NASA TECHNICAL STANDARDS PROGRAM

NASA-NTSP-1

Approved: 2015-04-22

NASA TECHNICAL STANDARDS PROGRAM (NTSP)

OPERATING PROCEDURES, PROCESSES, AND SYSTEMS

DOCUMENT HISTORY LOG

Status	Document Revision	Change Number	Approval Date	Description
Baseline			2015-06-15	Initial Release

FOREWORD

Technical standards are an integral part of NASA program and project design, development, and operation. These are important to the Agency for reasons, including but not limited to, complying with legal and other requirements, reviewing contract proposals and program and project design and development efforts to verify that technical requirements are met, capturing and disseminating lessons learned to share experiences and new technology, facilitating engineering excellence in development studies and operations, providing a common base for interoperability and supplier operations, preventing conflict and duplication of effort, and fostering and supporting reuse and sharing. Technical standards are accessible in the NASA Technical Standards System (NTSS) at https://standards.nasa.gov.

The NASA Technical Standards Program, sponsored by the NASA Chief Engineer, facilitates participation in development and use of voluntary consensus standards (VCS) and development of NASA engineering standards when no existing VCS meets NASA's needs. This document is published by the NASA Technical Standards Program Office to describe the roles and responsibilities, procedures, processes, and systems for implementing the NASA Technical Standards Program.

Requests for information, corrections, or additions to this document should be sent to the NASA Technical Standards Program Manager.

Approval:

Original Signed By

4/22/2015

Paul S. Gill

Date

Manager
NASA Technical Standards Program

Concurrence:

Original Signed By

4/27/2015

Adam D. West

Date

Program Executive

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1. SCOPE

1.1 Purpose

1.1.1 This document supports the implementation of National Aeronautics and Space Administration (NASA) Procedural Requirements (NPR) 7120.10, Technical Standards for NASA Programs and Projects. It establishes the NASA Technical Standards Program's (NTSP's) procedures, processes, and systems and is linked to Chapter 4, Development of Technical Standards, of NPR 7120.10.

1.1.2 This document implements the NASA Preferred Technical Standards Program Plan approved 10/7/1999, cancels ED10-OWI-005G, NASA Technical Standards Program, and supersedes the Process for Developing NASA Technical Standards (Engineering) Sponsored by the NASA Chief Engineer dated 3/14/2011.

1.2 Applicability

This document applies to NASA and contractor employees participating in NTSP activities.

2. APPLICABLE DOCUMENTS

2.1 The documents listed below are applicable to this document:

OMB Circular No. A-119	Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities
NPR 1441.1	NASA Records Retention Schedules
NPR 7120.10	Technical Standards for NASA Programs and Projects
NASA-NTSP-2	NASA Technical Standards Program (NTSP) Format, Content, and Template Instructions for NASA Technical Standards
NASA-NTSP-3	NASA Technical Standards Program (NTSP) Format, Content, and Template Instructions for NASA Technical Specifications
NASA-NTSP-4	NASA Technical Standards Program (NTSP) Format, Content, and Template Instructions for NASA Technical Handbooks
NASA Form 1676	NASA Scientific and Technical Information (STI) Document Availability Authorization (DAA) and Instructions

MPR 1440.2	MSFC Records Management Program
MSFC Form 2441	Records Plan
MSFC Form 4649	Recommendation for Maintaining a NASA Engineering Standard

2.2 This document provides requirements and guidance for procedures, processes, and systems of the NTSP but does not supersede nor waive established Agency requirements/guidance found in other documentation.

Note: See Appendix E for reference documents.

3. ACRONYMS AND DEFINITIONS

3.1 Acronyms and Abbreviations

AWR	Agency-wide Review
CIO	Chief Information Officer
CRM	Comment Resolution Matrix
DAA	Document Availability Authorization
DoD	Department of Defense
EEE	Electrical, Electronic, and Electromechanical
EMB	Engineering Management Board
HDBK	Handbook
ICSP	Interagency Committee on Standards Policy
IT	Information Technology
JPL	Jet Propulsion Laboratory
LLIS	Lessons Learned Information System
MIL	Military
MPR	MSFC Procedural Requirements
MSFC	Marshall Space Flight Center
NAMS	NASA Access Management System
NASA	National Aeronautics and Space Administration
NC	NASA Charter
NEN	NASA Engineering Network
NESC	NASA Engineering and Safety Center
NESP	NASA Engineering Standards Panel
NIST	National Institute of Standards and Technology
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
NTSP	NASA Technical Standards Program
NTSS	NASA Technical Standards System
OCE	Office of the Chief Engineer
OCHMO	Office of the Chief Health and Medical Officer
OCIO	Office of the Chief Information Officer

OMB	Office of Management and Budget
OPR	Office of Primary Responsibility
OPRD	Office of Primary Responsibility Designee
OSMA	Office of Safety and Mission Assurance
RF	Radio Frequency
SPEC	Specification
STD	Standard
STI	Scientific and Technical Information
SUNS	Standards Update Notification System
TDT	Technical Discipline Team
TDWG	Technical Discipline Working Group
TWG	Topic Working Group
U.S.	United States
VCS	Voluntary Consensus Standard
WBS	Work Breakdown Structure

3.2 Definitions

Application Note: Additional explanatory text provided by a user having a unique insight directly related to the use or application of a particular technical standard. The note may give more specific details on using a component in a specific application or relating to a particular process, e.g., the physical assembly of a product containing the component. Application notes are especially useful for providing experience in the use of the technical standard or giving guidance on more unusual uses of a particular component.

Cancellation: The process for implementing a decision to stop a document from being effective or valid.

Conformity Assessment: Demonstration that specified requirements relating to a product, process, system, person, or body are fulfilled, including activities such as testing, inspection, and certification, as well as the accreditation of conformity assessment bodies.

a. First-party conformity assessment activity is performed by the person or organization that provides the object.

b. Second-party conformity assessment activity is performed by a person or organization that has a user interest in the object.

c. Third-party conformity assessment activity is performed by a person or body that is independent of the person or organization that provides the object and of user interests in that object. (Source: ISO/IEC 17000, Conformity assessment — Vocabulary and general principles.**)**

Consensus: General agreement, but not necessarily unanimity, and includes a process for attempting to resolve objections by interested parties, as long as all comments have been fairly considered, each objector is advised of the disposition of his or her objection(s) and the reasons why, and the consensus body members are given an opportunity to change their votes after

reviewing the comments. (Source: Office of Management and Budget (OMB) Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.)

Handbook: A guidance document that provides engineering information; lessons learned; possible options to address technical issues; classification of similar items, materials, or processes; interpretative direction and techniques; and any other type of guidance information that may help the Government or its contractors in the design, construction, selection, management, support, or operation of systems, products, processes, or services. (Source: MIL-STD-967, Defense Handbooks, Format and Content.) Also, a how-to document containing procedural, technical, engineering, or design information or data about materials, processes, practices, or methods. Although NASA handbooks may contain "shall" statements, they are not intended to be requirements documents. Handbooks, or portions thereof, containing procedural or process requirements may be cited in contract, program, and other Agency documents. (Source: NPR 7120.10.)

Inactive for New Design: A term applied to an existing approved standard that is no longer approved for use in new designs or equipment. The standard can be used in support of existing designs or equipment. It alerts users that the standard is being phased out or its requirements are transitioning to a different standard. (Adapted from DoD 4120.24-M, Defense Standardization Program Policies and Procedures.)

Lesson Learned: Captured knowledge or understanding gained through experience, which, if shared, would benefit the work of others. Unlike an established practice, a lesson learned describes a specific event that occurred and provides recommendations for obtaining a repeat of success or for avoiding recurrence of an adverse work practice or experience. (Source: NPD 7120.6, Knowledge Policy on Programs and Projects.)

NASA-Endorsed Technical Standards: Proven technical standards that have been identified and recommended by NASA Headquarters offices for particular types of applications and that should be considered first for use in developing technical requirements for current and future NASA programs and projects. (Refer to NPR 7120.10.)

NASA Engineering Standards: Technical standards, specifications, and handbooks developed and approved by the NASA Chief Engineer for Agency-wide use. These are assigned a prefix of “NASA-STD-,” “NASA-SPEC-,” or “NASA-HDBK-,” respectively, to a unique document number. (Refer to NPR 7120.10.)

NASA Technical Standards System (NTSS), formerly known as NASA Standards and Technical Resource Tool (START): The tools and processes used to create and promulgate technical standards for the Agency. The website is officially maintained by the NASA Technical Standards Program at https://standards.nasa.gov.

Office of Primary Responsibility Designee (OPRD): An individual within the Office of Primary Responsibility (OPR) responsible for the development and maintenance of a NASA engineering standard after approval by the NASA Chief Engineer.

Performance Standard: A standard that states requirements in terms of required results with criteria for verifying compliance but without stating the methods for achieving required results; may define the functional requirements for the item, operational requirements, and/or interface and interchangeability characteristics; also may be viewed in juxtaposition to a prescriptive standard. (Source: OMB Circular No. A-119.

Revalidate: The process for renewing an approved standard that has not been revised or revalidated within the last 5 years and is determined to be current, necessary, meets users' needs, complies with NTSP procedures, and requires no changes. (Source: Adapted from DoD 4120.24-M and NPR 1400.1, NASA Directives and Charters Procedural Requirements.)

Revise: The act or process of reviewing an approved document carefully and changing, correcting, updating, or improving it where necessary.

Specification (SPEC): A document that prescribes, in a complete, precise, verifiable manner, the requirements, design, behavior, or characteristics of a system or system component. (Source: NPR 7123.1, NASA Systems Engineering Processes and Requirements.)

Standard or Technical Standard (STD): A document that contains common and repeated use of rules, conditions, guidelines, or characteristics for products or related processes and production methods and related management systems practices; the definition of terms, classification of components; delineation of procedures; specification of dimensions, materials, performance, designs, or operations; measurement of quality and quantity in describing materials, processes, products, systems, services, or practices; test methods and sampling procedures; or descriptions of fit and measurements of size or strength. (Source: OMB Circular No. A-119.)

Superseded: The process of causing a standard to be set aside or dropped from use as inferior or obsolete and replaced by another document.

Tailoring: The process by which individual requirements (sections, paragraphs, or sentences) of the selected technical standards and related documents are evaluated to determine the extent to which they are most suitable for specific program and project needs, and the modification of these requirements to ensure that each achieves an optimal balance between operational needs and cost. (Source: MIL-STD-962, Defense Standards Format and Content.)

Technical Discipline Working Groups (TDWGs): Standing technical working groups established for a specific discipline. See section 4.2.7 for responsibilities.

Technical Fellows: Technical experts in specific disciplines designated by the NASA Chief Engineer, supported by technical discipline teams (TDTs). See section 4.2.4 for responsibilities.

Topic Working Group (TWG): A group of technical discipline experts formed to develop a specific NASA engineering standard.

Topic Working Group Chair: An individual assigned to lead a TWG in the development of a specific NASA engineering standard.

Use: Incorporation of a standard in whole, in part, or by reference for procurement purposes, and the inclusion of a standard in whole, in part, or by reference in regulation(s). (Source: OMB Circular No. A-119.)

Voluntary Consensus Standards (VCS): Standards developed or adopted by VCS bodies, both domestic and international, that include provisions requiring that owners of relevant intellectual property have agreed to make that intellectual property available on a non-discriminatory, royalty-free, or reasonable royalty basis to all interested parties. (Source: OMB Circular No. A-119.)

VCS Bodies: Domestic or international organizations that plan, develop, establish, or coordinate VCS using agreed-upon procedures and that are defined by the following attributes: (1) openness, (2) balance of interest, (3) due process, (4) an appeals process, and (5) consensus. (Source: OMB Circular No. A-119.) Openness and balance of interest include the actual or allowed active and full representation of worldwide commercial industries and educational institutions with knowledge, expertise, or experience in the subject matter covered by each VCS.

Work Breakdown Structure (WBS): A product-oriented hierarchical division of the hardware, software, services, and data required to produce a program's or project's end product(s), structured according to the way the work will be performed and reflecting the way in which program/project costs and schedule, technical, and risk data are to be accumulated, summarized, and reported. (Source: NPR 7120.5, NASA Space Flight Program and Project Management Requirements.)

