

DATE: **July 2, 2015**
TO: Center Directives Manager
Langley Research Center



FROM: **Robert Hodson**
LaRC Deputy Chief Engineer

SUBJECT: MEMO Authorizing Continued Use of Expired Langley Directive
LPR 7120.4, LaRC Technical Authority Implementation Plan
Expiration date: August 5, 2014

REF A: [NASA Requirement Waiver for NPR 1400.1 \(3.5.2.6\), NRW 1400-37](#)

In accordance with reference A, I authorize the continued use of the expired subject directive.

LPR 7120.4, LaRC Technical Authority Implementation Plan
The subject directive has been reviewed prior to the expiration date and a summary of the required changes is: 1) Mandatory 5-year review. 2) No contextual changes required. 3) Updates to signature block to account for retirements and reassignments.
The directive was also assessed for the risk of continued use after expiration versus the risk of not having the directive available after expiration. The results of that risk assessment are: 1) Non-compliance with NPD 1000.0, NASA Governance and Strategic Management Handbook
Justification for the delay is: The delay is necessary to provide time for Centerwide review/update of LPR 7120.4 to ensure compliance.
The updated directive will be submitted for Centerwide review no later than December 31, 2015 .

Please refer any questions or concerns regarding the continued use of this directive to Robert Hodson, LaRC Deputy Chief Engineer.

7/9/2015

X Handwritten signature of Robert Hodson in black ink, written over a large 'X' mark.

Robert Hodson
LaRC Deputy Chief Engineer
Signed by: ROBERT HODSON

cc:
LMS Management Representative
LMS Directives Management



Langley Research Center

LPR 7120.4 B-1

Effective Date: August 5, 2009

Expiration Date: August 5, 2014

LANGLEY RESEARCH CENTER TECHNICAL AUTHORITY IMPLEMENTATION PLAN

National Aeronautics and Space Administration

Langley Research Center

Technical Authority Implementation Plan

Approved By:

<u>Original signed on file</u> Michael G. Ryschkewitsch, Chief Engineer NASA	<u>08/05/09</u> Date	<u>Original signed on file</u> Bryan D. O'Connor, Chief Safety and Mission Assurance	<u>08/05/09</u> Date
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Submitted By:

<u>Original signed on file</u> Lesa B. Roe, Director Langley Research Center	<u>07/27/09</u> Date	<u>Original signed on file</u> Clayton P. Turner, Chief Engineer Langley Research Center	<u>07/20/09</u> Date
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Concurrence

<u>Original signed on file</u> Vicki K. Crisp, Director Aeronautics Research Directorate	<u>07/21/09</u> Date	<u>Original signed on file</u> Luat Y. Nguyen, Director Flight Projects Directorate	<u>07/20/09</u> Date
<u>Original signed on file</u> Lelia B. Vann, Director Science Directorate	<u>07/16/09</u> Date	<u>Original signed on file</u> David E. Bowles, Director Exploration and Space Operations Directorate	<u>07/20/09</u> Date
<u>Original signed on file</u> Ajay Kumar, Director Systems Analysis and Concepts Directorate	<u>07/20/09</u> Date	<u>Original signed on file</u> Stephen P. Sandford, Director Systems Engineering Directorate	<u>07/20/09</u> Date
<u>Original signed on file</u> Charles E. Harris, Director Research and Technology Directorate	<u>07/20/09</u> Date	<u>Original signed on file</u> George B. Finelli, Director Center Operations Directorate	<u>07/20/09</u> Date
<u>Original signed on file</u> Damodar Ambur, Director Ground Facilities and Testing Directorate	<u>07/20/09</u> Date	<u>Original signed on file</u> Grant M. Watson, Director Safety and Mission Assurance Office	<u>07/20/09</u> Date
<u>Original signed on file</u> Howard J. Lewis, Director Research Services Directorate	<u>07/20/09</u> Date	<u>Original signed on file</u> Preston I. Carraway, Director Systems Management Office	<u>07/20/09</u> Date

Revision History

Version	Date	Description
1A	2007/01/16	Initial Release
Rev A	2009/07/20	Revision incorporating resolution to OCE 2009 audit findings #3, 4, 5, 6 and other updates.
Rev A-1	2010/03/05	Revision to meet compliance to NPR 1400.1

Table Of Contents

P.1 Purpose 6

P.2 Applicability 6

P.3 Authority..... 6

P.4 Applicable Documents 6

P.5 Measurement/Verification 6

P.6 Cancellation 6

1. Overview 7

2. Adherence to NPD 1000.0 7

3. Center Technical Authority 8

4. Flow of Engineering Technical Authority 9

5. Flow of Safety and Mission Assurance Technical Authority 10

6. Health and Medical Responsibility Flow 12

7. Roles and Responsibilities for Technical Authority 14

8. Selection and Identification of Technical Authorities 16

9. Mandatory Standards and Deviations/Waivers to Requirements 17

10. Dissenting Opinions 19

11. Center Policy and Procedures Supporting Technical Authority..... 21

12. Configuration Control of Technical Authority Implementation Plan 21

13. Technical Authority Budget..... 21

14. Listing of Langley Technical Authorities 21

Appendix A: Definitions..... 21

Appendix B: Acronyms 22

Appendix C: Verification Matrix 23

Appendix D: Referenced Documents.....25

P.1 Purpose

This plan documents the implementation of the technical authority initiative at Langley Research Center.

