



**STYLE GUIDE FOR
AFIT DISSERTATIONS THESES AND
GRADUATE RESEARCH PAPERS**

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STYLE GUIDE

FOR

AFIT DISSERTATIONS, THESES,

AND GRADUATE RESEARCH PAPERS

May 2007

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STYLE GUIDE FOR AFIT DISSERTATIONS, THESES AND GRADUATE RESEARCH PAPERS

I. Introduction

The *Style Guide for AFIT Theses and Dissertations* (hereinafter referred to as the *AFIT Style Guide*) contains guidance for preparing AFIT theses and dissertations. These documents are an important part of the Institute's graduate degree requirements. In this guide you will find detailed information about such topics as the systems of documentation used at AFIT, the formats of graphics and equations to convey technical information, and the formats of AFIT theses and dissertations.

As you prepare your document, you should realize that there are a number of aspects of format and features that are to be followed. Illustrations and equations must be presented in a consistent and standardized format. The appearance of chapter titles and subheadings within chapters is also standardized. Tables of Contents and Lists of Illustrations are required. These prefatory items are also presented in a standard format. This guide will help you establish the correct formats for these features. We strongly recommend that you learn and adopt the preferred formats early in the writing process; following preferred formats from the beginning will save you time preparing your report in the long run.

The *AFIT Style Guide* begins with Chapters II and III describing procedures for finding and documenting information relating to your research subject, including unique requirements for government publications and Defense Technical Information Center (DTIC) documents. Chapters IV and V discuss aspects of format and visual presentation of material. Chapters VI, VII, and VIII address seemingly minor but essential tasks associated with the proper completion of your dissertation, thesis or graduate research paper. Sample pages from theses and dissertations are included in an appendix. Finally, the *AFIT Style Guide* includes an index for ease of locating items discussed.

To understand how the guide can help you, it is important to understand what it is **not** intended to do. Specifically, it is **not** intended to be a general grammar or usage manual, **nor** is it intended to be a typing or word processing manual. The purpose of this guide is to provide information about the conventions of AFIT dissertations, theses or graduate research papers and to provide help in preparing those documents. Occasionally a thesis or dissertation advisor will require a variation from the formats described in this guide. Unless so directed by your advisor, you should follow the guidance given here. It will help you produce a report in which you can take pride, and it will ensure that the final submittal of the dissertation, thesis or graduate research paper is successful.

This *AFIT Style Guide* has evolved over many years and has been shaped and modified by the ideas and contributions of many AFIT instructors and students. Those who were responsible for earlier versions include Dr. Richard Davis, Dr. Richard Fenno, Dr. Frank Smith, Dr. David K. Vaughan, Dr. Robert Weaver, and Ms. Teresa Cunningham. This guide continues to evolve, responding to changes in print technology, faculty desires, and reader needs. The Office of Research and Sponsored Programs, AFIT/ENR, solicits suggestions for improvements.

Related Resources

The following sources should be consulted for information pertaining to other documentation and bibliographic systems. No dates are given; users will want to obtain the latest editions.

American Chemical Society. *American Chemical Society Style Guide and Handbook*. Washington.

American Institute of Physics. Publications Board. *Style Manual for Guidance in the Preparation of Papers*. New York.

American Mathematical Society. *A Manual for Authors of Mathematical Papers*. Providence RI.

American Psychological Association. *Publication Manual of the American Psychological Association*. Washington.

Associated Press. *The Associated Press Stylebook*. Dayton OH: Lorenz Press.

The Chicago Manual of Style. Chicago: University of Chicago Press.

Council of Biology Editors. Style Manual Committee. *CBE Style Manual: A Guide for Authors, Editors, and Publishers in the Biological Sciences*. Bethesda MD.

Gelfand, Harold and Charles J. Walker. *Mastering APA Style: Student's Workbook and Training Guide*. Washington: American Psychological Association.

Harvard Law Review: A Uniform System of Citation. Cambridge MA.

Hodges, John C., and others. *Harbrace College Handbook*. New York: Harcourt Brace Jovanovich.

Modern Language Association. *MLA Style Manual and Guide to Scholarly Publications*. New York.

Turabian, Kate L. *A Manual for Writers of Term Papers, Theses, and Dissertations*. Chicago: University of Chicago Press.

United States. Government Printing Office. *GPO Style Manual*. Washington.

In addition, most professional journals contain style guidelines which editors of those journals require potential authors to follow in preparing articles for publication.

Many publications include their "Style Guide for Authors" in the first number of each volume, or on the back cover of each issue. Consult your advisor to determine which publication style is most appropriate for your discipline.

Visit the AFIT Library <http://www.afit.edu/library/> webpage to see the variety of resources and guides listed, and contact a librarian for specific help.

II. Getting Started

Several Graduate School of Engineering Management Operating Instructions are applicable to research, and can be found on the AFIT Intranet. <https://intranet.afit.edu/en>

Thesis and Dissertation research at AFIT is governed by ENOI 36-127.

Classified Research

Before starting you should first see Security Manager. Classified Research is governed by ENOI 36-143.

Environmental, Safety and Health Issues for Research

All laboratory and field research activities will complete an [AFIT Lab and Field Experiment Safety Review Form](#) which can be located on the Environmental Safety and Occupational Health Web Site <https://cf.afit.edu/en/ESOH/> before any research work may commence. This is governed by ENOI 61-1.

Human Subjects Research

Human Subjects Research, including surveys in Biomedical and Behavioral Research is governed by ENOI 40-1.

Survey Approval Process

AFIT faculty and students conducting survey research must conform to all requirements stated in AFI 36-2601, *Air Force Personnel Survey Program*. Surveys include all attitude and opinion polls, questionnaires, telephone interviews, or related instruments. AFIT point of contact for survey research is AFIT/XP. Consult your faculty research advisor for current details.

Surveys collecting identifiable, private information are subject to Institutional Review Board (IRB) review in accordance with ENOI 40-1. Research conducted on human subjects without approval of an IRB protocol may not be publishable.

III. Accuracy of Research and Philosophy of Documentation

Advances in science, engineering, and all fields of research depend on the reliability of the research record, as do the benefits associated with them in areas such as national security. Sustained public trust in the research enterprise also requires confidence in the research record and in the processes involved in its ongoing development. The Office of Science and Technology has released a policy statement addressing the accuracy of the research record. Further information is available at <http://onlineethics.org/fedresmis.html#Section%20I>.

As you prepare your thesis, please keep in mind that your work is part of the greater research enterprise. It is your responsibility to communicate your original data and conclusions comprehensively and with clarity to readers familiar with your discipline. Do not hesitate to consult your advisor for further guidance.

Philosophy of Documentation

This part of the *AFIT Style Guide* describes the conventions and practices of documentation that will ensure that writers meet ethical and legal obligations in the use of published material. A basic principle of documentation is that writers must give credit for all of the material they use from other sources in the course of their research, that is, all material they did not create as primary data. This documentation we call **required documentation**. Documentation that identifies useful relevant information we call **elective documentation**; we **normally document only that information we actually cite** in our reports.

Citation

Citation refers to one of several types of systems that writers use to document their sources. In some publications, the signals for citation may be footnotes, in-line notes, or endnotes. Whatever the system, the purpose of each system is to flag material for which the writer is indebted and to identify the source. The sum of all citations in a paper, together with the bibliography, is the documentation system of the paper.

Quotation

A **quotation** (also called a direct quotation) occurs when a writer is indebted to a source not only for the source's ideas or facts, but also for the wording of those ideas; that is, the words of the source are used to communicate the ideas borrowed from the source. If the writer is indebted for anything from a source—words or ideas, the writer must acknowledge indebtedness by using a citation to document it. If the indebtedness also happens to involve using the wording of the source, the writer signifies the fact by—in addition to including a citation—using either quotation

marks (if the passage is shorter than four lines) or single spacing and extra indentation with no quotation marks (if the quoted passage is four lines or longer).

Paraphrase

A **paraphrase** falls into a gray area between summary and quotation. Whereas a summary uses only the source's content but not its words, a paraphrase uses the source's content stated in words and sentence structure that are similar to—but not exactly like—the source's. Because they are not convenient to use in connection with fact-based materials, paraphrases are seldom used in scientific and technical reports. If you do paraphrase, the source (and relevant page numbers) should be cited.

There is no simple answer to the problem of deciding how many words we may use from the source before we are required to show that we are quoting. A complete sentence taken from the source would certainly have to be treated as a quotation. But even a single word might have to be quoted, especially if it is a new technical word introduced or developed by the source. ***As a rule of thumb, if you use three or more consecutive substantive words from the source, you should quote it as well as cite it. In general, writers should use lengthy quotation sparingly. Short quotes are preferred to long quotes, and summaries are preferred to short quotes.***

Location of Citations in Sentences

If information discussed in an entire headed section is taken from a single source, you may place the citation immediately after the heading. Normally, however, you would place it in the narrative immediately following the discussion referring to the borrowed material. You should normally place the citation at the end of a sentence or at the end of an independent clause; avoid inserting the citation into the middle of the sentence. Place the end-clause punctuation (period, comma, or semicolon) after the citation, as shown in this sample sentence from a hypothetical paper:

According to one expert, widgets were more expensive in the third quarter of the fiscal year (Lloyd, 1986:236).

When quoting an extensive passage from the source (four lines or more), the citation follows two spaces after the period. And the quoted passage itself should be indented and single-spaced:

According to one expert, there were several reasons why widgets were more expensive in the third quarter of the fiscal year:

Although the price of widgets had been dropping slowly during the previous nine months, the price increased slightly. The increase in price was due to increased packing costs, increased shipping costs (because the packages were larger), and a delay in production caused by a workers' strike. (Lloyd, 1986:236)

In general, place the citations in such a way that they interrupt the flow of the narrative as little as possible (see Samples [18](#) and [19](#)).

Integrating Cited Material

It is initially difficult to avoid seeing the task of integrating cited material into your report as anything other than a “cut and paste” job. If this is your approach to including material found in your sources, your report will be choppy and disconnected, and readers will think that you are nothing more than a moderator serving to introduce a long line of guest speakers. You do not want this result. You want to blend your commentary with the ideas or comments of your sources as smoothly as possible.

One of the best ways to manage this situation is to use an appropriate lead-in phrase. Suppose, for instance, that a writer wants to begin a summary of information contained in a source. Here is a typical example:

According to a study conducted at National Metals, contamination of alloys is a primary cause of parts failure (1:26). Investigators at National Metals tested 120 alloy samples in a six-month period and discovered that contamination was widespread. They concluded that “any reputable company must spend an adequate amount [of its operating budget] on quality control” (1:75). Officials at National Metals increased their budget for quality control as a result of this investigation. Stockholders in the company strongly supported management’s actions (1:80). This example describes a company that followed its own advice.

Another company that followed its own advice is Union Plastics. . . .

In this example, the opening phrase, “According to a study conducted at National Metals,” alerts the reader to the fact that source material is entering the discussion, and the citation indicates where the information comes from. The direct quotation is followed by its own citation, which describes the factual information related to the number of tests; then two facts from the same source are presented (we assume from the same page of the source) before the next citation is given. Finally, the author draws an inference (that the company took its own advice) and transitions to the next section. This method of introducing source material should make it easy for the reader to separate original material from indebted material.

Multiple Citations

Using multiple citations eases the problem of referring to similar information contained in several sources without spending an inordinate amount of time doing so. One example of multiple citations is:

Chi square analysis is a popular tool in data analysis (2; 4:89; 7:33).

Here, three sources are cited, the first in its entirety, and the other two with specific page numbers. This citation does not mean that the exact words were found in all three sources, but

that the value of using the Chi square method was discussed and generally agreed upon by the authors cited. This method is much more efficient than writing something like

Smith likes Chi square analysis (2). So does Jones (4:89). And so does Brown (7:33).

Second-hand Sources

A ***second-hand source*** is a source that the writer has not seen directly but knows about because it is cited (or perhaps quoted) in a work the writer has been reading. For example, suppose you have been reading an article by Jones. Jones mentions an article by Bernelli, summarizes its contents, and provides a bibliographic citation. You would like to include Bernelli's findings in your report, but you know about them only as mentioned by Jones. Experienced scholars recommend that you put into your bibliography (and cite) only those works you have examined first-hand. There is a danger that the author you are reading (Jones, in our example) may have misread or misunderstood the article he is describing (Bernelli's article). Or he may have made an error in reporting its contents. If you repeat what Jones says without looking at Bernelli's original work, you will be repeating Jones' errors. There are two ways to deal with this situation. The first and best way is to obtain Bernelli's article. If, however, it is not possible to obtain the original, you need to make it as clear as possible that you are referring to a second-hand source, as in this example: "Another experiment, conducted by Bernelli at Johns Hopkins University and reported by Jones in *Scientific American* (3:98-100), found that" This phrasing informs the reader that the discussion is based on Jones' description, and the citation is to Jones' article; Bernelli's article does not appear in the bibliography. Even though readers might wonder why you did not obtain the original Bernelli article, they will understand you are reporting only what Jones said Bernelli said. In general, ***students should be aware that the use of secondary citations is strongly discouraged.***

Copyright

Government guidelines regarding copyrighted works:

<http://www.dtic.mil/dtic/submitting/copyright.html>

Frequently asked questions on copyright: <http://www.dtic.mil/cendi/publications/04-8copyright.html>

IV. Documentation

Comprehensive and accurate documentation is essential to sound scholarship. As a graduate student and a professional in your field, you are already aware of the legal and ethical reasons for documenting your report carefully. This part of the *AFIT Style Guide* discusses a method for gathering information from your sources, and it discusses the three primary AFIT documentation systems, the **author-year system**, the **numbered reference system**, and the **IEEE reference system**. The documentation system in a thesis or dissertation consists of two elements: **citations** embedded throughout the text and a **bibliography** (list of sources) at the end of the document.

AFIT theses and dissertations normally use one of three documentation systems: the author-year system, the numbered reference system, or the Institute of Electrical and Electronics Engineers, Inc. (IEEE) reference system. Each system refers the reader from the text to the bibliography for the identification of sources. The bibliography normally lists only those sources cited in the text. If you are especially indebted to a source, especially an individual for whom no source items are listed in the bibliography, that information is usually indicated in the acknowledgments. Regardless of the AFIT documentation system you use, you should ***single-space within bibliography entries and double-space between entries***.

In AFIT citations, each item of borrowed information in the text of your manuscript is followed by a brief parenthetical reference to the source, and all sources are identified at the end of the manuscript in a bibliography or list of references. The ***preferred form of citation at AFIT is the parenthetical citation system***. In years past, the footnote system of citation was used in all academic institutions, but recent practice has moved to the parenthetical system. A parenthetical system of citation indicates that the original source is referred to in the manuscript through use of parentheses, as in **(Jones, 1988:24)** (an example of the author-year parenthetical citation system), or **(4:24)** (an example of the AFIT numbered reference parenthetical citation system), or **[2:182]** (an example of the IEEE reference system).

You should note that there are many other parenthetical citation systems in use, including those preferred by the American Psychological Association (APA), the Modern Language Association (MLA), and others. AFIT students should consult their advisors to determine which parenthetical citation system should be used.

In general, writers should use that citation system which is appropriate to the subject and professional area of their thesis or dissertation topics. Thesis and dissertation advisors should be able to provide students with relevant information pertaining to the appropriate citation system.

Each professional organization issues its own documentation style guide, and students are encouraged to obtain copies for their use. Only three parenthetical citation systems are described in detail in the *AFIT Style Guide*, the author-year system, the numbered reference system, and the IEEE reference system.

The Author-Year System

The **author-year citation system** is particularly useful in scientific studies because currency of data is important; the form of the citation provides the author's name and the date of publication at a glance. The author-year system used at AFIT is similar to the APA system, but students should note that there are several major differences in the form of the entries, which are not discussed here.

In the **AFIT author-year system**, citations refer to sources listed in the bibliography at the end of the report. Sources in an author-year bibliography are not numbered; they are arranged alphabetically by first author's last name (see [Sample 22](#)). The citation includes the last name of the author, the year of publication, and the page number from which the borrowed information was taken. Thus, **(Lloyd, 1986:236)** refers the reader to page 236 of the work published by Lloyd in 1986.

These are some of the more **common variations** of the basic form:

(Lloyd, R., 1986:236) Works by two (or more) authors named Lloyd are listed in the bibliography. Reference is to the work written by R. Lloyd.

