functions shall be available that act as **Next** and **Back** but without affecting the system variables. Once the **Browse next** or **Browse back** operation has been selected, the normal **Next** and **Back** operations shall not be available until the user invokes the **Browse exit** operation. The system shall provide a distinct visual indication when the system is in the browse mode. [Source: MIL-HDBK-761A, 1989]

Definitions. **Browse back** is the action of moving to the previous window without permanently resetting system variables; however, system variables in the temporary state table will be reset. **Browse next** is the action of moving to the succeeding window without permanently setting system variables; however, system variables will be set to a temporary state table. **Browse exit** is the action of leaving browse mode.

- **15.5.2.6.6 Data access operations and features.** An interactive electronic technical manual shall provide users at least the following access operations or features:
 - a. **Marking.** Users shall be able to mark a displayed information element for later recall. "Marking" shall include the ability to create, name, delete, modify, and go to a mark.
 - b. **Outline and index.** Users shall have access to information through a hierarchical outline of the manual, an index, or both.
 - c. **Functional diagrams.** If a manual includes a functional diagram or graphic, users shall be able to gain access to information by selecting the appropriate portion of the diagram.
 - d. **Search.** Users shall be able to gain direct access to information by entering selection information in a Search operation.
 - e. **Cross-references.** If a displayed information element has a cross-reference or other related information associated with it, the element shall include a clear indication of that fact, and a user shall be able to display the related information and then return to the original display using the Return operation (see Paragraph 15.5.2.6.6.c). [Source: MIL-HDBK-761A, 1989]

15.5.2.7 User interface

- **15.5.2.7.1 Consistency.** The user-manual interaction and the display formatting of an interactive electronic technical manual shall be consistent across all devices upon which the manual can be presented. [Source: MIL-HDBK-761A, 1989]

15.5.2.8 Special requirements for proceduralized instructions

- **15.5.2.8.1 Form and content.** Procedural information in an interactive electronic technical manual shall be directive in form. It shall instruct a user how to operate, test, maintain, or repair a system. It shall contain the directive information (for example, the steps) and any additional supporting material needed or helpful in the successful completion of a procedure. [Source: MIL-HDBK-761A, 1989]

15.5.2.9 Special requirements for troubleshooting information

- **15.5.2.9.1 Troubleshooting logic.** The fundamental logic for interactive troubleshooting shall be specifically designed and shall include, but not be limited to, predefined fault isolation sequences and dynamically generated fault isolation recommendations based on system or user inputs. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.9.2 Contents.** Troubleshooting information shall include, but not be limited to (a) symptoms, (b) procedures, such as tests, repairs, and scheduled maintenance, (c) graphics, locator diagrams, and schematics, (d) parts and test equipment information, (e) equipment failure history, and (f) theory of operation. In addition, after a fault has been isolated, the manual shall permit direct access to relevant corrective maintenance procedures. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.9.3 User inputs.** Users shall have the following capabilities:
 - a. the ability to enter symptom information (a) by typing or (b) by initiating automatic retrieval from the system or equipment under observation,
 - b. the ability to enter and change test results, if appropriate,
 - c. the ability to confirm conditions or states if necessary to continue a user action,
 - d. the ability to review and browse through previous actions and test results, and
 - e. the ability to access information needed to troubleshoot the system or equipment in an efficient and clearly defined manner. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.9.4 Predefined fault isolation sequences.** Each step in a predefined fault isolation sequence shall be based on the reporting of an observed symptom or the result of a previous test and shall specify the next procedure, test, or corrective user action. [Source: MIL-HDBK-761A, 1989]

Definition. A **predefined fault isolation sequence** is a sequence of fixed procedures and tests that leads to a suspected fault. It is similar to a fault tree in a fault isolation manual.
- **15.5.2.9.5 Presentation of a predefined fault isolation sequence.** Predefined fault isolation sequences shall be presented as procedural steps that prompt users to perform tests, make observations, or perform corrective repair actions. [Source: MIL-HDBK-761A, 1989]

