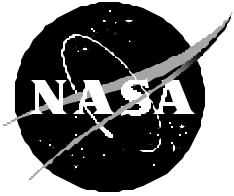


NASA/SP—2005–7602 (Rev.1)



# **NASA Publications Guide for Authors**

National Aeronautics and  
Space Administration

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July 2005

## NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers, but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., "quick-release" reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

- Access the NASA STI program home page at <http://www.sti.nasa.gov>
- E-mail your question via the Internet to [help@sti.nasa.gov](mailto:help@sti.nasa.gov)
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Telephone the NASA STI Help Desk at (301) 621-0390
- Write to:  
NASA STI Help Desk  
NASA Center for AeroSpace Information  
7121 Standard Drive  
Hanover, MD 21076-1320

NASA/SP—2005–7602 (Rev.1)



# **NASA Publications Guide for Authors**

National Aeronautics and  
Space Administration

NASA Scientific and Technical Information Program

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July 2005

## Acknowledgments

The NASA scientific and technical information (STI) program gratefully acknowledges the work of the NASA STI Publications Policy Review Committee (PPRC) and the NASA Center for AeroSpace Information.

### Available from:

NASA Center for AeroSpace Information  
7121 Standard Drive  
Hanover, MD 21076-1320  
301-621-0390

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
703-605-6000

This report is also available in electronic form at <http://www.sti.nasa.gov/> and <http://ntrs.nasa.gov/>

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# 1 Getting Started

This guide gives you basic information about publishing NASA scientific and technical information (STI). For additional information, contact your Center or Headquarters STI or technical publications manager and see <http://www.sti.nasa.gov>, "Publish STI." Extensive information is given in NASA Procedural Requirements (NPR) 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information (STI), reference 1.

Documenting and publishing the results of your work are part of your responsibilities as a NASA employee. The National Aeronautics and Space Act of 1958 established a requirement for NASA to provide "the widest practicable and appropriate dissemination of information concerning its activities and the results thereof." If you are engaged in NASA-funded or NASA-sponsored research and development and related efforts, it is important to publish the results of your work in the NASA STI Report Series or through other externally accessible channels, as appropriate.

STI is defined in NASA Policy Directive (NPD) 2200.1, Management of NASA Scientific and Technical Information (STI), reference 2, as the results (facts, analyses, and conclusions) of the Agency's basic and applied scientific, technical, and related engineering research and development. STI also includes management, industrial, and economic information relevant to this research.

Examples include, but are not limited to, technical papers and reports, journal articles, meeting, workshop, and conference papers and presentations, conference proceedings, and preliminary or non-published STI, including any of these examples that will be posted to a public Internet website.

This guide is based not only on requirements in NPR 2200.2 but also on current professional publications standards.

Section 1 gives an overview. It also reminds you of your role in sharing your work through documenting STI for NASA and the U.S. taxpayers, when appropriate.

Section 2 describes each type of report in the NASA STI Report Series and other forms of publications. It also discusses dissemination and safeguarding of STI for the future.

Section 3 discusses technical, data quality, and dissemination reviews, including the mandatory review via NASA Form (NF) 1676, NASA Scientific and Technical Information (STI) Document Availability Authorization (DAA), for any NASA STI released external to the Agency or presented at internal meetings or workshops at which foreign nationals may be present. This section also discusses handling unlimited and limited/restricted STI.

Section 4 provides recommended standards for document format, composition, and organization. It also gives specifics regarding the elements of a typical report.

Section 5 presents miscellaneous preparation recommendations. As a reminder, this section is intended to be a brief explanation. If you need more specific, detailed information, see NPR 2200.2 (ref. 1) and <http://www.sti.nasa.gov>. You can also contact the NASA Center for Aerospace Information (CASI), NASA's STI contractor facility, at email: [help@sti.nasa.gov](mailto:help@sti.nasa.gov).

Section 6 discusses two required forms you need to publish your NASA STI. These include NF-1676, and if you plan to publish in the STI Report Series, Standard Form (SF) 298, Report Documentation Page.

Please contact your Center technical publications office to discuss specific preparation, review and approval, distribution, and scheduling requirements for your proposed publication.

## **2 General Information**

### **2.1 Selection of Publication Type**

Various NASA and non-NASA publication types are available to you to publish NASA STI. NASA publication types include the NASA STI Report Series. Non-NASA publication types include oral presentations, periodicals, journal articles, books, or proceedings by non-NASA publishers. All releases are subject to approval as prescribed in reference 1 (NPR 2200.2) and the NF-1676.

#### ***2.1.1 NASA STI Report Series***

The NASA STI Report Series comprises six types of technical reports. The six report types (Technical Publication, Technical Memorandum, Contractor Report, Conference Publication, Special Publication, and Technical Translation) are described in Sections 2.1.1.1 through 2.1.1.6.

The appropriate NASA STI Report Series type is selected according to your document content and the needs of your readership. Make the selection based on the descriptions provided herein, with assistance from your Center technical publications office, if needed. Appendix A is a quick-reference tool for matching manuscript contents with the appropriate NASA STI Report Series type. Your selection is subject to approval as part of your Center's review process. Appendix B gives you a checklist of important items to know to publish in the NASA STI Report Series.

When a document is approved for publication, your Center technical publications office obtains a report number from the NASA Center for AeroSpace Information (NASA CASI). The NASA numbering scheme meets the ANSI (American National Standards Institute) standards and is in the format: NASA/TM--2005-123456, where TM is report series type. All STI that is published or released via any media must have an approved NF-1676 on file at the originating Center and submitted to NASA CASI. If you plan to present your STI at an internal seminar, workshop, or meeting at which foreign nationals are invited or likely to attend, you must also have your STI approved via NF-1676 prior to presentation. A copy of NF-1676 is found at URL [https://extranet.hq.nasa.gov/nef/user/form\\_search.cfm](https://extranet.hq.nasa.gov/nef/user/form_search.cfm) and through your Center forms manager and the forms server.

##### **2.1.1.1 Technical Publication (TP)**

This series comprises reports of completed research or of a significant phase of research that presents the results of NASA programs. TPs usually include extensive data or theoretical analysis, but they may also be compilations of significant scientific and technical data or information deemed to be of continuing reference value. TPs are the NASA counterpart to peer-reviewed formal professional papers but have less stringent limitations on manuscript length and extent of graphic presentation. In addition to reports documenting research, the types of documents assigned to this series include the following:

- a. Bibliographies of STI literature in defined subject areas with abstracts and/or extensive annotation
- b. Technical handbooks, critical tables, and extensive data compilations



- c. Design standards. Authors should also document their design standards in the NASA Technical Standards Program, in accordance with NPD 8070.6, Technical Standards (ref. 3)
- d. Scientific and technical textbooks and manuals
- e. State-of-the-art summaries, including critical reviews or surveys of a body of scientific or technical literature
- f. Technical reports or monographs that provide complete and comprehensive treatment of significant contributions to scientific and technical knowledge, or a critical evaluation of selected, previously published research

#### **2.1.1.2 Technical Memorandum (TM)**

This series records scientific and technical findings that are preliminary or of specialized interest, e.g., "quick-release" reports, working papers, and bibliographies that contain minimal annotation. TMs do not contain extensive analysis. The types of documents assigned to this series include:

- a. Preliminary data ("quick-release" reports)
- b. Working papers for professional peers beyond the basic work unit or for external circulation
- c. Individual papers prepared for presentation at or preprints for professional meetings or symposia, which may or may not be published later in proceedings or journals
- d. Preliminary proceedings of professional meetings or symposia sponsored or cosponsored by NASA. When the proceedings are not complete, indicate the extent of the content, e.g., "abstracts only" or "primarily viewgraphs," in the Supplementary Notes block of SF-298
- e. Theses or dissertations that relate to Agency work, written by NASA employees only
- f. Bibliographies that are written by NASA employees, contractors, and grantees, and that present listings of STI literature with minimal annotations
- g. Computer program application documentation
- h. Limited-use data compilations
- i. Reports to other agencies or non-NASA-sponsored research results

#### **2.1.1.3 Contractor Report (CR)**

This series comprises reports of scientific and technical findings by NASA-sponsored contractors, grantees, and cooperative agreement recipients and dissertations or theses by NASA contractors or grantees (if funded by NASA).

CRs may contain findings of completed or significant scientific and technical work or findings of preliminary or specialized interest.

