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NASA Policy Directive

NPD 7120.4E
Effective Date: June 26, 2017
Expiration Date: June 26, 2022

COMPLIANCE IS MANDATORY FOR NASA EMPLOYEES

Printable Format (PDF)

Subject: NASA Engineering and Program/Project Management Policy

Responsible Office: Office of the Chief Engineer

1. POLICY

a. This NASA Policy Directive (NPD) provides the statement of policy, principles, and responsibilities for program and project management and system and software engineering disciplines at NASA. Implementing procedural requirements under the purview of the Office of the Chief Engineer (OCE) comprise space flight programs and projects as described in NASA Procedural Requirements (NPR) 7120.5, research and technology programs and projects as described in NPR 7120.8, systems engineering as described in NPR 7123.1, technical standards as described in NPR 7120.10, the use of the metric system, knowledge management as described in NPD 7120.6, and software engineering as described in NPR 7150.2. This NPD also consolidates the Agency's crosscutting software policy and responsibilities across NASA Headquarters offices and Mission Directorates. These principles also apply to program and project management for information technology under the purview of the Office of the Chief Information Officer (OCIO) as described in NPR 7120.7 and institutional infrastructure under the purview of the Office of Strategic Infrastructure (OSI) as described in NPR 8590.1 and NPR 8820.2. For these program and project management and engineering disciplines, NASA policy is as follows:

(1) Acquisition: Follow a strategic acquisition process. NPD 1000.0 and NPD 1000.5 put in place a framework for ensuring that NASAs strategic vision, programs and projects, and resources remain properly aligned. The acquisition process and annual strategic resource planning form a continuous process to oversee this alignment. Decisions from the Agency strategic acquisition process guide budget and acquisition decisions, resulting in guidance to programs and projects. This guidance, in coordination with the relevant program and project management NPR, informs program and project acquisition strategy. The strategic acquisition process is further described in NPD 1000.5.

(2) Program/Project Management: Apply program and project management procedural requirements to plan, track progress, accomplish mission objectives, and follow the unique requirements and life-cycle reviews as defined in the relevant program and project management NPRs. The procedural requirements establish the process by which NASA formulates and implements programs and projects consistent with the governance model described in NPD 1000.0 and according to the following principles that establish a standard of uniformity in managing programs and projects at NASA:

(a) Programs and projects are managed based on a phased life cycle with key decision points (KDPs) where a program or projects status and readiness to proceed to the next phase are determined. This determination is supported by reviews through the life cycle and at KDPs and documented in evolving principal documents that govern the conduct of each phase and by the logical progression of four overarching processes: formulation, approval, implementation, and evaluation.

(b) The determination of a program's or project's readiness to proceed is made by the Decision Authority. Each program and project has a Decision Authority, the Agencys designated responsible individual who also approves the key program or project content, cost, schedule, and content parameters that govern the implementation of life-cycle activities. These are documented at each KDP in a memorandum that is part of retrievable program and project documentation.

(c) Programs and projects are reviewed by a governing Management Council or equivalent (e.g., Agency Program Management Council (PMC), Mission Directorate PMCs, Mission Support Council, or IT Program/Project

Management Board).

(d) Programs and projects establish cost and schedule estimates and maintain control plans for program and project management (e.g., Program or Project Plan; Systems Engineering Management Plan (SEMP); Earned Value Management (EVM); Work Breakdown Structure (WBS); program/project technical, cost, and schedule baselines and risks).

(e) Programs and projects are managed by trained program and project managers in compliance with Office of Management and Budget (OMB)-promulgated Federal acquisition program/project management certification requirements and/or other Agency requirements.

(3) Systems Engineering. Apply the systems engineering processes across the life cycle of products and components. Systems engineering is a methodical, disciplined approach for the design, realization, technical management, operations, and retirement of a system. NASAs procedural requirements for systems engineering are found in NPR 7123.1 and apply to all programs, projects, and activities in accordance with the relevant program/project management NPR.

(4) Requirements Management. Establish clear, concise, verifiable, and valid requirements for processes, products, and components. Track and implement requirements using requirements management and configuration management control processes. Changes to requirements are documented and submitted to established program/project change request systems. Approved relief from complying with a requirement includes documenting the change as either a deviation or a waiver.