- **15.5.2.9.6 Dynamically-generated fault isolation**

recommendations. Dynamically-generated fault isolation recommendations shall be derived from user inputs along with stored information and automated inputs. The system shall provide users recommendations of tests to perform or actions to perform to aid in the fault isolation process. Results of the tests or actions shall be used to update the system status and shall result in further recommendations, as appropriate. [Source: MIL-HDBK-761A, 1989]

Definition. A **dynamically-generated fault isolation recommendation** is a recommendation made by a computer system based on stored information and information received from user inputs, automated system inputs, or both. The information used by the system may include historical information, heuristics, probability factors, and cost factors. The recommendation may be derived using model-based reasoning, dependency models, fault-based reasoning, rule-based logic, information theory, or advanced artificial intelligence schema.

- **15.5.2.9.7 Presentation of dynamically-generated fault isolation recommendations.**

The starting point for dynamic troubleshooting shall be depicted in some representational form, for example, a functional or connectivity block diagram. These depictions shall convey information about the current components under investigation and any suspected faults. By interacting with the depictions, users shall be able to obtain additional information, such as lower levels of system detail, theory of operation, and parts information. Information presentation shall not be limited to a single set of troubleshooting recommendations, but shall permit users to view additional information such as a "best test" or "best repair list," previous actions performed during the troubleshooting process, test results, and block diagrams. [Source: MIL-HDBK-761A, 1989]

15.5.2.10 Presentation of parts information

- **15.5.2.10.1 Information available.** An interactive electronic technical manual shall include a data base of supporting parts information that (a) permits unambiguous identification of all parts that are replaceable or repairable at the current level of maintenance, (b) shows the precise physical relationship of each part to other parts of the system, and (c) provides the user the information needed to order parts through the use of an automatically-generated parts ordering form. [Source: MIL-HDBK-761A, 1989]

- **15.5.2.10.2 Accessibility of parts information.** Users shall be able to access information about a part at any time that part is identifiable in a display. Relevant displays include:
 - a. locator diagrams.
 - b. logic flow diagrams or circuit diagrams.
 - c. portions of text that cite the part using any valid designation of the part.
 - d. a dialog prompt for parts information. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.10.3 Direct access.** Users shall be able to obtain parts information directly by specifying a part using any applicable part identification or numbering system. [Source: MIL-HDBK-761A, 1989]

15.5.2.11 Descriptive information

- **15.5.2.11.1 Information available.** An interactive electronic technical manual shall include descriptive information to assist a user in the comprehension of procedural information. Descriptive information shall include, but not be limited to, theory of operation, diagrams, and general knowledge. [Source: MIL-HDBK-761A, 1989]
- **15.5.2.11.2 Presentation of descriptive information.** Descriptive information need not conform to any specified format, but shall be easily understandable and usable (see Section 15.2). Section and paragraph headings shall be employed as needed to assist users in identifying or understanding the organization of descriptive information (see Section 15.2.1). [Source: MIL-HDBK-761A, 1989]

15.6 Accommodating people with disabilities

Accessibility in design extends general design principles to cover those individuals who are faced with either temporary or permanent limitations in some dimension of human ability (e.g., sight, hearing, physical mobility, etc.). Although these rules are meant to make systems more accessible and thus make systems available to an increased number of users, it is not possible to design everything for use by everyone. However, there are often adaptations that can significantly increase system accessibility and usefulness. The goal of this section is to make systems more accessible and thus maximize the number of potential users.

Definitions. A **disability** is a physical or mental impairment that substantially limits one or more of a person's major life activities. A **reasonable accommodation** is any modification or adjustment to a job or the work environment that will enable a qualified

person with a disability to participate in the application process and to perform essential job functions.

15.6.1 Document readability and handling

People with visual disabilities may have difficulty reading printed documentation, and people with physical disabilities may have difficulty handling documentation. The following rules provide information that can be used to design documentation that will maximize the number of people who can read and handle it. [Source: Vanderheiden & Vanderheiden, 1991]

- **15.6.1.1 Electronic and printed form.** Manuals and other important documentation intended to be accessible should be available in electronic and printed form and include both text and graphic information.