(Lloyd, 1986b:236) Two works by Lloyd published in 1986 are listed in the bibliography; one is listed as Lloyd, 1986a, and the other is listed as Lloyd, 1986b. The works are assigned their "a" and "b" listing on the basis of alphabetical order according to the titles.

(Lloyd, 1986:Ch 6, 11) Separate chapters of the source are paginated independently. Reference is to page 11 of Chapter 6.

(Lloyd, 1986:236-242) Reference is to a series of consecutive pages.

(Lloyd and Brown, 1983:236) A work by two authors; Lloyd is listed first on the title page.

(Lloyd, 1986:236; Brown, 1985:112) A reference to two sources. Multiple sources can be placed in one citation as long as the topic of discussion is reasonably narrow.

(Lloyd and others, 1987:16) A reference to a work by three or more authors. It is also acceptable to list all authors: **(Lloyd, Brown, and Smith, 1987:16)**.

(Lloyd, 1986:4-3 to 4-5) Pages are numbered by section.

(Lloyd, undated:236) A reference to a publication with no publication date indicated.

In the author-year system, **entries are alphabetized according to the last name of the author (or last name of the first author in multiple-author works)**. Do not rearrange the names of the authors in multiple author works; the authors have determined the order of names among themselves and that order should be maintained. When several works by the same author are listed in the bibliography, use five hyphens followed by a period in the second and successive entries. Entries by the same author are arranged alphabetically. Entries published in the same year are arranged alphabetically according to title, and consecutive alphabetical suffixes are added to the years in individual entries (1987a, 1987b, and so on). This technique allows readers to distinguish among sources dating from the same year when they are given in the text.

The Numbered Reference System

The **numbered reference system** was initially known as the Air Force parenthetical documentation system. It was in use for many years before parenthetical citation became popular in the academic world in general. The numbered reference system has its advantages and disadvantages. Its main advantage is that it results in less space required for citations. Its main disadvantage is that the reader may have to refer to the bibliography to identify the author and the currency of data. In the numbered reference system, **each source in the bibliography is given an identifying number (see [Sample 21](#))**. **Sometimes the sources are arranged and numbered in alphabetical order, and sometimes in the sequence in which they are cited in the text.** In general, **sequential numbering is preferred when writing articles, while alphabetical numbering is preferred in theses and dissertations**. The alphabetical arrangement makes it easier for the readers to use the bibliography as a reference source, while the sequential arrangement can aid the writer.

In addition, the sequential order aids the reader while reading the text; the alphabetical order aids the reader when searching the bibliography. Either order requires the same amount of work from the writer. Writers considering using the numbered reference system should confer with their advisors at the earliest opportunity to determine if the advisor prefers one order over the other. Each bibliography entry begins with a number followed by a period; each subsequent line is aligned with the first letter of the first line.

After the items in the bibliography have been numbered, appropriately numbered citations can be placed in the manuscript. The citation **(6:27)** indicates that the borrowed material is found on page 27 of the sixth source listed in the bibliography.

Here are some frequent variations of the form:

(6:27-33) Information is taken from consecutive pages 27 through 33.

(6:27, 33) Information is taken from nonconsecutive pages 27 and 33.

(6:27; 8:23-24; 9:134) Information is taken from three sources.

(6:Sec II, 42) Separate sections of the work are pagged independently.

The IEEE Reference System

A number of engineering advisors prefer the use of the IEEE system for thesis and dissertation documentation, as described in *Information for IEEE Transactions and Journal Authors*. This documentation system is intended primarily for article publication, however, and sometimes may not accommodate the special documentation tasks required of theses and dissertations. All IEEE journals provide style guidance for authors on the back pages of the individual journals. Students should note that **style guidance can vary from journal to journal; there is no set style which applies to all IEEE publications**. Students should also be aware that the generally preferred IEEE referencing system is to use brackets [] instead of parentheses () and to cite the article without reference to page number unless a specific quotation is taken from the article.

This practice, while appropriate for the submission of articles for publication in journals, often is not sufficient for AFIT theses and dissertations. Students should discuss this matter with their advisors.

Here are two forms of the IEEE system:

[2] This reference indicates the author is referring to a discussion of a source document in its entirety, rather than to a single page in that document. This method is suitable when the source document is a relatively short work and discusses a limited topic.

[2:122-23] This reference indicates specific pages of the source document. This kind of reference is appropriate for longer source documents or when specific facts, ideas, quotations, or equations are mentioned in the thesis or dissertation.

Bibliographies

The **bibliography** is a term for the list of sources, included at the end of a report, for all items cited in the body of the report. The bibliography provides complete bibliographic information (author, title, and publication data) for readers interested in identifying, and possibly obtaining, the sources.

The following paragraphs illustrate the format of bibliographic sources used in AFIT papers, theses, or dissertations. They are examples of the format used in connection with the three AFIT documentation systems described in the *AFIT Style Guide* (the author-year system, the numbered reference system, and the IEEE reference system). If you are going to be using a documentation system other than those described in this *AFIT Style Guide*, you will want to obtain the most recent style guides published by the appropriate professional organization. You will also want to ensure that you have coordinated with your advisor prior to compiling your bibliography to ascertain that you are using an acceptable and appropriate documentation system for your area of academic specialization.

In the following examples, the **basic entry** is described. The form of the entry would be modified slightly to add the reference number in the case of bibliographies constructed to accompany the numbered reference system or the IEEE reference system. For instance, if the basic form looks like this in the example,

Maybeck, Peter S. *Stochastic Models, Estimating, and Control*. New York: Academic Press, 1988.

it would appear in this form in the numbered or IEEE reference system:

15. Maybeck, Peter S. *Stochastic Models, Estimating, and Control*. New York: Academic Press, 1988.

Books

The bibliographic entry for a book is divided into *three sections*, each separated from the other by a period: **Author. Title. Publication data.** Publication data include the city of publication (and the state or country of publication if the city is not well known), the name of the publisher, and the year of publication. **Military or civilian titles of authors are normally not included in bibliographies, nor are the names of the institutions for which they work.** When several cities are given, use the first city listed. When several different dates are given on the title or copyright page, the most recent date should be used. Here are some commonly used forms:

[Simple entry:]

Maybeck, Peter S. *Stochastic Models, Estimating, and Control*. New York: Academic Press, 1988.

[Second entry, same author:]

-----, *Stochastic Models for Compressed Data Input*. New York: Computer Services Press, 1990.

Note: Multiple sources by the same author are arranged alphabetically by title.

[Two authors:]

D'Azzo, John J. and Constantine H. Houpis. *Linear Control Systems Analysis and Design*. New York: McGraw-Hill Book Company, 1989.

[Three or more authors:]

Martin, John L. and others. *The Old Ethics and the New Military*. Boston: The High Times Press, 1991.

Note: It is also permissible to include the names of all authors instead of saying "and others."

[Later edition:]

Crouch, George W. and Robert L. Zetler. *A Guide to Technical Writing* (2nd Edition). New York: The Ronald Press Company, 1954.

Note: Later editions often contain much new or revised material. The term "second printing" technically means a second printing of the book using the original plates, with no new material added. Some publishing houses are inconsistent in their use of this term.

[Essay in a collection of essays:]

Emmelhainz, Larry M. "Total Quality Management in Air Force Logistics Planning," in *Total Quality Management in the Department of Defense*. Ed. Wayne Stone. Alexandria VA: The Freedom Press, 1990.

Note: This form is used when different individuals author chapters within a publication. Also note that the state is included, in Post Office abbreviated form, because the city of this publication might not be easily recognized.

Periodicals

A **periodical** is defined as any professional journal, magazine, newspaper, newsletter, pamphlet, booklet, brochure, or any other form of publication that is published in regular intervals in a numbered series. The **volume number and date of the issue in which cited material appears should be specified.**

[Simple entry:]

Vaughan, David K. "The Image of the Engineer in the Popular Imagination, 1880-1980," *Bulletin of Science, Technology Society*, 10: 301-304 (December 1990).

Note: In the above entry, the numbers 301-304 refer to the inclusive page numbers on which the article is found.

[Two authors:]

Jannerone, August G. and Ray E. Stratton. "Trouble in Costa Mesa: An Airpower Case Study in Peacetime Engagement," *The DISAM Journal*, 14: 99-108 (Winter 1991-92).

[Three or more authors:]

Thomas, Margaret, Gloria Jaffe, J. Peter Kincaid, and Yvette Stees. "Learning to Use Simplified English: A Preliminary Study," *Technical Communication*, 39: 69-73 (February 1992).

[Newspaper article:]

Wilson, Arthur. "The New Europe and National Defense," *The Dayton Daily News*, 23 March 1992, sec. A:2.

Howell, William. "The Leaner, Meaner Air Force," *The Air Force Times*, 15 February 1991: 6.

[Unsigned article:]

"View from the Top, The," *Quarterly Review of Economics*, 22: 53-55 (Summer 1982).

Note: This unsigned (no author given) source should be alphabetized among the Vs. Articles like **the** or **a** may be moved to end of the title, or they may keep their original location, as long as there is standardization within the bibliography. In the author-year system of documentation, the citation in the text would use the first few words of the title.

Government Publications

To the extent possible, bibliographic entries for government publications should resemble those of books: Author. Title. Publication Information. Because most government publications are not attributable to a single author (or to any identified authors), the issuing component or agency is usually listed as the author. Descriptive numbers or phrases (such as document numbers, series numbers, or contract numbers) should be included. *As with books, the title of the publication is italicized.*

[Report:]

Bureau of the Census. *Population Estimates and Projections*. Report Series P-25; No. 108. Washington: Government Printing Office, 1980.

Note: “Government Printing Office” is usually abbreviated as GPO

[Regulation:]

Department of the Air Force. *Communications: Air Force Standard Functional Address System*. AFR 10-6. Washington: HQ USAF, 22 January 1982.

[Manual:]

Department of the Air Force. *USAF Formal Schools Catalogue*. AFM 50-5. Washington: HQ USAF, 1 June 1980.

[Directive:]

Department of Defense. *Distribution Statements of Technical Documents*. DoD Directive 5200.20. Washington: GPO, 26 March 1971.

[Law:]

United States Congress. *National Security Act of 1979*. Public Law No. 193, 96th Congress, 1st Session. Washington: GPO, 1979.

[Hearing:]

Judicial Committee on Monopolies. *Hearings of Restoring Effective Enforcement of Antitrust Laws*. Hearing, 96th Congress, 2nd Session, 1979. Washington: GPO, 1979.

When transcribing data from government documents, be sure that you record pertinent identifying numbers, especially those assigned to documents by DTIC. If you gather information from a DTIC document whose number begins with any prefix other than ADA (+ numerals), **you should photocopy the SF Form 298** located inside that document. Prefixes other than the one just mentioned (ADA) or classified indicate that the source document is limited in distribution.

Limited Distribution or Classified Source

If you use material from limited distribution sources, your manuscript may also require limits on its distribution. Therefore, you should make photocopies of the SF 298 forms in the source documents in case your advisor needs to consult them when you submit your manuscript for final approval. Your advisors will want to review the material you are using from the limited distribution sources to determine the distribution status of your thesis. **In an unclassified thesis or dissertation intended for open publication, no reference is to be made to classified reports.** Even unclassified sections of classified reports are not to be cited or used in unclassified theses or dissertations. If you believe this restriction would impair the integrity of your report, you and your advisor should discuss the matter with the controlling authority in your school.

Independent Publications

This diverse group ***includes all publications except books, periodicals, and government publications.*** It includes manuals, brochures, pamphlets, conference proceedings, dissertations, theses, and other forms of published data. ***As nearly as possible, the information listed in an entry should resemble that provided for books.*** Because each publication is produced to meet the needs of the sponsoring organization, many unique documentation signals may appear on the title page or elsewhere, including company names, contract numbers, revision dates, division names, and committee names. The bibliographic entry should include enough of this peripheral information to enable readers to evaluate the worth of the document and to obtain it if they wish to do so.

[Thesis:]

Carpenter, Dennis M. *Relating Expected Inventory Backorders of Safety Stock Investment Levels*. MS thesis, AFIT/GIM/LSM/86S-15. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1981 (ADA1103970).

[Dissertation (AFIT):]

Neumann, David W. *Observation and Analysis of LiCa and MiMg Excimers*. Air Force Institute of Technology (AU), Wright-Patterson AFB OH, June 1980 (ADA1113137)(7229905).

Note: Both DTIC and ProQuest Information and Learning (hereinafter referred to as ProQuest) order numbers are included in AFIT dissertations.

[Dissertation (non-AFIT):]

Miro, Donald J. *A Comparative Evaluation of Relaxation Training Strategies Using EMG Biofeedback*. PhD dissertation. Loyola University of Chicago, Chicago IL, 1981 (8119983).

Note: The ProQuest order number is included as a convenience to the reader.

[Conference paper:]

DeWispelare, Aaron R. "Algorithm Efficiency in Generating Non- denominated Solution Sets," *Proceedings of the IEEE 12th Annual Symposium in Systems Theory*. 218-222. New York: IEEE Press, 1980.

[Research report:]

Blair, Morton F. and Milburn J. Werle. *The Influence of Free-stream Turbulence in the Zero Pressure Gradient Fully Turbulent Boundary Layer: Interim Report, 1 June 1982-1 June 1983*. Contract F49620- 78-C-00064. East Hartford CT: Adkins Research Center, September 1983 (ADA1913094).

[Company brochure:]

Honing Supplies. Product Catalog X-SP-50502. St. Louis: Sunnen Products Company, no date [1982].

Note: Information in brackets indicates information not found in the document itself but obtained elsewhere. In the example above, the author has learned from communicating with company personnel that the catalog was printed in 1982.

Unpublished Sources

Unpublished sources are sometimes used for information not available through usual channels. The source may be an individual or an agency in industry, government, the academic world, or elsewhere. While the material may be available in printed form, it is not “published” in the usual sense of the word, and it may not be easily available to those who might wish to obtain it. While the form of bibliographic entry may vary, the reader should be given sufficient information to evaluate the quality of the source and to be given a reasonable chance of obtaining it. The **information you provide about these sources should match as nearly as possible the information provided for published sources:** author, title (if any), description of the material, name and location of the originating organization or agency, and the date of issuance. Because the source is not a published work, the position or title of the author is often included to indicate the person’s authority in the subject area.

Reminder: Air University (AU) supports academic freedom. AU Instruction 36-2308 states, “Remarks made by guest lecturers, faculty, and students may be released or discussed with other individuals outside the school forum only after express permission is received from the speaker and approval obtained from the school commandant/commander concerned, or his/her designated representative.”

[Speech:]

Antonellis, Kevin B., Assistant Secretary of State, Middle East. “A Riddle Wrapped in an Enigma [Analysis of the Current Middle East Situation].” Address to Air Force Institute of Technology students and faculty. Air Force Institute of Technology, Wright-Patterson AFB OH. 8 January 1985.

[Class lectures or handouts:]

Dean, William A. Class handout, SYS 228, Basic Configuration Management. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, July 1986.

Note: Instead of the month (“July 1986”), the quarter (“Summer Quarter 1986”) may be listed.

[Correspondence:]

Murray, Doris. President, Telemetrodynamics Corporation, Long Beach CA. Personal Correspondence. 1 April 1991.

[Electronic message:]

HQ USAFE. "Advanced Contract Administration and Contract Law Site." Electronic Message. 151500Z, 20 May 1988.

[Telephone interview:]

Smith, C. Ross. Vice-President for Sales, Telemetrydynamics Corporation, Long Beach CA. Telephone interview. 9 April 1991.

[Personal interview:]

May, Marian C. Vice-President for Manufacturing, Telemetrydynamics Corporation, Long Beach CA. Personal Interview. 10 May 1991.

Elrod, William B. Chief, B-1 Electronic Equipment Branch, Air Force Materiel Command, Wright-Patterson AFB OH. Personal Interview. 8-9 July 1990.

[Memorandum:]

Aeronautical Systems Division, Air Force Materiel Command. Memorandum of Agreement with Air Force Contract Maintenance Center. Wright-Patterson AFB OH 18 September 1989.

[Contract:]

Aeronautical Systems Division, Air Force Materiel Command. Contract F36980-81C-0396 with Northrup Corporation. Wright-Patterson AFB OH, 12 October 1990.

[Report (unpublished):]

McNichols, Charles W. and Roger T. Manly. "Quality of Life in the United States Air Force: A Quick Look Report." Report to DCS/Personnel, HQ USAF, Washington DC. June 1988.