P.2 Applicability

- a. This LPR is applicably to the Langley Research Center.
- b. Technical authority will encompass large and small projects and activities in flight systems and ground support (FS&GS) projects, advanced technology development (ATD) projects with deliverables to FS&GS projects, applied research projects with deliverables to FS&GS, and research projects involving high risk ground systems.
- c. Technical authority will also encompass basic and applied research (BAR), other ATD projects, and analysis projects as designated by the Center Director, on a case by case basis as recommended by the Center Management Council.

P.3 Authority

NPD 1000.0, "Strategic Management & Governance Handbook,"

P.4 Applicable Documents

- a. NPD 1000.0, "Strategic Management & Governance Handbook,"
- b. NPD 7900.4C, "NASA Aircraft Operations Management"
- c. NPD 8900.5, "NASA Health and Medical Policy for Human Space Flight Exploration"
- d. NID, NM 1240-41, "NASA Health and Medical Authority"
- e. NPR 7100.1 and 7100.8E, Protection of Human Research Subjects.
- f. NPR 7120.5, "NASA Space Flight Program and Project Management Requirements"
- g. NPR 7900.3B, "Flight Operations Management"
- h. LAPD 1150.2, "Councils, Boards, Panels, Committees, Teams, and Group."
- i. LAPD 1700.2, "Safety Assignments and Responsibilities"
- j. LAPD 1710.1, "Langley Research Center Aviation Safety Policy"
- k. LPR 1710.16B, "Aviation Operations and Safety Manual"

P.5 Measurement/Verification

Verification will be accomplished as part of the LaRC Internal Audit process.

P.6 Cancellation

None

1. Overview

- 1.1 NASA Policy Directive (NPD) 1000.0, “Strategic Management & Governance Handbook,” sets up a “checks and balances” organizational model and authorizes engineering to maintain technical purview over institutional requirements and any deviations/waivers. Likewise, verification compliance is the responsibility of Safety and Mission Assurance (SMA), and SMA maintains technical purview over SMA requirements, policies and practices, and any deviations/waivers. The Health and Medical Authority (HMA) is responsible for implementation compliance with NPD 8900.5, *NASA Health and Medical Policy for Human Space Flight Exploration*, and NID, NM 1240-41, *NASA Health and Medical Authority*. NPD 1000.0 also assigns responsibility for policy direction for NASA engineering, as well as program and project management, to the NASA Chief Engineer.
- 1.2 The checks and balances organization model described in NPD 1000.0 will be put into practice through the implementation of the technical authority initiative developed by the NASA Chief Engineer.
- 1.3 The Engineering and SMA Technical Authorities are parallel to program/project management that are required to achieve balance in implementing technically sound, safe and successful projects. Technical Authority defines the delegation of responsibility for setting and enforcing institutional requirements from the Office of the Administrator to the Center Director, and then down through the Langley organization to an individual program or project. On technical matters, the assigned Technical Authorities provide an organizationally and financially independent voice equal to programmatic authority.

2. Adherence to NPD 1000.0

- 2.1 A clear separation of programmatic and technical authority will be maintained. Each designated Technical Authority will be organizationally and financially independent from the program/project programmatic authority. The Technical Authority to the program/project may be matrixed from an engineering organization or the Safety and Mission Assurance Office (SMAO), and will be a direct report of these respective organizations.

LaRC Implementation of Technical Authority

Engineering Directorates in **RED** Programmatic Directorates in **BLUE**
 Safety Directorate in **GREEN**

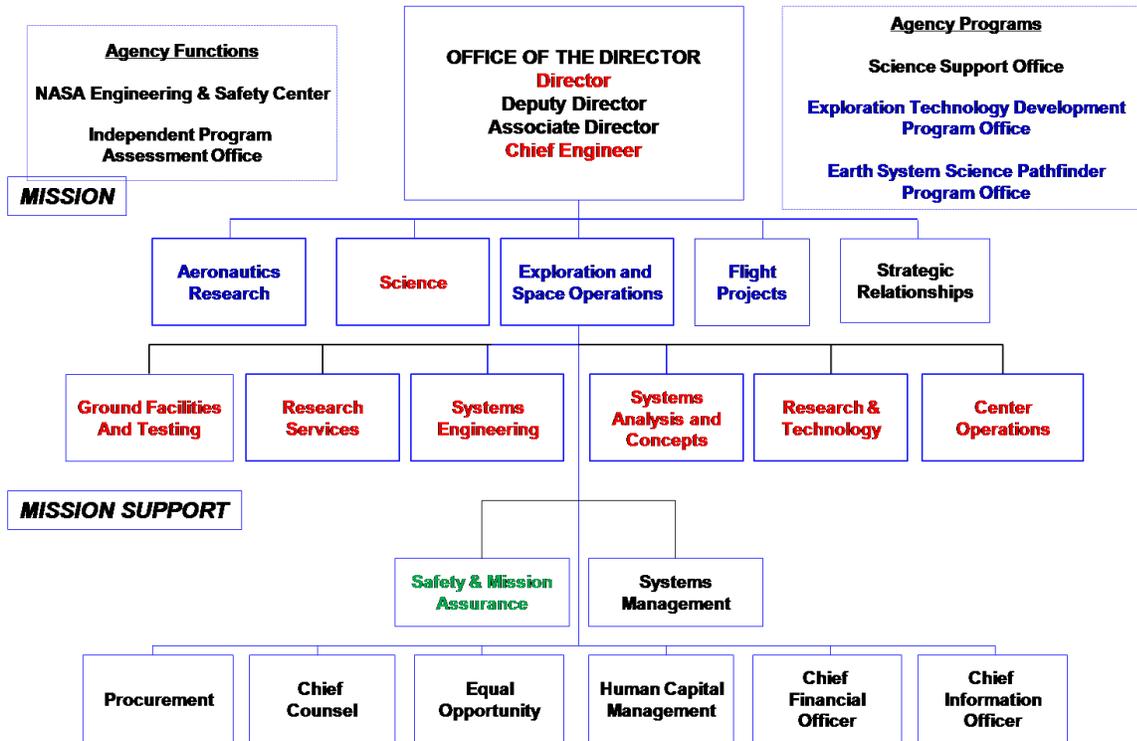


Figure 1: Organizations maintaining technical authority in the areas of engineering (red), safety and mission assurance (green); and programmatic authority (blue)