4. NTSP GOVERNANCE, ROLES, AND RESPONSIBILITIES

4.1 Governance Structure

The NASA Administrator, in accordance with OMB Circular No. A-119, has designated the authority for carrying out the responsibilities of NASA's Standards Executive to the NASA Chief Engineer, who is responsible for implementation of the Circular and who will represent the Agency on the Interagency Committee on Standards Policy (ICSP). The NASA Chief Engineer has delegated the authority for the day-to-day operations to the position of Program Executive within the Office of the Chief Engineer. In addition, the NASA Chief Engineer has selected the Marshall Space Flight Center (MSFC) as the responsible Center for management of the NTSP, from which the NTSP Manager is appointed.

As part of the NTSP governance, the NASA Engineering Management Board (EMB) has been established to provide guidance for development, coordination, review, assessment, and deployment of Agency engineering activities related to policies and standards. The EMB is

chaired by the NASA Chief Engineer. (See NASA Charter (NC) 1000-6, Engineering Management Board.)

The NASA Engineering Standards Panel (NESP) provides counsel and recommendations to the NTSP Manager and the Program Executive in accordance with the NESP Charter. (See Appendix A.)

NASA Engineering and Safety Center (NESC) Technical Fellows and the Technical Discipline Teams (TDTs) (see section 4.2.4) provide technical expertise in specific disciplines to support the NESP, TDWGs, TWGs, and OPRDs. Either a TDWG or a TWG develops a new NASA engineering standard. TDWGs (see section 4.2.7) provide continuing technical expertise in support of development, review, maintenance, and use of technical standards. Topic Working Groups (TWGs) are established to develop a new or revise an existing NASA engineering standard. The office of primary responsibility designee (OPRD) is assigned from the TDWG or TWG and may revise an existing NASA engineering standard and recommend maintenance of the technical standard.

The NTSP organization is shown in figure 1, NASA Technical Standards Program Organizational Structure.

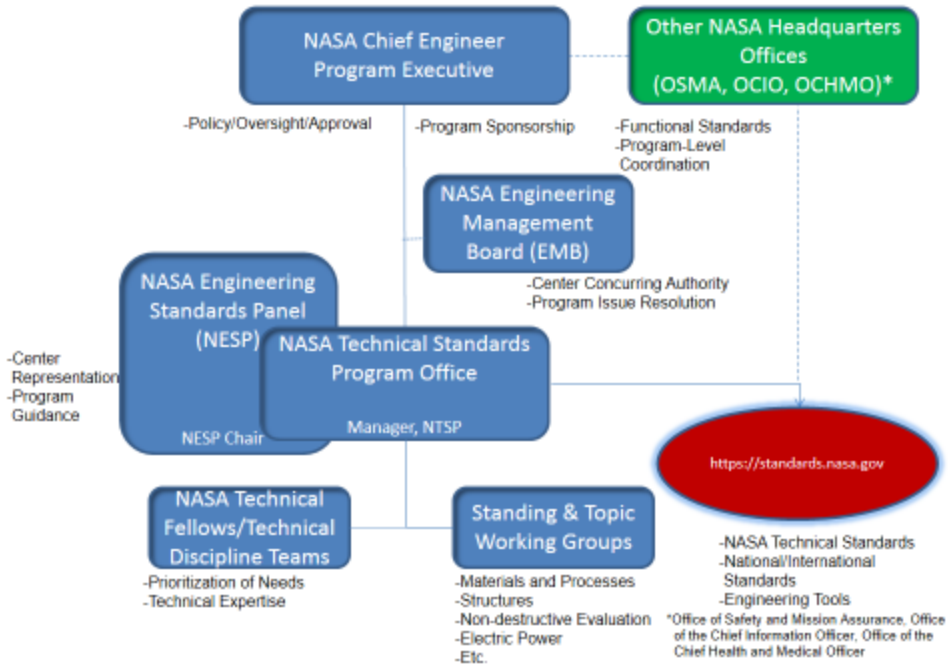

Figure 1—NASA Technical Standards Program Organizational Structure

4.1.1 Program Authority

The NASA Chief Engineer is the top-level authority for the Program, serving as the Agency Standards Executive. Technical standards policy is documented in NASA Policy Directive (NPD) 7120.4, NASA Engineering and Program/Project Management Policy.

4.1.2 Management Approach

The NTSP team strives for continuous innovation providing efficient and reliable service to NASA professionals, programs, projects, and authorized contractors. Immediate access to NASA standards, other Government agency standards, VCS, and other documentation, as well as user-friendly information technology and professionalism to promote technical excellence is provided by the team.

4.1.3 Agency-Level Approach

4.1.3.1 NPD 7120.4 contains NASA policy for technical standards.

4.1.3.2 NPR 7120.10 contains procedural requirements for responsibilities, requirements, and processes for technical standards activities established by the NASA Chief Engineer.

Note: See Appendix B for NTSP background information.

4.1.4 NTSP-Level Approach

4.1.4.1 Development of NTSP Documentation

The NTSP Manager, or designee, shall:

a. Develop NTSP internal documentation in accordance with the general requirements for preparing NASA engineering standards or as directed by the NTSP Manager to contain the following data, at a minimum:

(1) Document number.
(2) Document title.
(3) Purpose/scope.
(4) Applicability.
(5) Applicable documents.
(6) Requirements and/or guidance.
(7) Approval signature.
(8) Approval date.

b. Assign a unique document number to each document, consisting of a prefix of "NASA-NTSP-" and a number, beginning with "1."

c. Review and approve NTSP internal documentation and, if the documentation affects Agency-wide Program implementation, conduct reviews by the NESP with concurrence from the Program Executive.

4.1.4.2 Maintenance of Program-Related Documentation

4.1.4.2.1 The NTSP Manager, or designees, shall monitor and review NTSP internal documentation at least annually and maintain the documentation by the following:

a. Changes to the document, numbered beginning with "1" and noted in the Document History Log, changed in the document, and marked by bars in the right margin; review by NESP members and the Program Executive with approval by the NTSP Manager, except that editorial and administrative changes do not require NESP review.

b. Revisions to documents indicated by a capital letter at the end of the document number, with the first revision designated "A" and succeeding revisions indicated by letters "B" through "Z; after "Z," revisions continue with "AA," "AB," "AC," etc.

c. Revalidation performed annually, approved by the NTSP Manager with concurrence by the Program Executive.

d. Cancellation of the document, approved by the NTSP Manager with concurrence by the Program Executive.

Note: Examples of NTSP operating documentation to be maintained current and filed as records are:

(1) NASA-NTSP-1, NASA Technical Standards Program (NTSP) Operating Procedures, Processes, and Instructions.

(2) NASA-NTSP-2, NASA Technical Standards Program (NTSP) Format, Content, and Template Instructions for NASA Technical Standards.

(3) NASA-NTSP-3, NASA Technical Standards Program (NTSP) Format, Content, and Template Instructions for NASA Technical Specifications.

(4) NASA-NTSP-4, NASA Technical Standards Program (NTSP) Format, Content, and Template Instructions for NASA Technical Handbooks.

(5) NASA-NTSP-5, NASA Technical Standards System Documentation.

4.1.4.2.2 The NTSP Manager, or designee, shall provide documents necessary for Program implementation on a master list accessible to users.

4.1.4.3 NTSP Records

The NTSP Manager, or designee, shall maintain NTSP internal documentation and other records specified in the Records Plan (MSFC Form 2441) filed in the NTSP Manager's office in accordance with NPR 1441.1, NASA Records Retention Schedules, and MSFC Procedural Requirements (MPR) 1440.2, MSFC Records Management Program.

4.1.5 Center-, Program-, and Project-Level Approach

4.1.5.1 Center-, program-, and project-specific technical standards are controlled under Center- or program- and project-documented, approved processes and may be recommended for development as a VCS or NASA technical standard. (Refer to sections 5 and 6.)

4.1.5.2 Selection, tailoring, and use of technical standards as program and project requirements are specified in NPR 7120.10.

4.2 Roles and Responsibilities Relative to the NTSP

4.2.1 NASA Chief Engineer

In addition to the NASA Chief Engineer responsibilities relative to technical standards provided in NPD 7120.4 and NPR 7120.10, the NASA Chief Engineer approves NASA engineering standard baselines, revisions, inactivation for new design, and cancellations.

4.2.2 Program Executive

The Program Executive performs the following:

a. Provides oversight and monitors the overall effectiveness of the NTSP.

b. Consults with VCS bodies, domestic and international, and promotes participation in development of VCS and other activities when consultation and participation is in the public interest and is compatible with NASA's missions, authorities, priorities, and budget resources.

c. Ensures NTSP procedures for implementing OMB Circular No. A-119 are coordinated with appropriate NASA Offices to ensure compliance with applicable laws and regulations.

d. Ensures NASA participation in VCS bodies is consistent with NASA's missions, authorities, priorities, and budget resources to the extent possible.

e. Ensures that Agency technical and policy positions do not conflict with each other and are in the public interest, clearly defined, and known in advance to all federal participants on a given VCS committee.

f. Reviews NTSP documentation that applies across the Agency and NASA engineering standards before submittal to the NASA Chief Engineer for approval.

g. Submits NASA's annual OMB Circular No. A-119 report to the National Institute of Standards and Technology (NIST).

4.2.3 Engineering Management Board (EMB)

The standards-related responsibilities of the EMB members are as follows:

a. Designates a Center representative to the NESP.

b. Provides a forum for addressing standards-related topics, communicates standards activities within his/her Center, and ensures Center actions and assignments are completed promptly and efficiently.

c. Authorizes Center participants in VCS bodies' activities to represent NASA.

d. Provides assistance and expertise in decision making, and issues resolution relative to standards activities.

e. During the Agency-wide Review (AWR), submits formal Center concurrence or non-concurrence with NASA engineering standards upon completion of the Center's review.

4.2.4 NASA Technical Fellows with TDTs

As the Agency's designated technical experts in their specific engineering disciplines, NASA Technical Fellows, with assistance from their TDTs, provide the following:

a. Technical consistency across NASA through inputs to Agency-level specifications and standards and the tailoring of those standards for programs and projects.

b. Fosters the development and revision of NASA engineering standards and VCS.

c. Recommends and endorses specific engineering standards.

4.2.5 NTSP Manager, or Designees

The NTSP Manager or designees perform the following:

a. Develop, coordinate, and manage the Program and make specific recommendations to the Program Executive.

b. Guide the implementation of the Program and propose Program enhancements, modifications, and overall scope.

c. Work with the Program Executive to develop the annual budget and budget distribution for NTSP activities, subject to the NASA Chief Engineer's approval.

d. Coordinate participation in VCS bodies, implement an Agency-wide directory identifying NASA employees participating in specified VCS bodies, and prepare for submittal NASA's annual OMB Circular No. A-119 report to NIST.

e. Prepare, approve, and maintain currency of Program documentation necessary for Program implementation and ensure adherence to the operating procedures, processes, and systems in this document.

f. Set, control, and manage NTSP schedules and monitor milestones for NASA engineering standards in development or maintenance mode and other NTSP activities.

g. Serve as chair of the NESP.

h. Facilitate teamwork among NESP members to accomplish the common goals and objectives of the Program.

i. Execute consensus-based NESP recommendations on standards-related matters.

j. Present needs, status, and issues to the NESP, Program Executive, EMB, NASA Chief Engineer, and/or others as required.

k. Maintain the NTSS, including but not limited to usage metrics, standards automated processes, and standards published and in development by NASA; authorize inputs and modifications to NTSS, ensuring currency of information; and provide NTSP document updates to the NASA Engineering Network (NEN).

l. Monitor the contract(s) to provide technical standards and other standards- and engineering-related information to the Agency via NTSS; manage orders for non-subscription standards from the pay-by-the-document account and maintain metrics.

m. Review lessons learned and application notes submitted as relevant to engineering standards and ensure their applicability and linkage to the standard in the NTSS.

n. Develop and present awareness of Program activities and educate the Agency on the use of NTSS and NTSP procedures, processes, and systems.

o. Serve as the primary point of contact to answer questions on standardization and implementation of the NTSP.

p. Maintain official records of the NTSP.

4.2.6 NASA Engineering Standards Panel (NESP)

NESP members fulfill the responsibilities in accordance with the NESP Charter. (See Appendix A.)

4.2.7 Technical Discipline Working Groups (TDWGs)

TDWGs are standing working groups established to perform the following:

a. Provide continuous technical expertise, including documentation development, and issue resolution within the OCE as designated in table 3, Technical Discipline Categories.

b. Recommend technical standards for endorsement by the Agency.

c. Comply with TWG responsibilities in section 4.2.8 when developing a NASA engineering standard.

d. Recommend NASA engineering standards for conversion to VCS and Center-developed standards for conversion to NASA engineering standards.