Franke, Milton P. "The Effects of High Altitude Ablation on Air Force Readiness." Unpublished Report No. 4328. Air War College, Maxwell AFB AL, 1983.

Wyte, Lois E., Director of Production Engineering. "Schedule for 1989 Changeover in Assembly Plants." Report to Directors of GMC automotive divisions. Fisher Body Division, General Motors Corporation, Warren MI, 8 July 1988.

[Television program:]

Wall Street Week. Prod. Louis Rukeyser. Public Broadcasting System. WDPR-TV, Dayton OH. 30 September 1990.

[Radio program:]

All Things Considered. Prod. Noah Adams. National Public Radio. WGUC, Cincinnati OH. 2 February 1992.

[Computer software:]

Readability Plus. Version 1.0, IBM, 512k, disk. Computer software. Scandinavian PC Systems, Rockville MD, 1990.

[CD-ROM:]

“Qualitative Research.” *A Guide to Research Methods*. Version 2.0. CD-ROM.
New York: Sage Publishers, 1997.

Note: If you are citing an article published in another source but found on a CD-ROM, list the original source first in standard bibliographic format, then add the information about the CD-ROM.

World Wide Web and Similar Electronic Databases

The World Wide Web is quickly becoming a major source of ideas and information for researchers. Although a great deal of information may be found on the Web, students should realize that information obtained on the Web is ephemeral. That is, the information may be impermanent, tentative, and subject to change practically on a daily basis. Information found on the Web may not be traceable in the same manner that an article or book will be. Therefore, you should be cautious about including information found on the Web. The Web can provide good ideas for creative thinking and problem solving, but the information found on the Web will frequently change. If you do use information found on the Web, however, you should cite it in the same fashion as any other source, with a few minor modifications.

The entry should begin with the author's name (if known), the title of the article or document, any information that will identify the location of the information in the electronic text, and the Web address as completely as you can give it. You should also state the nature of the document (article, essay, excerpt from book, chat room discussion, and so on). Conclude with the date you found the information. The following is an example of a bibliographical entry for information found on the Web:

Jones, William. “Some Thoughts on User Reliability.” Excerpt from unpublished article. n. pag. <http://www.dtic.dla.mil/defenseink>. 20 March 1997.

The appropriate citation would be (Jones, 1997) (author-year system) or (appropriate number) (numbered reference system). There would be no page number shown because no page numbers were indicated in the electronic document. The abbreviation n. pag. (for not paginated) in the bibliographic entry indicates a lack of page numbers, which is usually the case with information published on the Web. Follow the same format for similar items found on the Internet or other electronic sources. Be consistent throughout your document, both in citations and bibliographic entries.

Anonymous Sources

When no author is given, the entry is placed in ***alphabetical order by the first main word in the title*** (the articles a, an, and the are not used for alphabetization purposes). Each entry begins on the left margin, and successive lines of the entry are indented five spaces.

DO NOT use five hyphens to indicate an anonymous source; alphabetize the entry according to its title (or agency, in the case of government or corporate publications).

Examples

Note: In all of the examples below, the date before the website is the date the website was accessed by the student writing the thesis or dissertation.

[Online book:]

Harnack, Andrew, and Eugene Kleppinger. *Online! A Reference Guide to Using Internet Sources*. Boston: Bedford/St. Martin's, 2000. 5 January 2000 <http://www.bedfordstmartins.com/online>.

[Online periodical:]

Franke, Milton. "Engineering of Complex Systems for the Future," *Engineering Management Journal*, 13 (2):25-33 (June 2001). 5 April 2003 <http://search.epnet.com/direct.asp?an=4884106&db=aph>.

[Online Government Publication:]

Assistant Secretary of the Air Force. *United States Air Force Statistical Digest FY 2001*. Annual. D 301.83/3:(DATE). 0422-G-01. Washington: SAF/FMC, 2002. 5 April 2003 <http://www.saffm.hq.af.mil/FMC/statdigest/2001/milonly/statdig01.pdf>.

[Online independent publication:]

Wagner, E., D. Jacques, W. Blake, and M. Pachter. "Flight Test Results of Close Formation Flight for Fuel Savings," *AIAA Atmospheric Flight Mechanics Conference and Exhibit*. AIAA Paper 2002-4490, Air Force Institute of Technology, WPAFB, OH and Edwards AFB, CA, 2002. 5 April 2003 http://pdf.aiaa.org/Preview/CDReadyMAFM02_574/PV2002_4490.pdf.

V. Format

When we talk of format as it pertains to AFIT theses and dissertations, we are talking about several aspects: the overall appearance of the text, the sequence of the information presented, the visual aids included in the text, and other non-textual characteristics like equations and numerical representations. A standardized format ensures that all AFIT theses and dissertations are more or less alike, and it ensures ease of reader comprehension of the material presented in them. ***Any format feature which aids the reader is helpful; any format feature which confuses the reader is not helpful.***

Appearance

Throughout the final copy, text and illustrations are to appear on ***one side of the paper only***. Final copies of theses and dissertations must be prepared on 8½ by 11-inch white, unlined, paper. One copy of the thesis should be printed on 25% rag (one copy of a PhD dissertation should be on 100% rag) and all other copies may be on regular bond copy paper. The typeface must be uniform throughout the text. The text must be uniformly dark. The ***final copy must be error-free***.

Italics

All titles of books or periodicals should be italicized. In addition, all foreign words or phrases or all non-standard words or phrases should be italicized. Do not place words in quotation marks unless you are quoting from a source.

Computer Printed Copy

Computer printers may be used to produce the final copy. However, the printer must produce letters that appear to be fully formed and composed of lines of uniform darkness. Printers must produce all standard punctuation marks. The following are **not** acceptable:

- * Dot matrix output in which dots are clearly discernible;
- * Letters on which descenders (like the bottom stems of the letters **q** or **y**) are omitted or squeezed up into the text line;
- * Fonts in which there is no clear distinction between upper and lower case letters;
- * Printers that justify the right margin by leaving unequal amounts of white space between letters or words. In general, ragged (unjustified) right margin is preferred.

You must ensure that your printer can produce all the necessary signs and symbols, and that it provides the variable spacing necessary for superscripts and subscripts.

Type must be crisp, clear, and easily readable. The ***appearance and the content of the final document must be acceptable to both the advisor and the school***. If you have questions about the suitability of the print you intend to use in the final copy, obtain advance approval from your department. See [Sample 30](#) for examples of typefaces and sizes.

Margins and Spacing

The side (left and right) and bottom margins must provide 1¼ inches of white space, and the top margin must provide 1 inch. These measurements apply to **all** pages in the document, including those containing visual aids and all items placed in the appendices. Keep these specifications in mind, especially when formatting your tables, figures, and computer printouts.

All text should be **double-spaced except for**:

- * ***Lists and tabulations, including bibliographies.*** Double space between items in a list and single space between lines in each item. This spacing must be used in bibliographies and other lists with short (two or three line) entries. When items in a list are essentially part of the running text, single spacing is not required.
- * ***Quotations more than three typed lines long.*** Indent the left margin of long quotations at least five spaces from the normal left margin. If the first sentence of a long quotation begins a paragraph in the original source, you may indent the beginning of that sentence an additional five spaces (Note: this extra indentation is optional). You may also indent the right side of the quotation five spaces (Note: this additional indentation is also optional). Do not use quotation marks to enclose these long, single-spaced quotations. Note that the citation follows the period of the final sentence of a long quotation. Single space long, indented quotations.

Headings and Subheadings

Rankings of headings should be distinguished by their appearance or placement on the page (see **Samples 15, 18, and 19**). The five levels of headings and their appearance are described below. Few theses or dissertations will require more than four levels of headings. ***All headings (except for the first level—the title) will be repeated in the table of contents.***

The ***first level of heading is the report title***; in this case it is the title of the thesis or the dissertation. The title should be ***short, concise and general***. The place for qualifying conditions, methods, or limitations to the subject matter belongs in the abstract or the body of the text, not in the title. Critically inspect the modifiers and modifying phrases in your title and eliminate unnecessary words. The title of the report appears on the cover, on the title page, approval page, and at the top of the first page of Chapter I. In all three cases, it is written in full capitals and centered horizontally. On the first page of Chapter I, the title is placed three vertical lines below the normal one-inch top margin (see **Sample 15**). If necessary, the title can be divided into two (or more) lines. The first main heading for Chapter I is placed four vertical lines below the last line of the report title.

The ***second level of heading is the main heading (the chapter title)***. Main headings are used for each main section of the document: each chapter, each portion of the appendix, and the bibliography. The main headings are centered 1¼ inch below the top of the page (except for Chapter I, as noted above). ***Individual words in the main heading are underlined, italicized or emboldened.*** The first letter of the first word is capitalized, as are all other words except articles (a, an, the), short prepositions, and short conjunctions. The narrative of the chapter begins three spaces below the last line of the main heading (chapter title). Titles of individual papers should be formatted as main headings.

The ***third level of heading is the subheading***. This level of heading is the kind of heading we usually think of when we think of headings inserted into the body of the report. Subheadings begin flush with the left margin. They are normally underlined or italicized, though bold print

may be used if the contrast is clearly noticeable. Subheadings are preceded by a triple horizontal space and followed by a double horizontal space. The first letter of the heading is capitalized, as are all other main words, as in main headings. ***Periods are not placed after subheadings.***

The ***fourth level of heading is the sub-subheading. Sub-subheadings are indented five spaces, underlined, italicized, or emboldened, and followed by a period.*** The text follows after the sub-subheading on the next line (see Samples [18](#) and [19](#)). Capitalize as in main headings and subheadings.

The ***fifth level of heading is the sub-sub-subheading.*** This level of heading is indented 10 spaces. The format and capitalization are the same as for sub-subheadings.

“Widows and Orphans”

Be careful not to create what are called “widows” and “orphans” in your text. A “widowed” line occurs when only one line of text in a new paragraph is placed as the last line on a page, or when a heading is placed at the bottom of a page with no text beneath it. An “orphaned” line occurs when the top of a page contains only one line of text. ***Move your text as necessary to avoid these isolated lines of text.***

Page Numbering

Number all prefatory pages except the cover page in lower-case Roman numerals (i, ii, iii, iv, etc.). The disclaimer, title page, and approval page are counted as a page even though it does not carry a number physically (silently numbered). Thus the first physically printed, numbered page in a thesis is the abstract. It is numbered as page “iv”. You can number, using Arabic numerals, the main body of the document (the text and supplementary material) in ***one of two ways--*** sequentially straight through the document or sequentially within sections of the document. The method you choose should be reflected in the system with which you number figures and tables. The sequential “straight-through-the-text” method uses a single series of Arabic numbers beginning with the first page of the introduction and continuing through the text, appendices, bibliography and vita. Sequential numbering makes it easier to fill out the SF Form 298, which requires a total page count. The sequential “within sections” method numbers chapters, individual appendices, the bibliography and the vita with identifying prefixes and sequential numbers. For example, the first three pages of Chapter II would be numbered 2.1, 2.2, 2.3 or 2-1, 2-2, 2-3. Pages of Appendix C would be numbered C.1, C.2, C.3 or C-1, C-2, C-3. The pages of the bibliography would be numbered BIB.1, BIB.2, BIB. 3 or BIB-1, BIB-2, BIB-3. Center the page numbers (Roman and Arabic) in the bottom margin about $\frac{3}{4}$ inch from the bottom of the paper. When a thesis consists of more than one volume (or binding), the title is repeated on a separate title page, and an Arabic number and a volume title or subtitle identifies each separate volume. The text of each volume of a multivolume begins on a new page 1. As a practical manner (due to binding considerations), the thickness of a printed volume should not exceed approximately 2 inches.

VI. Visual Aids

Visual aids are self-contained visual images designed to supplement the reader's understanding of textual material. Any material not in narrative form can be considered to be a visual aid. The specific form of the visual aid is less important than its coherence, effectiveness, and appropriateness. However, to be fully effective, a visual aid should be planned and prepared with the same care as if it were part of the textual material.

Traditionally, visual aids have been grouped into two kinds: tables and figures. There are a number of distinguishing features associated with tables and figures, and the distinctions between them should be understood clearly. Basically, a **table** consists of data arranged in columns and rows. A **figure** is any visual aid that is not a table. Figures typically include illustrations, graphs, schematic diagrams, photographs, and flow charts. Tables and figures are identified separately in the text and in the prefatory pages. The primary reason for distinguishing between tables and figures is that tables are statistical summaries of data, while figures are visual representations of things or concepts.

Tables

Tables are a convenient means for presenting quantities of data for easy review and comparison. When designing tables, place the independent variables in the left column (the y-axis) and the dependent variables from left to right along the bottom of the graph (the x-axis). Separate the columns of tables by lines or by white space. Each column should have a heading, written horizontally if possible. Units (such as dollars, pounds, meters) are listed in the column heading rather than in the columns, unless the columns contain mixed units. In numerical tables, align items on the decimal point unless they represent different values (like dollars, marks, and francs).

Center table numbers and titles **above** the table (see [Sample 17](#)). Citations to acknowledge indebtedness for information provided in tables may be included immediately after the table title, or they may be placed beneath the table, flush right with the table's edge.

Figures

A figure may be prepared in any manner, as long as the result is a clear, not smudged design capable of easy reproduction in the reprinting process. You may submit original drawings or designs in black reproducible ink, or you may submit high contrast photocopies in place of originals. To be suitable for microfilming, photocopies must be clear, sharply defined, and free of gray background shading. Figure numbers and titles are centered **below** the figures (see [Sample 16](#)). Citations to acknowledge indebtedness for material contained in figures may be included in the figure title, or they may be placed beneath the figure, flush right with the figure's edge.

Graphs are a type of figure useful for displaying values of continuous data. **Charts** are useful for displaying values of discrete data. Bar charts (either vertical or horizontal) and pie charts have the advantage of being relatively easy to design. Pictographs and other types of charts are also effective ways to present data. **Photographs** must be clear and professional in appearance. Color will be used in theses and dissertations only when essential to capture technical meaning or content. Pages containing visual aids should be numbered in the same way as other pages, and normal margin widths must be maintained.

Computer Printouts

Use only as many pages of computer printouts as are required to present essential numerical data or programs containing unique features. Do not include computer programs that perform routine calculations, and do not make extensive listings of raw data files, particularly when you can present such data more meaningfully in other graphics. In general, computer source listings should not be included in the body or as an appendix. Computer printouts must meet the paper and margin requirements specified for pages of the text. As on other pages, the print quality must be uniformly dark, cleanly defined, and suitable for microfilming. If the student and advisor agree that research-related computer printouts or computer programs are valuable enough to be retained in the department but not in the thesis, a note indicating their availability may be included in the thesis or dissertation, and these items will then be included in the department copy for subsequent reference.

Foldouts

Avoid the use of foldouts in theses and dissertations, because their large size complicates the document reproduction process, and they deteriorate more quickly than standard size pages. Both ProQuest and DTIC will film foldouts as separate pages. Thus, an 11 x 17-inch foldout will appear as two consecutive pages, and only the first page will be numbered. If a figure or table is too large to fit on an 8 ½ x 11 inch page, consider having the base printing plant or photo lab reduce it, or consider designing it across several pages with connecting points to guide the reader in interpreting it.

If foldouts must be used, they may extend to a maximum width of 35 inches, and they may be folded from one to four times. For ease of reference, foldouts are usually placed in an appendix. The maximum size reproduced by the base printing plant is 11 x 17 inches. Any larger foldouts will be sent to off-base printers; orders for such foldouts must be placed with the base printing office from six to eight weeks in advance of the date on which the final copy of the thesis or dissertation is due, and sufficient copies must be ordered to meet distribution requirements.

Reduction and Enlargement

The base printing plant can enlarge or reduce material as required. In addition, most photocopiers can enlarge or reduce copies as well. When material is to be enlarged or reduced to appear as a full-page figure or table (6 x 8¾ inch image area), be careful to maintain a 2:3 proportion of width to height.

Incorporating Graphics into the Text

All figures and tables must be cleanly presented and suitable for reproduction. **Margin requirements** for pages containing figures or tables are the same as those for all other pages of text: one inch at the top and one and one-quarter inches on all other margins. Leave three blank lines above and below tables and figures that are adjacent to text in the document in order to provide obvious visual separation from the text. You may **box** (draw lines around) figures and tables to provide additional visual separation from the text. If you use boxes, place titles outside the boxes. **Remember that titles are placed below a figure and above a table** (see Samples [16](#) and [17](#)).