3. Center Technical Authority

- 3.1 The Center Director is the Technical Authority for Langley Research Center. The Center Director shall delegate specific Engineering Technical Authority (ETA) responsibilities to members of the Langley engineering and technical communities.
- 3.2 The Center Director shall delegate specific safety and mission assurance technical authority (STA) responsibilities to members of the Langley SMAO. Only those individuals designated as Technical Authorities can exercise technical authority.
- 3.3 The Center Management Council (CMC) has the primary responsibility for the technical content and performance of Center activities to assure their compliance with program, mission, and Agency objectives. As part of this responsibility, the CMC shall assess program and project compliance with technical authority.

3.4 The CMC shall provide recommendations to the Center Director for the application of technical authority to non-FS&GS activities outside the scope of this plan.

4. Flow of Engineering Technical Authority

4.1 Engineering Technical Authority (ETA), shown in figure 3, flows from the Office of the Administrator through the Center Director to each Engineering Director (the heads of the Center Operations, Research Services, Ground Facilities and Testing, Research and Technology, Science, Systems Analysis and Concepts, and Systems Engineering Directorates), to the designated Technical Authority for individual programs, projects, and disciplines when the program/project is hosted at Langley.

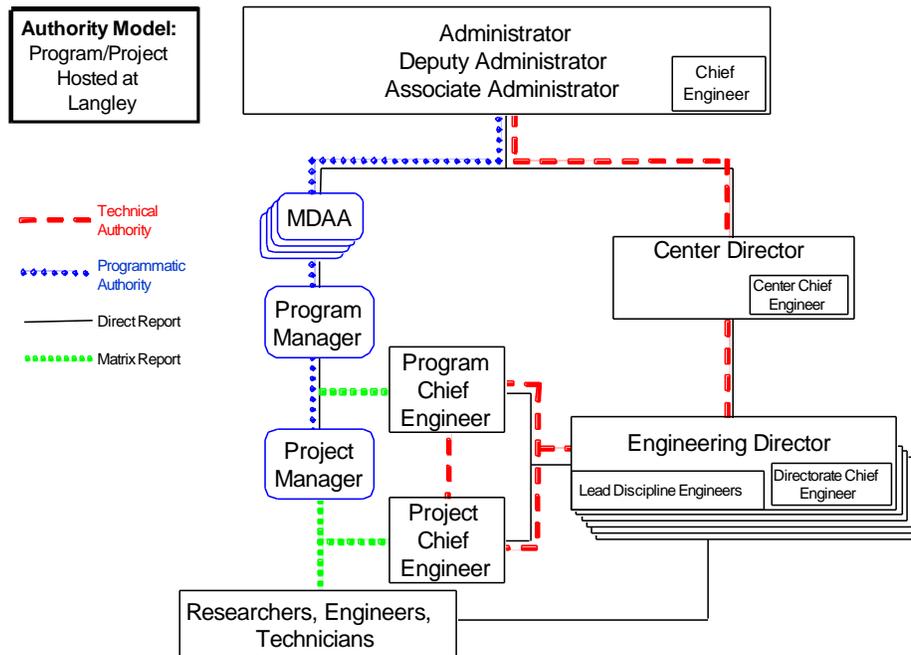
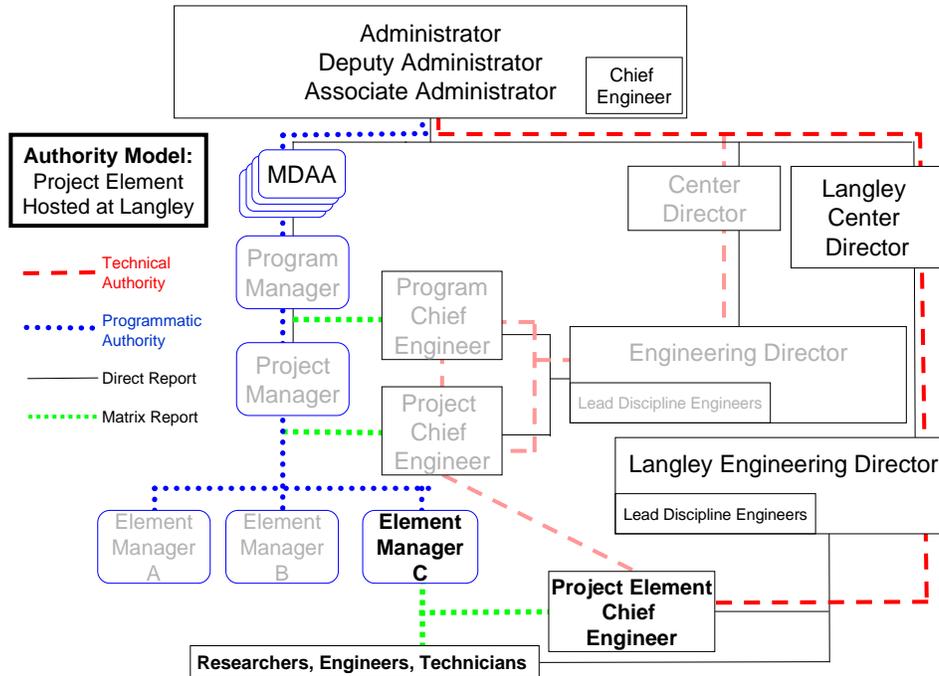