4.2.8 Topic Working Group (TWG) Chair, in Conjunction with the TWG

TWGs are established to perform the following:

a. Conduct proceedings based on the following:

(1) Openness.
(2) Balance of interest.
(3) Transparency.
(4) Due process.

b. Develop the draft NASA engineering standard, specification, or handbook upon authority to proceed from the NTSP Manager.

c. Comply with United States (U.S.) technology transfer requirements in accordance with NASA policy and procedures before and during development of the standard. Due diligence is exercised by the transferor of the document, as well as by the recipients of the document.

d. Resolve comments and submit unresolved comments to the NTSP Manager to facilitate resolution.

e. Upon approval of the NASA engineering standard, the TWG is dissolved and the TWG chair, if available, becomes the OPRD for the standard, or another OPRD is designated.

f. Respond to NTSP Manager’s requests and actions.

4.2.9 Office of Primary Responsibility Designees (OPRD) for NASA Engineering Standards

OPRDs perform the following:

a. Maintain the NASA engineering standard by performing a review of the approved document within the 5-year period following approval of the document and as the need for changes arise.

b. Prepare the revision, revalidation, inactivation for new design, editorial or administrative change, or cancellation recommendation and approve revalidation and editorial or administrative changes.

c. Record and resolve comments received during reviews to maintain the NASA engineering standard.

d. Submit unresolved comments to the NTSP Manager to facilitate resolution.

e. Maintain the record for technology transfer authorization if a NASA technical standard resides on another server and is linked to the NTSS for accessibility.

f. Control documents that contain export/transfer-controlled content in accordance with security and export-control procedures and processes.

g. Recommend NASA engineering standards for conversion to VCS and Center-developed standards for conversion to NASA engineering standards.

h. Respond to the NTSP Manager's requests and actions.

i. Comply with TWG responsibilities, when applicable.

j. Consider outstanding Change Requests (refer to section 6.7).

4.2.10 NASA Representatives Participating in VCS Bodies' Activities

NASA representatives are discipline experts who are sponsored by their respective organizations to participate in a VCS bodies' activities as a member or Agency lead as follows:

a. Comply with the requirements and guidelines for participation in VCS bodies in accordance with OMB Circular No. A-119, NPR 7120.10, standards developing body's procedures, and this document, including the rights of copyright holders.

b. Solicit comments from NASA discipline experts relative to VCS standards in development.

5. PARTICIPATION IN VCS BODIES' ACTIVITIES AS A NASA REPRESENTATIVE

5.1 Criteria for Participation in VCS Activities

Note: The NTSP promotes use of VCS, where feasible, in lieu of developing and maintaining NASA technical standards. When the need for a technical standard is identified, determination is made whether a VCS exists or is in development that meets or can be tailored (adapted) to meet NASA's needs. If not, development of a NASA engineering standard may be approved.

In most cases, active participation in development or revision of VCS, VCS bodies' activities, or conversion of a NASA engineering standard to a VCS is funded by NASA Centers. Participation is reported to the NTSP Manager annually during preparation of the OMB Circular No. A-119 report. (See section 5.3.) However, the NASA Chief Engineer may provide resources for participation in VCS activities on a case-by-case basis, depending on availability of funding, when the following criteria are met:

a. The VCS is necessary for use at multiple NASA Centers and will impact NASA programs and projects if not developed.

b. Development or revision of the VCS will consolidate or eliminate NASA, Center, or program and project engineering standards.

c. Ensure that NASA's interests as a whole are represented and not a particular person's or Center's.

d. Estimated completion of the VCS is expected within a 2-year period.

Note: Funding for development and testing of new technology is not within the scope of the NTSP, but funding from other sources to support testing activities on VCS is not prohibited.

5.2 Process for Participating as a NASA Representative in Development or Revision of a VCS, a VCS Body's Activities, or Conversion of a NASA Engineering Standard to a VCS

Note: The NTSP does not fund membership dues to a VCS body.

5.2.1 The NTSP Manager, or designee, shall:

a. Track the development of the VCS and maintain its status.

b. Coordinate with the OPRD to brief development progress to NESP members on a periodic basis.

c. Send NESP members an announcement of its approval for dissemination at their Centers.

d. Consider the approved VCS for NASA endorsement (refer to section 7).

5.2.2 A NASA representative who participates in VCS bodies' activities shall:

a. Provide the schedule and status at development milestones and as requested by the NTSP Manager.

b. Brief the NESP as requested on document development progress.

c. Notify the NTSP Manager upon approval of the VCS.

d. If development was to convert a NASA engineering standard to a VCS, review the approved VCS to ensure that all pertinent requirements and guidance from the NASA engineering standard have been included.

(1) If the VCS meets NASA's needs, prepare MSFC Form 4649, Recommendation for Maintaining a NASA Engineering Standard, to inactivate or cancel the NASA engineering standard and submit it to the NTSP Manager.

(2) If the VCS does not meet NASA's needs, revise the NASA engineering standard for specific applications.

5.3 NASA's Annual Report on Standards

Note: NASA is required by OMB Circular No. A-119 to submit annually a report to NIST describing use of VCS, participation in the development of VCS and VCS bodies' activities, and conformity assessments based on guidance issued by the Secretary of Commerce.

5.3.1 The NTSP Manager shall issue a call to Centers through NESP members for information for the annual report.

5.3.2 NESP members for their respective Centers shall:

a. Respond to the action in accordance with the requirements defined in the OMB Circular A-119.

Note: Refer to Appendix C for example questions and to Appendix D for an example questionnaire for participant information.

b. Prepare a response from the Center EMB member with the names of Center employees and VCS body(ies) of those funded by NASA who are authorized to participate in VCS activities as NASA representatives during the next fiscal year.

5.3.3 The NTSP Manager shall prepare the consolidated annual report and send it to the Program Executive for concurrence and submittal to NIST before the end of each year.

6. NASA ENGINEERING STANDARDS DEVELOPMENT AND MAINTENANCE

Note: The primary focus for developing and maintaining NASA engineering standards is to support NASA's space-flight missions.

Note: The six-stage process for developing and maintaining NASA engineering standards is shown in table 1, Six-Stage Process for NASA Engineering Standards Development and Maintenance.

Table 1—Six-Stage Process for NASA Engineering Standards Development and Maintenance

Stage 1	Stage 2	Stage 3	Stage 4 (Optional)	Stage 5	Stage 6
Initiate	**Develop**	**Agency-Wide Review and Comment Resolution**	**Conflict Resolution**	**Approve and Disseminate**	**Maintain**
• Identify need for a new NASA engineering standard (NESP) • Prepare proposal justification (Center experts), providing: – Applicable Lessons Learned – Abstract – Programs/Projects to which will apply – Impact on programs/projects if disapproved – Existing standards to consolidate/ eliminate – Accepted technical process(es) to be documented – Total cost • Approve proposal submittal (Center NESP member for EMB Member) • Review/score proposals (Center NESP Member) and prioritize (NESC) • Approve proposals (NTSP Manager with Program Executive concurrence) • Proceed to Stage 2	• Solicit Center interest to participate in development from NESP (NTSP Manager) • Assign TWG and name TWG Chair if proposal author is not available (NTSP Manager), or assign to Technical Discipline Working Group • Set development schedule (TWG) • Review lessons learned databases for incorporation of technical data (TWG) • Develop group consensus draft (TWG) • Conduct pre-reviews (TWG) • Provide TWG progress to NTSP Manager (TWG) • Complete NASA Form 1676, (TWG Chair/TDWG Chair/OPRD/NESP) • Send consensus draft and NASA Form 1676 to NTSP Manager for AWR (TWG Chair/TDWG Chair//OPRD) • Format and edit draft (NTSP Manager) • Proceed to Stage 3	• Conduct technical review of the draft and document Center comments/ concurrences in the Center CRM (NESP) • Prepare consolidated CRM (NTSP Manager) • Resolve comments and redline changes documented in the CRM into draft (TWG) • Revalidate that NASA Form 1676 is accurate for document in EMB review and document for approval (TWG Chair/TDWG Chair/OPRD/NESP) • Complete final draft and CRM (NTSP Manager) • If comment resolution is satisfactory, obtain EMB and Mission Directorate concurrence simultaneously (NESP/NTSP Manager) • If comments cannot be resolved, proceed to Stage 4 • Proceed to Stage 5	• Present issues to EMB (NTSP Manager and TWG Chair/OPRD) • Resolve issues (EMB/NASA Chief Engineer/NESC) • If changes result, prepare final standard and document resolution in CRM (NTSP Manager) • Revalidate that NASA Form 1676 is accurate for document final document, (TWG Chair/TDWG Chair/OPRD/NESP) • Proceed to Stage 5	• Review and approve the NASA engineering standard (NASA Chief Engineer) • File record documentation and publish the NASA engineering standard in NTSS (NTSP Manager) • Notify NESP of approval for dissemination at Center (NTSP Manager) • Proceed to Stage 6	• Review within 5 years and recommend (OPRD): – Revalidation – Revision; go to Stage 2 – Editorial or administrative Changes – Conversion to a VCS – Inactivation for New Design – Cancellation

Note: The flow diagram for developing NASA engineering standards is shown in figure 2, NASA Engineering Standards Development Process.

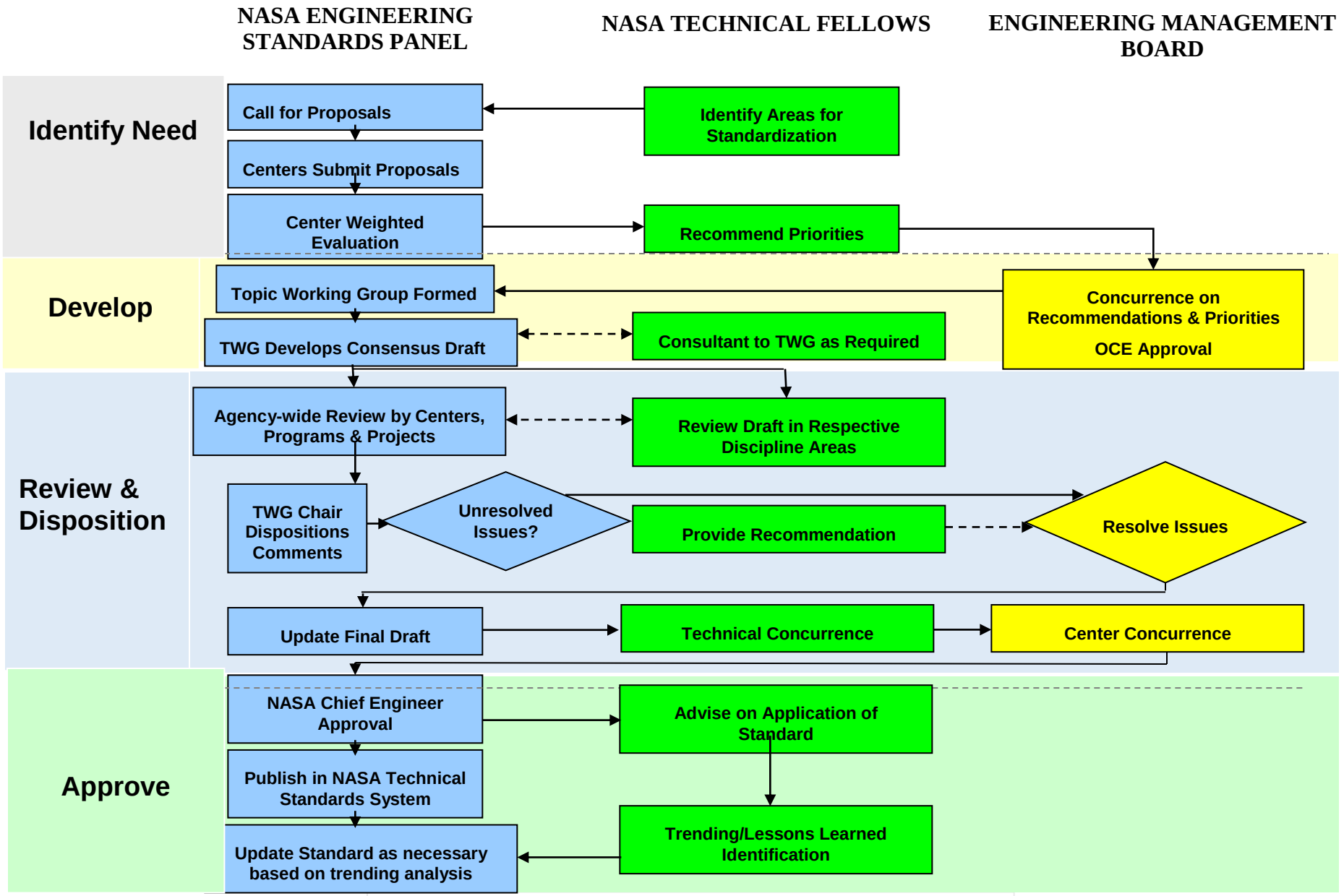

Figure 2—NASA Engineering Standard Development Process

Note: The timeline for development and maintenance of NASA engineering standards is shown in figure 3, Timeline for NASA Engineering Standards Development and Maintenance.