Discussion. This will enable the material to be presented on an assisting device such as an enlarged display, a speech synthesizer, or a Braille reader. [Source: Scadden & Vanderheiden, 1988]
- **15.6.1.2 Convertible format.** Documentation should be available in formats that can be converted easily. (for example ASCII format for normal text) [Source: Ladner, 1988]
- **15.6.1.3 Alternate formats.** Documentation should be provided in alternative formats such as electronic, large-print, audiotape, and Braille. [Source: Vanderheiden & Vanderheiden, 1991]
- **15.6.1.4 Type size.** Documentation should be provided in the largest type that is practical. [Source: Vanderheiden & Vanderheiden, 1991]
- **15.6.1.5 Alternate coding devices.** Color coding should not be the only coding device used. [Source: Vanderheiden & Vanderheiden, 1991, D-1]
- **15.6.1.6 Graphic information.** A textual description should be provided of all graphical information. [Source: Vanderheiden & Vanderheiden, 1991]
- **15.6.1.7 Placement of basic instructions.** Basic instructions for operation should be provided on the applicable device and in the documentation. [Source: Vanderheiden & Vanderheiden, 1991]
- **15.6.1.8 Compatible documentation.** Documentation should be compatible with electronic scanning and optical character reading devices. [Source: Vanderheiden & Vanderheiden, 1991]

15.6.2 Cognitive or language disabilities

People who have cognitive or language disabilities may have particular difficulty understanding documentation. The following rules provide information that can be used to design documentation that will maximize the number of people who can understand it. [Source: Vanderheiden & Vanderheiden, 1991]

- **15.6.2.1 Illustrations.** Descriptions should not require illustrations. [Source: Vanderheiden & Vanderheiden, 1991]

Discussion. This is especially true for descriptions provided for the basic operations. [Source: Vanderheiden & Vanderheiden, 1991]
- **15.6.2.2 Key information.** Key information should be highlighted and placed near the beginning of the document. [Source: Vanderheiden & Vanderheiden, 1991]
- **15.6.2.3 Instructions.** Step-by-step instructions should be provided that use numbers, bullets, or check boxes. [Source: Vanderheiden & Vanderheiden, 1991]
- **15.6.2.4 Directional terms.** When providing instructions, directional terms, such as left, right, up, and down should not be used. [Source: Vanderheiden & Vanderheiden, 1991]
- **15.6.2.5 Initiation of basic features.** A section of the document should be provided that offers information on how to initiate the basic features of the system or equipment. [Source: Vanderheiden & Vanderheiden, 1991]

Discussion. Consider using audio or videotapes in place of printed documentation to assure that the user is provided the information needed to operate the basic features. [Source: Vanderheiden & Vanderheiden, 1991]

Glossary

Abbreviation - A shortened version of a word or group of words formed by omitting one or more letters.

Acronym - A word formed from the initial letter or letters of a group of words.

Action statement - An action verb followed by the object or item acted upon.

Advance organizer - Supplementary information that is presented prior to the main body of information in which a user is interested.

Appendix - A body of supplementary information collected, labeled, and placed at the end of a document.

Browse back - The action of moving to the previous window without permanently resetting system variables; however, system variables in the temporary state table will be reset.

Browse exit - The action of leaving browse mode.

Browse next - The action of moving to the succeeding window without permanently setting system variables; however, system variables will be set to a temporary state table.

Caution - A written notice given when a situation might result in damage to or destruction of equipment or systems.

Center-justified text - Lines are centered on the page, with both right and left margins ragged.

Disability - A physical or mental impairment that substantially limits one or more of a person's major life activities.

Dynamically-generated fault isolation recommendation - A recommendation made by a computer system based on stored information and information received from user inputs, automated system inputs, or both. The information used by the system may include historical information, heuristics, probability factors, and cost factors. The recommendation may be derived using model-based reasoning, dependency models, fault-based reasoning, rule-based logic, information theory, or advanced artificial intelligence schema.

Figure - An exhibit that is primarily graphical or pictorial in nature, as opposed to verbal or numerical.

Fully-justified text - Spacing is added within and between words so that all lines are the same length, resulting in alignment of both right and left margins.

Heading - The title of an organizational subdivision of a document, that is, a title that has hierarchical significance.