(5) Software Engineering. Utilize a disciplined software engineering approach to acquire, develop, test, maintain, operate, and manage software supporting all NASA missions, programs, and projects. Software engineering is a core capability and a key enabling technology for NASAs missions and supporting infrastructure. NASAs procedural requirements for software engineering are found in NPR 7150.2 and apply to all of the Agencies investment areas containing software systems and subsystems. The disciplined software engineering approach:

(a) Ensures that programs, projects, systems, and subsystems that use or develop software follow a standard set of requirements.

(b) Brings the Agency's engineering community together to optimize resources and talents across Center boundaries. For engineers to effectively communicate and work seamlessly among Centers, a common framework of requirements is needed. Policy and procedural requirements for software are documented in this NPD and NPR 7150.2.

(c) Uses the NASA Independent Verification and Validation (IV&V) Program as the provider of IV&V services. The criteria used to determine which NASA projects are required to have IV&V are defined in NPR 7150.2.

(d) Asserts intellectual property rights for externally released software where deemed appropriate.

(e) Establishes procedures for external software release of software created by or for NASA that will maximize its benefit to NASA, the U.S. public, and the U.S. economy and to release software consistent with law and applicable agreements for commercial, industrial, educational, and Governmental purposes.

(f) Establishes procedures for internal NASA reuse and sharing of NASA owned software created by or for NASA to maximize software development efficiencies and to reduce the cost of NASA programs, projects, and activities.

(g) Complies with copyright laws protecting computing software and with the provisions of Executive Order (EO) 13103.

(6) Safety Engineering. Design, develop, fabricate, test, manage, operate, and dispose of NASAs vehicles, systems, and assets in a manner that protects all people, environments, and high-value equipment and property from harm.

(7) Technical Standards. Use established, consensus-based technical standards as defined in OMB Circular A-119 to provide an effective basis for defining requirements, evaluating implementation approaches, assessing resulting performance, and ensuring quality throughout the life cycle, in accordance with the following principles:

(a) Establish and maintain NASA Technical Standards as required in areas where established voluntary consensus standards (VCS) available from other sources do not meet NASAs technical needs.

(b) Encourage commonality in using technical standards across NASA programs and projects and, in appropriate instances, to mandate the use of specific technical standards to promote consistency in practice, reduce costs, ensure robust interfaces, and improve interoperability.

(c) Participate in developing VCS when such participation is in the public interest and is compatible with NASA's missions, authorities, priorities, and budget resources. Procedural requirements for technical standards are

documented in NPR 7120.10.

(8) Metric System of Measurement. Use the International System of Units (commonly known as the Internationale System of Units (SI) or metric system of measurement) for all new space flight projects and programs, especially in cooperative efforts with International Partners. 15 United States Code (U.S.C.) 205b and EO 12770 provide relief from use of SI if it is found that obtaining components in SI units would result in a significant increase in cost or delays in schedule. Each program and project will perform and document an assessment to determine an approach that maximizes the use of SI and document the approach in the Program or Project Plan in accordance with the governing NPR. This assessment will document an integration strategy if both SI and U.S. customary units are used in a project or program.

(9) Technical Assessments and Analysis. Resolve high-risk technical issues through in-depth assessments, testing, and analysis. The Agency has established the NASA Engineering and Safety Center (NESC) to perform independent technical assessments and analyses on a needs and available resources basis to ensure safety and mission success.

(10) Checks and Balances. Utilize checks and balances consistent with NPD 1000.0 that ensure compliance with NASA directives, procedural requirements, and applicable standards. Checks and balances include, but are not limited to, the following:

(a) Technical Authorities. NASAs Technical Authorities are members of key review and control boards and approve/disapprove waivers and deviations to requirements under their authority. The Agency has established three Technical Authority governance chains: Engineering, Safety and Mission Assurance, and Health and Medical.

(b) Dissenting Opinions. Dissenting opinions are respected throughout the Agency and are properly dispositioned according to a common process without fear of retribution. The dissenting person or organization is free to elevate a dissenting opinion successively up the chain of authority(s) until satisfied with the disposition or until finally resolved by the NASA Administrator.

(c) Risk. Formal processes are used for managing safety and mission success risk with clear accountability for risk acceptance by the responsible authoritative individual with signed documentation of the rationale and concurrence of the Technical Authorities, as referenced in NPR 8000.4.