The **title for a figure or table** must be sufficiently complete that it accurately describes the content of the graphic. The graphic and its title should be sufficiently self-contained so that if they were extracted from the document, the reader could still understand the purpose and the content of the graphic.

Thus, titles like “Variables” are inadequate; titles like “Values of Variables Used in Experiment Two” are better. Titles are not complete sentences. Use special care in **numbering tables and figures**. Figures are usually numbered in a consecutive series of Arabic numerals beginning with the first figure in the text and continuing throughout the document, including supplementary material.

In the title, either the word “Figure” or the abbreviation “Fig.” is acceptable; but **be consistent**. **In the text**, most advisors prefer the use of the word rather than the abbreviation. In the text, the words “figure” and “table” are capitalized when they are used with a number in reference to a specific graphic (for instance, “Figure 3 displays the distribution of the data points”).

Use Arabic numerals for tables and figures. Tables and figures are numbered in separate series, so that if you have one table and one figure in your text, you would have Figure 1 and Table 1. One common way to number either tables or figures is to begin with the first of each type that appears in the text and assign successively higher numbers to others that appear throughout the text and in appendices. An alternative to this “straight through the document” method is a system that numbers graphics in separate series within each section of the document. This system uses an identifying section prefix and a sequential number within the section: the title “Table 3.1” identifies the first table in Chapter III. **NOTE:** use this method only if you use the equivalent method of page numbering. If page numbers are “straight through the document,” graphics should be numbered “straight through the document”; if page numbers are linked to individual chapters, graphic numbers should be linked to chapters. **Do not mix numbering systems.**

Do not insert a graphic into the text until you have mentioned it in the text. The wording of the text should prepare the reader for the appearance of the graphic by introducing it. Place the graphic in the text as soon as it will conveniently fit in the available space. If there is room on the page after it is mentioned in the text, insert it on the same page. But be sure to leave adequate room for spacing the graphic.

If there is not adequate room on the same page, place it at the top of the following page. In such cases, the text of the page on which the graphic is introduced continues to the bottom of the page; do not leave extra white space at the bottom of the page. Regardless of their actual width (up to the maximum of 6 inches), graphics should be treated as if they occupied the full width of the page. Center the graphic between the left and right margins. No narrow column of text should be placed beside a graphic. Tables and figures that are too wide to fit on the page in their normal orientation may be rotated 90 degrees counterclockwise to the right (non-bound) edge of the page. Thus, for figures, the title is located parallel to the right margin, centered beneath the figure. For tables, the title is parallel to the left margin, centered above the table. Normal margin widths must be maintained.

Equations

Simple, short equations or formulae which are not critical to the development of main ideas in the text and which will be mentioned only once are placed in the text on the lines in which they occur. These “in text” equations are both preceded and followed by a double space. If punctuation follows the equation, it is placed after the double space. For example, a simple “in text” equation would appear as $F = ma$. Equations placed in the text in this fashion are not numbered.

More often, equations are formally “displayed” rather than being placed “in text.” Displayed equations are centered on the page, numbered, and their symbols (ensure you include units or dimensions) are defined. Equations are identified by the number originally applied to them in their first appearance in the text. An appropriate amount of spacing is provided above and below the equation, and the terms are usually italicized. This is an example of a “displayed” equation:

$$F = ma \quad (1)$$

where F is *force*, m is *mass*, and a is *acceleration*.

Alternately, the terms may be defined in a list below the equation:

$$F = ma \quad (1)$$

where

$$F = \text{Force (N)}$$

$$m = \text{mass (kg)}$$

$$a = \text{acceleration (m/sec/sec)}$$

A series of equations should be aligned on the equal signs wherever possible:

$$E = IR \quad (2)$$

$$26XY - 12 = 14(X + Y) \quad (3)$$

A long equation is begun at or near the left margin, broken before an operational sign, an arrow, or an equal sign, and ended near the right margin, leaving room for the equation number.

If a statement introducing an equation is a complete independent clause, it is followed by a colon. Otherwise, no punctuation is used after the introductory element. And even though an equation ends a sentence or other complete grammatical structure, no punctuation is placed after a displayed equation.

A displayed equation should be set apart from the text by at least one extra vertical space above and below it. A single displayed equation should be centered horizontally. Parentheses, brackets, integral signs, summation signs, and similar symbols should be as high as the expressions they include. Connecting words such as “hence,” “therefore,” and “but” should be typed flush with the left margin with at least one vertical line spacing above and below them.

Wherever possible, the symbols used in the report should be those that are accepted as standard in the field. If there are many symbols or if they are spread throughout the report, they should be identified in a list of symbols (usually in the prefatory material or in an appendix). If no such list is included, each symbol is normally defined where it is first used. In longer reports or where a substantial number of symbols are used, symbols are defined where first used even though a list is included in the prefatory material.

If symbols are defined in the text, the definitions are normally placed immediately following the formula or equation in which they are first used, often in a list or series that completes the sentence. If they are defined in a series, the word “where” is placed at the margin, and the series completes the sentence.

If they are placed in a list, the word “where” is placed at the margin, and the definitions are placed in a column (sometimes two columns) aligned on the equal signs.

In the presentation of data, metric measures are to be used instead of the usual United States measures. For example, use kilograms (kg) instead of pounds (lbs.); use meters (m) instead of feet (ft).

Summary

In general, when introducing supplementary visual enhancements into a text (such as figures, tables, equations, and so on), make every effort to ensure that the reader can logically follow the purpose of the enhancement and the kind of information it is intended to convey. Visual aids can add immeasurably to the communicability of textual material, but you will want to ensure that those visual aids are clearly explained. It is not true that visual aids can speak for themselves; they must be developed and integrated into the text with as much care as the text itself.

The following is a good set of criteria to employ when developing visual aids:

1. Make the visual aid esthetically appealing: don't crowd it with too much information or unnecessary information.
2. Make the visual aid balanced: don't present the data on one side of the visual aid while leaving excessive white space.
3. Avoid presenting too many visual aids in unbroken sequence: if you have ten or more tables in a row, all presenting the same kind of information, think about placing most of them in an appendix and using only the most important in the main body of the paper.
4. Remember: a visual aid should make reading the paper easier, not more difficult.

VII. Prefatory Pages

In AFIT theses and dissertations, the ***prefatory material*** includes the following: cover, disclaimer statement, title page, approval page, abstract, optional dedication, optional acknowledgments, table of contents, list of figures, list of tables, and an optional list of notations or symbols. Each of these is described below.

Prefatory Material:

1. Cover (unnumbered)
2. Disclaimer (silently numbered-i)
3. Title Page (silently numbered-ii)
4. Approval Page (silently numbered-iii)
5. Abstract (numbered-iv)
6. Dedication (optional) (numbered*)
7. Acknowledgments (optional) (numbered*)
8. Table of Contents (numbered*)
9. List of Figures (numbered*)
10. List of Tables (numbered*)
11. List of Notations or Symbols (optional) (numbered*)

* Remaining prefatory pages are consecutively numbered, printed in lower case Roman numerals. (For example: vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv, xvi, etc.)

Cover

The ***cover*** is placed immediately on the top of the disclaimer. Students print the cover on plain, blue, stock paper - there is no requirement for preprinting - using **Sample 1** or **2** as the template. The cover contains the following information below the AFIT crest: title of the thesis or dissertation, the identifying word “DISSERTATION,” “THESIS” or “GRADUATE RESEARCH PAPER” the name(s) and rank(s) of the author(s), the thesis or dissertation designator, institution identification information and the distribution statement (**see Samples 1 and 2**). This information is centered. All copies of documents reproduced and distributed by AFIT will be bound in blue covers.

Disclaimer Statement

The **disclaimer statement** indicates that the opinions and ideas contained in the dissertation, thesis, or graduate research paper are those of the student or students and are not to be construed as representing official policy of the student's branch of government service. A standard disclaimer statement is:

"The views expressed in this thesis are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the United States Government." (see [Sample 3](#))

International students may consider using the below disclaimer statement:

"The views expressed in this document are those of the author(s) and do not reflect the official policy or position of the United States Air Force, Department of Defense, United States Government, the corresponding agencies of any other government, NATO or any other defense organization."

Title Page

The **title page** is placed immediately after the disclaimer. It duplicates the cover contents and includes additional identifying information. The contents of the title page are the document designator, title of the document, the identifying word "DISSERTATION," "THESIS" or "GRADUATE RESEARCH PAPER" the supervising department (see **Thesis Designator** [pg 37](#)) and school to which it is submitted (in the case of dissertations, only the school), the degree and specialization for which the document was prepared, the name(s) and rank(s) of the author(s), the month and year of graduation, and the distribution statement (see **Samples 4 and 6**). Where there are two or more authors, their names are placed in alphabetical order (see [Sample 5](#)). The information is spaced and centered.

Approval Page

Approval pages are required in dissertations and theses. Signatures on the approval page indicate the official approval of the dissertation or thesis by the advisory committee and acceptance by the dean of the school (dissertation only). Information on the page includes the thesis or dissertation designator, the title of the document, and the name (with degrees previously earned) of the author, (see [Sample 7](#) and [8](#)). Space is provided for the signatures of the committee chairman, committee members, and the dean of the school (dissertation only). Information is centered and spaced. The names and titles of the individuals signing the approval page should be typed below the signature lines. The original printed copy of the dissertation or thesis must have signatures from all committee members and the dean of the school (dissertation only). Electronic and other additional copies may have the notation, "//signed//" (see [Sample 7](#) and [8](#)).

Abstracts

All AFIT theses actually contain two abstracts, one in the text and one located in the appropriate space on the SF 298. The abstract is generally the last item written, and it is included in the prefatory material (see [Sample 9](#)). The abstract included in the SF 298, attached to the end of the thesis, is limited to an absolute maximum of 200 words. Keep this in mind when considering your “prefatory” abstract. It is highly preferable to write one good, 200-words-or-less, abstract and use it both in the prefatory page version and on the SF 298 form.

The abstract summarizes the information contained in the report. The main items to be described in the abstract include the problem statement, the methodology followed in the thesis, the findings, and the conclusions. Obviously, it is impossible to say very much about all of these aspects in 200 words. But the reader should be able to discover the content and the methods used in the thesis by reading the abstract. The abstract is not an introduction; it is a succinct statement of the important aspects of the thesis.

In a report on an experimental subject, for example, the abstract would identify the problem that was studied, the equipment and procedures used, the results obtained, and the conclusions drawn. An abstract that lacks this basic information is of little value to the potential readers. Writers of theses and dissertations should remember that abstracts are usually republished in other reference volumes or electronic databases to help specialists keep informed about developments in their field or to provide a means of identifying reports that they may want to obtain and read.

Dissertations contain both abstracts described above, as well as a third abstract with a maximum length of 350 words which is used for reference volumes dedicated to the publication of dissertation abstracts (see [Sample 26](#)).

Dedication Page

The Dedication is optional. If a dedication is used, it should be centered on the page and in *italics*. The dedication should be brief and no heading is necessary. A dedication is typically no more than four lines (see [Sample 10](#)). ***It is prohibited to include any personal information in the following categories about U.S. citizens, DoD Employees and military personnel: social security account numbers; home addresses; dates of birth; telephone numbers other than duty officers which are appropriately made available to the general public; and names, locations and any other identifying information about family members of DoD employees and military personnel.***

Acknowledgments Page

The acknowledgments page is optional. If used, it is a place to acknowledge the assistance you received. Only persons who provided professional help should be acknowledged. The acknowledgments should be concise and to the point, typically no more than half a page (see [Sample 11](#)). Guidance and assistance from the committee chair and committee members are usually acknowledged. Substantial help from other faculty members, librarians, laboratory personnel, sponsoring organizations, or members of outside organizations may be acknowledged. Because the acknowledgements page is an informal statement from the author to the reader, it is usually written in the first person, and the reader may be addressed in the second person. Elsewhere in the report, third person is the more conventional form. ***It is prohibited to include any personal information in the following categories about U.S. citizens, DoD Employees and military personnel: social security account numbers; home addresses; dates of birth; telephone***

numbers other than duty officers which are appropriately made available to the general public; and names, locations and any other identifying information about family members of DoD employees and military personnel.

Table of Contents

Headings in the table of contents list the contents of the document from cover to cover in the sequence in which the content appears. The table of contents is a topic outline of the report, with page numbers added to indicate where each section begins (see [Sample 12](#)). A linking row of dots (periods) connects the topic with the page number. There should be double spacing between the main sections, and the main sections should be aligned. The page number column should be right justified. The wording of headings and subheadings in the body of the report and in the table of contents **must be identical**. Main document sections, subsections, and (when present) sub-subsections are listed with progressive indentation of subordinate headings to indicate relationships of topics described.

Use ***Roman numerals*** to label main sections—thesis or dissertation chapters. You may use ***Arabic numbers or letters*** to designate lower ranking headings. In the table of contents list all prefatory material except the cover, disclaimer, title page, approval page and the table of contents itself. All supplementary material is also listed. Each appendix is listed with its letter designation and a descriptive title; the title of the appendix should be identical to the title shown in the table of contents.

Lists

Most theses and dissertations contain ***lists*** showing the titles and locations of figures and tables contained in the report. Where it would be helpful to the reader, a list of symbols or notations is also included. Similarly, a short list of definitions of specialized technical terms may be included in the prefatory material. Longer lists of definitions or symbols should be placed in back matter supplements.

List of Figures

The ***list of figures*** includes all figures, whether they are in the text itself or in appendices. The term “figure” means all graphic aids except tables. Figures include drawings, photographs, flow charts, wiring diagrams, and so on. The layout of the list of figures is similar to that of the table of contents (see [Sample 13](#)). Each figure is assigned an Arabic number and given a descriptive title. Provide a page number for every figure in the report.

List of Tables

The ***list of tables*** includes all tables that appear in the document, in the sequence in which they are presented. The format is similar to that of the list of figures or table of contents (see [Sample 14](#)). Most thesis advisors prefer the use of Arabic numbers for both figures and tables. ***NOTE: Be sure to number figures and tables separately.***

Other Lists

You may want to include an alphabetical list of all symbols used in the report and give their definitions. Even though you have defined each individual symbol in the text when it is first used, and even though the symbols may be relatively common in your field, a list of symbols (sometimes called “notation”) can be a convenience to the reader. Consult your advisor if you are unsure about including such a list.

You may also include lists of specialized technical terms and their definitions or lists of acronyms (suggested if you introduce more than three acronyms) in the back matter supplement pages. If you place a list as a back matter supplement, call it a glossary of technical terms or list of symbols, abbreviations and acronyms. In either location, the terms in the list are alphabetized. Inform your readers at some point in the body of the report of the existence and location of such a list.

Document Designators

Dissertation Designator

The department will assign the dissertation designator. The five parts of the dissertation designator are:

1. Abbreviation for Air Force Institute of Technology (AFIT).
2. The letters DS. **(Only the two letters, DS.)**
3. An alphabetical symbol identifying the departmental affiliation of the research committee chair (such as ENG, ENP, or ENS).
4. A two digit numerical symbol identifying the fiscal year in which the dissertation is accepted (not necessarily the year assigned to identify the student’s class section), followed by a dash, “-“.
5. An alphanumerical or numerical symbol of one, two, or three digits, assigned by the department, that is unique to each dissertation within that program during that fiscal year.

“Possible Designator” Examples: AFIT/DS/ENV/03-M02
AFIT/DS/ENP/03-02
AFIT/DS/ENY/03-4
AFIT/DS/ENY/03-M4

Thesis Designator

The ***department responsible for the degree program assigns the thesis designator***. The five parts of the designator are:

1. Abbreviation for Air Force Institute of Technology (AFIT).
2. An alphabetical symbol identifying the student's educational program (such as GCE, GMS, or GOR).
3. An alphabetical symbol identifying the department responsible for the degree program of the thesis project (such as ENG, ENP, or ENS). If the primary thesis advisor is not a member of the department(s) responsible for the program, as listed in the current AFIT Graduate Catalog, then the heads of the departments involved will jointly determine which department is responsible for the thesis project and which department symbol will be used.
4. A two digit numerical symbol identifying the fiscal year in which the thesis is completed, followed by a dash, "-".
5. An alphanumerical or numerical symbol of one, two, or three digits, assigned by the department, that is unique to each thesis within that program during that fiscal year.