A NASA contracting officer's technical representative (COTR) or technical management can select a final report or non-required report authored by a contractor, grantee, or cooperative agreement recipient for publication as a NASA CP, SP, or TP in lieu of publication as a CR. You may publish a given report in one series only. Such reports must meet all criteria for the selected series and must be reviewed and approved at the level(s) required for that series.

#### **2.1.1.4 Conference Publication (CP)**

This series contains collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.

##### ***2.1.1.4.1 Preprints.***

You may publish a preprint as a TM and distribute to attendees at conferences even though you intend to distribute as a CP.

##### ***2.1.1.4.2 Release of Conference Proceedings in Both Series.***

You may wish to publish a conference in both series, for example, if a significant amount of time will elapse between presenting the abstracts and illustrations as a TM and the full proceedings as a CP, or if you need handouts of the abstracts for the conference and you have not yet collected the papers. When you publish abstracts as a TM and the proceedings are subsequently published as a CP, note in the Supplementary Notes block of SF-298 for the CP that the CP supersedes the TM.

#### **2.1.1.5 Special Publication (SP)**

This series, which records scientific, technical, or historical information from NASA programs, projects, and missions, is most often concerned with subjects having substantial public interest. Examples of topics covered by this series, and the ranges of numbers assigned to the various topics, include the following:

- a. General series (numbered below 3000), e.g., NASA/SP--2005-2999
- b. Handbooks and data compilations (numbered in 3000 series), e.g., NASA/SP--2005-3000
- c. History and chronology series (numbered in 4000 series), e.g., NASA/SP--2005-4000

- 4000: Reference works
- 4100: Management histories
- 4200: Project histories
- 4300: Center histories
- 4400: General histories
- 4500: Monographs in Aerospace History
- 4600: Electronic media (data CDs and DVDs)
- 4700: Historical conference proceedings

d. Numbers in the 5000 range were originally assigned to technology commercialization information, but this type of information is now published outside the STI Report Series

e. Management publications series (numbered from 6000 to 6999), e.g., NASA/SP--2005-6000. This series documents requirements, plans, theories, or techniques for management or administration of NASA-sponsored scientific and technical work. It includes NASA projects or programs that have application to more than one Center, to other U.S. Government agencies, or to partnerships with industrial or international organizations. Although reports discussing methods of scheduling, funding, or staffing may be included, reports containing specific costs or labor figures are not appropriate. When the primary content of a report is scientific findings or technical development, such as a TM or TP, you should use another series

f. Bibliographic series (numbered from 7000 to 7999), e.g., NASA/SP--2005-7000. Regularly published abstracts, continuing bibliographies, indexes, publication guides, and announcement journals

#### **2.1.1.6 Technical Translation (TT)**

This series consists of English-language translations of non-English scientific and technical material pertinent to NASA's mission. A translation of material protected by copyright is a derivative work, distribution of which is constrained by international copyright law. However, TTs are retained at NASA CASI for U.S. Government use subsequent to the initial request for the translation.

#### **2.1.2 Non-NASA STI Publications**

Appropriate non-NASA publications for NASA STI include professional society journals, trade journals, and similar periodicals produced by professional, technical, or academic organizations, proceedings of scientific and technical conferences, symposia, and workshops, oral presentation, and books. These types of manuscripts submitted for publication must also have NASA prior approval via NF-1676.

Presentations at society meetings and other professional gatherings ensure the timely dissemination of NASA scientific and technical findings to appropriate audiences. You may also obtain a TM number for your presentation; this allows you to distribute copies to attendees and ensures that the paper is included in the NASA Aeronautics and Space Database (NA&SD) and its public interface (if appropriate), the NASA Technical Report Server (NTRS). "If appropriate" in the preceding sentence means unclassified, unlimited, and no copyright or distribution restrictions in the information. Such TMs may be published in proceedings published by the meeting sponsor.

#### **2.1.3 Duplicate Publication**

Publication of STI through non-NASA channels does not preclude the publication of equivalent information by NASA. For example, you can report significant findings in a journal and more detailed documentation of these findings as a NASA TP. You should not publish identical material through different channels, with the following exceptions for the TM series:

- Preprints of presentations at professional meetings
- Preprints of journal articles

## **2.2 Dissemination**

Regardless of type of publication, your NASA STI is distributed to the widest practical and appropriate audience unless the information must be protected (e.g., due to national security, export control, trade secret, restrictions/limitations, patent, other proprietary status, or Privacy Act consideration information). Before you release or distribute your NASA STI to the public, including on public Internet websites, you must have a signed and approved NF-1676 or your Center's equivalent on file at your Center. Your Center's technical publications office will send the NF-1676 with your STI to NASA CASI.

NASA CASI is responsible for initially disseminating NASA STI for the STI program, based on the release categories indicated on the NF-1676. For example, if the STI is unclassified and unlimited, it may be disseminated by NASA CASI to the National Technical Information Service (NTIS), the Government Printing Office (GPO) and Depository Libraries, and other U.S. Government agencies. If the STI is limited, it will be distributed by NASA CASI only in accordance with the NF-1676. NASA STI sent to NASA CASI is added to NA&SD, which is available to NASA and U.S. Government agencies and their contractors and grantees. Appropriate unclassified and unlimited NASA STI is also made available to the public through the NTRS.

As an author, you may also choose to have a Center distribution to known authors in your field, conference registrants, members of organizations or groups known to have an interest in your field, and persons who have requested similar prior papers. Check with your Center technical publications office, because there are additional approvals required if your STI is restricted or limited.

## **2.3 Safeguarding and Archiving STI**

The advantages of publishing and disseminating your report in the NASA STI Report Series are not only that it gains wide dissemination but also that it is archived (i.e., recorded for posterity) at the National Archives and Records Administration (NARA) through NASA CASI.

All NASA STI submitted to NASA CASI is backed up and safeguarded both on-site at CASI and off-site according to NASA requirements specified in NPR 2810, Security of Information Technology (ref. 4).

# **3 Reviews and Handling Unlimited and Limited STI**

## **3.1 Professional, Technical, and Data/Information Quality Reviews**

Professional reviews (also called editorial and content reviews) are performed by individuals or groups with technical knowledge or background tempered by interdisciplinary expertise in program management, history, and/or education. Such reviews assess the quality of the document content in terms of its readability, communication of information, and suitability for a particular audience without focus on technical content. See also Appendix C, Publications Review Checklist.

Technical reviews are performed by peers having expertise within the technical discipline of the activity or research being documented. Such reviews assess the technical integrity and merit of the activity or research being performed and the results being documented without regard to the effectiveness of the document at communicating the information. See Table 1 for guidance on required reviews.

Data/information quality reviews (ref. 5) are inherent in technical reviews. NASA accepts and encourages technical and data quality review by qualified external reviewers or committees of external reviewers for

its typical STI. The Agency also accepts technical review by qualified internal reviewers or committees of internal reviewers who are selected on the basis of technical expertise and who do not have (or have disclosed) prior situations or personal or funding issues that would affect their technical review. Peer reviews must be conducted in an open and rigorous manner. Peer reviews must also ensure that the data are reliable, unbiased, accurate, complete, and have full documentation, and they must ensure that circumstances that could affect data quality are identified and disclosed. For information on NASA’s data quality guidelines that implement reference 5, see <http://www.sti.nasa.gov>, STI-Related Information.

NASA also abides by the OMB *Final Information Quality Bulletin for Peer Review*,” December 15, 2004, available at [http://www.whitehouse.gov/omb/inforeg/peer2004/peer\\_bulletin.pdf](http://www.whitehouse.gov/omb/inforeg/peer2004/peer_bulletin.pdf). In extremely rare circumstances, NASA may publish publicly available STI that falls within the OMB definition of “Influential” or more rare, “Highly Influential” information. If you believe that your work may fall within one of these categories, OMB requires an additional level of peer review beyond that indicated in Table 1, including public notification prior to publication. Contact your center technical publications office and the NASA Information Quality Officer at NASA Headquarters (see <http://www.sti.nasa.gov/nasaonly/qualinfo.html>) for additional information on requirements for the more extensive level of peer review.