(d) Independent Reviews. Independent programmatic and technical reviews are conducted covering scope, cost, schedule, risks, or functional acceptability. Independence in this context requires reviewers who are not under the supervision, direction, advocacy, or control of the project.

(e) Compliance Assessments. Periodic assessments are conducted within the Agency and its contractor community to check compliance against requirements (i.e., engineering and program/project management policies, procedural requirements, and invoked standards) to ensure requirements are implemented when conducting NASA-funded work.

(11) Training. Hold NASA leaders, managers, supervisors, and employees accountable for ongoing training and skills enhancement in the disciplines of program/project management and engineering.

(12) Knowledge Management. Effectively manage the Agency's knowledge to cultivate, identify, retain, and share knowledge to continuously improve the performance of NASA in implementing its mission. This includes developing skills in effectively identifying, capturing, and transferring knowledge. The policy for knowledge management is further described in NPD 7120.6.

2. APPLICABILITY

a. This NPD is applicable to NASA Headquarters and NASA Centers, including Component Facilities and Technical and Service Support Centers. This language applies to the JPL, a Federally Funded Research and Development Center, other contractors, recipients of grants, cooperative agreements, or other agreements only to the extent specified or referenced in the applicable contracts, grants, or agreements.

b. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term shall. The terms: may or can denote discretionary privilege or permission, should denotes a good practice and is recommended, but not required, will denotes expected outcome, and are/is denotes descriptive material.

c. In this directive, all document citations are assumed to be the latest version unless otherwise noted.

3. AUTHORITY

a. Need for International Defense Cooperation and Military Export Controls; Presidential Waiver; Report to

Congress; Arms Sales Policy, 22 U.S.C. 2751, et seq.

b. Electronic and information technology, 29 U.S. Code § 794d.

c. Policy and Objective, 35 U.S.C. 200, et seq.

d. Definitions, 40 U.S.C. § 11101, et seq.

e. Purposes, 44 U.S.C. § 3501, et seq.

f. The National Aeronautics and Space Act, as amended, 51 U.S.C. § 20113.

g. Managing Information as a Strategic Resource, OMB Circular A-130.

4. APPLICABLE DOCUMENTS AND FORMS

a. Declaration of Policy, 15 U.S.C. § 205b.

b. Metric Usage in Federal Governmental Programs, EO 12770.

c. Computer Software Piracy, EO 13103.

d. Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities, OMB Circular A-119.

e. NPD 1000.0, NASA Governance and Strategic Management Handbook.

f. NPD 1000.5, Policy for NASA Acquisition.

g. NPD 7120.6, Knowledge Policy on Programs and Projects.

h. NPR 2210.1, Release of NASA Software.

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

j. NPR 7120.7, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements.

k. NPR 7120.8, NASA Research and Technology Program and Project Management Requirements.

l. NPR 7120.10, Technical Standards for NASA Programs and Projects.

m. NPR 7123.1, NASA Systems Engineering Processes and Requirements.

n. NPR 7150.2, NASA Software Engineering Requirements.

o. NPR 8000.4, Agency Risk Management Procedural Requirements.

p. NPR 8590.1, Environmental Compliance and Restoration Program.

q. NPR 8820.2, Facility Project Requirements (FPR).

r. NASA-STD-8719.13, NASA Software Safety Standard.

5. RESPONSIBILITY

a. The NASA Chief Engineer, NASA Chief Information Officer (CIO), NASA Chief, Safety and Mission Assurance, NASA Chief Health and Medical Officer, Associate Administrators for Mission Directorates, and Center Directors are responsible for promoting policies, standards, best practices, and guidance in their areas of responsibility under this NPD. They will coordinate efforts to maximize the commonality, clarity, and effectiveness of direction and guidance. The roles and responsibilities of NASA management are defined in NPD 1000.0 and further detailed in NPD 1000.3. The key roles and responsibilities within the context of this NPD are summarized in the following sections.

b. The NASA Chief Engineer shall:

(1) Lead Agency-wide initiatives to advance capabilities in engineering and program/project management.

(2) Establish Agency-wide policies, procedural requirements, standards, lessons learned, and best practices.

(3) Assess and monitor the Agency's capabilities in engineering and program/project management. Provide leadership for the Technical Capabilities disciplines for which the NASA Chief Engineer is responsible and assess

and develop recommendations to advance the capability to meet Agency current and future needs.