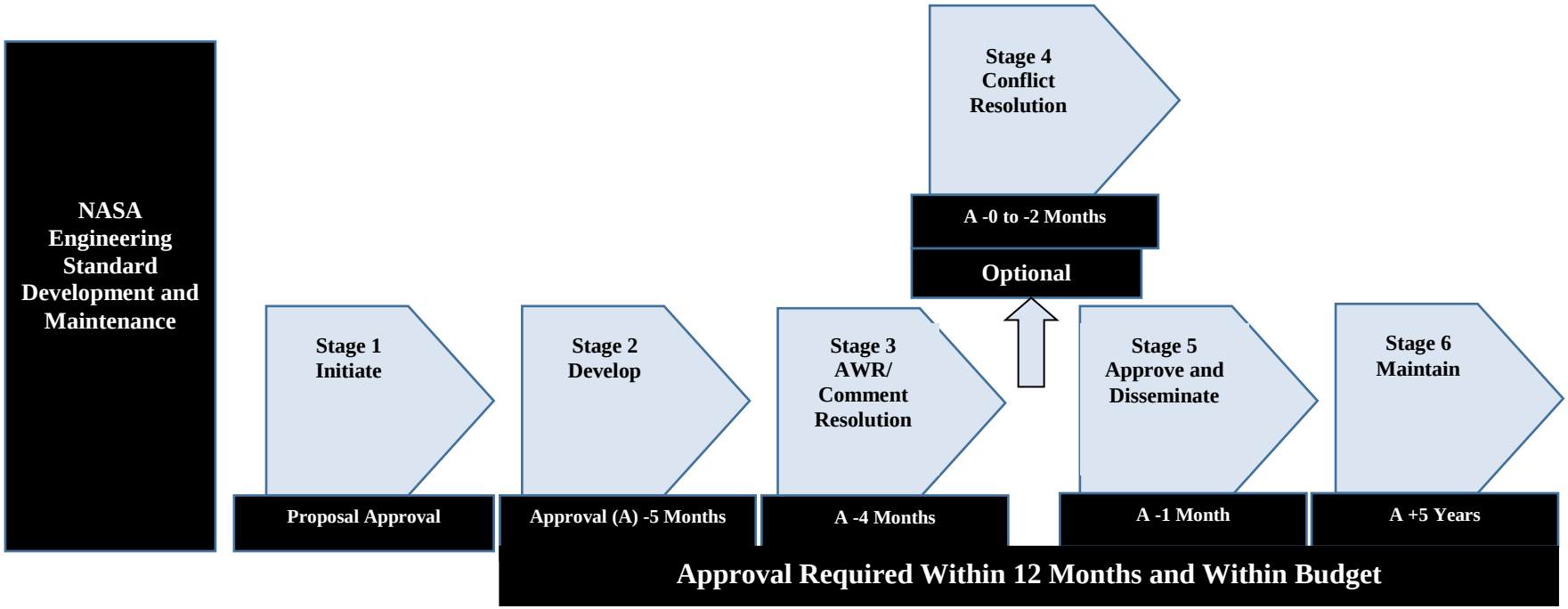

Figure 3—Timeline for NASA Engineering Standards Development and Maintenance

6.1 Stage 1, Initiate

6.1.1 Identify Need for a NASA Engineering Standard

Note: NASA engineering standards are developed to promote interoperability among NASA programs and projects by developing NASA-unique standards, capture and preserve engineering lessons learned and best practices, and facilitate the infusion of technology into all NASA programs and projects. Resources, when available, may be used for the preparation of new and required NASA engineering standards using existing information and data. Funding for development and testing of new technology is not within the scope of the NTSP.

Note: A Technical Fellow or any NASA employee or contractor may identify the need to develop a NASA engineering standard.

6.1.1.1 When the Agency's need for a NASA engineering standard versus a voluntary consensus standard is identified, NESP members shall coordinate within their respective Centers those proposals and justifications for which the Agency has a need for standardization, including EMB or delegate approval to commit Center resources and ensuring proposal preparation for presentation to the NESP, in coordination with the NTSP Manager.

Note: Providing detailed information and using the guidelines and examples provided in the NTSS are imperative to ensure adequate evaluation and approval of the proposal.

6.1.1.2 The NTSP Manager shall request the Center subject matter expert to present the proposal to the NESP.

6.1.1.3 NESP members from Ames Research Center, Armstrong Flight Research Center, Glenn Research Center, Goddard Space Flight Center, Jet Propulsion Laboratory, Johnson Space Center (includes White Sands Test Facility), Kennedy Space Center, Langley Research Center, Marshall Space Flight Center, Stennis Space Center, and NESC shall:

a. Abstain from evaluation of the proposal if the Center will not be impacted by the technical content or requirements of the standard, if it originates from their Center, or if there is any cause for bias or partiality.

b. Coordinate evaluation of the proposal based on the weighted criteria in table 2, Evaluation Criteria and Weighting for Proposals to Develop a NASA Engineering Standard.

Note: The primary ground rules to develop NASA engineering standards are that all basic research and testing must have been completed and that completion of development of a NASA engineering standard must be within a 12-month timeframe and within allocated budget.

Table 2—Evaluation Criteria and Weighting for Proposals to Develop a NASA Engineering Standard

Weighting	Criteria
50%	(1) The proposed technical standard is necessary to capture Agency-wide NASA-unique best practices and processes or establish those in identified deficiency areas.
30%	(2) The proposed technical standard or its products will be used by multiple NASA Centers and/or multiple programs/projects that perform the specific technical discipline.
20%	(3) Determination and evaluation of similar technical standards have been performed that established VCS or other Government agency technical standards do not exist, are not in development, or cannot be adapted (tailored) to meet NASA's technical needs.

6.1.1.4 The NTSP Manager shall provide the proposal and NESP recommendation to the NESC NESP member for the discipline Technical Fellow's recommendation.

6.1.1.5 The NESC NESP member, in coordination with the discipline Technical Fellow, shall review the NESP recommendation and recommend concurrence/non-concurrence to the NTSP Manager.

6.1.1.5.1 If the Technical Fellow does not concur, the NTSP Manager shall reconvene the NESP, obtain consensus following discussion of each position from the Center technical expert and Technical Fellow.

6.1.1.5.2 Based on consensus, the NTSP Manager shall:

a. If consensus is concurrence, prepare a package of concurred-with proposals for Technical Fellow prioritization if funding is not available for all proposals.

b. Prepare a signature package consisting of a concurrence memorandum summarizing the NESP and Technical Fellow's recommendations and the proposal(s) and send the signature package to the Program Executive.

c. If consensus is non-concurrence, cancel the proposal and notify the NESP.

6.1.2 Approval to Develop a NASA Engineering Standard

6.1.2.1 In coordination with the Program Executive, the NASA Chief Engineer shall approve development of the NASA engineering standard(s).

6.1.2.2 The NTSP Manager shall:

a. Assign a unique document number by determining the category number that represents the discipline (table 3, Technical Discipline Categories) and assigning a three-digit number to it as follows:

NASA-XXX-XXXXXR
| | | | |_____ Revision Indicator
| | | |_____ Sequentially assigned 3-digit number
| | |_____ Technical discipline category number 0-10
| |_____ Indicates document type acronym (STD (standard), SPEC (specification) or HDBK (handbook))
|_____ Indicates NASA document

Table 3—Technical Discipline Categories

Technical Category No.	Technical Category Definition
0	**Documentation and Configuration Management, Program Management**: Program Management; Configuration and Documentation Management; Packaging, Shipping, and Handling; Transportation; Reproduction and Document Archiving; Drawing Practices.
1	**Systems Engineering and Integration, Aerospace Environments, Celestial Mechanics**: System Analysis, Engineering and Integration; Orbital and Celestial Mechanics, Trajectory/Performance; Aerospace Environments; Standards for Weights and Units of Measurement; System Terminology; Automation and Robotics/Robotic Space Flight, Flight Mechanics, Aero-science.
2	**Computer Systems, Software, Information Systems**: Computer Design (Flight and Ground), Software Design (Flight and Ground), Computer and Software Security, Information Systems (ADP) and Network Communications Design. (Primarily assigned to the Office of the Chief Information Officer standards)
3	**Human Factors and Health**: Space Flight Ergonomics; Space Flight Human and Health Design Factors. (Primarily assigned to the Office of the Chief Health and Medical Officer)
4	**Electrical and Electronics Systems, Avionics/Control Systems, Optics**: Electrical/Electronic Design, including Printed Circuit Boards; Electrical Ground and Airborne Support Equipment; Electromagnetics and Electrical Discharge Control; Electrical Power; Electrical, Electronic, and Electromechanical (EEE) Parts; Guidance, Navigation, and Control; Optics; Radio Frequency (RF) Design.
5	**Structures/Mechanical Systems, Fluid Dynamics, Thermal, Propulsion, Aerodynamics**: Structural Design, including Stress Corrosion Control; Mechanical Design, including Mechanical and Propulsion Ground and Airborne Support Equipment; Propulsion and Power Design; Thermal Design; Flight and Fluid Dynamics; Pyrometry; Electrically Initiated Explosive Subsystems, Life Support/Active Thermal, Passive Thermal, Loads and Dynamics.

Table 3—Technical Discipline Categories (Continued)

Technical Category No.	Technical Category Definition
6	**Materials and Processes, Parts**: Materials and Materials Testing, including Fluids and Propellants; Material Processes, including Material Selection; Manufacturing; Mechanical Parts, Nondestructive Evaluation.
7	**System Test, Analysis, Modeling, Evaluation**: System, Subsystem, Component, and Parts Testing, including Environmental Testing; Test Evaluation; Test Bed; Analysis and Modeling; System Simulation.
8	**Safety, Quality, Reliability, Maintainability**: Safety (Flight, Ground, Personnel, and Equipment); Quality (Hardware and Software); Reliability (Hardware and Software); Maintainability (Hardware and Software). (Primarily assigned to the Chief, Safety and Mission Assurance standards)
9	**Operations, Command, Control Telemetry/Data Systems, Communications**: Flight and Ground Operations; Mission Command and Control; Telemetry and Data Systems Design; Flight-to-Ground Radio Frequency (RF) Communications, Human Space Flight Operations.
10	**Construction and Institutional Support**: Facilities Design; Roads and Ground Support; Institutional Support (Local Transportation, Fire Control, Telephones, Health Care, etc.).

Note: The word "design" can include development, supporting design analyses, fabrication, manufacture, construction, installation, testing, inspections, cleaning, packaging, transporting, storage, operation, and end-of-service disposal of hardware, equipment, systems, components, etc.

b. Notify NESP of approval to develop.

6.2 Stage 2, Develop

6.2.1 TWG Formation

6.2.1.1 The subject matter expert who developed the proposal shall become the TWG Chair unless unavailable, in which case the NTSP Manager appoints the TWG Chair. In the event of a jointly prepared proposal, the preparers shall determine the TWG Chair and Co-Chair.

6.2.1.2 The NTSP Manager shall:

a. Issue a call to NESP members for Center experts with interest in participating in TWGs to develop NASA engineering standards, or

b. If a Technical Discipline Working Group is already established, contact the working group chair to determine if support from the Centers is needed.

Note: Additional Center participation is optional in this case.

6.2.1.3 The NTSP Manager shall solicit Center TWG members from the NESP members, notify the TWG Chair of Center-approved participants on specific TWGs, and file the notification.

Note: Selection of TWG members should include at least three members from three different NASA Centers. The Chair is encouraged to recommend discipline reviewers from industry and academia as well. The NTSP Manager approves industry and academia TWG members.

6.2.1.4 NESP members shall select and approve Center TWG participants and notify the NTSP Manager.

6.2.1.5 The TWG Chair, Technical Discipline Working Group Chair, or OPRD shall:

a. Maintain a current list of assigned TWG members' or Technical Discipline Working Group members' information, along with that of the discipline reviewers from industry and academia.

b. Establish a development schedule for the standard within the 1-year timeframe required by NPR 7120.10.

c. Review and identify lessons learned sources for incorporation of technical contents into the draft standard.