**Table 1. NASA STI Report Series/Publication Type**

<b>Document Type</b>	<b>Review Requirement</b>
TP	Technical review by committee of peers or expert single reviewer
TM	Review by technical management
CR	Review by NASA technical management or expert reviewer
CP	Review by technical management
SP	Professional review controlled by HQ Office or NASA Center
TT	No technical review; some printing authorization required; permission to use copyrighted information must be obtained
Non-NASA Publications	Review by technical management and proofreading review

### **3.2 Dissemination Reviews**

NASA’s dissemination reviews are handled through the mandatory NF-1676 review. The NF-1676 review is NASA’s compliance review for the release of NASA STI by or for NASA through any channel or media. It also applies to the presentation of NASA STI at internal meetings or workshops at which foreign nationals may be present. The NF-1676 review not only encourages technical approval but also requires reviews for restricted access STI, such as national-security-classified information, export-controlled information, proprietary/sensitive STI, and documents disclosing an invention. A copy of the

latest version of NF-1676 can be found at [https://extranet.hq.nasa.gov/nef/user/form\\_search.cfm](https://extranet.hq.nasa.gov/nef/user/form_search.cfm) or via your Center's forms manager or server.

### **3.3 Handling Publicly Available and Limited STI**

#### ***3.3.1 Publicly Available STI***

Publicly available STI is STI that is unclassified, does not contain export-controlled or proprietary/sensitive information, has no distribution limitations, and if it contains information disclosing an invention, it has been cleared by the Headquarters or Center Patent or Intellectual Property Counsel. If it is intended for use on a public Internet website, it must also meet the NASA Internet guidelines, discussed in Section 3.3.2.1.

All NASA STI that does not meet any of the criteria for distribution limitations described herein will be considered approved for public release. Information approved for public release will be made available by NASA CASI to any and all pertinent distribution channels, in keeping with the policy set forth in OMB Circular A-130 (ref. 6).

#### ***3.3.2 Limited STI***

The following section discusses types of limitations that pertain to NASA STI. If you electronically transmit limited STI (via email or the Internet, including within a NASA Center), you must encrypt it. See NPR 2810 (ref. 4) and URL <http://www.sti.nasa.gov>, Publish STI, Electronic File Formats.

##### **3.3.2.1 NASA Internet Guidelines**

NASA has additional guidelines if you plan to release your document on a public Internet website. These are cited in "NASA Internet Publishing Content Guidelines," NITR (NASA Information Technology Requirement) 2810-3 (ref. 7), available through the Agency's NODIS (NASA Online Directives Information System) Internet website. If restrictions apply based on this document, use the appropriate restriction in Section 3.3.2.13.

##### **3.3.2.2 Administratively Controlled Information (ACI)**

Guidelines for determining and marking administratively controlled information (formerly referred to as "For Official Use Only (FOUO)" information) are given in NPR 1600.1, Security Procedures and Guidelines (ref. 8) and via NASA Form 1686. For more information about ACI that does not fall within the categories indicated on NF-1676, contact the NASA Headquarters Office of Security and Program Protection.

##### **3.3.2.3 National Security Reviews**

Your STI must be reviewed via NF-1676 to determine whether the information is subject to security classification (see NPR 1600.1, ref. 8, and NPR 2810.1, ref. 4). It must also be reviewed if it is intended for release to a foreign government and/or for publication, dissemination, and presentation when such material contains information pertaining to the Department of Defense, e.g., aeronautics programs, space launches, or space operations, regardless of the source of the materials.

### 3.3.2.4 Export Control Reviews

Export control limitations are applied to information subject to:

- a. Arms Export Control Act, 22 U.S.C. 2778 et seq. (ref. 9)
- b. Export Administration Act of 1979, Pub. L. 96-72 Stat. 503, 50 U.S.C. app. 2401 et seq. (ref. 10)
- c. International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130 (ref. 11)
- d. Export Administration Regulations (EAR), 15 CFR Parts 730-774 (ref. 12)

These regulations establish lists or categories of technical data subject to export control that may not be exported or disclosed to foreign nationals without proper authority. The term exported includes providing information, or making information available, to a foreign national (including a U.S. citizen representing a foreign national if that individual intends to provide the information to a foreign national) either within the U.S. or abroad. Information placed on the Internet in an unrestricted manner is deemed an export.

The export control review is required to ensure that NASA STI Report Series; conference, meeting, and symposia presentations; abstracts; and external publications containing information subject to control under pertinent U.S. export laws or regulations are suitably protected. Each such report, presentation, abstract, or publication must be reviewed and approved by or in conjunction with the Headquarters or Center Export Administrator prior to the release, in any media, to audiences that may include foreign nationals. Examples are

- a. Presentations at internal meetings at which foreign nationals are likely to attend
- b. Presentation at “open” meetings in the U.S. which may include foreign nationals
- c. Presentations at meetings held in foreign countries
- d. Publications intended for public dissemination and/or distribution
- e. Unrestricted electronic releases over the Internet

The abstract, complete report, and presentation must be approved prior to release.

Under certain conditions, officials overseeing specific contracts or projects may, on a case-by-case basis, be granted limited delegations of authority to approve publications when the contracts or projects are restricted to topics exempt from export controls. These limited delegations are coordinated through the NASA Office of External Relations and the cognizant NASA Headquarters Mission Directorate.

#### **3.3.2.4.1 International Traffic in Arms Regulations (ITAR – 22 CFR 120-130)**

The ITAR implements the Arms Export Control Act, and contains the United States Munitions List (USML). The USML identifies articles, services, and related technical data that are designated as "Defense Articles" and "Defense Services," pursuant to Sections 38 and 47(7) of the Arms Export Control Act. The ITAR is administered by the U.S. Department of State. "Technical Data" as defined in the ITAR does not include information concerning general scientific, mathematical, or engineering principles commonly taught in schools, colleges, and universities or information in the public domain (as that term is defined in 22 CFR 120.11). It also does not include basic marketing information on function and purpose or general system descriptions. For purposes of the ITAR, the following definitions apply:

- a. "Defense Article" (22 CFR 120.6). A "Defense Article" is any item or "Technical Data" on the United States Munitions List (USML) (22 CFR 121.1). The term includes "Technical Data" recorded or stored in any physical form, models, mockups, or other items that reveal "Technical Data" directly relating to items designated in the USML. Examples of "Defense Articles" included on the USML are (1) launch vehicles, including their specifically designed or modified components, parts, accessories, attachments, and associated equipment, (2) remote-sensing satellite systems, including ground control stations for telemetry, tracking, and control of such satellites, as well as passive ground stations if such stations employ any cryptographic items controlled on the USML, or they employ any uplink command capability, all components, parts, accessories, attachments, and associated equipment (including ground support equipment) that is specifically designed, modified, or configured for such systems. (See 22 CFR 121.1 for the complete listing.)
- b. "Technical Data" (22 CFR 120.10). Information that is required for the design, development, production, manufacture, assembly, operation, repair, testing, maintenance, or modification of "Defense Articles." This includes information in the form of blueprints, drawings, photographs, plans, instructions, and documentation.
- c. Classified information relating to "Defense Articles" and "Defense Services." Information covered by an invention secrecy order (35 U.S.C. 181 et seq.; 35 CFR Part 5).
- d. Software directly related to "Defense Articles," including, but not limited to, system functional design, logic flow algorithms, application programs, operating systems, and support software for design, implementation, test, operations, diagnosis, and repair.

If NASA STI contains "Technical Data" or "Defense Articles" as defined above, it is restricted by ITAR and all copies must bear the "ITAR Notice" in 3.3.2.13. Release or distribution of the same information by NASA contractors is subject to the same notice. The restriction marking must appear on the cover, title page, and SF-298.