(4) Serve as the Agency Engineering Technical Authority (ETA), approve/disapprove waivers and deviations to requirements under their authority, and support and concur on safety and mission success risk acceptance decisions.

(5) Establish boards (e.g., NASA Engineering Management Board and Program and Project Management Board) and teams to address engineering and program/project management issues.

(6) Maintain the official list of NASA program, projects, and activities in coordination with the Office of the Chief Financial Officer, who maintains the official Meta-Data Manager (MdM) database.

(7) Advise the Administrator and senior officials on matters pertaining to engineering and program/project management.

(8) Ensure use of best practices by selecting and applying technical standards to NASA programs and projects.

(9) Develop NASAs technical workforce (in the areas of engineering and program/project management) through a competency-based training model that identifies learning experiences and activities.

(10) Facilitate disseminating, utilizing, and implementing lessons learned and best practices.

(11) Serve as the Metric Executive for NASA to meet the external requirements of 15 U.S.C. § 205b and EO 12770.

(12) Maintain periodic oversight of compliance with the Office of the Chief Engineer's policy, procedural requirements, and standards throughout the Agency and its contractor community.

(13) Collect and analyze measurement data from compliance assessments to monitor and control the use of policies, procedural requirements, and standards.

(14) Advise NASA senior management on matters pertaining to knowledge management and related services; provide strategic guidance to the NASA Chief Knowledge Officer (CKO)for coordinating Agency-wide initiatives to advance capabilities to identify, capture, and transfer knowledge; champion, support, integrate, and collaborate NASA-wide knowledge management efforts pertaining to engineering and program/project management; and conduct knowledge sharing activities, including relevant online resources, forums, and publications.

(15) Integrate NASA software management, software acquisition, software engineering, and software assurance requirements into policies, directives, and standards.

(16) Document NASA guidance and best practices to support NASAs systems engineering, software engineering, and program and project management processes.

(17) Establish and manage the Agency's software classification definitions.

(18) Through the Engineering Management Board, charter working groups to oversee the implementation and update of an Agency-wide plan to work toward continuous, sustained software engineering process and product improvements and to ensure appropriate visibility of software issues within the Agency.

(19) Establish and enforce policies and procedural requirements in this directive.

(20) Oversee the functional management of NESC and ensure the performance of NESCs services and activities.

c. The NASA Chief, Safety and Mission Assurance shall:

(1) Establish Agency-wide standards and lessons learned relative to safety and mission assurance.

(2) Serve as the Agency Safety and Mission Assurance Technical Authority (SMATA), approve/disapprove waivers and deviations to requirements under their authority, and support and concur on safety and mission success risk acceptance decisions.

(3) Appoint and support requested representatives to boards, groups, and teams established by the Chief Engineer to address program/project management and engineering issues.

(4) Ensure the safety, quality, and reliability of NASA software.

(5) Review project software processes and make recommendations to programs/projects, governing Program Management Councils, Mission Directorates, governing IT Program/Project Management Boards, and independent Technical Authorities.

(6) Conduct oversight of NASAs software assurance programs.

(7) Independently assess project software management, engineering, and assurance practices.

(8) Oversee the functional management of the NASA IV&V Program and ensure the performance of all software IV&V processes, services, and activities.

(9) Charter the IV&V Board of Advisors, which makes recommendations for allocating IV&V services to projects based on the requirement for IV&V in NPR 7150.2.

(10) Select and maintain the list of software projects to which IV&V is to be applied.

d. The NASA Chief Health and Medical Officer shall:

(1) Serve as the Agency Health and Medical Technical Authority (HMTA) and approve/disapprove waivers and deviations to requirements under their authority, and support and concur on safety and mission success risk acceptance decisions.

(2) Ensure Agency policy, direction, and procedural requirements are flowed down into Center HMTA implementation plans.

(3) Develop and maintain Agency-wide health and medical technical standards applicable to programs and projects.

(4) When applicable, approve programs and projects approaches to HMTA based on Centers HMTA infrastructures.

e. The NASA CIO shall:

(1) Serve as the senior advisor to the Administrator on all Agency IT requirements.