Figure 2: Flow of engineering technical authority when the program/project is hosted at Langley



*Shaded boxes indicate positions hosted at other Center(s); shaded lines indicate TA flow at other Center(s)

Figure 3: Flow of engineering technical authority when only an element of a project is hosted at Langley

4.2 When Langley is hosting a key element of the project, the element will be “projectized.” Examples are: Orion project elements such as the Service Module, Crew Module, or Launch Abort System for the Crew Exploration Vehicle (CEV) project. In these cases, as demonstrated in figure 4, technical authority flows from the Office of the Administrator through the Langley Center Director and Langley Engineering Director to the designated Technical Authority for the project element (Project Chief Engineer). In addition, there is a second flow of technical authority from the Office of the Administrator through the Center Director and Engineering Director of the Center hosting the project, to the Technical Authority for the project (Program/Project Chief Engineer), to the Langley Technical Authority for the project element (Project Chief Engineer). The Technical Authorities for the project and project element shall integrate the appropriate institutional requirements from the two Centers.

4.3 Project personnel shall document deviations in the project files.

4.4 Technical Authorities where a deviation is required shall work the disposition per the documented procedures at their Centers.

5 Flow of Safety and Mission Assurance Technical Authority

5.1 The flow of Safety and Mission Assurance Technical Authority (STA) has two possible paths at Langley: one for programs/projects hosted at Langley and one for a project element hosted at Langley. When Langley is the host for a program or a project within a program, as shown in figure 4, STA flows from the Office of the Administrator through the Center Director to the Langley Director, and then from the

SMAO to the designated Technical Authority for individual projects and disciplines (program/project CSO).

5.2 When Langley is hosting a key element of the project, the element will be “projectized.” In these cases, as shown in figure 5, STA flows from the Office of the Administrator through the Center Director to the Langley Director, and then from the SMAO to the designated Technical Authority for individual projects or disciplines (project CSO). In addition, there is a second flow of STA from the CSO for the hosting project (program/project CSO) to the designated Technical Authority for individual projects and disciplines (project CSO). The STA flow from the Office of the Administrator to the hosting project’s CSO will be in accordance with the hosting Center’s TA implementation plan. The Technical Authorities for the project and project element shall integrate the appropriate institutional requirements from the two Centers.

5.3 Project personnel shall document deviations in the project files.

5.4 Technical Authorities where a deviation is required shall work the disposition per the documented procedures at their Centers.

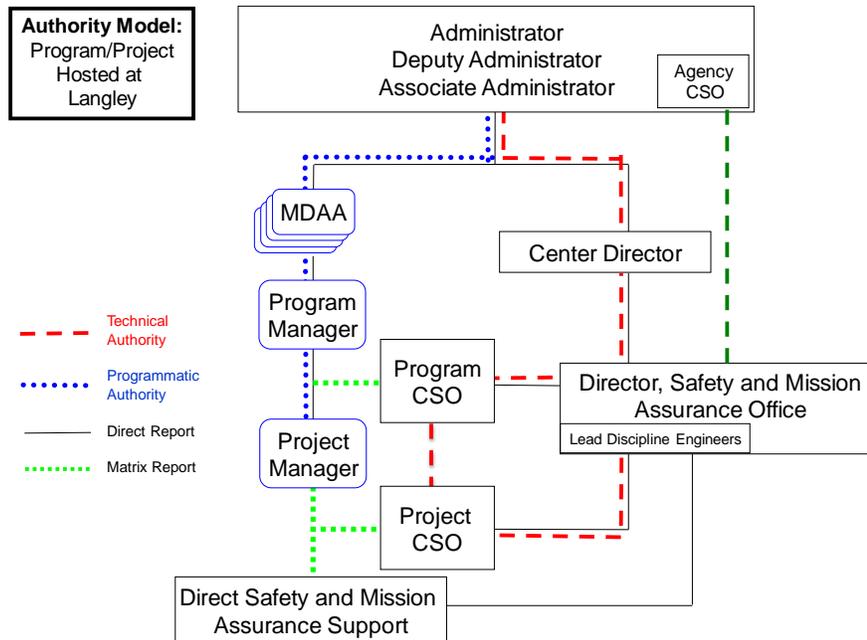
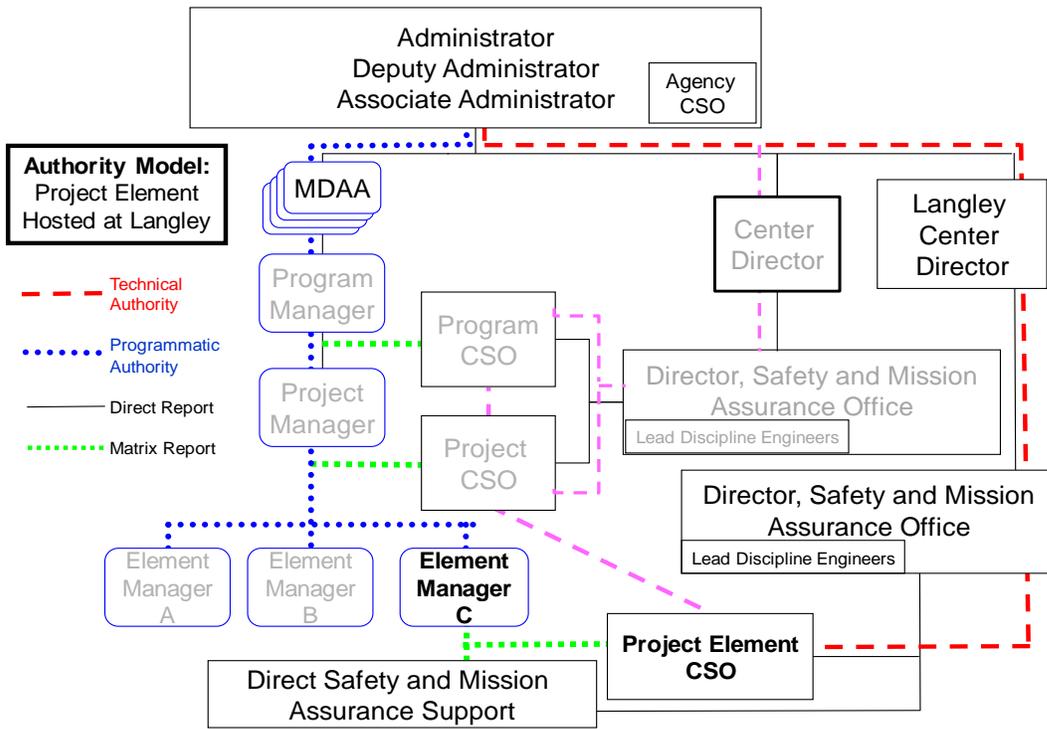