Note: A lesson learned does not have to be derived from NASA's experience, but validation is required. Lessons learned are available from NASA's Lessons Learned Information System at http://llis.nasa.gov/ and from other sources.

d. Provide progress reports of the document development status to the Center NESP member monthly or to the NTSP Manager as requested.

Note: The reports may include the lessons learned that have been incorporated, the status of development, changes in schedule for development, issues, etc.

e. Apprise the discipline Technical Fellow of development status.

6.2.2 Development of a NASA Engineering Standard

6.2.2.1 The TWG or OPRD shall:

a. Develop the TWG consensus draft of the standard, specification, or handbook in accordance with the instructions and templates provided in NASA-NTSP-2 for standards, NASA-NTSP-3 for specifications, and NASA-NTSP-4 for handbooks; for revisions, redline changes in the currently approved version of the document obtained from the NTSP Manager.

b. Indicate on NASA Form 1676, NASA Scientific and Technical Information (STI) Document Availability Authorization (DAA), provided by the NTSP Manager, whether the draft document is believed to contain technology transfer/export-controlled information or not, sign the form, obtain Center/JPL Export Control Representative's confirmation and signature, and General Counsel's review and signature if warranted.

Note: The NTSP Manager signs sections 7 and 9 on NASA Form 1676.

Note: If the standard contains technology transfer/export-controlled information, notify the NTSP Manager and follow procedures for handling export-controlled information. Developers are discouraged from including technology transfer/export-controlled information in NASA engineering standards.

c. Conduct preliminary reviews of the working draft, as necessary, to facilitate official review and approval.

Note: Technical Fellows serve as consultants during development as required.

d. Submit the TWG's draft consensus standard or OPRD-redlined standard and NASA Form 1676 to the NTSP Manager, requesting AWR of the draft.

6.2.2.2 The responsible NESP member shall:

a. Monitor development by the TWG chair or OPRD and offer suggestions on resolving issues.

b. Ensure that the TWG or OPRD properly completes NASA Form 1676.

6.2.2.3 The NTSP Manager, or designee, shall:

a. Ensure the draft document is edited and formatted (usually within 30 days) and returned to the TWG Chair or OPRD for concurrence of redlined changes.

b. Ensure NASA Form 1676 received from the Center/JPL is marked and signed.

c. If concurrence is not received, the TWG Chair or OPRD shall redline changes into the edited and formatted document and send it to the NTSP Manager within the specified timeframe.

d. If concurrence is received, proceed to section 6.3.

6.2.2.4 If the draft document is not completed within the required timeframe, within budget, inability to obtain Agency-wide concurrence, or for other reasons, the TWG chair or OPRD shall request an extension to complete the draft or complete an MSFC Form 4649 to request withdrawal from development.

Note: If development is not completed within 1 year from project initiation to include funding transfers and other administrative functions or by the end of the extended timeframe, the NTSP Manager may cancel development of the standard.

6.2.2.5 Center EMB members shall ensure that assigned OPRDs and TWG members from their Center give the standard development effort sufficient priority to meet the 1-year development schedule.

6.3 Stage 3, Agency-wide Review (AWR) and Comment Resolution

6.3.1 The NTSP Manager shall assign an action to the respective Center NESP members to conduct Center-wide reviews (collectively referred to as AWR) of the draft for technical accuracy and adequacy (usually due within 30 days).

6.3.2 NESP members shall:

a. Be aware of document distribution restrictions (stated in the footer of the template).

b. Ensure technical reviews for accuracy and adequacy of each draft document are conducted by the Center's experts, program and project offices, and directorates/organizations.

c. Prepare the Center's Comment Resolution Matrix (CRM), consolidating all comments received into one CRM and providing names of specific program and project offices, directorates, and organizations with names of persons who reviewed the draft document with their comments or a notation that a review occurred but no comments were received, along with one of the following dispositions for the Center:

(1) Concur.

(2) Concur with comments. (Provide comments with specific "from/to" change recommendations.)

d. Send the Center's CRM to the NTSP Manager.

e. If a comment cannot be resolved by the TWG Chair or OPRD and a non-concurrence from the opposing Center is expected, notify the NTSP Manager immediately to suspend the review until the issue is resolved.

6.3.3 The NTSP Manager, or designee, shall ensure preparation of a consolidated CRM comprised of all comments received from the AWR within 10 days from the action due date.

6.3.4 The TWG, Technical Discipline Working Group, or OPRD shall:

a. Have full and open discussions to resolve comments with the reviewers.

b. Document the disposition of each comment received in the CRM with rationale if not accepted, usually within a 30- to 60-day period, depending on the number of comments received.

c. If comment resolution does not result in changes to the document, send the final resolution matrix to the NTSP Manager; proceed to section 6.3.6.

d. If comment resolution results in changes to the document:

(1) Redline the changes as documented in the CRM using the Review/Track Changes tool in Microsoft® Word® into the NTSP-formatted and edited document that was reviewed by the Agency.

(2) Submit the redlined Draft 2 (in Microsoft® Word® format), the consolidated CRM, and the revalidated NASA Form 1676 confirmed by the NTSP member to the NTSP Manager; proceed to section 6.3.6.

Note: No changes except minor administrative changes that have no technical impact are to be made to the standard unless documented and concurred with in the CRM.

6.3.5 If non-concurring comments cannot be resolved by the TWG or OPRD and the associated NESP members, the following actions are taken:

a. The NESP member shall notify the NTSP Manager that issues cannot be resolved.

b. The NTSP Manager shall facilitate resolution and elevate the issue to the Program Executive if unresolvable.

c. The Program Executive shall, if warranted, elevate the issue to the EMB for conflict resolution.

6.3.6 The NTSP Manager shall issue an action to the engineering NESP members to obtain EMB concurrences from Centers that did not abstain from proposal evaluation for this NASA engineering standard, usually within a 15-day period.

6.3.7 The NESP member shall:

a. Obtain formal Center concurrence or non-concurrence with the final draft/CRM from the AWR, documented via formal memorandum or email from the EMB members to the NTSP Manager.

b. Notify the NTSP Manager immediately if there is not Center or NESC agreement with the final draft and CRM.

Note: This activity occurs only to obtain EMB concurrences with the results of the AWR—not to entertain new comments.

c. Ensure NASA Form 1676 for the document presented for approval has been revalidated.

6.3.8 The TWG Chair, Technical Discipline Working Group Chair, or OPRD shall verify that the signed NASA Form 1676 applies to the document presented for approval, prepare and obtain signatures on the NASA Form 1676 if the control changes, and send it to the NTSP Manager.

6.3.9 The NTSP Manager, or designee, shall:

a. Sign NASA Form 1676 in sections 7 and 9, if necessary, for the final document and verify that the distribution statement in the document's footer is correct.

b. If there are no issues, prepare and transmit the final document, the final consolidated CRM, NASA Form 1676, formal Center concurrences from NASA Centers that did not abstain from evaluation of the proposal to develop this NASA engineering standard and NESC, and any supporting data to the Program Executive; proceed with document approval.

c. If there are issues that cannot be resolved, proceed with conflict resolution at the dissenting Center's EMB member's request.

Note: The Technical Fellow's recommendation is provided to the EMB.

d. If issue resolution results in technical changes to the standard, notify NESP members of those changes, provide final (and redlined if feasible) document and revised consolidated CRM, request NESP members to obtain Center concurrence or confirm that the current concurrence still stands.

e. Review the signature package and submit the package containing the following to the Program Executive; proceed with document approval:

(1) Final NASA engineering standard.
(2) Final consolidated CRM.
(3) Signed NASA Form 1676 for the final standard.
(4) EMB concurrences from reviewing Centers and NESC.
(5) Any supporting data.

6.4 Stage 4 (Optional), Conflict Resolution

6.4.1 The Program Executive, in coordination with the NTSP Manager, shall schedule a meeting with the EMB for the TWG Chair or OPRD to present conflicts and issues that cannot be resolved, including the following information:

a. The issue(s) resulting in the non-concurrence(s), including agreed-to facts and discussion of the differing positions with rationale and impacts.

b. The approach used by the TWG Chair, Technical Discipline Working Group Chair, or OPRD to resolve the issue(s) and the outcome of that approach.

c. The reason(s) the issue(s) remains unresolved, with considerations for and against listed, and the recommendation of the TWG Chair, Technical Discipline Working Group Chair, or OPRD.

6.4.2 The EMB members and the NASA Chief Engineer shall resolve conflicts and issues with support from the NESC.

6.4.3 The NTSP Manager shall proceed in accordance with EMB and NASA Chief Engineer recommendations.

6.4.4 If changes to the standard result from the resolution, the NTSP Manager shall:

a. Prepare the final document and consolidated CRM indicating EMB resolution of issues.

b. Ensure revalidation of NASA Form 1676 and verify that the distribution statement on the document is correct; proceed to section 6.5.

c. Update the signature package.

6.5 Stage 5, Approve and Disseminate

6.5.1 The NTSP Manager shall transmit the signature package to the Program Executive**.**

6.5.2 The Program Executive shall review the signature package for technical accuracy and adequacy and obtain NASA Chief Engineer's approval.

Note: The TWG is officially dissolved upon approval or disapproval of the NASA engineering standard.

6.5.3 Once a NASA engineering standard has been approved by the NASA Chief Engineer, the NTSP Manager shall:

a. Change the document as indicated in NASA-NTSP-2, NASA-NTSP-3, or NASA-NTSP-4.

b. Enter the approved NASA engineering standard's information in the Standards Update Notification System (SUNS). (Refer to online instructions in the NTSS.)

c. Prepare an announcement regarding the document's approval and its availability in the NTSS for NESP dissemination.

6.5.4 NESP members shall ensure cancellation of Center technical standards replaced by NASA engineering standards, if applicable.

6.6 Stage 6, Maintain

a. The TWG Chair or Technical Discipline Working Group Chair shall become the OPRD of the approved standard and maintain the approved NASA engineering standard(s) for which he/she is responsible as follows:

(1) First, determine and document in MSFC Form 4649 which NASA programs and projects are currently using this NASA engineering standard or will use it in the future.

(2) Review the criteria for revalidation, revision, editorial or administrative changes, inactivation for new design, cancellation, and conversion to a VCS (refer to section 5) and determine the correct recommendation for maintaining the NASA engineering standard—

(A) Whenever the need arises.

(B) Within 5 years from the new or revised approval date, the last revalidation date, or the inactivation date.

b. The NTSP Manager shall notify NESP members and OPRDs that revalidation is due prior to the 5-year review due date.

Note: The NTSP Manager and the Program Executive have the authority to recommend maintenance of a NASA engineering standard when warranted.

6.6.1 Revalidate

6.6.1.1 Criteria for Revalidation

The responsible OPRD shall review the active NASA engineering standard and verify that it meets the following criteria for revalidation:

a. Is relevant, current, technically accurate and adequate, necessary, meets users' needs, and complies with NTSP procedures.

b. Cannot be immediately replaced with, or converted to, a VCS.

c. Requires no changes, including changes to applicable documents and their related requirements and changes in scope, except those editorial or administrative in nature.

d. Does not conflict with or duplicate other requirements.

e. No significant feedback or requests for change from users have been received during the last 5 years.

6.6.1.2 Process for Revalidation

6.6.1.2.1 The OPRD shall review the standard against the criteria in section 6.6.1.1 and, if it meets the criteria, recommend revalidation by submitting MSFC Form 4649, Recommendation for Maintaining a NASA Engineering Standard, to the NTSP Manager.

6.6.1.2.2 The NTSP Manager shall request the NESP to conduct a review of the NASA engineering standard for revalidation and concur/non-concur.

6.6.1.2.3 Non-concurring NESP members shall recommend an alternative(s) (refer to sections 6.6.1.2.7 through 6.6.1.2.11) for maintaining the NASA engineering standard.

6.6.1.2.4 The OPRD shall comply with NESP recommendations.

6.6.1.2.5 If the NESP concurs, the NTSP Manager shall change the document as indicated in NASA-NTSP-2, NASA-NTSP-3, or NASA-NTSP-4.

Note: Revalidations are executed by administrative changes.

6.6.1.2.6 The NTSP Manager shall publish the revalidated document in NTSS; send an announcement to the NESP members to disseminate; and file the recommendations from the OPRD and NESP and the document as a record.

Note: This action extends the review date for the next revalidation for another 5 years.

6.6.1.2.7 If the NASA engineering standard is needed but requires revision, the OPRD shall follow the procedure in section 6.6.2.

6.6.1.2.8 If editorial or administrative changes are required, the OPRD shall follow the procedure in section 6.6.3 and state that the document is also revalidated with those changes.