(2) Identify the sourcing strategy for centrally provisioned IT services such as network, desktop, Web, and data centers.

f. Mission Directorate Associate Administrators shall:

(1) Execute the NPRs and related policy documents governed by this NPD.

(2) Appoint and support requested representatives to boards, groups, and teams established by the Chief Engineer to address program/project management and engineering issues.

(3) Support and provide information for assessments conducted by the Office of the Chief Engineer, Office of Safety and Mission Assurance, and Office of Chief Health and Medical Officer.

(4) Develop plans for manifesting independent reviews, organizing and staffing of independent review teams, monitoring execution of the reviews, reporting results, and capturing lessons learned with support from Center Directors, the Office of the Chief Financial Officer, and OCE.

(5) Classify their respective work efforts in accordance with NPRs, applicable standards, and local Center directives to identify applicable legal, institutional, and technical requirements.

(6) Ensure corrective actions resulting from noncompliances are identified, implemented, and tracked to closure.

(7) Ensure their program and project portfolios comply with NPD 1000.5.

(8) Ensure data delivery, usage, and access rights are considered early during project development for the entire project life cycle.

g. The Space Technology Mission Directorate (STMD) through the Technology Transfer Program is responsible for overall management of the NASA software release program under NPR 2210.1 and establishes and implements software release procedures, requirements, and supplemental policy in cooperation with the Office of the Chief Engineer and General Counsel. The STMD Software Release Authority Working Group (SRAWG) oversees the software release process.

(1) The chairperson of the SRAWG shall be a member of the NESC Software Technical Discipline Team (TDT) Software Working Group (SWG).

(2) A member of the NESC Software TDT SWG will be a member of the SRAWG. The SRAWG will coordinate with the NESC Software TDT SWG to ensure appropriate visibility of software issues within the Agency. Additional responsibilities for the NASA software release program are provided in NPR 2210.1.

h. Center Directors shall:

(1) Locally align management and engineering practices to support Agency needs.

(2) Execute the NPRs and related policy documents governed by this NPD.

(3) Support and provide information for assessments conducted by the OCE.

(4) Ensure corrective actions resulting from noncompliances are identified, implemented, and tracked to closure.

(5) Incorporate knowledge gained by lessons learned in Center policies, standards, procedures, and practices to support continuous improvement in implementing NASA missions.

(6) Appoint and support requested representatives to boards, groups, and teams established by the Chief Engineer to address program/project management and engineering issues.

(7) Appoint and support an individual as the Centers Software Release Authority (SRA). The Center Director may appoint a group of individuals as the Software Release Group to be chaired by the Center SRA in accordance with NPR 2210.1. The SRA will be the Center representative on the SRAWG.

(8) Provide information to support the creation of the Agencys Mission Software Inventory.

(9) Designate the Center ETA implementation responsibility to an individual in the Center's engineering leadership to perform delegated responsibilities of the Center ETA role and responsibilities.

(10) Support the technical authorities in approving/disapproving waivers and deviations to requirements under their delegated authority, and support the safety and mission success risk acceptance decision process.

(11) Support Mission Directorate Associate Administrators' (MDAAs) efforts to organize and staff independent review teams, monitor execution of the reviews, reporting results, and capturing lessons learned.

i. The Chief Financial Officer shall:

(1) Provide leadership for planning, analyzing, justifying, controlling, and reporting all Agency fiscal resources.

(2) Oversee all financial management activities relating to the programs and operations of the Agency. Assess and monitor the Agency's programmatic analysis capabilities such as cost and schedule analysis capabilities, methods, and tools.

(3) Serve as the Agency Programmatic Analysis Capability Leader provide leadership for key programmatic functions, and provide tools, processes, data, resources, and consulting services to enable the Agency's programmatic capabilities.

(4) Establish Agency-wide polices, procedural requirements, standards, lessons-learned, and best practices for programmatic analysis, and coordinate the application of workforce to support programmatic analysis work (both in-line and independent assessment).

(5) Maintain and update the Agency's official list of programs and projects work breakdown structure used in the financial and budgeting system.

j. Managers and engineers responsible for realizing a program, project, service, or activity shall:

(1) Classify their work efforts in accordance with NPRs, mandatory standards, and local Center directives to identify applicable legal, institutional, and technical requirements, e.g., software is classified consistent with its use, as described in NPR 7150.2, and safety, as described in NASA-STD-8719.13, and execute their program or project in accordance with these specifications.