#### **3.3.2.4.2 Export Administration Regulations (EAR - 15 CFR 730-744)**

The EAR implements the Export Administration Act and contains the Commerce Control List (CCL). The CCL lists commodities, technology, and software subject to the export control authority of the U.S. Department of Commerce. The items on this list are export controlled for



reasons of national security, foreign policy, proliferation, and/or short supply. These regulations are administered by the U.S. Department of Commerce. Information subject to EAR export restrictions includes that specific "Technology" identified in the CCL (15 CFR 774).

a. "Technology" (Supplement 2 to 15 CFR 774). Specific information necessary for the development, production, or use of a product on the CCL. The information may be in the form of technical data or technical assistance.

b. "Technical Data." Information that may take forms such as blueprints, plans, diagrams, models, formulae, tables, engineering designs and specifications, manuals, and instructions written or recorded on other media or devices such as disk, tape, or read-only memories.

c. "Software." A collection of one or more computer or microcomputer programs fixed in any tangible medium of expression.

d. "Development Information." Specific information necessary for any stages prior to serial production, such as design, design research, design analyses, design concepts, assembly and testing of prototypes, pilot production schemes, design data, process of transforming design data into a product, configuration design, integration design, and integration design layouts.

e. "Production Information." Specific information necessary on any production stages, such as product engineering, manufacture, integration, assembly (mounting), inspection, testing, and quality assurance.

f. "Use Information." Specific information necessary for operation, installation (including onsite installation), maintenance (checking), repair, overhaul, and refurbishment.

g. Examples of information not subject to export control under the EAR. Such examples include:

(1) information that is publicly available via literature, library, patent, or seminar

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### **3.3.2.11.2 Notification Response**

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## 4 Format Information

The authorizing documents and standards for this guide are listed here. If you experience conflicting guidance, the sequence of the following list governs selection of the appropriate standard:

- NPR 2200.2, (ref. 1)
- Instructions issued by NASA Centers that implement the requirements of NPR 2200.2
- NASA publications containing style specifications (e.g., this document)
- U.S. Government Printing Office Style Manual (ref. 14)
- Technical society or other professional style guides

### 4.1 Templates (NASA STI Report Series)

You can see samples of NASA STI Report Series covers and title pages in NPR 2200.2 (ref. 1). You can access the templates for the NASA STI Report Series at <http://www.sti.nasa.gov>, Publish STI.

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### 4.2 Sections of Report

#### 4.2.1 Covers

Use the standard elements given on the NASA STI Report Series templates.

##### 4.2.1.1 Front Cover

- a. Report number(s). (If another agency's, Center's, or contractor's report or document number is added to the NASA report number, it must be positioned to the right or below the NASA report number)
- b. NASA insignia (the "meatball"); other logos as appropriate
- c. Title of report
- d. Author name(s), affiliation, and location
- e. Optional one-color line art or black-and-white photo or image
- f. Distribution notices, if applicable. Distribution notices, including limitations and restrictions, such as ITAR, EAR, SBIR, proprietary information, and copyright notices, must be placed on the cover, title page, and SF-298. See Section 3.3.2.13
- g. Conference information. Authors may choose to add conference information, such as conference name, location, dates, and sponsor

- h. Joint project or sponsorship information, if appropriate
- i. Rule (meaning a graphic straight line)
- j. Month/year

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#### **4.2.1.2 Back of Front Cover**

- a. NASA STI program profile

#### **4.2.2 Front Matter**

The subsections that follow identify standard elements for pages that precede the body, or text, of a NASA STI Report Series document.

#### **4.2.2.1 Title Page**

- a. Author name(s), affiliation(s), and locations
- b. Editor name and affiliation, if applicable (for edited CPs, TPs, or TMs when the editor has contributed scientific and technical expertise and judgment)
- c. Agency name and address (corporate source)
- d. Contract statement and number, if applicable
- e. Joint project or sponsorship information, if appropriate
- f. Conference information (name of conference, location, dates, sponsors, etc.), if applicable
- g. Distribution notices, if applicable. See Section 3

#### **4.2.2.2 Back of Title Page (p. ii)**

A sample of the back of a report title page that shows each of the following elements is given in Appendix D.

- a. Acknowledgment, if applicable
- b. Disclaimers, if applicable

- c. Statement announcing that the document is available from NASA CASI. In some cases, the document may also be available from the NTIS. Documents that are marked to be available from NTIS must be unlimited, unclassified (no restricted-access data). See the sample back of title page in NPR 2200.2 (ref. 1)
- d. International Standard Serial Number (ISSN), International Standard Book Number (ISBN), and/or Library of Congress Control Number (LCCN), if applicable
- e. Level of technical or professional review

### **4.2.2.3 Optional Front-Matter Elements**

- Foreword (by someone other than you as the author) and/or preface (by you as the author) (SPs, CPs, and reference works may contain either or both)
- Table of contents (Short reports may not need one, but longer reports do)
- List of tables
- List of figures or illustrations
- List of acronyms, symbols, and abbreviations used in text (may alternately be placed as an appendix or after introduction in text)

## **4.2.3 Body**

**4.2.3.1 Introduction.** The primary function of an introduction is to define the subject, significance, purpose, objectives, and scope of the work. The introduction may also include background information. Introductions will vary to some extent, depending on the nature of the material in the report.

**4.2.3.2 Symbols List.** An alphabetical-order or logical-order symbols list (with definitions and units) may directly follow the introduction or may be placed as front matter or in an appendix. If the list includes symbols from both the Latin and Greek alphabets, the symbols in the Latin alphabet precede those in the Greek. The list of subscript and superscript symbols usually follows the main symbols list, but may be included in the main list (for example, when a primary symbol and subscript or superscript are defined as a unit or when a symbol is used as both primary symbols and subscript or superscript).

**4.2.3.3 Main Text.** The central theme of a scientific and technical paper is developed in the main text. The overall organization of a report varies according to its subject and complexity. For example, experimental investigations contain comprehensive descriptions of specimens, apparatus, and procedures. Theoretical investigations, on the other hand, emphasize the application of new information to the state of the art. Typical report subsections are "Procedure," "Tests," "Discussion," and "Results."

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#### **4.2.4 Back Matter**

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When an appendix is written by someone other than you as the author of the main report, that person's name and affiliation should appear after the title of the appendix proper and after the appendix title on the contents page. A credit such as "With appendix [number and title] by [author]" should be placed on the report title page, in the contents, and in block 6 of the SF-298.

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- *What to Cite.* Cite all works consulted in the preparation of a paper--particularly those from which you take information--in the text where appropriate and in the reference list
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**4.2.4.3 Report Documentation Page (RDP).** The RDP (SF-298) is required for all reports published in the NASA STI Report Series, and is used for other types of information as determined by individual Center technical publications offices. Directions for preparing the SF-298 are given on the back of the form. The information given here offers further guidance. See also Appendix F.

- Place funding number in block 5
- *Symposium Presentation Preprinted as a Technical Memorandum or Published as a Conference Publication.* Identify the symposium in block 11, Supplementary Notes
- *Authors With Different Affiliations.* The affiliation of each author should be listed in block 11, Supplementary Notes, if they are different
- *Subject Categories. Required.* NASA CASI uses these categories to distribute reports to subscribers. See Appendix G to select categories; then place the number of the category in block 12a, Distribution/Availability Statement
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  - Objectives of the investigation
  - Methods used (e.g., simulations, experiment, or remote sensing)
  - Results obtained
  - Conclusions reached
- *Subject Terms.* Required; provide at least three. Select from the NASA Thesaurus (ref. 15) and place them in block 14
- *Classified Reports.* Ensure that all elements of SF-298 are unclassified and marked as such
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#### **4.3.1.6 Conference Sponsors and Editors**

Conference sponsorship is indicated on the title page of any proceedings published by NASA. The guidelines that follow are intended for use in preparing papers for the NASA STI Report Series. However, they may also be applied to NASA-authored works prepared for release through other channels. Your Center technical publications office can provide Center-specific guidelines and information about software for preparing reports.

#### **4.3.1.7 Mechanics and Layout**

##### ***4.3.1.7.1 Recommendations for Usage***

- *Font Size.* 11- to 12-point type (font) is highly recommended. Do not use a point size smaller than 10-point type
- *Print Resolution.* Set a minimum of 300 dots per inch
- *Type Style.* Choose sans serif for titles, text of figures, tables, and graphics; choose serif for text

##### ***4.3.1.7.2 Requirements for Text Placement***

A column of text may not end with a section heading alone, a heading and only one line of text, or a short line that is not the last line of a paragraph. A column may not begin with the last line of a paragraph. A page may not end with a hyphen.

##### ***4.3.1.7.3 Page Numbering***

- Use lower case roman numerals for pagination of front matter. Reserve page i for the title page, but do not show the number on the page
- Number main text pages sequentially throughout with arabic numerals (preferred style). If a long report has multiple sections or parts, it may be necessary to number sectionally with sets of numbers that indicate both section and page (e.g., 1-1, 4-2)

- Number back matter (such as appendixes) sequentially with main text (preferred style). If necessary, appendixes may be numbered separately, with the appendix designator followed by a hyphen, then the page number (e.g., A-1, A-2)
- Assign an implied page number to blank pages or pages that have a special layout which prevents the number from being shown

#### **4.4 Tables and Figures**

After data have been acquired, a decision must be made as to which data are to be presented in tabular (table) form and which in graphic (figure) form. Similar data should be presented in the same form throughout a report. To present detailed numerical data, use tables; for other types of information display, graphs may be more suitable.