Figure 4: Flow of safety and mission assurance technical authority when the program/project is hosted at Langley



*Shaded boxes indicate positions hosted at other Center(s); shaded lines indicate TA flow at other Center(s)

Figure 5: Flow of technical authority when only an element of a project is hosted at Langley

6 Health and Medical Responsibility Flow

6.1 The Center is responsible for assuring that the programs/projects comply with health and medical requirements through the process specified in this Health and Medical Authority (HMA) implementation plan, which is compliant with NPD 8900.5, *NASA Health and Medical Policy for Human Space Flight Exploration*, and NID, NM 1240-41, *NASA Health and Medical Authority*. The NASA Chief Health and Medical Officer (CHMO) hears appeals of HMA decisions when issues cannot be resolved below the Agency level.

6.2 The Center also has a responsibility for the health and medical requirements for the personnel involved with the Center’s aircraft and simulators. Figure 6 shows the flow down of authority for Health and Medical for Aircraft and Simulators at NASA Langley.

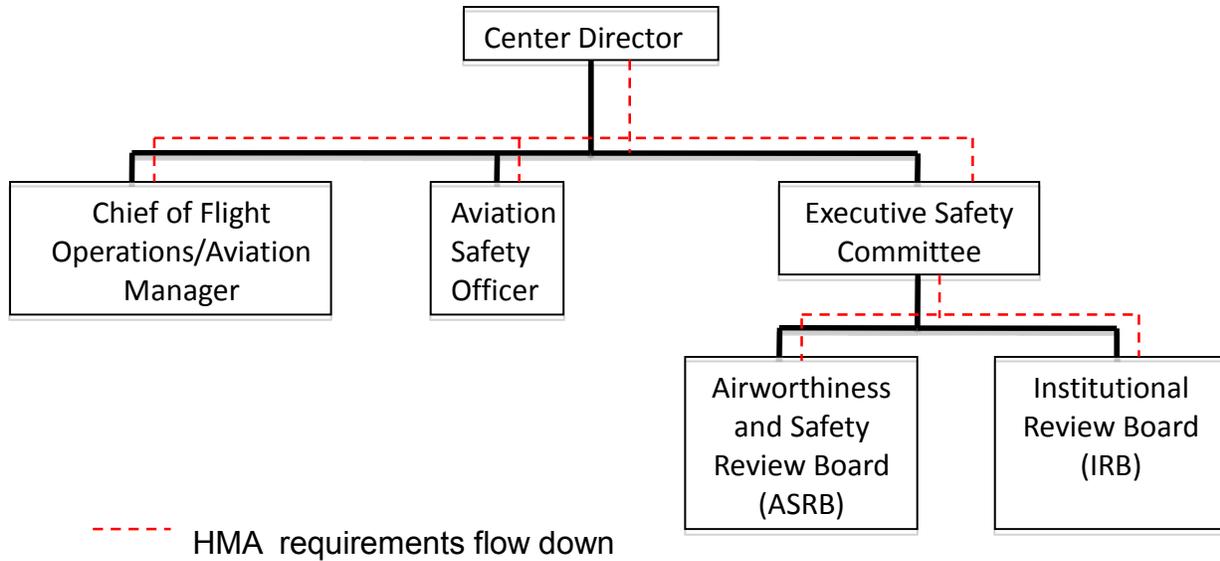


Figure 6: Requirements flow down for health and medical for aircraft and simulators

6.3 Any organization at NASA Langley that desires to conduct flight research or manned simulator operations must coordinate these activities through the Research Services Directorate (RSD). The Director of RSD is the Center’s Chief of Flight Operations/Aviation Manager, who is responsible for flight operations and aviation safety. The responsibilities of the RSD Director include, but are not limited to: ensuring compliance with the Center Safety Program; and, defining/proposing and implementing the management guidelines, processes and procedures necessary to enable safe and effective operations of Langley-assigned aircraft, including appropriate training/certification programs for all functional areas. The Aviation Safety Officer (ASO) is the focal point for aviation safety matters for the Center Director and the RSD Director. The ASO reports to the Center Director on all aviation safety matters. ASO responsibilities include, but are not limited to: defining and implementing the Center Aviation Safety Program in conjunction with the Ground Safety Officer and the RSD Director to address all areas of flight and ground operations safety; fostering aviation safety measures, promoting mishap prevention, and developing and updating an aviation accident reporting and investigation plan; and, maintaining conformance with prescribing directives, standards, and procedures, identifying or recommending corrective action when required. The responsibilities of the Chief of Flight Operations/Aviation Manager and the ASO are defined in LAPD 1700.2, *Safety Assignments and Responsibilities*, and LAPD 1710.1, *Langley Research Center Aviation Safety Policy*.