(2) Require providers (including internal NASA providers) to have proven organizational capabilities and experience to deliver quality products on time, within budget, and within technical acceptability.

(3) Require providers to develop a plan to manage product development, operation, maintenance, and disposal throughout the program/project life cycle. This plan will include the collection and reporting of actual expenditures at the project level by life-cycle phases.

(4) Include NASA safety and mission assurance and other responsible oversight practitioners in acquisition, review, verification, maintenance, and certification processes.

(5) Ensure providers allow access to products and associated artifacts to enable insight/oversight by engineering and assurance (which include the NASA IV&V Facility and NASA Safety Center) personnel.

(6) Execute NASAs life-cycle requirements for programs, projects, systems, and software.

(7) Collect, document, and submit program/project and engineering lessons learned and organize, host, and actively participate in knowledge sharing activities to learn and contribute knowledge to the shared goal of safety and

mission success in accordance with NPD 7120.6.

(8) Support and provide information for assessments of Centers and contractors capabilities and compliance with engineering and program/project management requirements and standards.

(9) Ensure that the minimum essential contractor-originated data are identified and acquired with sufficient access and usage rights to support the full project life cycle. Each project manager should define contract data deliverables and coordinate data requirements of other functional specialties, e.g., safety, reliability, quality, logistics, and test and verification, to minimize data acquisition redundancies and inconsistencies.

(10) Apply requirements in NPR 7150.2 to software activities developed in-house, contracted directly, or subcontracted from a NASA prime contractor.

(11) Ensure that security risks in space flight systems are identified and security risk mitigations are planned for these systems in the Project Protection Plan.

k. The IV&V Program Manager shall:

(1) Establish and manage the Agency's software IV&V services and procedures.

(2) Establish, maintain, and report on the results of IV&V services and findings.

(3) Support NASAs program for improving software assurance and other trusted verifications (e.g., independent assessments, peer reviews, and research).

(4) Determine and document the services provided by the NASA IV&V Facility on projects.

l. The Program/Project Management Boards shall review program and project software processes and products including, but not limited to, evidence of conformance to this policy; use of insight/oversight; use of IV&V and other trusted verifications (e.g., independent assessments and peer reviews); and risk mitigation processes based on program/project consequences of failure, risk, complexity, life span, size, and cost.

m. The Assistant Administrator for Diversity and Equal Opportunity shall provide assistance, advice, and coordination to ensure compliance with equal opportunity requirements regarding the accessibility of electronic information and information technology, including software, for persons with disabilities.

6. DELEGATION OF AUTHORITY

None.

7. MEASUREMENT/VERIFICATION

a. Compliance with this NPD and its associated NPRs is verified through periodic benchmarks and assessments conducted under the authority of the OCE. Results from these benchmarks and assessments are communicated to senior management, who ensure corrective actions are identified, implemented, and tracked to closure. Measurement data on compliance is collected and tracked over time by the OCE.

b. Compliance is determined by reports and data products filed with the OCE (e.g., Program and Project Plans and requirements Compliance Matrixes).

c. Compliance is determined using performance measures to assess theAgencys compliance with intellectual property rights associated with computer software acquired, distributed, or used by the Agency in accordance with E.O. 13103.

8. CANCELLATION

NPD 7120.4D, NASA Engineering and Program/Project Management Policy dated February 16, 2017.

Robert Lightfoot
Acting Administrator

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ATTACHMENT A: (TEXT)

ATTACHMENT A. DEFINITIONS

Activity - Any of the project components or research functions that are executed to deliver a product or service or provide support or insight to mature technologies.

Authoritative Data - Data that has been designated as valid for specific official programs/projects. The designated data is controlled by processes.

Deviation - A documented authorization releasing a program or project from meeting a requirement before the requirement is put under configuration control at the level the requirement will be implemented.

Engineering - Work required to define, develop, realize, deploy, operate, and sustain useful and cost-effective NASA systems by engineering disciplines and scientific and other nontechnical functions.

Evaluation - The continual self-evaluation and independent assessment of the performance of a program or project and incorporation of the evaluation findings to ensure adequacy of planning and execution according to plans.

External software release - software release of NASA-owned software to any individual or entity not employed by or contracted to NASA.