“Possible Designator” Examples: AFIT/GEE/ENV/03-M02
AFIT/GNE/ENP/03-02
AFIT/GMS/ENP/03-02
AFIT/GMS/ENY/03-4
AFIT/GMS/ENY/03-M4

Graduate Research Paper Designator

Each graduate research paper is assigned an identifying alphanumerical designator that appears on the cover, approval page, abstract, and SF 298.

Graduate Research Paper Designator

The department responsible for the program will assign the graduate research paper designator. The five parts of the graduate research paper designator are:

1. Abbreviation for Air Force Institute of Technology (AFIT).
2. An alphabetical symbol identifying the student's educational program (such as GMO, IGOS, IGA or IMTM).
3. An alphabetical symbol identifying the departmental affiliation of the research committee chair (such as ENV, ENY or ENS). If the research committee chair is not a member of the department(s) responsible for the program, as listed in the current AFIT Graduate Catalog, then the heads of the departments involved will jointly determine which department is responsible for the research paper and which department symbol will be used.

4. A two digit numerical symbol identifying the fiscal year in which the graduate research paper is completed (not necessarily the year assigned to identify the student's class section), followed by a dash, "-".
5. An alphanumerical or numerical symbol of one, two, or three digits, assigned by the department, that is unique to each graduate research paper within that program during that fiscal year.

"Possible Designator" Examples: AFIT/GMO/ENS/03-M02
AFIT/IGOS/ENS/03-02
AFIT/GMO/ENV/03-4
AFIT/IMTM/ENV/03-M4
AFIT/IGA/ENV/03-S15

VIII. Supplementary Materials

The **supplementary materials** in a thesis or dissertation consist of the parts of the document that are placed after the last chapter of the report. Supplementary materials consist of the appendices, bibliography, vita, the Category and Distribution Statement, and the Report Documentation Page, commonly referred to as the Standard Form (SF) 298.

Appendices

An **appendix** contains material that supports the text; its contents explain or present further details about some portion of the text. **Large sets of data** are contained in Appendices. This includes data from which an extended series of curves was developed, or computer programs, calibration procedures, sample calculations, sample survey or interview forms, lengthy quotations or draft publications, or other details that could distract or delay the reader if they were placed in the body of the text (see [Sample 20](#)). Generally, the **discussion within an appendix is confined to a single topic**. Approvals (or certifications, assurances, training, etc.) required by Federal laws and guidelines that you obtain in order to complete your research are placed in separate Appendices. Examples of such **Approvals** are: **Human Subject Exemption Approvals or Human Subject IRB Review Approvals**; **Animal Care Approvals**; or **Controlled Substances Approvals**, such as Chemical, Biological, or Radioactive Materials Approvals.

Multiple detailed topics typically require multiple appendices. Begin each appendix on a new page. If there is only one appendix, call it simply “Appendix,” and give it a descriptive title, as in “Appendix: Data Tables.” If there are multiple appendices, assign them successive capital letters: Appendix A, Appendix B, and so on. **Be sure to give each appendix a title**. Center the appendix letter and title at the top of the page in the same fashion as other main headings in the report are prepared. **Separate title pages for appendices are not necessary**. Margins and other format features of appendices are the same as for normal pages of the text.

In the Table of Contents, list the appendix letter, descriptive title, and page number. **Be sure to mention each appendix at an appropriate place in the text**. For example, where the discussion of a particular curve begins, you might write, “The data from which this curve was plotted are shown in Appendix C.” If you fail to mention an appendix, the reader might not be aware of its existence and usefulness.

Vita

Each AFIT thesis and dissertation may conclude with a brief, one-page, biographical sketch (or **vita**) of the author or authors (see [Sample 23](#)). Write the vita in the third person and include the most important facts about your life. If you have extensive military or federal service, focus primarily only on information related to the field in which your AFIT degree will be granted. End the narrative with your entry into AFIT, or, if known with certainty, your follow-on assignment. In theses having more than one author, the **vita for each author is placed on a separate page** and the pages placed in alphabetical order according to the first letter of the author’s last name. Disclosure of any personal information is voluntary, however, **it is prohibited to include any personal information in the following categories about U.S. citizens, DoD Employees and military personnel: social security account numbers; home addresses; dates of birth; telephone numbers other than duty officers which are appropriately made available to the general public; and names, locations and any other identifying information about family members of DoD employees and military personnel**.

For Official Use Only (FOUO)

Information that has not been given a security classification pursuant to the criteria of an Executive Order, but which may be withheld from the public because disclosure would cause a foreseeable harm to an interest protected by one or more Freedom of Information Act exemptions (see list in Chapter C3 of DoD 5400.7R), shall be considered as being for official use only (FOUO). No other material shall be considered FOUO.

Distribution Statements, Destruction Notices, and SF 298

The appropriate [Department of Defense distribution statement](http://www.dtic.mil/dtic/submitting/distrib_statement.html) http://www.dtic.mil/dtic/submitting/distrib_statement.html must be placed on the cover, title page, and SF 298 (see [Sample 24](#)) of each thesis and dissertation produced at AFIT. These distribution statements should be included in addition to classification statements as needed (see “A Reference Guide for Military DoD Documents” AD-A423966). The Air Force requires a Destruction Notice (see slide #55 of [STINFO Briefing](#)) to be placed on the cover and title page of all technical documents that are classified or have Distribution Statements B-X; that is, all limited distribution documents. The distribution statement is also indicated on the Thesis Distribution Memorandum (see [Sample 25](#)). The Department of Defense Directive [5230.25](#), “Withholding of Unclassified Technical Data from Public Disclosure,” and Department of Defense Directive [5230.24](#), “Distribution Statements on Technical Documents,” states the policy for marking and disseminating [DoD technical documents](#).

To carry out the policy accurately, you **should**:

1. Be aware that DTIC documents may be governed by limitations of distribution of information the document contains. This information should be clearly shown on the SF 298 (or the earlier DoD Form 1473) that accompanies these documents.
2. Be sure to make photocopies of the SF 298 (or the earlier DoD Form 1473) from any DTIC document you use whose DTIC number begins with a **prefix other than ADA**(+ numerals). Be certain that the photocopy clearly shows the distribution statement and the name of the controlling agency.

After you have prepared the final bibliography for your thesis or dissertation, count the number of limited distribution documents listed in the bibliography.

- * If you cited no limited distribution documents, and if you and your advisor have no other reason for limiting distribution of your report, use Statement A (described below).
- * If you cited one or more limited distribution sources, your thesis or dissertation may need to be limited to the same level of distribution as your most restricted source. For example, if your source is limited by the restraints of Statement D, your report may be limited by the restraints of Statement D (described below).

You should consult your thesis or dissertation advisor to determine the proper distribution statement to use.

The distribution statements (Statements A through X) and the explanations of their use are presented below. These statements are applicable only to documents prepared by DoD agencies and do not pertain to documents or materials available to the general public.

The Distribution Statements below are referenced from the Department of Defense Directive [5230.24](#), “Distribution Statements on Technical Documents,” as of 15 June 2004.

To verify the most up-to-date directives for marking and disseminating DoD technical documents, please refer to [Defense Technical Information Center](#), <http://www.dtic.mil/whs/directives/corres/rtf/d523024x.rtf>.

Statement A

The text of Distribution Statement A reads:

“APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.”

- Distribution Statement A may be used only on unclassified technical documents that have been cleared for public release by competent authority in accordance with DoD Directive 5230.9 (by AFIT/PA in accordance with PAOI (Public Affairs Operating Instructions) 35-2, AFIT Supplement 1 dated 6 Feb 2006). Technical documents resulting from contracted fundamental research efforts will normally be assigned Distribution Statement A, except for those rare and exceptional circumstances where there is a high likelihood of disclosing performance characteristics of military systems, or of manufacturing technologies that are unique and critical to defense, and agreement on this situation has been recorded in the contract or grant.
- Technical documents with this statement may be made available or sold to the public and foreign nationals, companies, and governments, including adversary governments, and may be exported.
- This statement may not be used on technical documents that formerly were classified unless such documents are cleared for public release by the controlling DoD office.
- **This statement shall not be used on classified technical documents** or documents containing export-controlled technical data as provided in DoD Directive 5230.25.
- The department is to notify AFIT/ENR if the document is not to be circulated to DTIC.

Statement B

The text of Distribution Statement B reads:

“DISTRIBUTION AUTHORIZED TO U. S. GOVERNMENT AGENCIES ONLY; [FILL IN REASON - Must use one of the reasons from the table below] [DATE OF DETERMINATION]. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO [INSERT NAME OF APPROPRIATE CONTROLLING DoD OFFICE – Must include Agency Acronym and complete address.]”

When using Distribution Statement B, also use one of the following Destruction Notices:

DESTRUCTION NOTICE – For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

DESTRUCTION NOTICE – For classified documents, follow the procedures in DoD 5220.22-M, National Industrial Security Program Operating Manual, Section 5-705 or DoD 5200.1-R, Information Security Program Regulation, Chapter VI, Section 7.

- Distribution Statement B may be used on unclassified or classified technical documents if necessary to ensure distribution limitation in addition to need-to-know requirements imposed by DOD Directive 5200.1-R, or in the event the document is declassified.

• **Reasons for imposing Distribution Statement B** include:

Foreign Government Information	<i>To protect and limit distribution in accordance with the desires of the foreign government that furnished the technical information. Information of this type normally is classified at the CONFIDENTIAL level or higher in accordance with DoD 5200.1-R.</i>
Proprietary Information	<i>To protect information not owned by the U.S. Government and protected by a contractor's "limited rights" statement, or received with the understanding that it not be routinely transmitted outside the U.S. Government.</i>
Critical Technology	<i>To protect information and technical data that advance current technology or describe new technology in an area of significant or potentially significant military application or that relate to a specific military deficiency of a potential adversary. Information of this type may be classified or unclassified; when unclassified, it is export-controlled and subject to the provisions of DoD Directive 5230.25.</i>
Test and Evaluation	<i>To protect results of test and evaluation of commercial products or military hardware when such disclosure may cause unfair advantage or disadvantage to the manufacturer of the product.</i>
Contractor Performance Evaluation	<i>To protect information in management reviews, records of contract performance evaluation, or other advisory documents evaluating programs of contractors.</i>
Premature Dissemination	<i>To protect patentable information on systems or processes in the developmental or concept stage from premature dissemination.</i>
Administrative or Operational Use	<i>To protect technical or operational data or information from automatic dissemination under the International Exchange Program or by other means. This protection covers publications required solely for official use or strictly for administrative or operational purposes. This statement may be applied to manuals, pamphlets, technical orders, technical reports, and other publications containing valuable technical or operational data.</i>
Software Documentation	<i>Releasable only in accordance with DoD Instruction 7930.2.</i>
Specific Authority	<i>To protect information not specifically included in the above reasons and discussions, but which requires protection in accordance with valid documented authority, such as Executive orders, classification guidelines, DoD or DoD Component regulatory documents. When filling in the reason, cite "Specific Authority (identification of valid documented authority)."</i>

Statement C

The text of Distribution Statement C reads:

“DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS; [FILL IN REASON - Must use one of the reasons from the table below] [DATE OF DETERMINATION]. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO [INSERT NAME OF APPROPRIATE CONTROLLING DOD OFFICE - Must include Agency Acronym and complete address.]”

When using Distribution Statement C, also use one of the following Destruction Notices:

DESTRUCTION NOTICE – For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

DESTRUCTION NOTICE – For classified documents, follow the procedures in DoD 5220.22-M, National Industrial Security Program Operating Manual, Section 5-705 or DoD 5200.1-R, Information Security Program Regulation, Chapter VI, Section 7.

- Distribution Statement C may be used on unclassified or classified technical documents if necessary to ensure distribution limitation in addition to need-to-know requirements imposed by DOD Directive 5200.1-R, or in the event the document is declassified.

- *Reasons for applying Distribution Statement C* include:

Foreign Government Information	<i>Same as distribution statement B.</i>
Critical Technology	<i>Same as distribution statement B.</i>
Software Documentation	<i>Same as distribution statement B.</i>
Administrative or Operational Use	<i>Same as distribution statement B.</i>
Specific Authority	<i>Same as distribution statement B.</i>

Statement D

The text of Distribution Statement D reads:

“DISTRIBUTION AUTHORIZED TO DEPARTMENT OF DEFENSE AND U.S. DEPARTMENT OF DEFENSE CONTRACTORS ONLY; [FILL IN REASON - Must use one of the reasons from the table below] [DATE OF DETERMINATION]. OTHER REQUESTS SHALL BE REFERRED TO [INSERT NAME OF APPROPRIATE CONTROLLING DOD OFFICE - Must include Agency Acronym and complete address.]”

When using Distribution Statement D, also use one of the following Destruction Notices:

DESTRUCTION NOTICE – For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

DESTRUCTION NOTICE – For classified documents, follow the procedures in DoD 5220.22-M, National Industrial Security Program Operating Manual, Section 5-705 or DoD 5200.1-R, Information Security Program Regulation, Chapter VI, Section 7.

- Distribution Statement D may be used on unclassified or classified technical documents if necessary to ensure distribution limitation in addition to need-to-know requirements imposed by DOD Directive 5200.1-R, or in the event the document is declassified.

- *Reasons for imposing Distribution Statement D* include:

Foreign Government Information	<i>Same as distribution statement B.</i>
Administrative or Operational Use	<i>Same as distribution statement B.</i>
Software Documentation	<i>Same as distribution statement B.</i>
Critical Technology	<i>Same as distribution statement B.</i>
Specific Authority	<i>Same as distribution statement B.</i>

Statement E

The text of Distribution Statement E reads:

“DISTRIBUTION AUTHORIZED TO DOD COMPONENTS ONLY; [FILL IN REASON - Must use one of the reasons from the table below]] [DATE OF DETERMINATION]. OTHER REQUESTS SHALL BE REFERRED TO [INSERT NAME OF APPROPRIATE CONTROLLING DOD OFFICE - Must include Agency Acronym and complete address.]”

When using Distribution Statement E, also use one of the following Destruction Notices:

DESTRUCTION NOTICE – For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

DESTRUCTION NOTICE – For classified documents, follow the procedures in DoD 5220.22-M, National Industrial Security Program Operating Manual, Section 5-705 or DoD 5200.1-R, Information Security Program Regulation, Chapter VI, Section 7.

- Distribution Statement E may be used on unclassified or classified technical documents if necessary to ensure distribution limitation in addition to need-to-know requirements imposed by DOD Directive 5200.1-R, or in the event the document is declassified.

- **Reasons for imposing Distribution Statement E** include:

Direct Military Support	<i>The document contains export-controlled technical data of such military significance that release for purposes other than direct support of DoD-approved activities may jeopardize an important technological or operational military advantage of the United States. Designation of such data is made by competent authority in accordance with DoD Directive 5230.25.</i>
Foreign Government Information	<i>Same as distribution statement B.</i>
Proprietary Information	<i>Same as distribution statement B.</i>
Premature Dissemination	<i>Same as distribution statement D.</i>
Test and Evaluation	<i>Same as distribution statement B.</i>
Software Documentation	<i>Same as distribution statement B.</i>
Contractor Performance Evaluation	<i>Same as distribution statement B.</i>
Critical Technology	<i>Same as distribution statement B.</i>
Administrative-Operational Use	<i>Same as distribution statement B.</i>
Specific Authority	<i>Same as distribution statement B.</i>

Statement F

The text of Distribution Statement F reads:

“FURTHER DISSEMINATION ONLY AS DIRECTED BY [INSERT NAME OF APPROPRIATE CONTROLLING DOD OFFICE - Must include Agency Acronym and complete address] [DATE OF DETERMINATION] OR HIGHER DOD AUTHORITY.”

When using Distribution Statement F, also use one of the following Destruction Notices:

DESTRUCTION NOTICE – For classified documents, follow the procedures in DoD 5220.22-M, National Industrial Security Program Operating Manual, Section 5-705 or DoD 5200.1-R, Information Security Program Regulation, Chapter VI, Section 7.

DESTRUCTION NOTICE – For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

- Distribution Statement F is normally used only on classified technical documents but may be used on unclassified technical documents when specific authority exists (e.g., designation as direct military support as in statement E). Distribution Statement F is also used when the DoD originator determines that the information is subject to special dissemination limitation specified by paragraph 4-505, DOD Directive 5200.1-R.