Indication statement - States the name of an indicator that the user reads or observes and the indication expected to result from the action.

Left-justified text - Lines of text are aligned at the left, but spacing within and between words is not varied, resulting in a ragged right margin.

Linking sentence - A sentence that connects the paragraph it is in to the paragraph that precedes or follows it. The connection is usually accomplished by repeating a word or phrase or referring to a concept.

List - A series of similar or related items in which each item is marked and displayed on a separate line or lines. The markings can be graphic symbols, such as bullets (•) or squares (□), or sequential identifiers, such as numbers or letters. An item can be a word, a phrase, a sentence, or a group of sentences.

Mechanical binding - The pages are punched with either round or slotted holes and then placed in a ring binder or bound with a comb or spiral binder.

Note - a written notice given to draw the reader's attention to something or to supply additional information.

Pamphlet binding - The pages are stitched or stapled together. There are two types of pamphlet binding, saddle stitched and side stitched.

Perfect binding - The pages are assembled, the left side is cut and roughed, glue is applied, and the cover is attached to the pages.

Pica - The unit of measurement used in printing. It is equal to 0.17 inch (4.23 mm).

Point - A measure of the height of type; there are 72 points in an inch (2.54 cm).

Predefined fault isolation sequence - A sequence of fixed procedures and tests that leads to a suspected fault. It is similar to a fault tree in a fault isolation manual.

Print contrast - The ratio of the difference in brightness between the printing and its background to the brightness of the background (assuming dark print on a light background). It is defined by $(B_1 - B_2)/B_1$, where B_1 is the brighter of the two.

Proceduralized instruction - A set of step-by-step instructions a procedure intended to ensure the successful completion of a task.

Reasonable accommodation - Any modification or adjustment to a job or the work environment that will enable a qualified person with a disability to participate in the application process and to perform essential job functions.

Right hand page/Left hand page - The terms right-hand page and left-hand page have meaning only if pages are printed on both sides. In that case, a right-hand page is the page printed on the front, and a left-hand page is the page printed on the back. Thus, when the pages are bound, and the document is open, the right-hand page appears on the right, and the left-hand page appears on the left.

Right-justified text - Lines of text are aligned at the right, but spacing within and between words is not varied, resulting in a ragged left margin.

Saddle stitching - A type of pamphlet binding that permits the document to lie flat

Serifs - Decorative elements (short lines, knobs, and balls) at the ends of the strokes that form letters. Sans serif fonts do not have these decorative elements.

Stated indication - What is expected if the equipment or system is operating normally.

Table - An array of data or text in rows and columns. Usually at least one dimension, either the rows or the columns, is labeled; sometimes both are labeled.

Technical Issuances - According to FAA Order 1320.1D, are publications acquired from non-agency sources or developed within FAA that directly concern installation, maintenance, or modification of equipment, equipment systems, facilities, or aircraft. Manufacturers' instruction books for plants and equipment are included in this category. A basic objective of using this category is to permit the merging of internally-developed and externally-acquired technical manuals and publications into consolidated, single source documents. Because of necessary deviations from standard directive format and issuance procedures, they are designated technical issuances.

Title - A word or phrase that describes or identifies the contents of a document or a portion of a document.

Type family - A collection of fonts that are similar in design but vary in size and boldness.

Warning - A written notice given to a reader when a situation might result in personal injury or loss of life; a caution is a written notice given when a situation might result in damage to or destruction of equipment or systems; a note is a written notice given to draw the reader's attention to something or to supply additional information.