##### ***4.4.1 Placement of Tables and Figures***

- *On a Page.* Place all tables and figures as close as possible to their first citation in the text. It is permissible to place them before a citation, if necessary, as long as they are on the same or facing page
- *In a Section.* Place tables and figures as close as possible to their first citation in the text unless it is necessary to group them at the end of the report
- *At the End of a Report.* Grouping figures and tables at the end of a report is appropriate only when such placement facilitates speedy publication or when large groups of figures or tables create reading or layout problems. In these cases, place figures and tables at the back of the document, following the references
- *In an Appendix.* If tables and figures contain only supplementary information, place them in an appendix and leave the text to carry a discussion of the data and summary graphs
- *Orientation.* Orient figures upright (portrait), rather than broadside (landscape, side-reading) whenever feasible
- *Foldouts.* Avoid them if possible. Instead, rearrange and spread the figure or table horizontally across a two-page layout

##### ***4.4.2 Titles for Tables and Figures***

- Never give two tables or figures the same title within the same document
- Be as brief as possible, but also be descriptive. Include purpose and content
- Craft titles so that readers of the table of contents can understand the nature of the illustration before they look at it. For example, instead of “Comparison,” use “Cost Comparison of Two Launch Options in FY99 Dollars.” Or, instead of “Graph of Results,” use “Results of Performance Testing A, B, and C”



### 4.4.3 Tables

Preparation of useful tables requires careful attention to detail.

- *Organization.* Arrange the table so that the values are in columns topped by column labels (in the following form: concept, symbol, and unit of measure, e.g., Change, D, m/s) and the constants or independent variables are given in the first column. In addition, organize the first-column entries in the way that will be most helpful to the reader. Ensure structural uniformity. If column labels change in the middle of a table, divide the table into two tables
- *Footnotes.* Use table footnotes to present information concerning special conditions relating to an entry or a class of entries. Identify each footnote by superscript italic letters. If letters are confusing, use asterisks, daggers, or other symbols

### 4.4.4 Figures

Examples of figures are photographs, artwork, graphs, and drawings and diagrams.

**4.4.4.1 Photographs.** For compatibility, ensure that photographs of similar subjects are of similar size.

#### 4.4.4.2 Graphs

- *Consistency.* For easy comparison by the reader, present similar data in the same type of graph drawn to the same scale, using the same symbology throughout the report
- *Lines.* Make them as simple as possible. It is advisable to have no more than six types of lines and data points on a graph; it is better to have only four. The lines and data points should refer to the same condition in related figures
- *Scale.* Ordinate (vertical axis) and abscissa (horizontal axis) scales and proportions should be the same on similar figures (thus allowing overlays)

#### 4.4.4.3 Drawings and Diagrams

- *Labels.* Capitalize the first word of the label. When space is very limited, use letters or numbers rather than words, arranging them in some spatial order (for example, clockwise around the drawing). Identify these letters or numbers in a key
- *Leaders.* Leaders from a label to an item in a figure go from the beginning of the first word (if it is from the left of the label) and from the end of the last word (if it is from the right of the label). Arrowheads are not used on leaders, only on dimension lines
- *Shading.* When it is necessary to differentiate parts of a drawing, use shading rather than color. It is also acceptable to use spaced black dots or lines for this purpose

#### 4.4.4.4 Text in Figures.

When you prepare figures

- Limit the text in figures to letters, numbers, symbols, words, and short phrases
- Identify the letters, numbers, and symbols in a key or legend
- Provide details and explanations in the body of the document where the figure is discussed
- Place equations in the body of the document
- Display tabular material in a separate table

#### 4.4.4.5 Use of Color.

Although there are no restrictions on the use of color for documents posted on the web, NASA has limitations on the use of color in printed documents. The use of color increases preparation and printing costs and may delay the publication date. Color is used in printed NASA STI Report Series documents only when necessary to convey scientific and technical material clearly and unambiguously. The use of color must be justified and authorized on a case-by-case basis using Center-specific procedures. For further assistance, contact your Center technical publications office or Printing Officer.

## 5 Special Preparation Concerns

Attention to editorial details, such as clear, concise sentences and paragraphs, well-constructed headings and outlines, and consistent use of abbreviations and symbols increases reader confidence in your work. Whether or not you choose to use the editorial expertise provided by your Center technical publications office, following a style guide can improve your writing. In addition to the information in this guide and your Center technical publications office's guides, the following publications are recommended for use in preparing NASA STI Report Series. The style guides published for specific scientific and technical disciplines are also acceptable for use in NASA STI Report Series and other papers by NASA authors.

- McCaskill, Mary K.: *Grammar, Punctuation, and Capitalization—A Handbook for Technical Writers and Editors*, [NASA SP-7084, 1990 \(ref.16\)](#)
- American National Standards Institute: *Scientific and Technical Reports—Preparation, Presentation and Preservation*. ANSI-NISO Z39.18-1995, 1995 (ref. 17)
- Swanson, Ellen: *Mathematics Into Type: Copyediting and Proofreading of Mathematics for Editorial Assistants and Authors*. American Mathematical Society, 1979, 1986 (ref. 18)

### 5.1 Titles and Headings

Titles should

- Convey maximum information as succinctly as possible
- Involve careful word selection because much indexing and abstracting is based only on the title

Headings should

- Be brief and descriptive
- Not contain verbs
- Be numbered only when cross-referencing is needed
- Be paired with at least one other heading under the same order level heading
- Be ranked in no more than three levels or sublevels, unless the publication is long or complex

## **5.2 Cross-References**

Be sure to check cross-references in the following items each time your manuscript is revised if you do not use an automated feature to track and update them. Inattention to these details can cause errors and reduce the confidence of the reader in your conclusions.

- Text
- Figures
- Tables
- Symbols list
- Glossary (not in most papers—normally included in symbols)
- Appendixes
- Index
- Table of Contents

## **5.3 Trade Names and Trademarks**

A trade name, or commercial name, is any name used by a person to identify his or her business or vocation. Generally, these names are not registered. A trademark is a word or symbol that is used to identify a particular product or service in a way that distinguishes it from other similar products or services. A trademark may be registered.

Use generic names whenever possible and avoid using trade names or trademarks because it is improper to advertise, endorse, or criticize commercial products or services in NASA publications. If use of a trade name or trademark is the only way to specify material or equipment that is necessary to reproduce the results, follow these guidelines:

- Use trademarks only as a proper adjective (i.e., capitalized and modifying the generic term); on their first appearance in the text, accompany the trademark with the name of its registered owner

- State in a disclaimer that trade names or trademarks are used in the report for identification only and that this usage does not constitute an official endorsement, either expressed or implied, by NASA. Place this disclaimer on the back of the title page of NASA STI Report Series documents or as a footnote to other documents (such as journal articles and conference proceedings) with information concerning the trademark or trade name
- Never compare commercial products; present the data and let the reader make the comparison

#### **5.4 Spacecraft Designations**

- Piloted spacecraft are always designated with arabic numerals before and after launch (e.g., Apollo 17)
- Unpiloted spacecraft are designated with capital letters before launch and arabic numerals after successful launch
- Rockets and launch vehicles are designated by name and roman numeral, including stages of multicomponent vehicles (e.g., Saturn V, S-IVB stage, and Delta III)

#### **5.5 Abbreviations**

- Abbreviate units of measure after numbers
- Follow the U.S. GPO *Style Manual* (ref. 14) for standard forms of U.S. Customary Units
- When using SI units, follow the International System of Units conventions
- Remember that singular and plural units carry the same abbreviation (e.g., 1 in. and 3 in.)
- Introduce other abbreviations and acronyms in parentheses after the first use of the complete term to avoid repetition and conserve space (e.g., root mean square (rms))
- Include an abbreviation, symbols, or acronym list in the front or back matter of the report to avoid repetition and conserve space
- In reference lists, use abbreviations for source material cited after the title
- Abbreviate periodicals and meeting titles according to style sources, such as the American Chemical Society's *CASSI* (ref. 19) and the *Abbreviations Dictionary* (ref. 20)

#### **5.6 Numerals**

- Use numerals at all times with units of measure; use numerals for values 10 and greater when used without units
- Separate numbers of more than four into groups of three from the decimal point. A small (or thin) space is the preferred separator, in compliance with recommended international practice for scientific and technical documents, although a comma is sometimes used