Formulation - The identification of how the program or project supports the Agency's strategic needs, goals, and objectives; the assessment of feasibility, technology, and concepts; risk assessment, team building, development of operations concepts and acquisition strategies; establishment of high-level requirements and success criteria; the preparation of plans, budgets, and schedules essential to the success of a program or project; and the establishment of control systems to ensure performance to those plans and alignment with current Agency strategies.

Implementation - The execution of approved plans for the development and operation of the program/project, and the use of control systems to ensure performance to approved plans and continued alignment with the Agency's strategic needs, goals, and objectives.

Independent Verification and Validation - Verification and validation performed by an organization that is technically, managerially, and financially independent of the development organization (ISO/IEC 24765:2008 Systems and software engineering vocabulary).

Primary Mission Objectives - Outcomes expected to be accomplished that are closely associated with the reason the mission is proposed, funded, developed, and operated (i.e., objectives related to top-level requirements or their flow down).

Program - A strategic investment by a Mission Directorate or Mission Support Office that has a defined architecture and/or technical approach, requirements, funding level, and a management structure that initiates and directs one or more projects. A program defines a strategic direction that the Agency has identified as critical.

Project - A specific investment having defined goals, objectives, requirements, life-cycle cost, a beginning, and an end. A project yields new or revised products or services that directly address NASAs strategic goals. They may be performed wholly in-house; by Government, industry, and academic partnerships; or through contracts with private industry.

Software - Computer programs, procedures, scripts, rules, and associated documentation and data pertaining to the development and operation of a computer system. This definition applies to software developed by NASA, software developed for NASA, commercial-off-the-shelf (COTS) software, Government-off-the-shelf (GOTS) software, modified-off-the-shelf (MOTS) software, reused software, auto-generated code, embedded software, the software executed on processors embedded in Programmable Logic Devices (see NASA-HDBK-4008), and open-source software components.

> *Note 1: Only for purposes of the NASA Software Release program, the term software, as redefined in NPR 2210.1, does not include computer databases or software documentation.*

> *Note 2: Definitions for the terms COTS, GOTS, heritage software, MOTS, legacy software, software reuse, and classes of software are provided in NPR 7150.2.*

Waiver - A documented authorization releasing a program or project from meeting a requirement after the requirement is put under configuration control at the level the requirement will be implemented.

ATTACHMENT B. ACRONYMS

COTS Commercial off-the-shelf software

EVM Earned Value Management

GOTS Government off-the-shelf software

IT Information Technology

IV&V Independent Verification and Validation

KDP Key decision point

MOTS Modified off-the-shelf software

NESC NASA Engineering and Safety Center

NPD NASA Policy Directive

NPR NASA Procedural Requirements

R&T Research & Technology

SI System's Internationale

SRA Software Release Authority

SRAWG Software Release Authority Working Group

SWG Software Working Group

TDT Technical Discipline Team

VCS Voluntary consensus standards

WBS Work Breakdown Structure

ATTACHMENT C. REFERENCES

C.1 NPD 1000.3, The NASA Organization.

C.2 NPD 1280.1, NASA Integrated Management System Policy.

C.3 NPD 1440.6, NASA Records Management.

C.4 NPD 2081.1, Nondiscrimination in Federally Assisted and Conducted Programs.

C.5 NPD 2091.1, Inventions Made by Government Employees.

C.6 NPD 2190.1, NASA Export Control Program.

C.7 NPD 2800.1, Managing Information Technology.

C.8 NPD 2810.1, NASA Information Security Policy.

C.9 NPD 8700.1, NASA Policy for Safety and Mission Success.

C.10 NPR 1441.1, NASA Records Management Program Requirements.

C.11 NPR 2190.1, NASA Export Control Program.

C.12 NPR 2810.1, Security of Information Technology.

C.13 NPR 2800.1, Managing Information Technology.

C.14 NPR 7500.2, NASA Technology Transfer Requirements.

C.15 NPR 8705.2, Human-Rating Requirements for Space Systems.

C.16 NASA-HDBK-2203, NASA Software Engineering Handbook.

C.17 NASA-HDBK-4008, Programmable Logic Devices (PLD) Handbook.

C.18 NASA-HDBK-7009, NASA Handbook for Models and Simulations: An Implementation Guide for NASA-STD-7009.