6.4 Independent safety oversight of aircraft operations and protection of human research subjects is provided by the Center’s Airworthiness and Safety Review Board (ASRB) and the Institutional Review Board (IRB), respectively. The Agency policy for aircraft is provided in NPD 7900.4C, *NASA Aircraft Operations Management*, and NPR 7900.3B, *Flight Operations Management*. The Agency’s requirements for the

IRB are provided in NPR 7100.1 and 7100.8E, *Protection of Human Research Subjects*.

6.5 The corresponding health and medical requirements for aircraft personnel at NASA Langley are found in LPR 1710.16B, *Aviation Operations and Safety Manual*. NASA Langley's ASRB and IRB are chartered via LAPD 1150.2, *Councils, Boards, Panels, Committees, Teams, and Groups*.

6.6 In summary, RSD, ASRB, and IRB ensure the health and medical safety of personnel participating as primary aircrew, mission managers, experiment observers, and human subjects involved in the work and research conducted at NASA Langley on board aircraft and in simulators.

7 Roles and Responsibilities for Technical Authority

7.1 Center Director

The Technical Authority for Langley Research Center as designated by the NASA Administrator; responsible for implementing technical authority at Langley in accordance with NPD 1000.0 and guidance from the Office of the Chief Engineer, the Office of Safety and Mission Assurance (OSMA) and the NASA CHMO; responsible for developing, maintaining, and assuring compliance to institutional requirements for the safe operation of programs, projects, and project elements at Langley; responsible for the resolution of requests for deviations/waivers from institutional requirements; responsible for the resolution of dissenting opinions.

7.2 Center Chief Engineer

Responsible for overall leadership of the engineering technical authority process for Langley Research Center hosted programs, projects, project elements, and activities (as defined in section 2.0) to include policy direction and technical authority process implementation; and advises the Center Director on the resolution of deviations/waivers to institutional requirements and the resolution of dissenting opinions.

7.3 Engineering Director (the heads of the Center Operations, Research Services, Ground Facilities and Testing, Research and Technology, Science, Systems Analysis and Concepts, and Systems Engineering Directorates)

The formally delegated Technical Authority for specific engineering technical authority responsibilities in the engineering directorate as designated by the Center Director; responsible for selecting or recommending program/project Technical Authorities and discipline Technical Authorities; responsible for implementing engineering technical authority in the Engineering Directorate; responsible for developing, maintaining, and assuring compliance to institutional requirements for safe operations; and as delegated, responsible for the resolution of requests for deviations/waivers from institutional requirements and the resolution of dissenting opinions.

7.4 Directorate Chief Engineer

Responsible for the guidance of the engineering technical authority process in the Directorate to include organizational procedures and the verification of engineering technical authority implementation in the Directorate; and advises the Engineering Director on deviations/waivers of institutional requirements and resolution of dissenting opinions.

7.5 Directorate Branch Heads/Lead Discipline Engineers

Responsible for the guidance of the engineering technical authority process in the branch to include organizational procedures and the verification of engineering technical authority implementation in the branch; and advises the Engineering Director on deviations/waivers of institutional requirements and resolution of dissenting opinions. The Branch Head is designated as a Lead Discipline Engineer (LDE) functioning as a Technical Authority responsible for the application of discipline specific standards; and as delegated, responsible for the resolution of requests for deviations/waivers from discipline specific requirements. The LDEs are also responsible for supporting the review of processes/activities, such as trend analysis, risk analysis, hazard analysis, and failure mode and effect analysis (FMEA), for their disciplines. For smaller projects that are primarily focused in one branch, the Branch Head will function at the Project Chief Engineer.

7.6 Director, Safety and Mission Assurance Office (SMAO)

The formally delegated Technical Authority for safety and mission assurance technical authority (STA); responsible for recommending to the Center Director program/project Chief Safety and Mission Assurance Officers (CSO) and selecting SMA discipline Technical Authorities; responsible for implementing STA; responsible for developing, maintaining, and assuring compliance to institutional safety and mission assurance requirements, practices and policies; and responsible for the resolution of requests for deviations/waivers from SMA institutional requirements and the resolution of dissenting opinions.

7.7 Branch Head, Mission Assurance Branch, SMAO

Recommends to the Director, SMAO a Chief Safety and Mission Assurance Officer (CSO) for programs and larger projects/elements hosted by Langley. For smaller projects/elements serves as the CSO and assign a Mission Assurance Manager to implement day-to-day safety and mission assurance activities.

7.8 Program/Project Managers

Responsible for the overall success of their programs/projects to include cost, schedule, and program/project requirements within the constraints of institutional requirements for safe operations; has the authority to make a decision while resolution of dissenting opinions or technical issues are reviewed at the next higher level of Programmatic and Technical Authority; and for implementing and recognizing technical authority in their programs/projects.

7.9 Program/Project Chief Engineer (PCE)

The formally delegated Technical Authority for a program/project as designated by the Center Director (or Engineering Director); responsible for delivering a safe product by applying and ensuring the application of institutional requirements; and responsible for the development and disposition of program/project deviations/waivers and dissenting opinions. The PCEs are also responsible for the review and approval of processes/activities such as trend analysis, risk analysis, hazard analysis, and FMEA for their programs or projects; and for documenting the results of the review (peer, technical quality, life cycle, etc) in program/project files.