6.6.1.2.9 If the NASA engineering standard does not meet the criteria for revalidation, revision, or editorial or administrative changes, the OPRD shall follow the procedure in either section 6.6.4 or section 6.6.5.

6.6.1.2.10 If the NASA engineering standard is inactive for new design and the standard is still needed, the OPRD shall follow the procedure in section 6.6.1.2.1.

6.6.1.2.11 If the NASA engineering standard is inactive for new design and the standard is no longer needed, the OPRD shall follow the procedure in section 6.6.5.

6.6.2 Revise

6.6.2.1 Criteria for Revision

The OPRD shall review the NASA engineering standard and verify that it meets the following criteria for revision:

a. Requires technical changes to be technically accurate and adequate, remain current, and meet users' needs, i.e., incorporation of new technology and data.

b. The subject matter is still relevant and necessary for Agency use.

c. Changes are necessary to comply with NTSP procedures.

d. Changes in the scope are necessary.

e. Cannot be immediately replaced with, or converted to, a VCS.

6.6.2.2 Process for Revision

6.6.2.2.1 The OPRD shall:

a. If the NASA engineering standard meets the criteria in section 6.6.2.1, recommend revision by submitting MSFC Form 4649, Recommendation for Maintaining a NASA Engineering Standard, to the NTSP Manager.

b. Request the currently approved Microsoft® Word® version of the standard from the NTSP Manager.

c. Indicate revisions by a capital letter at the end of the document number, with the first revision designated "A," and succeeding revisions indicated by letters "B" through "Z," e.g., NASA-STD-0001 (the baseline) is revised to NASA-STD-0001A; after "Z," continue revisions with "AA," "AB," "AC," etc.

d. Request that the NTSP Manager issue a call for participants if a TWG is needed to revise the NASA engineering standard; proceed to section 6.2.1.2.

e. If a TWG is not necessary, redline changes in the currently approved Microsoft® Word® version; proceed to section 6.3.

f. Follow the same content and format instructions for revisions as is prescribed for new standards.

Note: If the technical change(s) to the NASA engineering standard only impacts limited, discrete paragraphs of the standard, the OPRD may elect to submit only the paragraph changes for AWR and concurrence, as opposed to the entire document. However, if the NTSP Manager determines

that the changes are too extensive for a paragraph review, a review of the entire document may be required.

g. If the OPRD elects to submit only the technical paragraph changes for AWR, send the redlined paragraph(s) to the NTSP Manager, requesting AWR; proceed to section 6.3.

h. If review of only the specific technical changes is issued and technical comments on other sections of the standard are received, resolve those comments as well.

Note: The process to revise a NASA engineering standard is the same process as used to approve the initial standard.

Note: When a new revision is approved, the previous version is superseded by the current version; use of a superseded document requires Technical Authority approval. The current version supersedes the previous version.

Note: An approved revision extends the review date for the next revalidation for another 5 years.

6.6.2.2.2 The NTSP Manager shall change the document as indicated in NASA-NTSP-2, NASA-NTSP-3, or NASA-NTSP-4.

6.6.3 Editorial or Administrative Changes

6.6.3.1 Criteria for Editorial or Administrative Changes

The OPRD shall review the NASA engineering standard and verify that the necessary changes meet the following criteria:

a. Are editorial in nature, e.g., correction of typographical errors, fonts, and characters even if they are in a technical context, that if not corrected would cause the document to be used incorrectly.

b. Are administrative changes, e.g., organizational changes, changes that do not add or change requirements, or changes that cannot be altered or edited if reviewed Agency wide.

c. Use to effect revalidations, inactivations for new design, and cancellations following documented reviews and approvals.

6.6.3.2 Process for Editorial or Administrative Changes

6.6.3.2.1 If the NASA engineering standard meets the criteria in 6.6.3.1, the OPRD shall recommend the editorial and/or administrative changes by submitting MSFC Form 4649, Recommendation for Maintaining a NASA Engineering Standard, to the NTSP Manager and send the redlined document or paragraph changes to the NTSP Manager.

6.6.3.2.2 The NTSP Manager shall:

a. Review the recommendation, verify that it meets the change criteria in 6.6.3.1, and process the change.

Note: Editorial or administrative changes identified in 6.6.3.1.a and b do not require AWR but may require other notifications.

b. Change the document as indicated in NASA-NTSP-2, NASA-NTSP-3, or NASA-NTSP-4.

c. Publish the changed standard, send an announcement to the NESP members to disseminate, and retain the recommendation and the original standard as a record.

Note: An approved editorial or administrative change does not extend the review date for the next revalidation.

d. If the changes do not meet the change criteria, notify the OPRD and propose revision, inactivation, or cancellation of the standard; proceed to section 6.6.2, 6.6.4, or 6.6.5.

6.6.4 Inactive for New Design

6.6.4.1 Criteria for Inactivation for New Design

The OPRD shall review the NASA engineering standard and verify that it no longer should be approved for use in new designs or equipment; however, it can be used in support of existing designs or equipment.

6.6.4.2 Process for Inactivation for New Design

6.6.4.2.1 If the NASA engineering standard meets the criteria in section 6.6.4.1, the OPRD shall recommend inactivation by submitting MSFC Form 4649, Recommendation for Maintaining a NASA Engineering Standard, to the NTSP Manager and, when applicable, recommend a superseding document(s) for new design application, including a precautionary note(s) to ensure that the user is clear to what extent a recommended replacement document applies.

Note: A replacement document(s) should be consistent with performance-based standards.

Examples:

a. If the replacement document is technically equivalent or superior to the superseded standard, the inactivation for new design notice may directly refer readers to the replacement document.

b. For situations when testing or widespread review/use warrants use in most applications, the following statement may be used: It has been determined that [enter

document number] is a suitable replacement, but users are cautioned to evaluate this document for the particular application before citing it. (Provide the applications.)

c. *For situations when testing or widespread review/use warrants use in specific applications, the following statement may be used: It has been determined that [enter document number] is a suitable replacement for specific applications, but users are cautioned to evaluate this document for the particular application before citing it. (Provide the particular applications.)*

d. *To offer an alternative(s) for users to investigate further, the following statement may be used: Users may consult [list the document numbers] as possible replacements. Users are cautioned to evaluate these documents for the particular application before citing them.*

Note: Users are cautioned to evaluate these documents for their particular application before using or citing them.

6.6.4.2.2 The NTSP Manager shall request the OPRD of the standard to brief the NESP and provide rationale for the recommendation.

6.6.4.2.3 If concerns are expressed, the NESP shall recommend an alternative(s) for maintaining the NASA engineering standard.

6.6.4.2.4 The OPRD shall comply with NESP recommendations.

6.6.4.2.5 If there are no concerns relative to inactivating the standard, the NESC NESP member shall obtain the discipline Technical Fellow's recommendation.

6.6.4.2.6 The NTSP Manager shall:

a. Notify the NESP and OPRD of the Technical Fellow's recommendation.

b. If the Technical Fellow does not concur with the change to inactive for new design, reconvene the NESP and obtain consensus following discussion of each position from the Center technical expert and the Technical Fellow.

c. Based on consensus, prepare a signature package consisting of a concurrence memorandum summarizing the OPRD, NESP, and Technical Fellow's recommendations and send to the Program Executive, or cancel the inactive recommendation.

6.6.4.2.7 In coordination with the Program Executive, the NASA Chief Engineer shall approve or disapprove inactivation of the standard.

6.6.4.2.8 The NTSP Manager shall:

a. Change the document as indicated in NASA-NTSP-2, NASA-NTSP-3, or NASA-NTSP-4.

Note: Inactivations for new design are executed by administrative changes.

b. Publish the inactivation in NTSS and disseminate to the NESP.

6.6.4.2.9 The OPRD shall revalidate only that a need still exists for the inactive document every 5 years after the inactivation date.

6.6.5 Cancel

6.6.5.1 Criteria for Cancellation

The OPRD shall review the NASA engineering standard and verify that it meets the following criteria for cancellation:

a. Inactivation for new design has been considered.
b. No longer effective or valid.
c. No longer needed by the Agency, even in long-term programs and projects.

6.6.5.2 Process for Cancellation

6.6.5.2.1 If the NASA engineering standard meets the criteria in section 6.6.5.1, the OPRD shall recommend cancellation by submitting MSFC Form 4649, Recommendation for Maintaining a NASA Engineering Standard, to the NTSP Manager and, when applicable, recommend a replacement document, ensuring that the user is clear to what extent a recommended replacement document applies. (Refer to the note in section 6.6.4.2.1.)

6.6.5.2.2 The NTSP Manager shall schedule the OPRD of the standard to brief the NESP and provide rationale for the recommendation to cancel.

6.6.5.2.3 If concerns are expressed, the NESP members shall recommend an alternative for maintaining the NASA engineering standard.

6.6.5.2.4 The OPRD shall comply with NESP recommendations.

6.6.5.2.5 If there are no concerns relative to cancellation, the NESC NESP member shall obtain the discipline Technical Fellow’s recommendation.

6.6.5.2.6 The NTSP Manager shall:

a. Notify the NESP members and OPRD of the Technical Fellow’s recommendation.

b. If the Technical Fellow does not concur with cancellation, reconvene the NESP and obtain consensus following discussion of each position from the Center technical expert and the Technical Fellow.

c. Based on consensus, prepare a signature package consisting of a concurrence memorandum summarizing the OPRD, NESP, and Technical Fellow's recommendations and send to the Program Executive, or cancel the recommendation.

Note: Rationale may include a recommendation to revise, editorially or administratively change the standard, or inactivate for new design.

6.6.5.2.7 In coordination with the Program Executive, the NASA Chief Engineer shall approve or disapprove cancellation of the NASA engineering standard.

6.6.5.2.8 The NTSP Manager shall:

a. Change the document as indicated in NASA-NTSP-2, NASA-NTSP-3, or NASA-NTSP-4.

Note: Cancellations are executed by administrative changes.

b. Publish the standard's cancellation in NTSS and disseminate to the NESP.

Note: Cancelled documents are not normally reinstated; a new technical standard is developed almost always using the proposal process for a new NASA engineering standard. Reinstatement may be allowed by the Program Manager and Program Executive under certain circumstances where the cancelled document is adequate and timeliness of reinstatement is of the essence.

6.7 Recommendation for Changes to NASA Engineering Standards

To recommend changes to a NASA engineering standard, a NASA engineering standard user shall submit a Change Request, accessible in NTSS, to the NTSP Manager for coordination with the OPRD.

6.8 Change in Technology Transfer/Distribution Authorization

6.8.1 If a document that is currently accessible, or at any time has been accessible in NTSS, is later identified as a restricted document, the OPRD shall notify the NTSP Manager immediately and follow up with a copy of the NASA Form 1676.

6.8.2 The NTSP Manager shall notify the technology transfer/distribution authority and remove the document from NTSS.

6.8.3 If the document is still needed by NASA, the OPRD shall provide information to the NTSP Manager for requesting the document.

7. TECHNICAL STANDARDS ENDORSED BY ENGINEERING

Note: Endorsed standards narrow the field of potential technical standards that help drive commonality throughout NASA's engineering community. They serve as a "pick list" based on experience to ensure that proven technical standards have not been overlooked by programs and projects in the selection of requirements for design, development, and operations. Technical standards endorsed by the NASA Chief Engineer ("OCE Endorsed Engineering Standards") may include approved NASA engineering standards developed under sponsorship of the NASA Chief Engineer, plus approved technical standards developed by national and international VCS bodies and other Government agencies.

7.1 Criteria for Recommending Engineering Standards for Endorsement by NASA

Note: NASA's technical community may recommend technical standards for consideration for endorsement by engineering.

A subject matter expert shall recommend endorsement by completing a Recommendation for NASA Endorsement or Endorsement Removal using the following criteria:

a. The technical standard is approved in accordance with a documented, approved process and is reviewed and updated on a periodic basis.

b. The technical standard addresses common, high-level functions that need to be addressed by projects across or within a given program or elements across or within a given project.

c. The technical standard uses best engineering practices representative of the most current proven technology.

d. The technical standard is widely accepted by discipline experts from industry, military, academia, and NASA to ensure proven, consistent, common practices in the discipline area are applied.

e. The technical standard is not a program- or project-specific or Center standard, a Center-specific laboratory procedure or process, or a procurement specification.

7.2 Approval of Engineering Standards for Endorsement by NASA

7.2.1 In consultation with the NASA Technical Fellows, the Program Executive or NTSP Manager shall approve or disapprove the technical standard(s) for endorsement.