Statement X

The text of Distribution Statement X reads:

“DISTRIBUTION AUTHORIZED TO U. S. GOVERNMENT AGENCIES AND PRIVATE INDIVIDUALS OR ENTERPRISES ELIGIBLE TO OBTAIN EXPORT-CONTROLLED TECHNICAL DATA IN ACCORDANCE WITH DOD 5230.25 [INSERT DATE OF DETERMINATION] CONTROLLING DOD OFFICE IS [INSERT NAME OF APPROPRIATE CONTROLLING DOD OFFICE - Must include Agency Acronym and complete address.]”

When using Distribution Statement X, also use the following Destruction Notice:

DESTRUCTION NOTICE – For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

- Distribution statement X shall be used on unclassified documents when distribution statements B, C, D, E, or F do not apply, but the document does contain technical data as explained in DoD Directive 5230.25. This statement shall not be used on classified technical documents; however, it may be assigned to technical documents that formerly were classified.

Export Control Law Statement

Documents marked with the distribution statement X, as well as any technical documents that are determined to contain export-controlled technical data, shall be marked also with the Export Control Law Statement:

“WARNING: SUBJECT TO EXPORT CONTROL LAWS

WARNING – THIS DOCUMENT CONTAINS TECHNICAL DATA WHOSE EXPORT IS RESTRICTED BY THE ARMS EXPORT CONTROL ACT (Title 22, U.S.C., Sec 2751, et. seq.) OR THE EXPORT ADMINISTRATION ACT OF 1979, AS AMENDED, Title 50, U.S.C., App. 2401 et. seq. VIOLATIONS OF THESE EXPORT LAWS ARE SUBJECT TO SEVERE CRIMINAL PENALTIES. DISSEMINATE IN ACCORDANCE WITH PROVISIONS OF DOD DIRECTIVE 5230.25.”

When it is technically infeasible to use the entire statement, an abbreviated marking may be used, and a copy of the full statement added to the "Notice To Accompany Release of Export-Controlled Data" required by DoD Directive 5230.25.

Thesis Distribution Memorandum

To ensure that the proper distribution statement appears on the dissertation, thesis or graduate research paper and that copies are sent to the appropriate recipients, the advisor should sign the Thesis Distribution Memorandum (see [Sample 25](#)). When the completed thesis is turned in, make sure all information is still correct. **(Verify that the Distribution Statement selected is the correct statement for the thesis and that the memorandum is signed by the primary thesis advisor and the Department Head.)**

AFIT Public Release (All Distribution Statement A documents only)

An AFIT Public Release is required for all Distribution Statement A dissertations, theses and graduate research papers. Contact AFIT PA, for the current SECURITY AND POLICY REVIEW WORKSHEET

Nonprint Product

Students should discuss with faculty advisors the intention to include a nonprint product of a Compact Disk – Read Only Memory (CD-ROM) for communication of electronic work (files, programs, etc.) attached to a thesis or dissertations. Do not attach it to the blue AFIT back cover as the library staff will attach it to the professionally hardbound copy of the work. Nonprint products should be referenced in the document. The student must include a completed Page 1 & Page 2 of the Nonprint Report Documentation Page (DTIC Form 530) with the document. The printed Page 1 & Page 2 of the Nonprint Report Documentation Page (DTIC Form 530) will be placed immediately before the SF 298 in the document. The template for the nonprint report documentation page is found at <http://www.dtic.mil/dtic/dtic530template97.doc>

Report Documentation Form (SF 298) (Rev. 8-98)

Every thesis and dissertation must include the report documentation form known as the Standard Form (SF) 298 (see [Sample 24](#)). The *instructions for completing the SF 298* are on the next page.

Instructions for Completing the SF 298

Instructions are keyed to block numbers on the form; material must fit within the space of the blocks on the form.

- Block 1. Month and year of your graduation (not the month you turn in the thesis).
- Block 2. Enter the phrase **Master's Thesis** or **Doctoral Dissertation**.
- Block 3. Indicate the time during which the work was performed and the report was written, e.g., Jun 2001 – Mar 2002.
- Block 4. Enter the complete title of the thesis or dissertation. **TITLES ARE NOW TO BE UPPER AND lower case LETTERS.** On classified documents, enter the title classification in parentheses.
- Block 5a/b/c. Leave blank.
- Block 5d. Enter ENR funding number if work was funded. (Ask advisor for the number.)
- Block 5e/f. Leave blank.
- Block 6. Enter name (s) of person (s) responsible for writing the thesis/dissertation. The form of entry is the last name, first name, middle initial, and if military, add rank and branch of service or if civilian, enter GS rank and sponsoring agency. Follow alphabetical order for two or more authors.
- Block 7. Enter address: Air Force Institute of Technology, Graduate School of Engineering and Management (AFIT/EN), 2950 Hobson Way, WPAFB OH 45433-7765.
- Block 8. Enter your thesis or dissertation designator (Example: AFIT/GAQ/ENV/03-10M).
- Block 9. Enter the name, rank, title, complete address (including street number and zip code) and phone number (DSN if applicable or commercial) of your sponsor, if you have one; enter N/A if there is no sponsor.
- Block 10. Leave blank.
- Block 11. Leave blank.
- Block 12. Enter the appropriate distribution statement.
- Block 13. Leave blank.
- Block 14. Enter a short abstract. Maximum length is 200 words. The main items to be described in the abstract include the problem statement, the methodology followed, the findings and conclusions.
- Block 15. Enter four or five key words or phrases. Choose at least four of these terms from the DTIC Thesaurus, a reference guide located near the reference desk in the AFIT Library. The DTIC Thesaurus is, also, accessible on the web at <http://stinet.dtic.mil/str/> by clicking on DTIC Thesaurus and conducting a search. Use of these terms will ensure that other researchers conducting DTIC searches can readily locate your document.
- Block 16a, 16b, and 16c. Enter security classification in accordance with security classification regulations, e.g. U, C, S, etc. If this forms contains classified information, stamp classification level on the top and bottom of this page.
- Block 17. Enter either UU (Unclassified Unlimited) or SAR (Same as Report).
- Block 18. Page count. Enter the total number of all pages in the thesis or dissertation with any type of printed material. Cover is Page 1, every page with printing is counted as a page, SF 298 is the last page and is counted as a page in the page count.
- Block 19a. Enter the faculty advisor's name and department office symbol.
- Block 19b. Indicate the department phone number of the faculty advisor.

IX. Preparing and Submitting the Final Copy

Each MS and PhD student will submit materials to the department or committee chair at the time specified in school directives. The unbound original and all copies of the thesis will be placed in an AFIT blue cover page and blue back cover.

Submission of Final Copy

The calendar year deadlines for activities leading up to graduation change each year, depending on the date of the graduation ceremony. Each department provides students a list of deadlines for key events linked to graduation, including the desired submittal date for theses and dissertations.

Ensure that you know these dates and meet their deadlines.

Material must be submitted as specified in AFIT Instruction 36-141 and applicable Operating Instructions. Originals and copies of theses and dissertations must be clean, clear, and suitable for reproduction. Materials must be submitted and accepted on or before the final acceptance date established by the schools.

<http://www.afit.edu/sc/AFIT%20publications%2001062006/AFIT%2036-141.pdf>

Thesis

When turning in thesis materials, you ***must include*** the items as indicated on the Checklist of Thesis Documents and Receipt (see [Sample 28](#)).

Dissertation

When turning in dissertation materials, you ***must include*** the items as indicated on the Checklist of Dissertation Documents and Receipt (see [Sample 29](#)).

PhD completions are entered into the officer records as soon as all doctoral requirements are satisfied (any time during the academic quarter).

Processing

After the completed thesis or dissertation has been accepted, the document will be submitted by AFIT/ENR to DTIC. The AFIT/ENR office will process dissertations to ProQuest. The AFIT/ENR office will send theses and dissertations to the sponsors (if the sponsor is listed on the 298), along with the Research Assessment Questionnaire (see [Sample 27](#)).

Electronic Copies

Both MS theses and PhD dissertations will be submitted on a **diskette, CD-ROM or zip drive to the department as well as in printed copies**. The following instructions apply:

- a. All MS theses and PhD dissertations must be formatted as an Adobe Acrobat Portable Data File (*.pdf). The complete thesis or dissertation, exactly as approved by the research committee, is to be provided as a single file.
- b. Computer workstations with instructions for preparing the *.pdf file are available in Building 640 & 641, in all the common use labs (640, RM 210, 214, 215, 222, 225, & 641, RM 310/323, 325).
- c. All files are to be named using the thesis or dissertation designator. All slash “/” marks should be changed to a dash “-” mark. For example, the electronic file for the thesis designated AFIT/GAP/ENP/03-M12 should be titled “AFIT-GAP-ENP-03-M12.pdf”. This electronic file will be delivered to your academic department. Departments are responsible for posting the files to the EN server.
- d. The SF 298 is to be included with the electronic copy in the same order (last printed page) as in a printed copy.

Research Impact Statement

A Research Impact Statement is required for all theses and dissertations (**see [Sample 31](#)**). Graduating students, in collaboration with their thesis or dissertation advisors, prepare a Research Impact Statement using the sample format. Both a printed page and an electronic file must be submitted at the same time the final thesis or dissertation document is delivered to the academic department. The department educational technician will save the file in WORD 95 (or later) with the student last name and RIS as a filename to the shared drive in the department folder K:\Research Impact Statements\EN*\LastNameRIS.doc. For example: K:\Research Impact Statements\ENP\MeerRIS.doc. Additional guidance in preparing individual data entries is provided below:

- a. The first two lines of data must be entered in the tabular format provided. Limit *Keywords* and *Program* title to the space provided. Enter the thesis designator for related projects in the *Related Thesis #* fields. Under the *Funding* field, enter the amount of external sponsor funding that came to AFIT (usually through your faculty advisor) to help fund your research, your thesis, your project, and other expenses related to your research, such as equipment, research assistantships, or conference travel. If you have questions about this field, contact your faculty advisor.
- b. The *Title* should match the thesis or dissertation title. Often the title is directed to a highly technical audience. Thus, an alternate title can be indicated in the *Subject* line.
- c. The *Air Force, DOD, or other Relevant Program Description* should provide the reader with a clear statement of the Air Force, DoD or other relevant mission, weapon system, program, etc., that the research supports. Do not discuss the thesis or dissertation work in this section.

- d. The *Impact Statement* connects the *Technical Abstract* to the *Air Force, DOD, or other Relevant Program Description*. This is the place to champion the main accomplishments of the AFIT research and is the most important section in the Research Impact Statement. You should direct your comments to the non-technical Air Force management audience. Be as specific as possible with respect to AFIT's accomplishments. (This information will also aid in the preparation of training reports.)
- e. The *Technical Abstract* must be exactly the same as the abstract on the SF298.
- f. *Subject Terms* may also be taken directly from the SF298.
- g. *Publications* and *Presentations* resulting from this research should be listed in the last two sections. Papers in preparation, submitted, etc., should be indicated. There will be an opportunity to update this information.
- h. Often faculty advisors have considerably greater insight into the impact of the research performed. Therefore, it is essential that all advisors review and edit student inputs. This data is essential for the School to accurately represent your accomplishments.

Appendix A. Thesis Proofreading Guide

This guide may be used to check theses. It does not cover everything that can go wrong, but it does contain the *most common errors*.

Thesis Designator

1. Make sure you have the correct designator and check all pages on which it appears:
 - a. Blue Cover
 - b. Title Page
 - c. Approval Page
 - d. Abstract
 - e. SF Form 298

Thesis Title

2. Make sure it is the **SAME** on all of the following:
 - a. Blue Cover
 - b. Title Page
 - c. Approval Page
 - d. Top of the first page of Chapter I
 - e. SF Form 298
 - f. Thesis Acceptance Sheet
 - g. Thesis Distribution Memorandum

Blue Cover

3. Students print the cover on plain, blue, stock paper - students may obtain the blue stock paper free from their department.

Title Page

4. Check the Title Page for format. Make sure the graduation month and year are correct—for example: **March 2004**.

SF 298 Form

5. Check to assure all information is included. Follow the instructions given in the *AFIT Style Guide* (See Chap. 8). **Be sure to complete the sponsor information in Block 9.**
 - a. Everything that is supposed to be in caps is in caps—such as the designator.
 - b. Block 14 (Abstract). Maximum of 200 words.
 - c. Make sure Block 15 is filled in correctly. Choose at least 4 terms from the DTIC Thesaurus, a guide located near the reference desk in the library or on the web at <http://stinet.dtic.mil/str>
 - d. Make sure the *page count* is correct in Block 18. Count cover (page 1) to cover (final page) as follows: cover + sum of all Roman numeral pages (include silently numbered pages) + sum of all Arabic numeral pages in the count and SF-298 (front).

Thesis Distribution Memorandum

6. Since this form was turned in previously, make sure all information is still **correct**. (*Verify* that Distribution Statement selected is the correct statement for your thesis and that the memo is signed by your primary thesis advisor.) See Chapter VIII of the *AFIT Style Guide* for Distribution Statements.

Table of Contents

7. a. Be sure to put the word “**Page**” above the numbers on all pages of the Table of Contents. (see [Sample 12](#)). This also applies to the List of Figures and List of Tables.
- b. Make sure titles are **EXACTLY** the same as the titles on page listed.
- c. If a title has two lines, the second line should be single-spaced under the first. **DO NOT** indent the second line; the second line should have the same left margin as the first line.

Matching Titles

8. Go through each page of the thesis to make sure that the title is **EXACTLY** the same in the Table of Contents or List of Tables/Figures as it is on the actual page. This is where most errors are found in theses.

Chapter Headings

9. Check the chapter headings to see that they are in the proper format. See Chapter V of the *AFIT Style Guide*.
 - a. [Sample 15](#) of the *AFIT Style Guide* has the format for the first chapter, (which has the title of the thesis at the top of the page). ***This is true for Chapter I only!*** If the thesis title has two lines, double-space and center the second line under the first line.
 - b. Headings on chapters, tables, figures, appendices, etc., may be single- or double-spaced. Center the second line of the heading under the first line of the heading; be consistent throughout the report.

Margins

10. Spot-check the margins. The top margin should be 1 inch, the other margins should be 1-1/4 inch. Page numbers should be approximately 3/4 inch from bottom. Chapter V of the *AFIT Style Guide* has guidance on this subject.

Bibliography

11. Check format of bibliography. (see [Samples 21 and 22](#))
IMPORTANT. Check for AD Numbers—if different than ADA (ex: ADB); it may require a “limited” distribution. **AD numbers should be set up correctly**, i.e., (ADA123456). Other items to watch for:
 - a. Make sure the citations in text correspond with entries in Bibliography.
 - b. Make sure the entries are in alphabetical order.
 - c. There should **not** be a comma between city and state.
 - d. Use 2-letter state abbreviations.

- e. There should **not** be a period after abbreviated military ranks.
- f. There should **not** be periods between D and C in Washington DC.

Vita

12. Check the vita for proper format in accordance with Chapter VIII (see [Sample 23](#)) of the *AFIT Style Guide*. In the case of dual authors, each author provides a separate vita.

Page Numbers

13. Be sure that all pages that should be numbered are numbered. Make sure all pages are present and in the correct order.

Back Cover

14. The back cover is plain, blue, stock paper - students may obtain it free from their department.

Appendix B. Sample Thesis and Dissertation Pages

Note: To turn any of the following Appendix B pages into “templates”: COPY or SAVE AS the page to another Word document and to a different location. Clear out the current contents (delete) of its Header and Footer. Then insert your data and save the document under a specific name for your project.

Sample 1. Cover, Single-Author Thesis



**SHORT, CONCISE AND GENERAL
THESIS TITLE**

THESIS

Joseph Q. Public, Captain, USAF
AFIT/GAE/ENY/02-35

**DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY**

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

Sample 2. Cover, Dual-Author Thesis



**SHORT, CONCISE AND GENERAL
THESIS TITLE**

THESIS

Douglas E. James
Captain, USAF

Joseph Q. Public
Captain, USAF

AFIT/GAE/ENY/02-35

**DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY**

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

Sample 3. Disclaimer Statement

The views expressed in this thesis are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the United States Government.