7.10 Program/Project Chief Safety and Mission Assurance Officer (CSO)

The formally delegated safety and mission assurance Technical Authority for a program/project as designated by the Center Director based on recommendations from the Director, SMAO; responsible for delivering a safe product by applying and ensuring the application of institutional safety and mission assurance requirements; responsible for reviewing program/project deviations/waivers and dissenting opinions; and disposition of deviations/waivers and dissenting opinions to SMA requirements. The CSOs are also responsible for the review and approval of safety and mission assurance processes/activities such as, risk analysis, hazard analysis, and failure mode and effect analysis (FMEA) for their programs or projects.

7.11 Researcher, Engineer, Technician

Responsible for delivering systems, subsystems, and/or components to the program/project that meet the documented requirements, including safety and mission assurance.

8 Selection and Identification of Technical Authorities

8.1 Technical authority is formally delegated (flow down) as described in sections 5.0 and 6.0. The Center Chief Engineer shall maintain a listing of all Langley Technical Authorities; see Section 14, "Listing of Langley Technical Authorities."

8.2 The NASA Chief Engineer shall approve the selection of Engineering Directors, Program Engineering Technical Authorities, and category 1 (as described in NPR 7120.5) Project Technical Authorities. The NASA Chief Engineer was provided an initial listing of all Langley Technical Authorities.

8.3 The Center Chief Engineer shall notify the NASA Chief Engineer annually, at a minimum, of any changes to the Langley listing of Technical Authorities.

8.4 There will be a designated CSO for all programs, projects, and elements hosted by Langley.

8.5 For any program and larger projects/elements, the Branch Head, Mission Assurance Branch (MAB) shall assign a CSO.

- 8.6 The Langley Director, Safety and Mission Assurance Office shall approve the selection of CSO for any program or larger projects/elements.
- 8.7 The NASA Chief Safety Officer shall approve the selection of a program CSO.
- 8.8 For smaller projects/elements, the Branch Head, MAB shall serve as the CSO and assign a Mission Assurance Manager to implement day-to-day safety and mission assurance activities.

9 Mandatory Standards and Deviations/Waivers to Requirements

- 9.1 The Headquarters' Office of the Chief Engineer and Office of Safety and Mission Assurance will periodically issue a listing of mandatory standards that must be implemented across all NASA programs and projects. The Director of the Systems Management Office (SMO) shall maintain a current listing of these mandatory standards on Langley Nx Web site in the Langley Office of Chief Engineer folder (Nx, Home, Projects and Programs, OCE, Mandatory Standards and Delegation Letters: <https://nx.larc.nasa.gov/dsweb/View/Collection-18462>). The NASA Chief Engineer has issued delegation responsibilities for some of these mandatory standards to the Center Directors.
- 9.2 The Langley Chief Engineer shall provide information updates and guidance to the Engineering Directorates as revisions occur. It is the responsibility of the Program and Project Managers, Chief Engineers and Chief Safety and Mission Assurance Officers to be aware of these and either implement, tailor or obtain a deviation/waiver. Directorates and Branch Heads are responsible to be aware of these as they apply to the work performed in their respective organizations and ensure these are implemented, tailored or appropriate deviations/waivers submitted. Note that tailoring may result in a deviation.
- 9.3 The evaluation and disposition of deviations/waivers to agency and institutional requirements is the responsibility of the Technical Authority. Technical Authorities shall approve deviations/waivers from requirements at their levels. The organizational level and organizations that agreed with the establishment of the requirement must agree to the deviation from the requirement.
- 9.4 The Technical Authority granting a deviation from the requirement shall notify the Program/Project Manager, the Engineering Director, Chief Engineer, and S&MA Director to maintain a common understanding and proper documentation of the requirements.
- 9.5 Once the deviation is agreed to as described above, Program/Project Managers shall approve the deviation consistent with their responsibilities to implement technical authority requirements.

9.6 The next higher level of technical, safety and programmatic authority must be informed in a timely manner of each deviation request and the subsequent action taken.