- Close up four-digit numbers unless they are in aligned columns with numbers of five or more digits

## 5.7 Mathematical Presentation

For a better quality publication, we recommend the following:

- Use the standard symbols established in your discipline
- Define the symbols at the time of their first appearance in a document
- Include an alphabetical symbols list in the document where appropriate (in front matter, after the introduction, or in the appendix)
- Close up numbers and letter symbols in expressions and equations; however, leave a space before and after mathematical functions (such as "sin " and "lim") and math operation (such as +, -, and x); before differentials  $d$  and after their arguments; after the arguments of trigonometric and logarithmic terms; and before and after functional notation
- Number equations in the main text continuously as (1), (2), (3),...
- Number equations in appendixes by either continuing the numbering of the main text or by restarting the numbering in each appendix as (A1), (A2), (B1), (B2)
- Use the same number for any repeated equation
- Use identifiers such as (1a) or (C3a) for equivalent or derivative equations
- Use a brace to connect groups of equations with the same number
- Place equation numbers at the right margin, leaving space between the equation and the number; if there is not enough room for the number on the line with the equation, place it on the line below the equation
- Refer to equations in text as equation (6) or (eq. (6))

## 5.8 International System of Units

The International System of Units (SI) is the preferred system of weights and measures for NASA as stated in NPD 8010.2, *Use of the Metric System of Measurement in NASA Programs* (ref. 21).

- If you performed your scientific and technical activities using the metric system, document or report your findings using SI units
- If you performed your scientific and technical activities using inch-pound measurements, document or report your findings using U.S. customary units
- Clearly indicate in your STI which form of unit you use

- If you need additional information on SI units, symbols, prefixes, and usage in documentation in both the U.S. and in the international business community, refer to Artusa, Elisa A. *SI (Metric) Handbook*, NASA TM-109197 (ref. 22)

## **5.9 Proofreading**

We recommend that you

- Proofread your publication for accuracy and consistent quality
- Proofread after each revision cycle

## **5.10 Checklists, Questions, and Other Information**

Checklists are included as Appendixes B and C to assist you with the details of the publication process. Frequently asked questions and the answers are found in Appendix H. Appendix I defines acronyms and definitions.

# **6 Forms Required to Publish NASA STI**

## **6.1 NF-1676**

All STI that is released external to the Agency, including on public websites, or presented at internal meetings or workshops at which foreign nationals may be present, must have an approved NF-1676 on file at the center and a copy submitted with the document when it is sent to NASA CASI. For additional information on the categories on NF-1676, see NPR 2200.2, chapter 4. The latest NF-1676 is available at URL [https://extranet.hq.nasa.gov/nef/user/form\\_search.cfm](https://extranet.hq.nasa.gov/nef/user/form_search.cfm) and through your Center's Forms Manager and server.

## **6.2 SF-298**

STI that is in the NASA STI Report Series must also have an SF-298 as the last page of the document. [Note, for SPs, include the SF-298 as a separate file but do not include it as the last page of the document.] You can locate this form via URL [https://extranet.hq.nasa.gov/nef/user/form\\_search.cfm](https://extranet.hq.nasa.gov/nef/user/form_search.cfm) and through your Center's Forms Manager or server. For instructions on NASA's customized use of this Government-wide form, see URL <http://www.sti.nasa.gov/nasaonly/publish/SF298instr.pdf>

## **6.3 Center-Specific Forms**

Two Centers either use a Center-specific version of this form (such as a web-based implementation) and/or other related forms. Contact your Center's technical publications office for guidance.

## Appendix A

### Types of NASA STI Publications and Related STI Report Series

Manuscript Contents	Appropriate Series
Article for a professional journal	None required; TP for expanded treatment and TM for preprint
Article for a technical magazine	None required; TP for expanded treatment and TM for preprint
Atlas of scientific imagery	TP or SP
Bibliography: Continuing Extensive annotation Minimal annotation	SP TP TM
Contractor or grantee results and findings	CR, TP, or SP
Critical review of the literature	TP
Critical tables	TP
Data compilation: Extensive use Limited use	TP TM
Design standards	TP
Dissertation or thesis by employee, relating to work	TM
Dissertation or thesis by NASA contractor or grantee (if funded by NASA)	CR
Engineering report	TP
Handbook	TP
History	SP
Letter (e.g., for a professional journal)	None required
Limited distribution report	TP, TM, CR

Literature survey, review	TP
Management report	SP (6000 series)
Manual	TP or TM
Monograph	TP
Preliminary results report	TM
Preprint of paper for a professional meeting	TM
Proceedings of a workshop, conference, seminar, etc.	CP
Program description or summary	SP
Report to another agency	TM
Research report	TP
Review paper	TP
Security-classified report	TP, TM, CR
Sponsored research report: NASA sponsor Non-NASA sponsor	CR TM
State-of-the-art review	TP
Technical report, complete and comprehensive	TP
Textbook, scientific or technical	TP
Translation	TT
Working paper (external circulation)	TM



## Appendix B

### Author Checklist To Publish Documents in the NASA STI Report Series

\_\_\_\_\_ Determine if the NASA STI Report Series is appropriate for your needs (NPR 2200.2 and URL <http://www.sti.nasa.gov/>)

\_\_\_\_\_ Determine with your Center's technical management and technical publications office the appropriate report type and the level of technical review (NPR 2200.2)

\_\_\_\_\_ Contact your Center's technical publications office to determine the following:

- What publishing services are available, turnaround times, and costs (if applicable)
- Help using the Agency templates that are available at URL <http://www.sti.nasa.gov/nasaonly/template/template.html>)
- What is required if you need printed copies. [Note: NASA requires electronic copies to NASA CASI.]
- What type of electronic file is required if you wish to add your document to your Center's Technical Report Server that links to the NASA Technical Report Server (<http://ntrs.nasa.gov>)
- Tips on how to complete [NASA Form \(NF\) 1676](#) (Scientific and Technical Information (STI) Document Availability Authorization (DAA)) or your Center's version of this form. This is an Agency requirement in order to release STI in any media
- Advice on how to complete [SF \(Standard Form \) 298](#) (Report Documentation Page), which is the last page of your document for NASA STI Report Series. This form facilitates correct indexing into the worldwide STI and other databases and accurate subsequent dissemination

\_\_\_\_\_ Complete the draft of your document

\_\_\_\_\_ Complete SF-298 and add it as the last page of your document or have your publications office do this. If your document is an SP, complete SF-298 and send it with your document but do not include it as the last page

\_\_\_\_\_ Have appropriate technical personnel review and approve your document. See Appendix C for information on items to check prior to publication

\_\_\_\_\_ Revise document, if necessary, and produce final document

\_\_\_\_\_ Send your document through your Center's appropriate channels (appropriate channels are defined by NF-1676 or your Center's equivalent); you may not publish STI in any format unless this form is approved and on file at your Center

\_\_\_\_\_ Send to Center's technical publications or printing office

\_\_\_\_\_ Request that your document be added to your Center's Technical Report Server, if appropriate (if your document is unlimited and unclassified)

\_\_\_\_\_ Coordinate your publication with your Center's publications office, who will send it to NASA CASI:

Attention: Acquisitions  
NASA Center for AeroSpace Information (CASI)  
7121 Standard Drive  
Hanover, MD 21076-1320  
email: [help@sti.nasa.gov](mailto:help@sti.nasa.gov)

## Appendix C

### Publications Review Checklist

Check the following items before you release your document. Contact your technical publications office to see what services are available to assist you.

- \_\_\_\_\_ Report is written clearly.
- \_\_\_\_\_ All numbered or lettered items (figures, tables, equations, references, and appendixes) are introduced in correct order.
- \_\_\_\_\_ All numbered or lettered items are numbered or lettered correctly and referred to accurately.
- \_\_\_\_\_ No incorrectly or inconsistently spelled words or obvious grammar or punctuation errors exist.
- \_\_\_\_\_ No statements that will embarrass NASA or the U.S. Government are included.
- \_\_\_\_\_ Any conclusions presented are supported by the text.
- \_\_\_\_\_ References cited are available with sufficient information to identify correct document.
- \_\_\_\_\_ Graphic and tabular data are clearly presented and are consistent.
- \_\_\_\_\_ Report complies with policies for restricted, proprietary, or classified information.
- \_\_\_\_\_ Appropriate technical review has been done.
- \_\_\_\_\_ Appropriate release review requirements have been done prior to releasing it external to NASA or at internal workshops or conferences at which foreign nationals may be present. This is done via the NF-1676. (Contact your Center technical publications office to find out what the specific requirements are.)