Sample 4. Thesis Title Page, Single Author

AFIT/GEE/ENV/02-2

SHORT, CONCISE AND GENERAL THESIS TITLE

THESIS

Presented to the Faculty

Department of Systems and Engineering Management

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Engineering and Environmental Management

Zachary S. Belcher, BS

Captain, USAF

March 2002

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

Sample 5. Thesis Title Page, Dual Author

AFIT/GM/ENP/02-2

SHORT, CONCISE AND GENERAL THESIS TITLE

THESIS

Presented to the Faculty

Department of Engineering Physics

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

in Partial Fulfillment of the Requirements for the

Degree of Master of Science

Connie C. Hutchinson, BS
Captain, USAF

Gregory F. McCoy, BS
Captain, USAF

March 2002

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

Sample 6. Dissertation Title Page

AFIT/DS/ENG/02-2

SHORT, CONCISE AND GENERAL DISSERTATION TITLE

DISSERTATION

Presented to the Faculty

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

in Partial Fulfillment of the Requirements for the

Degree of Doctor of Philosophy

David E. Meer, BS, MS

Captain, USAF

December 2002

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

Sample 7. MS Thesis Approval Page

AFIT/GCE/ENG/02-2

SHORT, CONCISE AND GENERAL THESIS TITLE

John C. Jones, BS
Captain, USAF

Approved:

//signed//
Glen P. Doe (Chairman)

Date

//signed//
Larry W. Doe (Member)

Date

//signed//
Amanda A. Doe (Member)

Date

Sample 8. Dissertation Approval Page

AFIT/GS/ENG/03-2

SHORT, CONCISE AND GENERAL DISSERTATION TITLE

David E. Doe, BS, MS
Captain, USAF

Approved:

//signed//
John H. Doe (Chairman)

Date

//signed//
Eileen A. Doe (Dean's Representative)

Date

Alice M. Doe (Member)

Date

/signed/
Howard J. Doe (Member)

Date

Accepted:

Martin F. Doe, Jr.
Dean, Graduate School of
Engineering and Management

Date _____

Sample 9. Abstract (in text)

AFIT/GOA/ENS/02-2

Abstract

The purpose of this research was to improve the effectiveness of organizational meetings, thereby reducing the waste from ineffective meetings. Specifically, this thesis sought to answer three research questions addressing the essential elements for effective meetings, the benefits from productive meetings, and the information and skills critical to conducting meetings. The research questions were answered through a comprehensive literature review, and the use of the Delphi Technique. However, the solicitation of meeting materials from 16 Malcolm Baldrige National Quality Award winners and 90 Fortune 1,000 firms provided additional information. Seven experts, representing Air Force and industry, participated in two rounds of the Delphi Technique. The research identified the need for a concise and realistic length management tool to instruct managers on how to conduct effective meetings. Further, research highlighted that few corporations in industry have such a tool, even among those firms recognized as being the pinnacle of quality.

The culmination of this effort was the development of an effective meeting management guide to outline and discuss the key elements for preparing and conducting organizational meetings. Recommendations to implement effective meeting management training using the guide are discussed.

Sample 10. Dedication

AFIT/GIR/ENS/02-6

To Father and Mother

Sample 11. Acknowledgments

Acknowledgments

I would like to express my sincere appreciation to my faculty advisor, Lt Col Jacob Doe, for his guidance and support throughout the course of this thesis effort. The insight and experience was certainly appreciated. I would, also, like to thank my sponsor, Capt Carey Doe, from the Air Force Materiel Command for both the support and latitude provided to me in this endeavor.

I am also indebted to the many maintenance professionals who spent their valuable time explaining the processes and procedures they used in the maintenance of their support equipment. Special thanks go to TSgt Lynn Doe, who served as my liaison and was always available to answer my questions.

James C. Doe

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Note: *It is prohibited to include any personal information in the following categories about U.S. citizens, DoD Employees and military personnel: social security account numbers; home addresses; dates of birth; telephone numbers other than duty officers which are appropriately made available to the general public; names, locations and any other identifying information about family members of DoD employees and military personnel..*

Sample 12. Table of Contents

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Sample 15. First Page of Thesis.

NOTE: This sample also illustrates the first four levels of headings.

MEASURING USER SATISFACTION OF THE ELECTRONIC MAIL SYSTEM AT
AIR FORCE MATERIEL COMMAND HEADQUARTERS AS AN INDICATOR OF
THE SYSTEM'S EFFECTIVENESS

I. Introduction**General Issue**

The Air Force Materiel Command (AFMC) has installed a local area network designed to connect 3,000 users throughout its headquarters at Wright-Patterson Air Force Base. One of the principal goals of the network is to provide users with a powerful electronic mail system capable of meeting the users' communications needs (Strong, 1993).

The AFMC initially allocated \$9 million to fund the network project which began in May, 1991 (Strong, 1993). Currently, 2,600 users are connected to the network through a series of 35 file servers. The network is managed by AFMC's Office Automation staff with TRW, Inc. acting as the primary contractor.

Detail One.

This local area network and its electronic mail system represent a major investment in an information system which is considered to be the model for the Air Force. For example, this system has already been installed at Air Mobility Command Headquarters at Scott Air Force Base and is

Sample 16. Figure in Text

were extracted from the article “Distribution and Repair In Variable Environments (DRIVE) Model Logic” by Richard Moore and Bob McCormick (McCormick and Moore, 1992).

Section 1 - The DRIVE System

The Weapon System Management Information System (WSMIS) is a decision support system that assesses logistics support, focusing on weapon system availability. DRIVE makes up two modules within WSMIS; D087J (Classified DRIVE) and D087K (Unclassified DRIVE). DRIVE extends the WSMIS approach of logistics capacity assessment to the Air Logistics Center (ALC) level by defining repair and distribution priorities, based on elements such as aircraft availability goals, planned flying hours, and worldwide asset position (see Figure 2 below).

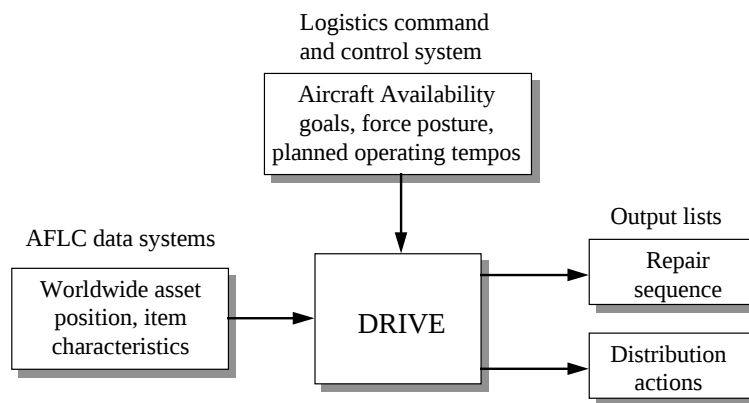


Figure 2. Basic DRIVE Architecture (Abell et al, 1992)

DRIVE prioritizes the repair of exchangeable items (Line Replaceable Units (LRU) and Shop Replaceable Units (SRU)) so the greatest increase in base level weapon system availability is achieved per repair sources expended.

Sample 17. Table in Text

for estimating demand for reparable (rotatable) aircraft parts. American Airlines Decision Technologies

Division developed a PC-based decision support system called the Rotable

Allocation and Planning Systems (RAPS) to provide forecasts of rotatable parts demand.

Table 2. Summary of Models

MODEL	METRIC	MOD-METRIC	VARI-METRIC	DYNA-METRIC
Indenture	Single	Multiple	Multiple	Multiple
Echelons	Multiple	Multiple	Multiple	Multiple
Number of Items	Multiple	Multiple	Multiple	Multiple
Location	Multiple	Multiple	Multiple	Multiple
Demand Assumptions	Steady state, independent, and stochastic demand (Poisson)	Steady state, independent, and stochastic demand (Poisson)	VTMR > 1, independent, stochastic, Poisson demand. Pipeline quantities have negative binomial distribution	Dynamic instead of steady state. Stochastic, multi-period. Considers time dependent scenarios.
Objective	Minimize expected backorders	Minimize LRU backorders	Maximize aircraft availability	Readiness, sustainability, and sortie generation

RAPS provided a multi-million dollar benefit for American Airlines, upon initial implementation, through the identification of over and under allocated parts (Tedone, 1989:62).

Sample 18. Numbered Citations in Text.

NOTE: This sample also illustrates the fourth level of heading.

included classroom teachers per pupil, support staff per pupil and administrative staff per pupil. Output measures included student scores on proficiency exams (44:1625).

5. When examining the efficiency of highway maintenance patrols, Cook et al. addressed the need to develop a measurement technique capable of handling non-economic factors. These factors included average age of pavement, number of accidents, and traffic volume per day (17:114).

Difficulty Estimating a Service Sector Production Function.

The previously examined problems, caused by lack of quantifiable measures, relates to a larger theoretical problem when measuring public and service sector organizations. In economic terms, it is difficult to estimate a production function or appropriate production possibilities frontier in public organizations.

Methods for evaluating the relative productivity of units in the public sector have lagged behind similar applications where production functions were more directly obtainable. (7:57)

The difficulty in establishing an appropriate production function, coupled with the measurement problems previously identified, lead researchers to look for an alternative technique for measuring performance.

Traditional economic theory defines a production function as the relationship between inputs and outputs where the quantity produced is equal of some function of

Sample 19. Author-Year Citations in Text.

NOTE: This sample also illustrates fourth-level headings.

organization with a viable substitute for economic or productivity measures. Throughout the literature, user satisfaction has been widely accepted as a surrogate measure for system success (Bailey and Pearson, 1983:530; Raymond, 1987:173; Ives and others, 1983:785; Tan and Lo, 1990:203; Hiltz and Johnson, 1990:739).

User Satisfaction Defined.

User satisfaction is defined as the “extent to which users believe the information system available to them meets their information requirements” (Ives and others, 1983:785). As such, user satisfaction is a subjective measure of system success. In partial answer to the first research question, therefore, user satisfaction must be measured subjectively by asking the users what their satisfaction level is.

Basis for Accepting User Satisfaction.

The research in this area began with the work of Cyert and March, who developed the original concept of user information satisfaction in their book entitled, *A Behavioral Theory of the Firm*, published in 1963. In their empirical research, Cyert and March found that when an information system successfully meets the needs of the users, the users’ satisfaction with that system is reinforced. Therefore, the users will be more likely to use the system in the future and the satisfaction with the system will continue to be reinforced (Cyert and March, 1963:124-127). According to Bailey and Pearson, another early researcher, Evans, found that

Sample 20. Appendix

Appendix A: Student Feedback Form

Instructions: Please respond to the following questions as honestly and directly as possible. Your comments will provide valuable feedback which will be used to improve the content and presentation of this course. Remember, this is the first administration of the course material. Consequently, the course developers and the Air Staff are relying on your critique to help make this course more relevant and effective for future students.

How did you feel about the relevance of the content of this course? (Be as specific as possible.)

How did you feel about the presentation (slides, instruction, handouts) of this course? How could the presentation be improved?

Do you feel this course provided you with valuable information/knowledge? Why or Why not?

The purpose of this course was to familiarize you with basic IRM concepts and principles. To what extent do you feel this objective was met?

If you would like to provide additional comments, please do so here.

THANK YOU FOR YOUR FEEDBACK!

AFIT SCN 01-5, Expires 10 Nov 2 002

Sample 21. Numbered Bibliography

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Sample 22. Author-Year Bibliography

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Sample 23. Vita

Vita

Captain Ronald B. Cole graduated from Our Lady of Good Counsel High School in Wheaton, Maryland. He entered undergraduate studies at the University of Maryland in College Park, Maryland where he graduated with a Bachelor of Science degree in Marketing in May 1996. He was commissioned through the Detachment 330 AFROTC at the University of Maryland where he was recognized as a Distinguished Graduate and nominated for a Regular Commission.

His first assignment was at Columbus AFB as a student in Undergraduate Pilot Training in February 1997. In May 1998, he was assigned to the 99th Contracting Squadron, Nellis AFB, Nevada where he served as an operational acquisition contracting officer. While stationed at Nellis, he deployed overseas in July 2000 to spend three months in Riyadh, Saudi Arabia as the Joint Task Force-Southwest Asia contingency contracting officer. In May 2002, he entered the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to the Pentagon.

Note: It is prohibited to include any personal information in the following categories about U.S. citizens, DoD Employees and military personnel: social security account numbers; home addresses; dates of birth; telephone numbers other than duty officers which are appropriately made available to the general public; names, locations and any other identifying information about family members of DoD employees and military personnel.

Sample 24. SF 298; Report Documentation Page

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 074-0188	
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 01-09-2002		2. REPORT TYPE Master's Thesis		3. DATES COVERED (From – To) Jun 2001 – Sep 2002	
4. TITLE AND SUBTITLE An Air Force Guide for Effective Meeting Management				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Belcher, Zackery, S., Captain, USAF				5d. PROJECT NUMBER If funded, enter ENR #	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S) Air Force Institute of Technology Graduate School of Engineering and Management (AFIT/EN) 2950 Hobson Way WPAFB OH 45433-7765				8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/GOA/ENS/02-2	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) ASC/QI Attn: Mr. John R. Smith 1865 4 th Street WPAFB OH 45433-7765 DSN: 785-4539				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT The purpose of this research was to improve the effectiveness of organizational meetings, thereby reducing the waste from ineffective meetings. Specifically, this thesis sought to answer three research questions addressing the essential elements for effective meetings, the benefits from productive meetings, and the information and skills critical to conducting meetings. The research questions were answered through a comprehensive literature review, and the use of the Delphi Technique. However, the solicitation of meeting materials from 16 Malcolm Baldrige National Quality Award winners and 90 Fortune 1,000 firms provided additional information. Seven experts, representing Air Force and industry, participated in two rounds of the Delphi Technique. The research identified the need for a concise and realistic length management tool to instruct managers on how to conduct effective meetings. Further, research highlighted that few corporations in industry have such a tool, even among those firms recognized as being the pinnacle of quality. The culmination of this effort was the development of an effective meeting management guide to outline and discuss the key elements for preparing and conducting organizational meetings. Recommendations to implement effective meeting management training using the guide are discussed.					
15. SUBJECT TERMS Meeting Management, Delphi Technique, Malcolm Baldrige, Business Meetings, Management, Leadership Training, Organizational Meetings, Quality, Meeting Guide, Meeting Training, Management Training, Organizational Theory, Group Dynamics					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 206	19a. NAME OF RESPONSIBLE PERSON Stephen P. Chambal, Capt, USAF (ENS)
REPORT U	ABSTRACT U	c. THIS PAGE U			19b. TELEPHONE NUMBER (Include area code) (937) 255-6565, ext 4314; e-mail: Stephen.Chambal@afit.edu

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18

Sample 24. Instructions for SF 298

Instructions for Completing the SF 298

Instructions are keyed to block numbers on the form; material must fit within the space of the blocks on the form.

- Block 1. Month and year of your graduation (not the month you turn in the thesis).
- Block 2. Enter the phrase **Master's Thesis** or **Doctoral Dissertation**.
- Block 3. Indicate the time during which the work was performed and the report was written, e.g., Jun 2001 – Mar 2002.
- Block 4. Enter the complete title of the thesis or dissertation. **TITLES ARE NOW TO BE UPPER AND lower case LETTERS.** On classified documents, enter the title classification in parentheses.
- Block 5a/b/c. Leave blank.
- Block 5d. Enter ENR funding number if work was funded. (Ask advisor for the number.)
- Block 5e/f. Leave blank.
- Block 6. Enter name (s) of person (s) responsible for writing the thesis/dissertation. The form of entry is the last name, first name, middle initial, and if military, add rank and branch of service or if civilian, enter GS rank and sponsoring agency. Follow alphabetical order for two or more authors.
- Block 7. Enter address: Air Force Institute of Technology, Graduate School of Engineering and Management (AFIT/EN), 2950 Hobson Way, WPAFB OH 45433-7765.
- Block 8. Enter your thesis or dissertation designator (Example: AFIT/GAQ/ENV/03-10M).
- Block 9. Enter the name, rank, title, complete address (including street number and zip code) and phone number (DSN if applicable or commercial) of your sponsor, if you have one; enter N/A if there is no sponsor.
- Block 10. Leave blank.
- Block 11. Leave blank.
- Block 12. Enter the appropriate distribution statement.
- Block 13. Leave blank.
- Block 14. Enter a short abstract. Maximum length is 200 words. The main items to be described in the abstract include the problem statement, the methodology followed, the findings and conclusions.
- Block 15. Enter four or five key words or phrases. Choose at least four of these terms from the DTIC Thesaurus, a reference guide located near the reference desk in the AFIT Library. The DTIC Thesaurus is, also, accessible on the web at <http://stinet.dtic.mil/str/> by clicking on DTIC Thesaurus and conducting a search. Use of these terms will ensure that other researchers conducting DTIC searches can readily locate your document.
- Block 16a, 16b, and 16c. Enter security classification in accordance with security classification regulations, e.g. U, C, S, etc. If this forms contains classified information, stamp classification level on the top and bottom of this page.
- Block 17. Enter either UU (Unclassified Unlimited) or SAR (Same as Report).
- Block 18. Page count. Enter the total number of all pages in the thesis or dissertation with any type of printed material. Cover is Page 1, every page with printing is counted as a page, SF 298 is the last page and is counted as a page in the page count.
- Block 19a. Enter the faculty advisor's name and department office symbol.
- Block 19b. Indicate the department phone number of the faculty advisor.