C.19 NASA/SP-2007-6105, NASA Systems Engineering Handbook (on the NASA Technical Reports Server (NTRS) at http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20080008301.pdf).

C.20 NASA-STD-7009, Standard for Models and Simulations.

C.21 NASA-STD-8739.8, Software Assurance Standard.
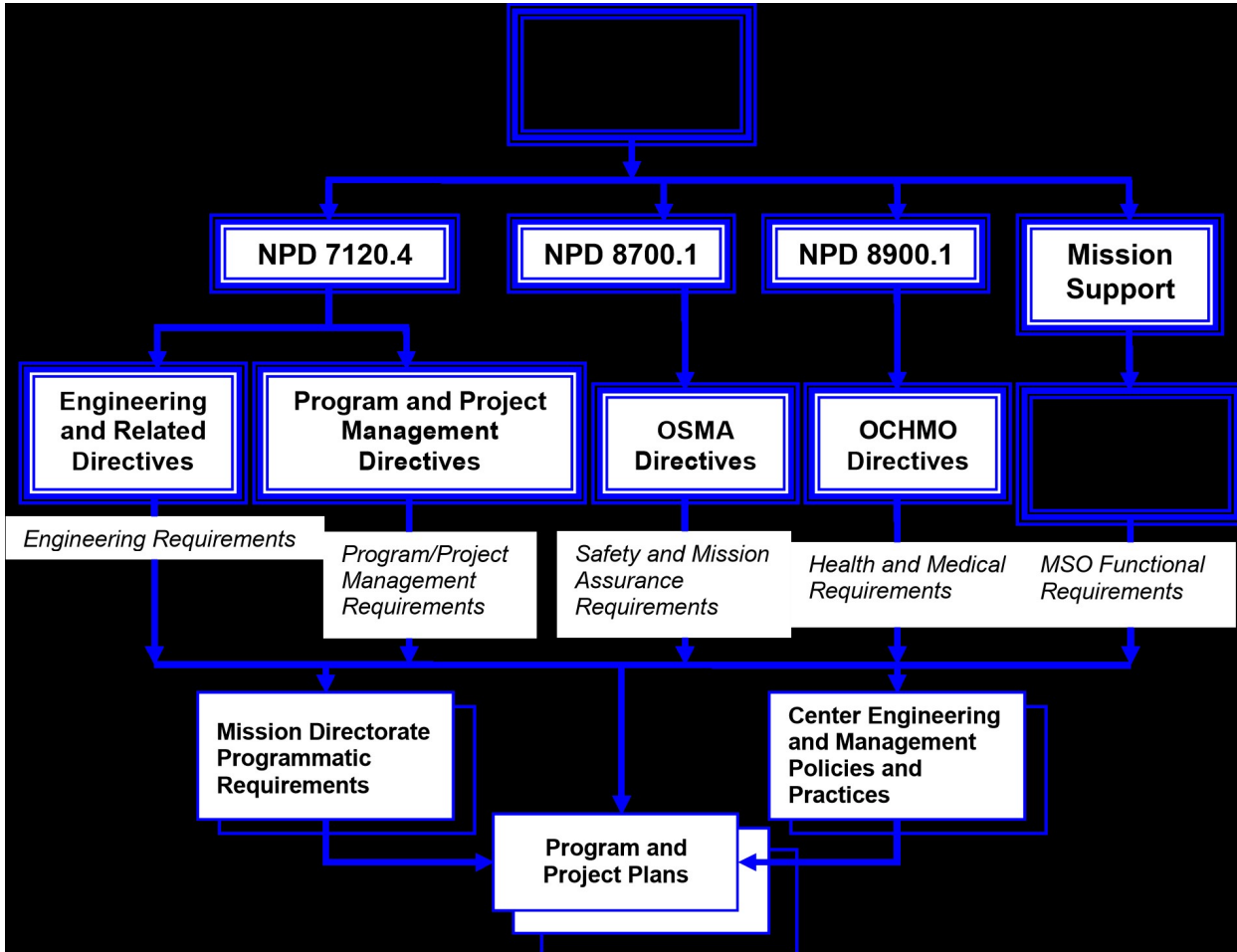
ATTACHMENT D.

Figure 1. Flowdown of Requirements Through the Document Tree

(URL for Graphic)

None.

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