## Appendix D

### Back of NASA STI Report Series Title Page

#### Acknowledgments

The authors thank William James, who was instrumental in obtaining source data.

**Instruction:** If the report is restricted or limited, delete National Technical Information Service below.

This is a preprint of a paper intended for presentation at a conference. Because changes may be made before formal publication, this is made available with the understanding that it will not be cited or reproduced without the permission of the author.

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Hanover, MD 21076-1320

#### Available from:

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5285 Port Royal Road  
Springfield, VA 22161-2171

[Optional Information:]

This report is also available in electronic form at URL [http://\[ \]](http://[ ])

## Appendix E

### References to Electronic Documents in NASA STI Reports

Citations of electronic documents appear in the "References" section of the report along with citations of paper documents. The citation should include

- Name of author
- Title of document
- Title of main document, if applicable
- Electronic address
- Date document was written or posted, if available
- Revision number, if applicable
- Paragraph numbers, if applicable
- Date of accession

Electronic documents can be revised or become inaccessible without warning. You are encouraged to save a copy of the referenced document either on paper or electronically on disk or hard drive.

When printing electronic addresses in citations, ensure that extra punctuation or characters are not included in the address and all characters of the address are included. If it becomes necessary to break an electronic address because of available line space, do not use a hyphen. The additional hyphen could be mistaken for a character in the address. Electronic addresses should be broken after slashes, dots, or colons. Avoid placing an electronic address at the end of a sentence. Restructure the sentence to set off the address as you would an equation.

In addition, both NASA STI Report Series and other STI documents are published electronically. Because internal or nonpublished documents are difficult, if not impossible, to access, reference to these is discouraged. If the information must be referenced, it should be treated similar to an informal personal communication. Clearly identify the reference as such and place the following identification in a parenthetical note in the reference list, with an appropriate notation: "unpublished," "to be published," or "personal communication." Personal communications should include name and affiliation of person doing the communicating.

The following references are cited in the suggested style. Information in quotation marks should be italicized. Some line returns are forced to illustrate concepts for breaking lines.

1. Harnack, Andrew; and Eugene Kleppinger: *Online! A Reference Guide to Using Internet Sources*, Bedford/St. Martins, 2003. <http://www.bedfordstmartins.com/online/index.html>. Accessed March 28, 2005
2. Harnack, Andrew; and Gene Kleppinger: *Beyond the MLA Handbook: Documenting Electronic*

Sources on the Internet, <http://english.ttu.edu/kairos/1.2/inbox/mla.html>. Accessed March 28, 2005

3. Walker, Janice R; and Todd Taylor: *The Columbia Guide to Online Style*, [http://www.columbia.edu/cu/cup/cgos/idx\\_basic.html](http://www.columbia.edu/cu/cup/cgos/idx_basic.html). Accessed March 28, 2005

4. Beckleheimer, Jeff: *How Do You Cite URLs in a Bibliography?* <http://www.nrlssc.navy.mil/bibliography.html>. Accessed March 28, 2005

5. University of Alberta. *Citation Style Guides for Internet and Electronic Sources*, <http://www.library.ualberta.ca/guides/citation/index.cfm> . Accessed March 28, 2005

6. Information and Documentation-Bibliographic references-Part 2: Electronic documents or parts thereof, *Excerpts From Final Draft International Standard ISO 690-2*. International Organization for Standardization, <http://www.nlc-bnc.ca/iso/tc46sc9/standard/690-2e.htm>. Accessed March 28, 2005

# Appendix F

## Report Documentation Page (SF-298)

For help completing this form, see instructions on the form and supplementary instructions on NASA's use of the form at URL [https://extranet.hq.nasa.gov/nef/user/form\\_search.cfm](https://extranet.hq.nasa.gov/nef/user/form_search.cfm)

NOTE: For covers and title pages, NASA uses the month and year of actual publication. Block 1 should also include the actual date of publication (not when you first fill out the RDP). Since the RDP is an intergovernmental form that does not allow Agency customization, input your data as follows: day (always insert the first day of the month as 01), month (ex. 03 for March), and year in 4 digits (ex. 2005).

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188		
<p>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 this 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 any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p><b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b></p>					
1. REPORT DATE (DD-MM-YYYY) 31-01-2005		2. REPORT TYPE Technical Memorandum, Contractor Report, etc.		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Insert title and subtitle (if applicable)  <b>SAMPLE</b>		5a. CONTRACT NUMBER NAS1-12345 (CR Report type -- contract)			
		5b. GRANT NUMBER NAG1-1234 (CR Report type -- grant)			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S) Smith, John J.; Brown, William R.; and Jones, Thomas R.		5d. PROJECT NUMBER NCC1-123 (CR Report type -- cooperative agreement)			
		5e. TASK NUMBER Task 6 (CR Report type, if applicable)			
		5f. WORK UNIT NUMBER 323-10-05-01			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) [Insert NASA center here, ex. NASA Langley Research Center] [Insert city, state, and zip code here, ex. Hampton, VA 23681-2199] [Insert contract or grant organizational name, as applicable]			8. PERFORMING ORGANIZATION REPORT NUMBER Ex. L-12345 (For TP, TM, CP, SP) or appropriate number for CR		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) National Aeronautics and Space Administration Washington, DC 20546-0001			10. SPONSORING/MONITOR'S ACRONYM(S) NASA		
			11. SPONSORING/MONITORING REPORT NUMBER NASA/TM-2005-000000		
12. DISTRIBUTION/AVAILABILITY STATEMENT Unclassified - Unlimited Subject Category 00 Availability: NASA CASI (301) 621-0390					
13. SUPPLEMENTARY NOTES Smith, Brown, and Jones, Langley Research Center (If CR report type add: COTR or Technical Monitor: First, MI, Last Name) An electronic version can be found at <a href="http://techreports.larc.nasa.gov/ltrs">http://techreports.larc.nasa.gov/ltrs</a> or <a href="http://techreports.larc.nasa.gov/cgi-bin/NTRS">http://techreports.larc.nasa.gov/cgi-bin/NTRS</a>					
14. ABSTRACT Insert a brief abstract (not to exceed 200 words)					
15. SUBJECT TERMS Insert 4 or 5 subject terms					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			STI Help Desk (email: <a href="mailto:help@sti.nasa.gov">help@sti.nasa.gov</a> )
U	U	U	UU	25	19b. TELEPHONE NUMBER (include area code) (301) 621-0390

Standard Form 298 (Rev. 8-96)  
Prescribed by ANSI Std. Z39-18

## Appendix G

### NASA Aeronautics and Space Database Subject Divisions and Categories

This table lists the subject divisions and categories used to catalog NASA STI before it is processed and entered in the NASA Aeronautics and Space Database.