Sample 25. Thesis Distribution Memorandum (Front)

MEMORANDUM FOR EN _____ Date _____

FROM: _____
Author's Name Rank/Grade

SUBJECT: Thesis Distribution _____
Thesis Designator

THESIS TITLE: _____

PART I - To be completed by all students.

1. I request my thesis be assigned the following Distribution Code:

- ☐ A Approved for public release; distribution is unlimited.
- ☐ B Distribution authorized to U.S. Government agencies only . . .
 - ☐ Foreign Govt. Info ☐ Premature Dissemination
 - ☐ Proprietary Info ☐ Admin/Operational Use
 - ☐ Critical Technology ☐ Software Documentation
 - ☐ Test & Evaluation ☐ Specific Authority
 - ☐ Contractor Perf Eval
- ☐ C Distribution authorized to U.S. Government agencies and their contractors . . .
 - ☐ Foreign Govt. Info ☐ Admin/Operational Use
 - ☐ Critical Technology ☐ Specific Authority
 - ☐ Software Documentation
- ☐ D Distribution authorized to DoD and DoD contractors only . . .
 - ☐ Foreign Govt. Info ☐ Critical Technology
 - ☐ Admin/Operational Use ☐ Specific Authority
 - ☐ Software Documentation
- ☐ E Distribution authorized to DoD components only . . .
 - ☐ Direct Military Support ☐ Software Documentation
 - ☐ Foreign Govt. Info ☐ Contractor Perf Eval
 - ☐ Proprietary Info ☐ Critical Technology
 - ☐ Premature Dissemination ☐ Admin/Operational Use
 - ☐ Test & Evaluation ☐ Specific Authority
- ☐ F Further dissemination only as directed . . .
- ☐ X Distribution authorized to U.S. Government agencies and private individuals. . .eligible to obtain export-controlled technical data...

2. A survey was/was not (circle one) used in this thesis. If so the Survey Control Number was _____.

Sample 25. Thesis Distribution Memorandum (Back)

PART II - To be completed by students requesting limited distribution theses.

3. Rationale for requesting distribution other than Category A (Be specific e.g. data, citations, etc.)

4. I have coordinated with _____ (organization) and they will serve as the releasing authority for this thesis. (other than Category A)

5. If known, please describe the date and/or condition under which this limited distribution may be changed and what the new distribution statement should be.

Author's Signature

Author's Typed Name

PART III - To be completed by student thesis advisor

1st Ind, Thesis Advisor

TO: EN_

Concur.

Thesis Advisor's Signature

Thesis Advisor's Typed Name

2nd Ind, EN_ (Required for Category B-X, for Category A, forward to AFIT/PA)

Approved.

(Signature)

Sample 26. Special Dissertation Abstract

A NUMERICAL SOLUTION OF INCOMPRESSIBLE TURBULENT CHANNEL FLOWS BY INVARIANT MODELING

by

Robert N. Poplawski, PhD
Major, USAF

Major John V. Kitowski, Advisor

A numerical technique was developed for incompressible turbulent channel flows which predicts the entire flow field downstream of any initial station. The technique includes any of the flow fields from a two-dimensional confined ejector region to the fully developed turbulent flow regime. The continuity, momentum, four one-point velocity correlations, and volumetric constraint equations are used as fundamental governing equations. Closure is achieved by using Donaldson's Invariant Models, which require the specification of six constants to accommodate the experimental data. The numerical solutions were obtained by converting the momentum and one-point velocity correlation equations (with corresponding boundary conditions) to an implicit linear tri-diagonal set of $5N-7$ equations in $5N-7$ unknowns, where N represents the number of transverse grid lines. These equations were solved by inverting N five by five matrices once the axial pressure gradient was specified. Because the pressure was inconstant over affected areas, the equations were adjusted.

Sample 27. AFIT Research Assessment Questionnaire



RESEARCH ASSESSMENT QUESTIONNAIRE

TO: «OSymbol»
(«SName»)
«Address1»
«City» «State» «ZipCode»

Thank you for sponsoring the AFIT thesis or dissertation listed below. AFIT is working hard to keep its research focused on defense technologies of interest to the Air Force and to the nation.

Title: «Title»

Student Author: «Author»

Designator: «Designator»

Faculty Advisor: «FacultyAdvisor»

Date of Graduation: «Graduate_Date»

Please help us determine the value and contribution of this research to your organization's mission by answering the questions below:

1. Did this research contribute to a current task or goal of interest to your organization? Y / N
2. Would you have completed this work if AFIT had not done it? Y / N
3. Regardless of your answers above, how would you rate this work?
Highly significant
Significant
Slightly significant
No significance

4. If AFIT had not done this work, please estimate what it would have cost your organization to perform it, either by using in-house resources or by contract.* Man-Years ____ \$ _____

**Please note that typically an MS thesis requires 0.5MY of the student's time and one month of the faculty advisor's time. For a PhD dissertation the numbers are 2MY for the student and 4 months for the advisor.*

5. . Please describe how this thesis impacted your area of responsibility, or provide other comments you would like to make. (For example, have particular changes been made or planned as a result of this work? What was/will be the impact of the changes?) All comments will be shared with the faculty advisor, the academic department, and AFIT administrators as appropriate.

You may mail this to AFIT/ENR, 2950 Hobson Way Street, Wright-Patterson AFB OH 45433-7765, or fax it to (937) 656-9043 (DSN 986-9043), or just e-mail your answers (only) to 1 to 5 to research@afit.edu.

If you use e-mail, please include the designator above so that we might identify the project.

Thank you.

Name of Evaluator

Office Symbol

Grade/Rank of Evaluator

Sample 28. Checklist of Thesis Documents and Receipt

OFFICE OF RESEARCH AND SPONSORED PROGRAMS (AFIT/ENR) CHECKLIST OF THESIS DOCUMENTS & RECEIPT

Candidate's Name: _____ Designator: AFIT/ / /

Please deliver these items to your department for forwarding to ENR as a package, except as noted:

1. Original Plus a Printed Copy (*or more) of Thesis**:
 - ☐ Original on 25% or greater rag stock, unbound and 1 sided, for the AFIT library collection
 - ☐ Copy, bound, for Sponsor via ENR
 - *If you have multiple sponsors, please deliver one bound printed copy per sponsor.
 - Note: Candidate should have provided copies (in the format prescribed by the department) directly to:
 - ☐ Faculty Advisor
 - ☐ Academic Department
 - ☐ Each thesis committee member (typically 3 faculty)
 - **If you have a nonprint product, include one copy on a CD-ROM with each printed copy.
 - Provide one additional unbound copy for DTIC if you have nonprint product with your thesis.
2. ☐ Copy of AFIT/PA Public Release (Distribution A only).
3. ☐ 1 printed copy of the Research Impact Statement (See Chapter IX and Sample 31).
4. ☐ 1 electronic file of the Research Impact Statement in MSWord saved by your department's Ed Tech to K:\Research Impact Statements\EN*\LastNameRIS.doc (See Chapter IX and Sample 31).
5. ☐ Proof of .pdf delivered to department (See Chapter IX). _____ Initials of department representative.
6. ☐ 1 paper copy of the SF298, Report Documentation Page.

NOTES:

1. Samples are found in the *Style Guide for AFIT Dissertations, Theses, and Graduate Research Papers*.
2. The department will copy the .pdf file of the thesis to the AFIT Only server.
3. Each printed copy of the thesis must have the blue stock paper front and back cover.
4. Each copy of the thesis requires an SF 298 (front side only) as the last page.

ENR Received by: _____

Date: _____

Sample 29. Checklist of Dissertation Documents and Receipt

OFFICE OF RESEARCH AND SPONSORED PROGRAMS (AFIT/ENR) CHECKLIST OF DISSERTATION DOCUMENTS & RECEIPT

Candidate's Name: _____ Designator: AFIT/ / /

Dissertation Process

Step 1: Submit final document (either as a printed copy or electronic file) to AFIT/PA for release approval.

Step 2: Obtain Dean's approval of the final dissertation document. Note: When requesting the Dean's signature on the final document, the Dean's Representative letter must accompany the document along with the AFIT/PA release approval. The copy to present the Dean is your dissertation on 100% rag paper.

Step 3: After the Dean's approval, please deliver the below listed items to ENR as a package, except as noted:

1. Original plus 2 (*or more) copies of dissertation**:

- ☐ Original on 100% rag stock, unbound and 1 sided, for the AFIT library collection
- ☐ Copy 1, unbound, for ProQuest microfilming
- ☐ Copy 2, bound, for Sponsor via ENR

*If you have multiple sponsors, please deliver one bound printed copy per sponsor.

Candidate should have provided copies (in the format prescribed by the department) directly to:

- ☐ Faculty Advisor
- ☐ Academic Department
- ☐ Each committee member

**If you have a nonprint product, include it on a CD-ROM for each printed copy. Additionally, provide a printed unbound copy for DTIC if you have nonprint product with your dissertation.

2. ☐ AFIT/ENR submission requirements:

- ☐ Completed NORC Survey of Earned Doctorates (get from ENR)
- ☐ 1 printed copy of the Research Impact Statement (see Chapter IX and Sample 31)
- ☐ 1 electronic file of the Research Impact Statement in MSWord saved by your department's Ed Tech to K:\Research Impact Statements\EN*\LastNameRIS.doc (See Chapter VIII and Sample 31).
- ☐ Copy of AFIT/PA Public Release
- ☐ 1 paper copy of the SF298, Report Documentation Page.

3. ☐ ProQuest Information and Learning Company Agreement with enclosures (get from ENR)

- ☐ Completed ProQuest Information and Learning Company Agreement (get from ENR)
- ☐ Cashier's check for \$55.00, made out to ProQuest Information and Learning Company (for the publishing fee). If you request extra services, there will be an extra charge at your expense. Please note that AFIT does not endorse or recommend any extra services.
- ☐ Original of Special Dissertation Abstract with advisor's name (see Sample 26)
- ☐ Copy of the title page of your dissertation (see Sample 6)

4. ☐ Proof of .pdf delivered to department (See Chapter IX). _____Initials of department representative.

NOTES:

- 1 Samples are found in the *Style Guide for AFIT Dissertations, Theses, and Graduate Research Papers*.
- 2 The department will copy the .pdf file of the dissertation to the AFIT Only server.
- 3 Each printed copy of the dissertation must have the blue stock paper front and back cover.
- 4 Each copy of the dissertation requires an SF 298 (front side only) as the last page.

Received by: _____ Date: _____

Sample 30. Illustrations of Type Faces and Sizes

The suggested minimum font size is 12 point. Times New Roman is often selected as the font. Consider raising subscripts to a font size of 9 point while sub-subscripts are often in font size 7 point.

Readability goes well beyond word usage and grammar. Consider how words, sentences and paragraphs will look when they appear on the page. Type face and type size play vital roles. Also remember that when a thesis is transferred to microfiche it is reduced 24X. When enlarged it comes back to only 85% of original size. The original type size must be sufficient to retain readability through this process. This paragraph is done in Courier - 12 pt.

Readability goes well beyond word usage and grammar. Consider how words, sentences and paragraphs will look when they appear on the page. Type face and type size play vital roles. Also remember that when a thesis is transferred to microfiche it is reduced 24X. When enlarged it comes back to only 85% of original size. The original type size must be sufficient to retain readability through this process. This paragraph is done in Times New Roman - 12 pt.

Readability goes well beyond word usage and grammar. Consider how words, sentences and paragraphs will look when they appear on the page. Type face and type size play vital roles. Also remember that when a thesis is transferred to microfiche it is reduced 24X. When enlarged it comes back to only 85% of original size. The original type size must be sufficient to retain readability through this process. This paragraph is done in Times New Roman - 11 pt.

Labels in charts and graphs exist in cramped quarters, yet must be noticed, be legible and readable. A sans-serif face such as Univers, in bold face caps, usually fills the bill.

BIFURCATED FALVBARMS TRENDS [Univers bold face 12 pt]

BIFURCATED FALVBARMS TRENDS [Univers bold face 10 pt]

BIFURCATED FALVBARMS TRENDS [Univers bold face 9 pt]

BIFURCATED FALVBARMS TRENDS [Univers bold face 8 pt]

Sample 31. Research Impact Statement

Student B.F. Lowe	Faculty Advisor Perram, G.P.	Thesis Designator AFIT/GEP/ENP/02-2	Keyword #1 Lasers	Keyword #2
Sponsor (MAJCOM) Agent AFRL/DEL (AFMC)	Agent Hager, G.D.	Phone (505)-846-0718	Program Airborne Laser	Funding \$15,000

Title: Radial Diffusion Between Coaxial Cylinders

Subject: Kinetics in the Supersonic Nozzle of a Chemical Oxygen-Iodine Laser

Air Force, DOD, or Other Relevant Program Description:

Within the last decade, tactical theater ballistic missiles - such as the Scuds used by Iraq during Desert Storm – have emerged as major threats to American forces deployed abroad and allied nations as well. The \$5B Airborne Laser program mounts a Chemical Oxygen-Iodine Laser weapon, or COIL, aboard a Boeing 747 to provide boost-phase theater missile defense. The Airborne Laser weapon system would operate at altitudes above the clouds where it can acquire and track missiles in boost flight, and then accurately point and fire the laser with such energy that the missile is destroyed over enemy territory.

Impact Statement:

The Chemical Oxygen-Iodine Laser operates by injecting molecular iodine into a supersonic flow of electronically excited molecular oxygen to produce lasing on the 1.315 micron transition in atomic iodine. Energy losses can result from the interaction of the gas flow with the nozzle assembly through surface reactions. Some COIL devices use teflon coated nozzle blades to minimize such energy losses. However, flaking of the teflon coating requires regular maintenance. To assess the affects of nozzle material on laser performance, this experimental research project measured the rates for surface deactivation at various metal and coated surfaces.

Technical Abstract:

The rates for deactivation of singlet oxygen, $O_2(b^1 \Sigma_g^+)$, upon collision with pyrex, teflon, aluminum, copper, and nickel surfaces have been determined in a steady-state flow tube reactor. Numerical and approximate analytic solutions of the radial diffusion equation with coaxial cylindrical boundary conditions are presented to obtain wall deactivation probabilities from observed first-order decay rates. The probability for deactivation at nickel surfaces is large, ≈ 0.026 . However, it is unlikely that surface deactivation of $O_2(b^1 \Sigma_g^+)$ in chemical oxygen-iodine lasers has any significant effect on laser performance.

Subject Terms: Chemical Oxygen-Iodine Laser (COIL), Airborne Laser (ABL), singlet oxygen, surface deactivation.

Publications:

1. G.P. Perram, D.A. Determan, J.A. Dorian, B.F. Lowe, and T.L. Thompson, "Radial Diffusion Between Coaxial Cylinders and Surface Deactivation of $O_2(b^1 \Sigma_g^+)$ ", Chem Phys, 162, 427, June 1992.
2. G.P. Perram, D.A. Determan, J.A. Dorian, B.F. Lowe, and T.L. Thompson, " Surface Deactivation of $O_2(b^1 \Sigma_g^+)$ ", Intense Laser Beams and Applications, SPIE Volume 1871, 181 (1993).

Presentations:

1. G.P. Perram, D.A. Determan, J.A. Dorian, B.F. Lowe, and T.L. Thompson, "Radial Diffusion Between Coaxial Cylinders and Surface Deactivation of $O_2(b^1 \Sigma_g^+)$ ", SPIE International Symposia on Laser Engineering, 16-23 January 1993, Los Angeles, CA.

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