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Index

A	
Abbreviations	15-14
Accessibility	15-70, 15-71, 15-72
Acronyms	15-14
Adjunct questions	15-6
Appendices	15-45
Audio	15-63
B	
Binding	15-19, 15-20
C	
Capitalization	15-11
Color and shading	15-32
Columns	15-24
Components of documents	
appendices	15-45
copyright and patent issues	15-51
cover page	15-35
figures	15-37
footnotes	15-50
formulas and equations	15-43
glossary	15-46
index	15-46
lists	15-42
lists of exhibits	15-36
publication date	15-51
table of contents	15-35
tables	15-40
tabs	15-50
user feedback forms	15-47
warnings, cautions, and notes	15-44
Content	15-53
Copyright	15-51
Cross referencing	15-7
Cross-references	15-57
D	
Document hierarchy	15-21
Document level considerations	
size	15-18
Document size	15-18
E	
Exhibit	15-24
F	
Feedback forms	15-47
Figures	15-37
content	15-39
identification	15-37
location	15-37
orientation	15-39
oversize figures	15-39
style	15-38
Figures and examples	15-3
Flow chart	15-6

Foldout pages	15-25
Font	15-29
Footers	15-20, 15-21
Footnotes	15-50
Format	15-55

G

Glossary	15-46
Graphic symbols	15-17
Graphics	15-61

H

Headers	15-20, 15-21
Heading	15-4

I

Index	15-46
Instructions	15-67
Interactive electronic technical manuals	
descriptive information	15-70
Interactive electronic technical manuals	
audio	15-63
graphics	15-61
interaction style	15-65
presentation of parts information ..	15-69
special requirements for proceduralized	
instructions	15-67
special requirements for troubleshooting	
information	15-68
text	15-60
user interface	15-67
warnings, cautions, and notes	15-64
Introductory summary	15-6
Itemization	15-5

J

Justification	15-28
---------------------	-------

L

Line length	15-27
Line spacing	15-27
Lists	15-42

M

Margins	15-20, 15-21
Mathematical signs	15-17
Measurement	See Units of measurement

N

Numbering	15-5, 15-6, 15-23
Numbers	15-16

O

Organization	15-53
advance organizers	15-6
internal cross references	15-7

numbering of sections and subsections	15-5
task versus list orientation	15-7
titles and headings	15-4
P	
Page level considerations	
margins	15-20
Page numbering	15-23
foldout pages	15-24
Paragraphs	15-7
Passive voice	15-10
Phrases	15-11
Point size	15-25
Print size	15-26
Proceduralized instructions	
branching and cross references	15-57
format	15-55
miscellaneous	15-57
organization and content	15-53
wording of steps	15-55
Pronouns	15-14
Publication date	15-51
Punctuation	15-11
R	
Right and left hand pages	15-22
S	
Sentences	
capitalization	15-11
choice of wording	15-8
complexity	15-9
length	15-9
person and mood	15-10
positive, not negative wording	15-10
punctuation	15-11
standard phrases	15-11
voice	15-10
word order	15-9
writing level, readability	15-8
Seriation	15-5
Spacing	
text	15-21
Specific user documentation contents	
interactive electronic technical manuals	15-58
Spelling	15-16
Standard words	15-13
Symbols	15-17, 15-18
T	
Table of contents	15-3, 15-6, 15-35
Tables	15-40
content	15-41
formatting	15-41
identification	15-40
location	15-41
orientation	15-42
oversize tables	15-42
Tabs	15-3, 15-50
Terminology	15-12
Text	15-60
Text size	15-25
Title	15-4, 15-5
Type size	15-25
Typographic issues	
color and shading	15-32
justification	15-28
line length	15-27
line spacing	15-27
print contrast, quality	15-31
type size	15-25
type style (font)	15-29
typographic emphasis	15-30
upper versus mixed case text	15-29
U	
Units of measurement	15-16, 15-17
User documentation	
components of documents	15-32
layout and formatting	15-18
making documentation appear easy to use	15-3
matching documentation to users	15-2
specific user documentation contents	15- 51
writing user documentation	15-4
W	
Warnings	15-44, 15-64
White space	15-21
Wording	
sentences	15-10
Words and symbols	
abbreviations and acronyms	15-14
concrete, non-ambiguous words	15-13
consistency	15-12
definitions	15-14
graphic symbols	15-17
letter symbols and mathematical signs	15-17
numbers	15-16
other symbols	15-18
pronouns	15-14
short, high-frequency words	15-12
spelling	15-16
standard words	15-13
units of measurement	15-17
Writing user documentation	
organization	15-4
paragraphs	15-7
sentences	15-8
titles and headings	15-4
words and symbols	15-12