7.2.2 The NTSP Manager shall add the "NASA-Endorsed" status in NTSS.

7.3 Removal of "NASA Endorsed" Status for an Endorsed Engineering Standard

7.3.1 When a NASA-endorsed technical standard no longer meets the criteria, in coordination with the Technical Fellows, the NTSP Manager or Program Executive shall ensure completion of a Recommendation for NASA Endorsement or Endorsement Removal to remove the document from the endorsed list and "NASA Endorsed" status in NTSS

7.3.2 The NTSP Manager shall remove the "NASA-Endorsed" status in NTSS.

8. NASA TECHNICAL STANDARDS SYSTEM (NTSS)

Note: NTSS is the single point, "one-stop shop" website accessible at https://standards.nasa.gov and is administered by the NTSP Manager. Users are required to be registered in the NASA Access Management System (NAMS) for automatic login to NTSS. A user who is not registered in NAMS can log in to https://nams.nasa.gov/. *See "New Account Instructions" on the home page.*

NASA users are provided access to technical standards and related information from various standards developing bodies and other technical information to potentially reduce research time, streamline workflow, and avoid unnecessary costs. Technical standards are provided via subscriptions for highly used technical standards and by pay-by-the-document requests. NTSP is responsible for the costs associated with document orders placed through the NTSS. NASA users are also provided the following to implement requirements in NPR 7120.10:

a. NASA-endorsed technical standards to evaluate for use as program and project requirements.

b. Electronic notification when selected standards are modified to ensure use of current versions and to check impacts on program and project requirements. Changes to technical standards can have major impacts on the safety, performance, reliability, and cost of programs and projects. Using out-of-date standards, unless required to meet specific needs, misses improvements and the benefits of experience, and exposes programs and projects to the risk of repeating those failures that led to update of the standard.

Public users are provided access to limited information in NTSS, which includes approved NASA technical standards, NASA engineering standards in development, and NASA Center standards authorized for public access.

8.1 NTSS Control and Content

8.1.1 The NTSP Manager shall:

a. Authorize information in NTSS.

b. Maintain online processes and control changes.

c. Assign maintenance responsibilities to ensure current information is accessible in NTSS.

d. Assign and indicate a primary and backup system administrator in NTSS.

Note: The NTSP's information systems backup data procedures are contained in OA-0801-M-MSF-2707, MCS Moderate Infrastructure System Security Plan.

8.1.2 NESP members shall provide a point of contact for providing Center technical standards, when permitted, to the NTSS search.

8.1.3 For all technical standards residing on another server that are linked to NTSS, their OPR shall be responsible for maintaining the record of technology transfer/distribution authorization.

8.2 Lessons Learned Association with Standards

The NTSP Manager, or designee, shall review lessons learned with the Lessons Learned Lead for possible association with the specific technical standard.

8.3 Application Notes Development and Linkage to Technical Standards

Note: The NASA technical community may develop and submit application notes relative to specific standards to the NTSP Manager.

The NTSP Manager, or designee, shall review and approve application notes for linkage in NTSS.

9. Work Breakdown Structure

Note: The NTSP supports only technical standard development/review—not research, procedure/method/technology development, testing, or data analysis.

Table 4, NTSP Work Breakdown Structure, provides the work breakdown structure used to produce the NASA Technical Standards Program's end products.

Table 4—NTSP Work Breakdown Structure

WBS Number	WBS Name	WBS Description
811540.01	Technical Standards	Setting technical requirements for Technical Excellence by providing the required technical standards for NASA programs and projects and supporting enhanced use of standards.

WBS Number	WBS Name	WBS Description
811540.01.01	Technical Standards Program Management NTSP Manager/Staff	Provide for the manager and project lead Civil Servants and contractor support for the day-to-day operation of the NTSP, including but not limited to: 1. Coordination and resolution of the standards development process with each Engineering NESP member, including discipline expert scoring of proposals against fixed criteria, EMB member concurrence with implied priorities, and NESC review/adjustment of priorities for presentation to the Chief Engineer. 2. Standards development project status monitoring, comment compilation/disposition control, document editing/formatting for review, and preparation for final approval and dissemination of NASA engineering standards. 3. Preparation of OMB Circular A-119 compliance reports. 4. Management of the NTSS and user support. 5. Procedure development, data analysis, and NTSS use and performance metrics and trend analyses. 6. Coordination of the NESP monthly teleconferences and annual (at a minimum) face-to-face meetings. 7. Development and execution of the NTSP budget. 8. Support briefings to internal and external stakeholders. 9. Identification and evaluation of new standards needs and review/acceptance of endorsed standards. 10. Linking of Lessons Learned and Application Notes to standards.

WBS Number	WBS Name	WBS Description
811540.01.02	Technical Standards Program Support Contract/Mods	The NTSS is a NASA-wide, web-based resource providing: 1. Electronic access to full text standards from any source to all NASA users authorized in IdMAX in support of NASA programs and projects. 2. User support services, including standards update notifications for registered standards, and links to lessons learned and application notes for specific standards. 3. Electronic access to supplier catalogs and databases for fasteners and other mechanical parts. Funding covers license fees for copyrighted standards, the integrated user interface (contracted), and the standards update service.
811540.01.03	NESP Technical Management	Center Technical Management includes but is not limited to: 1. Participation in the NESP, principally for Center coordination of standards reviews, policy/procedure development, interchange with other NASA standards development (OSMA, CIO, OCHMO). 2. Support of non-funded Center experts in development as contributors/project leaders for VCS and their review by NASA Centers. 3. Identification and evaluation of new standards needs and review/acceptance of endorsed standards.
811540.01.04	Technical Standards Development	Provides civil servant and contractor labor support for the development and maintenance of VCS and NASA engineering standards, specifications, and handbooks including: 1. TWG Chair/OPRD 2. TWG support members 3. Center review (excluding Center Technical Experts) 4. Comment resolution/disposition

10. OUTREACH AND EDUCATION

The NTSP Manager, or designees, shall develop articles, prepare exhibits, make presentations relative to the NTSP, sponsor training, and educate those involved in NTSP activities in the procedures, processes, and systems, such as participation in VCS activities, development and maintenance of NASA engineering standards, and use of the NTSS.

APPENDIX A

CHARTER

NASA ENGINEERING STANDARDS PANEL

1. Purpose

a. This Charter establishes the NASA Engineering Standards Panel (NESP) and sets forth requirements for functions, membership, liaisons, roles and responsibilities, meetings, and records retention.

b. The NESP is established to provide counsel and recommendations to the Office of the Chief Engineer (OCE) NASA Technical Standards Program (NTSP) Manager relative to formulation, implementation, and oversight of projects for the proposal, development, and maintenance of NASA engineering standards; development, review, endorsement, and tailoring of voluntary consensus standards (VCS); and related information to support engineering excellence in NASA programs and projects. The NTSP Manager coordinates recommendations on actions with the NTSP Executive.

2. Applicability/Scope

This Charter applies to NASA Headquarters and all NASA Centers, including Component Facilities and Technical and Service Support Centers, and to the Jet Propulsion Laboratory (JPL) to the extent specified or referenced in its contract.

3. Authority

a. Public Law 104-113, National Technology Transfer and Advancement Act of 1995.

b. Office of Management and Budget (OMB) Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.

c. NASA Procedural Requirements (NPR) 7120.10, Technical Standards for NASA Programs and Projects.

4. Functions

The NESP provides counsel and recommendations on the development and coordination of NASA engineering standards activities supporting implementation of NPR 7120.10. The NESP shall perform the following:

4. Functions (Continued)

a. Participate in the development of Agency-level NASA engineering standards policies, procedures, and processes.

b. Facilitate sharing NASA engineering standards knowledge within the representatives' respective organizations and across NASA Centers.

c. Promote the use of the NASA engineering standards development process, the conversion of NASA engineering standards to VCS, and the participation in development and tailoring of national and international VCS to meet NASA's needs.

d. Provide oversight and serve as NASA Center liaison for proposal development, review, comment/issue resolution, Center concurrence, dissemination, implementation, maintenance, and improvements of NASA engineering standards at their Center.

e. Ensure 5-year reviews and MSFC Forms 4649, Recommendation for Maintaining NASA Engineering Standards, are completed by the Center OPRDs of NASA engineering standards.

f. Coordinate signatures on NASA Form 1676, NASA Scientific and Technical Information (STI) Document Availability Authorization (DAA), prior to sending the standard for AWR and the final standard for approval.

g. Review, at least annually, in collaboration with the NTSP Manager, the accomplishments, effectiveness, and priorities of the NTSP in support of the Program's planning and evaluation process.

h. Support the development and establishment of ad hoc committees, as needed, to develop and coordinate NASA engineering standards.

i. Support the coordination and integration of NASA technical standards developed outside the OCE under the sponsorship of other Headquarters Offices into the NASA Technical Standards System (NTSS).

j. Serve as liaison between internal and external standards developing organizations, such as the Consultative Committee for Space Data Systems (CCSDS) which develops standards for space-related data and communications systems, to ensure collaboration across Centers.

5. NESP Membership

The NESP consists of designated individuals who represent their respective Centers or Offices on technical standards-related matters. The process for nomination and selection of engineering panel members is Center-specific, designated by the Engineering Management Board (EMB)

5. NESP Membership (Continued)

members. Headquarters representatives are designated by their respective Office chiefs/managers. The NTSP Manager serves as the NESP Chair.

a. The membership of the NESP shall include the following:

(1) NASA Engineering Standards Panel Chair.

(2) Engineering Representatives of all NASA Centers and JPL, who have been designated as their Center/JPL representative by written authorization from their respective EMB members to the NTSP Manager, having direct involvement in and responsibility for the engineering capability that supports their Center's mainstream programs and projects. Centers designating more than one representative have only one vote in standards-related NESP matters.

(3) NASA Engineering and Safety Center Representative.

(4) NASA Office of the Chief Engineer, Program Executive.

(5) NASA Office of Safety and Mission Assurance Representative.

(6) NASA Office of the Chief Information Officer Representative.

(7) NASA Office of the Chief Health and Medical Officer Representative.

(8) Other technical standards-developing Headquarters Offices as may be identified by the NTSP Manager.

(9) Mission Directorates, at the discretion of the respective office.

(10) Ex-officio members as designated by the NTSP Chair.

6. Roles and Responsibilities

An NESP member is usually an experienced person who is tasked with managing that Center's or Office's standards activities under the NTSP. NESP members have the following specific responsibilities:

a. To the extent delegated, make decisions acting for their respective Center's EMB member or NASA Office Chief in standards-related matters.

6. Roles and Responsibilities (Continued)

b. Serve as the point of contact for their respective Center or Office on NASA engineering standards-related work.

c. Coordinate their respective Center's or Office's participation in the NTSP in accordance with NTSP requirements and procedures, including promoting awareness and registration to the NTSS, providing guidance on its use, and coordinating training to access NTSS features.

d. In coordination with the NTSP Manager, screen all proposals for standards development to ensure these meet the requirements of a technical standard and are not duplications of existing standards.

e. Coordinate review of proposed new NASA engineering standards and proposed revisions, revalidations, inactivations for new design, or cancellations with the appropriate individuals, the Office of Primary Responsibility Designees (OPRDs) (also known as subject matter experts), and Center organizations.

f. Work with their respective Centers or Offices to identify VCS or other standards (e.g., other Government agency standards) suitable to their needs and to monitor the development of NASA engineering standards to ensure completion within the allotted timeframe and allocated budget and ensure maintenance of those standards (in coordination with the OPRDs) as needed.

g. Work within their respective Centers or Offices to recommend technical standards for endorsement by NASA.

h. Within 5 years, ensure review by the OPRDs of the NASA engineering standards for which their respective Centers have OPRD responsibility for relevancy, currency, technical accuracy, and adequacy and feasibility of replacing the existing standard with, or converting it to, a VCS that is technically sufficient for NASA use.

i. Coordinate concurrence with NASA engineering standards in development and the review of draft VCS within their respective Centers or Offices.

j. Keep the NTSP Office informed of VCS activities and standards in preparation in their respective Centers or Offices.

k. Participate in NESP meetings on a routine basis, including participation to help establish Program procedures, address issues, present the status of their Center standards activities, as well as represent their Center interests.

6. Roles and Responsibilities (Continued)

l. In coordination with the NTSP Manager and the NASA OCE, respond to all NTSP requests and actions, including the maintenance of NASA engineering standards for which their respective Centers have responsibility.

m. Promote participation in VCS bodies' activities, help to coordinate authorization of Center or Office employees to participate in VCS bodies, and report annually on these activities to the NTSP Manager in accordance with OMB Circular No. A-119 directives, including individuals' participation in VCS bodies and standards in development.