<p><b>AERONAUTICS</b></p> <ul style="list-style-type: none"><li>01 Aeronautics (General)</li><li>02 Aerodynamics</li><li>03 Air Transportation and Safety</li><li>04 Aircraft Communications and Navigation</li><li>05 Aircraft Design, Testing and Performance</li><li>06 Avionics and Aircraft Instrumentation</li><li>07 Aircraft Propulsion and Power</li><li>08 Aircraft Stability and Control</li><li>09 Research and Support Facilities (Air)</li></ul> <p><b>ASTRONAUTICS</b></p> <ul style="list-style-type: none"><li>12 Astronautics (General)</li><li>13 Astrodynamics</li><li>14 Ground Support Systems and Facilities (Space)</li><li>15 Launch Vehicles and Launch Operations</li><li>16 Space Transportation and Safety</li><li>17 Space Communications, Spacecraft Communications, Command and Tracking</li><li>18 Spacecraft Design, Testing and Performance</li><li>19 Spacecraft Instrumentation and Astrionics</li><li>20 Spacecraft Propulsion and Power</li></ul> <p><b>CHEMISTRY AND MATERIALS</b></p> <ul style="list-style-type: none"><li>23 Chemistry and Materials (General)</li><li>24 Composite Materials</li><li>25 Inorganic, Organic, and Physical Chemistry</li><li>26 Metals and Metallic Materials</li><li>27 Nonmetallic Materials</li><li>28 Propellants and Fuels</li><li>29 Space Processing</li></ul> <p><b>ENGINEERING</b></p> <ul style="list-style-type: none"><li>31 Engineering (General)</li><li>32 Communications and Radar</li><li>33 Electronics and Electrical Engineering</li><li>34 Fluid Mechanics and Heat Transfer</li><li>35 Instrumentation and Photography</li><li>36 Lasers and Masers</li><li>37 Mechanical Engineering</li><li>38 Quality Assurance and Reliability</li></ul>	<p><b>LIFE SCIENCES</b></p> <ul style="list-style-type: none"><li>51 Life Sciences (General)</li><li>52 Aerospace Medicine</li><li>53 Behavioral Sciences</li><li>54 Man/System Technology and Life Support</li><li>55 Exobiology</li></ul> <p><b>MATHEMATICAL AND COMPUTER SCIENCES</b></p> <ul style="list-style-type: none"><li>59 Mathematical and Computer Sciences (General)</li><li>60 Computer Operations and Hardware</li><li>61 Computer Programming and Software</li><li>62 Computer Systems</li><li>63 Cybernetics, Artificial Intelligence and Robotics</li><li>64 Numerical Analysis</li><li>65 Statistics and Probability</li><li>66 Systems Analysis and Operations Research</li><li>67 Theoretical Mathematics</li></ul> <p><b>PHYSICS</b></p> <ul style="list-style-type: none"><li>70 Physics (General)</li><li>71 Acoustics</li><li>72 Atomic and Molecular Physics</li><li>73 Nuclear Physics</li><li>74 Optics</li><li>75 Plasma Physics</li><li>76 Solid-State Physics</li><li>77 Physics of Elementary Particles and Fields</li></ul> <p><b>SOCIAL AND INFORMATION SCIENCES</b></p> <ul style="list-style-type: none"><li>80 Social and Information Sciences (General)</li><li>81 Administration and Management</li><li>82 Documentation and Information Science</li><li>83 Economics and Cost Analysis</li><li>84 Law, Political Science and Space Policy</li><li>85 Urban Technology and Transportation</li></ul> <p><b>SPACE SCIENCES</b></p> <ul style="list-style-type: none"><li>88 Space Sciences (General)</li><li>89 Astronomy</li><li>90 Astrophysics</li></ul>
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39 Structural Mechanics

**GEOSCIENCES**

42 Geosciences (General)

43 Earth Resources and Remote Sensing

44 Energy Production and Conversion

45 Environment Pollution

46 Geophysics

47 Meteorology and Climatology

48 Oceanography

91 Lunar and Planetary Science and Exploration

92 Solar Physics

93 Space Radiation

**GENERAL**

99 General

## Appendix H

### Frequently Asked Questions (FAQ's)

*Q: If I have a question that isn't covered in this document, what other sources of information are there?*

A: For more information about the NASA scientific and technical information (STI) program and NASA publications, you can contact any of the following sources:

- Access the NASA STI program Home Page at <http://www.sti.nasa.gov/>
- E-mail your question via the Internet to [help@sti.nasa.gov](mailto:help@sti.nasa.gov)
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Telephone the NASA STI Help Desk at (301) 621-0390
- Write to:

NASA STI Help Desk  
NASA Center for AeroSpace Information (CASI)  
7121 Standard Drive  
Hanover, MD 21076-1320

*Q: I've been invited to give a talk at a scientific conference on my research findings. Should I publish my presentation?*

A: Yes. Oral presentations of scientific and technical findings are one way to ensure the timely dissemination of information to audiences at society meetings and other professional gatherings. NASA and NASA-sponsored authors who take this approach should distribute copies of the presentation to attendees and publish their presentation in the appropriate NASA STI Report Series, if appropriate, to include their work in the NASA Aeronautics and Space Database, and its public interface, the NASA Technical Report Server (if the document is unclassified/unlimited).

*Q: What approvals are required to publish my findings through a foreign publisher or distribute my document to a foreign audience?*

A: Export control review and approval to release STI are required for domestic and foreign publishing. Complete, have approved, and have your Center maintain your file copy of NASA Form 1676, "NASA Scientific and Technical Information Document Availability Authorization (DAA)" or your Center's equivalent to this form prior to release to any audience.

Contact your Center's technical publication and export control office for more information.

*Q: What is an "external publication"?*

A: An external publication is defined as a technical paper, article, or book etc. reporting on NASA research submitted by a NASA employee, contractor, or grantee for publication through a non-NASA channel.

*Q: How is the NASA STI Report Series defined?*

A: There are discrete report designations that characterize NASA and NASA contractor STI reports. These include Technical Publication (TP), Technical Memorandum (TM), Contractor Report (CR), Conference Publication (CP), Special Publication (SP), and Technical Translation (TT).

*Q: Please clarify the roles of a "technical monitor."*

A: A technical monitor is the NASA employee appointed to monitor or manage technical progress, referred to in grant instructions as the technical officer. In contract instructions, this employee may be identified as the project manager or the contracting officer's technical representative (COTR).

*Q: What is the basis for selecting a suitable series category for a NASA publication and who decides?*

A: Selection of the correct series in which a document is published should be based on the content of your manuscript and the needs of an identifiable readership. Make the preliminary determination in conjunction with your Center technical publications office. It is subject to approval as part of the NASA Headquarters Office or the originating Center's review process.

*Q: What approvals are required to release STI in hard copy or via the Internet?*

A: You must have an approved copy on file of NASA Form 1676 or your Center-specific version of this form to release STI in any media.

*Q: I need to use color in my document. What approvals are required?*

A: First consider how your document will be disseminated. Color is useful if you will disseminate via the Internet; however, remember that readers may print to black and white printers. For hard (paper) copies, U.S. Government-wide restrictions exist on the use of color because color increases the cost of printing, so discuss your options and restrictions with your Center's technical publications and printing offices early in your planning process.

*Q: What is the best format source for creating an STI document?*

A: Templates of typical NASA STI Report Series are available from the STI homepage at URL <http://www.sti.nasa.gov/>. These include suggested typefaces, font sizes, standard covers, title pages, and interior column formats for publications released in the NASA STI Report Series.

# Appendix I

## Acronyms and Definitions

Acronyms:

ANSI	American National Standards Institute
BXA	Bureau of Export Administration
CASI	Center for Aerospace Information
CFR	Code of Federal Regulations
COTR	Contracting Officer's Technical Representative
CP	Conference Publication
CR	Contractor Report
DAA	NASA Form 1676, NASA Scientific and Technical Information (STI) Document Availability Authorization (DAA)
EAR	Export Administration Regulations
GPO	Government Printing Office
ITAR	International Traffic in Arms Regulations
NARA	National Archives and Records Administration
NASA	National Aeronautics and Space Administration
NA&SD	National Aeronautics and Space Database
NF	NASA Form
NP	NASA Publication (nontechnical, general information that is not part of the STI series)
NPD	NASA Policy Directive

NPR	NASA Procedural Requirements
NTIS	National Technical Information Service
NTRS	NASA Technical Report Server
PDF	Portable Document Format
PS	Postscript
RDP	Report Documentation Page
SBIR	Small Business Innovation Research
SF	Standard Form
SGML	Standard Generalized Markup Language
SI	International System of Units
SP	Special Publication
STI	Scientific and Technical Information
TIFF	Tagged Image File Format
TM	Technical Memorandum
TP	Technical Publication
TRS	Technical Report Server
TT	Technical Translation
URL	Uniform Resource Locator
USML	U.S. Munitions List

Definitions:

dpi dots per inch. The manner in which the resolution (sharpness and clarity) of a

printer or scanner is measured. For example, if a printer has a resolution of 300 dpi, that means that in 1 in., there are 300 dots in a row across and 300 dots in a row down. The more dots per inch, the smaller each dot has to be, and the smoother the printed image will appear to be.

- Front matter written material preceding the main text of a book or report; examples of front matter are table of contents, preface, and foreword.
- Rule line or bar (1/4 in. for the NASA cover) added to a page for emphasis or decoration; also a thin line either vertical or horizontal, often used to separate parts of a table or columns of text.
- Sans serif category of type that has no serifs. Serifs are the tiny crossbars on the ends of the strokes on letters in some type designs. An example of sans serif type is Helvetica.
- Serif category of type that has serifs. Examples of serif types are Times Roman and Garamond. Research indicates that serif fonts are more readable.

## References

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