7. Meetings

a. The NESP shall meet at the request of the NTSP Manager on an annual basis, at a minimum, and participate in teleconferences (usually monthly) as scheduled. The NTSP Manager shall establish the agenda and assign actions as required. The NTSP Manager shall determine additional attendance at NESP meetings and may designate temporary members or invite other participants, including representatives from industry, academia, and other Government agencies.

b. Minutes of all NESP meetings shall be maintained and copies provided to NESP members and others as designated by the NTSP Manager.

8. Records

The NTSP Manager is responsible for the maintenance of this Charter, NESP meeting minutes (including all presentations, actions, and action responses tracked through closure), and all other records associated with the activities and actions of the NESP in accordance with the NTSP Records Plan.

APPENDIX B

NASA TECHNICAL STANDARDS PROGRAM BACKGROUND

B.1 History of the NTSP

Technical standards have been an integral part of NASA program and project design, development, and operation since the Agency was established in 1959. Technical standards are important to the Agency for many reasons, including but not limited to:

a. Complying with legal and other requirements.

b. Reviewing contract proposals and in-house design and development efforts by support contractors to verify that technical requirements are met.

c. Capturing and disseminating lessons learned to share experiences and new technology.

d. Facilitating engineering excellence in development studies and operations.

e. Providing a common base for interoperability and supplier operations.

f. Preventing conflict and duplication of effort.

g. Fostering and supporting reuse and sharing.

In the past, each Center, program, and project was responsible for its own standards development and selection of non-NASA technical standards that met their needs. Few technical standards were applicable "Agency wide," and these were primarily in the area of safety. Department of Defense (DoD) standards and specifications were the foundation and main source for technical standards used by the Agency.

The NASA Chief Engineer's Office and the Office of Safety and Mission Assurance (OSMA) worked through the NASA Engineering Management Council (currently the Engineering Management Board (EMB)) to provide higher productivity, interoperability, and cost savings to Mission Directorates and their programs and projects. An approach to accomplish this was to consolidate, at the Agency level, access to standards, specifications, and supporting documentation, regardless of their origins (NASA, voluntary consensus standards (VCS) developing bodies, DoD, industry, or other sources); convert NASA's Center-developed technical standards into Agency-wide NASA technical standards; and designate technical standards preferred for use by the Agency.

In September 1995, the NASA Chief Engineer assigned Marshall Space Flight Center (MSFC) as the lead Center for the NASA Preferred Technical Standards Program to consolidate standards-related efforts Agency wide. The Agency-wide Program was sponsored by the NASA Chief

Engineer's Office with participation from all NASA Centers, including their remote facilities, and the Jet Propulsion Laboratory (JPL), to support NASA's needs for technical standards as part of the "Provide Aerospace Products and Capabilities" Cross-Cutting Process in the NASA Strategic Plan. It addressed elements of the following process objectives:

a. Improve and maintain NASA's engineering capability so that NASA will be recognized as the leading aerospace engineering research and development organization in the world.

b. Capture and preserve engineering and technological best practices and process knowledge to continuously improve NASA's program and project management.

c. Facilitate the insertion of technology into all programs and proactively transfer technology, form commercialization partnerships, and integrate innovative approaches to strengthen U.S. competitiveness.

The Program was structured to rapidly identify and provide a readily accessible, electronic, common Agency-wide system of NASA "preferred" technical standards, specifications, handbooks, and guidelines to reduce duplication, enhance acceptance of best practices, and improve interoperability. It encouraged the use of VCS required by Office of Management and Budget (OMB) Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities, in the selection and use of technical standards. Development of NASA technical standards (standards, specifications, and handbooks) was approved when no VCS met NASA's needs. A standards update notification system (SUNS) was developed to notify users of changes to designated technical standards to determine if changes impact program/project requirements.

The NASA Engineering Standards Steering Council was established to implement the Program goals and objectives and is currently known as the NASA Engineering Standards Panel (NESP).

The Program was initially comprised of four elements:

a. NASA Standards Review and Development.
b. Voluntary Consensus Standards Development.
c. Information System.
d. Awareness/Education.

As the Program evolved, its name was changed to the NASA Technical Standards Program (NTSP), as it no longer focused on "preferred" standards.

B.2 Goals and Objectives

In support of NASA Policy Directive (NPD) 1001.0, 2014 NASA Strategic Plan, Strategic Goal 3 to serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure, the Program's goals are to promote technical excellence and further mission success by enhancing NASA's technical capabilities through standardization with the following initiatives:

a. Facilitate participation in the development of VCS and their adaptation (tailoring) for use to meet NASA's needs.

b. Manage the development of NASA technical standards, specifications, and handbooks where VCS cannot meet NASA's unique needs.

c. Provide the NASA community with access from a single access point to essential standards, specifications, and other documentation; notifications when changes to these documents occur; related lessons learned and application notes; and engineering tools, thereby saving NASA time and money.

Interoperability, compatibility, and integration are also key standardization goals that are to be satisfactorily addressed for programs and projects. These goals are specified and validated during the requirements generation process and throughout the product or system life cycle.

Specific objectives and the goals are indicated in Table 5, Goals and Objectives for NTSP Activities.

B.3 Stakeholder Definition

The NTSP is an Agency-wide program sponsored by the NASA Chief Engineer. The Program provides access to the NASA Technical Standards System (NTSS) to any NASA employee or contractor registered in NAMS who is searching for immediate and current information on technical standards, NASA directives, Center technical standards, and other standards-related information. NASA technical standards, specifications, and handbooks are provided to the public unless restricted. Usage of technical standards by NASA Centers is reviewed before preparation of the Request for Proposals to ensure NASA's needs are met by the upcoming contract to provide access to standards. A feedback system is provided for submittal of comments with responses to the submitter, usually within 24 hours. Program status and future plans are communicated to the NESP members, Program Executive, EMB members, the NASA Chief Engineer, and others as required.

Table 5—Goals and Objectives for NTSP Activities

No.	Goals	Objectives
1	Promote the use of VCS by programs/projects.	a. Provide access to VCS, including those designated as NASA-Endorsed Technical Standards approved by NASA Headquarters Offices via a centralized web-based portal. b. Maintain current status of VCS in development with NTSP-supported participation accessible to the Agency and the public. c. Educate, inform, and guide programs and projects relative to OMB Circular No. A-119's requirement to use VCS when they meet or can be adapted (tailored) to meet NASA's needs.
2	Promote participation in development of VCS.	a. Upon approval by the NASA Chief Engineer, provide funding to participate in development of VCS and in VCS developing bodies' activities. b. Distribute draft VCS funded by or provided for Agency-wide Review and comment and submit comments for consideration for inclusion in the standard. c. Annually request data from NASA Centers on their participation in development of VCS for reporting to the National Institute of Standards and Technology (NIST) and prepare the draft report for the NASA Standards Executive's concurrence.

Table 5—Goals and Objectives for NTSP Activities (Continued)

No.	Goals	Objectives
3	Manage the development of NASA engineering technical standards, specifications, and handbooks in compliance with NASA policy and procedural requirements and NTSP procedures, processes, and instructions.	a. Increase the technical development of NASA. b. Ensure that processes are followed within the required timeframes and report status to the Program Executive. c. Maintain current status of documents in development accessible to the Agency and the public.
4	Provide a single-point, "one-stop shop," authenticated access to technical standards, related data, and engineering tools.	a. Enhance technical, safety, and health and medical capabilities across NASA by providing and maintaining best practices representing the most current proven technology to mitigate risks via: (1) The NTSS for standards information, with a seamless interface to search and retrieval tools for locating essential standards, specifications, application notes, lessons learned, and other documentation. (2) On-line, electronic access to full-text technical standards based on the Agency's need via subscriptions for unlimited use and pay-by-the-document orders as provided under contract. (3) Electronic notification to users of changes to designated technical standards. (4) Access to engineering tools. (5) Access to NASA technical standards, specifications, and handbooks to the public unless restricted.

Table 5—Goals and Objectives for NTSP Activities (Continued)

No.	Goals	Objectives
4	(Continued)	b. Develop Statement of Work and monitor contract performance for providing technical standards Agency wide.
5	Improve interoperability within and external to NASA.	Encourage the use of VCS and those designated as NASA-Endorsed Technical Standards.
6	Develop Agency standardization policies and procedural requirements and NTSP internal documentation.	a. Provide policy on technical standards for inclusion in NASA directives. b. Develop and maintain Agency-wide procedural requirements for technical standards. c. Develop, implement, and maintain current internal NTSP documentation, such as NASA-NTSP-1, NASA Technical Standards Program (NTSP) Operating Procedures, Processes, and Systems, Information Technology (IT) Security Plan, test plans, templates, and instructions, and maintain a master list of technical standards in NTSS.
7	Educate, inform, and guide NASA programs and projects in standards-related activities.	a. Conduct training on use of the NTSS. b. Educate the Agency on use of VCS by NASA programs and projects as required by OMB Circular No. A-119. c. Provide training and guidance on the process for developing and maintaining NASA engineering standards.

APPENDIX C

EXAMPLE QUESTIONS FOR NASA'S ANNUAL REPORT ON PARTICIPATION IN VOLUNTARY CONSENSUS STANDARDS (VCS) BODIES' ACTIVITIES

1. List the Government-unique standards that Centers/the Jet Propulsion Laboratory (JPL)/Headquarters Office(s) used in lieu of VCS during FYXXXX and provide an explanation of the reasons why their use would be inconsistent with applicable laws or otherwise impractical.

2. List the VCS that Centers/JPL/Headquarters Office(s) substituted for Government-unique standards in FYXXXX as a result of review under Section 15(b)(7) of OMB Circular No. A-119.

3. List the VCS bodies in which your Center/JPL/Headquarters Office participated during FYXXXX.

4. Provide the total number of your Center's/JPL's/Headquarters Office's representatives who participated in VCS activities during FYXXXX and the total number of activities in which these Center/JPL/Headquarters Office representatives participated:

    a. Total number of Center/JPL/Headquarters Representatives.

    b. Participation in total number of activities.

5. Provide any conformity assessment activities (as described in the Federal Register, Volume 65, Number 155, Guidance on Federal Conformity Assessment Activities, dated August 10, 2000) in which Centers/JPL/Headquarters Office(s) were involved in FYXXXX.

6. Provide an evaluation of the effectiveness of OMB Circular No. A-119 policy and recommendations for any changes.

7. Provide any other comments you would like to share on behalf of your Center/JPL/Headquarters Office.

APPENDIX D

EXAMPLE QUESTIONNAIRE FOR PARTICIPATION IN VOLUNTARY CONSENSUS STANDARDS (VCS) BODIES' ACTIVITIES AS A NASA REPRESENTATIVE

Formal Agency approval is required before NASA employees and contractors participate as NASA representatives in VCS bodies' activities. Example information requested follows.

1. NASA Representative's information (full name, Center or NASA Office, phone number, and email address)**.**

2. The name of the VCS developing body in which you are a NASA representative.

3. Describe your role on the committee as a NASA representative (Project Lead, Chair, Committee member, etc.).

4. The name of the committee.

5. List other NASA representatives participating on this VCS developing body.

6. List the document number and/or title of the technical standard to be completed.

7. Describe the scope/description of the technical standard.

8. If you are not actively participating in a VCS developing body's development activity, describe the function(s) you are performing with the VCS developing body on behalf of NASA, e.g., serving on a committee.

9. Provide the estimated date that the draft will be available for public review.

10. Additional Comments.

APPENDIX E

REFERENCES

Public Law 104-113, National Technology Transfer and Advancement Act of 1995.

ISO/IEC 17000, Conformity assessment – Vocabulary and general principles.

NPD 7120.4, NASA Engineering and Program/Project Management Policy.

NPD 7120.6, Knowledge Policy on Programs and Projects.

NPR 1400.1, NASA Directives and Charters Procedural Requirements.

NPR 7120.5, NASA Space Flight Program and Project Management Requirements.

NPR 7123.1, NASA Systems Engineering Processes and Requirements.

NASA Charter (NC) 1000-6, Engineering Management Board.

NASA Preferred Technical Standards Program Plan dated October 7, 1999.

DoD 4120.24-M, Defense Standardization Program Policies and Procedures.

MIL-STD-962, Defense Standards Format and Content.

MIL-STD-967, Defense Handbooks, Format and Content.

OA-0801-M-MSF-2707, MCS Moderate Infrastructure System Security Plan.