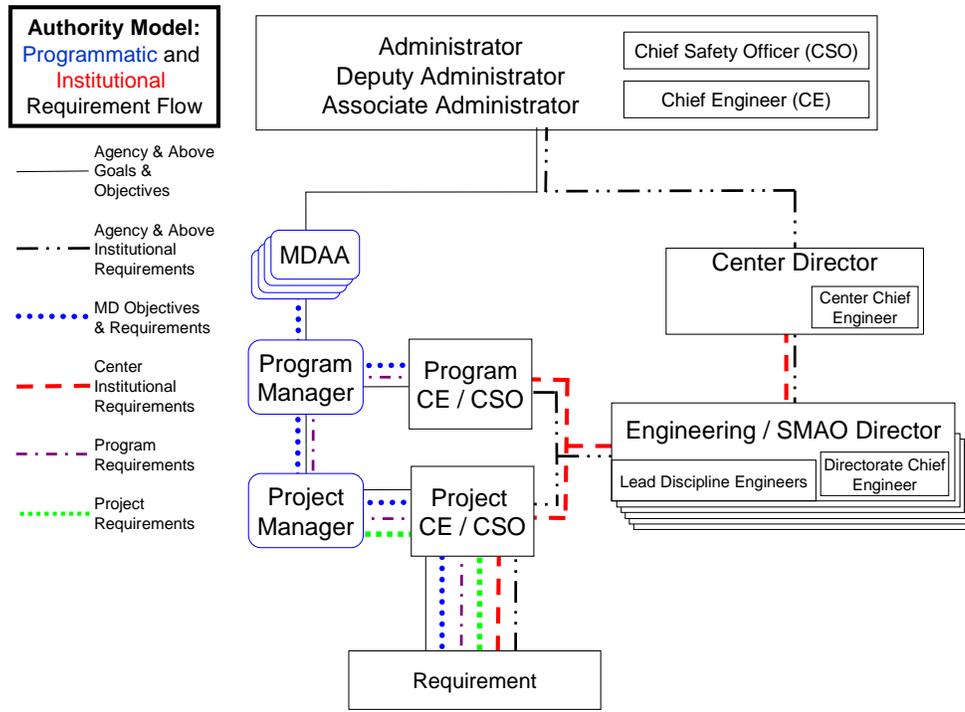


Figure 7: The flow of SMA goals, objectives, and requirements

9.7 Figure 7 illustrates the flow of goals, objectives, and requirements through the programmatic and institutional chains of command. The technical authority to deviate or waive from an Agency or higher institutional requirement is at the Administrator or above, unless specific delegation has been given by the NASA Chief Engineer, NASA SMA Director, or the Administrator. The Systems Management Office (SMO) shall maintain these delegation letters for reference. The technical authority to deviate/waive from Center institutional requirements and delegated Agency requirements or standards is at the Center Director.

Table I: Level of deviation/waiver decision authority for institutional requirements

Requirements	Level of Deviation Decision	Examples
Agency and Higher Institutional Requirements	Administrator and above	Executive orders, <i>Human-Rating Requirements for Space Systems</i> (NPR 8705.2A), <i>Planetary Protection Provisions for Robotic Extraterrestrial Missions</i> (NPR 8020.12C), and <i>Systems</i>

Center Institutional Requirements and Delegated Agency Requirements/Standards	Center Director	<i>Engineering Procedural Requirements (NPR 7123.1)</i> <i>Wind-Tunnel Model Systems Criteria (LPR 1710.15), Langley Research Center Pressure Systems Handbook (LPR 1710.40), and Design, Verification/Validation, and Operations Principles for Space Flight Systems (LPR 8705.1); NASA-STD-5002, Load Analysis of Spacecraft and Payloads</i>
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9.8 Similarly, the authority to deviate/waive from Agency and higher, mission directorate, program, and project goals, objectives, and requirements is at the programmatic level that the goal, objective, or requirement was established.

Table II: Examples and notional programmatic goals, objectives, and requirements

Goals, Objectives, & Requirements	Examples	Level Goal, Objective, or Requirement Established By
Agency and Higher Goals and Objectives	Presidential policy; executive orders; and <i>The Vision for Space Exploration</i>	President, Congress
MD Objectives and Requirements	Return the space shuttle to flight; enable human Travel beyond low earth orbit; conduct scientific exploration of the Earth, Moon, Mars and beyond; advance the science of subsonic, supersonic, and hypersonic flight	Administrator
Program Requirements	The program shall develop a system to carry humans beyond low earth orbit; the program shall conduct scientific exploration of Earth	Mission Directorate
Project Requirements	The CEV shall have a crew-to-crew communication system that covers the mission envelope; the crew-to-crew communication system shall cover a volume of N km around the CEV; the crew-to-crew communication system shall remain attached to the crew member; the crew-to-crew communication system shall provide simultaneous N-way communications	Program Project

10 Dissenting Opinions

10.1 Unresolved issues of any nature (e.g., programmatic, safety, engineering acquisition, or accounting) within a team should be quickly elevated to achieve resolution at the appropriate level. At the discretion of the dissenting person(s), a decision may be appealed to the next higher level of management for resolution. Dissenting opinions raised by a Technical Authority (whether in the area of

engineering, safety, or human and medical) are handled in accordance with the general process described subsequently.

- 10.2 Personnel with dissenting opinions shall present to the appropriate engineering and safety Technical Authorities in a timely manner with all relevant facts, the technical, including risk, rationale for the differing views, and the recommendations resulting from each view.
- 10.3 Technical Authorities shall inform management in the technical authority, project/program, and safety and mission assurance chains of accountability in a timely manner of the existence of a dissenting view and the disposition of the dissent.
- 10.4 Teams will have full and open discussions with all the facts made available to understand and assess issues. Issues unresolved within a team should be quickly elevated to achieve resolution at the appropriate level. At the discretion of the dissenting person(s) (level n), a dissenting view is identified and presented to the appropriate engineering and safety Technical Authorities (level n+1).
- 10.5 The Technical Authority shall document the concern in a memorandum. The memorandum is signed by the representative of each view and concurred on by all affected parties. This memorandum is provided to the appropriate engineering and safety Technical Authorities for action. In parallel, copies of the memorandum are provided to the next level engineering and safety Technical Authorities (level n+2), Program/Project Manager, and the Managers of involved management oversight organizations for their information or action as they deem appropriate.
- 10.6 The memorandum will contain three primary components to assist the Technical Authority in making an objective, timely, and correct technical decision: 1) facts that are agreed to by all parties, 2) discussion of the differing positions, rationale, and implications including risk, and 3) the recommendations of each party.
- 10.7 The engineering and safety Technical Authorities' decision/action on the memorandum will be documented and provided to the dissenter and to the managers who were notified of the dissent as noted above. This documentation becomes part of the project record.
- 10.8 If urgent resolution of the issue is required, a team member representing the base recommendation and a team member advocating the dissenting position will make an oral presentation to the next higher level of engineering and safety Technical Authorities (level n+1). The Program or Project Managers, as well as the managers of other involved organizations at the next level (level n+2) are to be notified of the need for urgent resolution of the dissenting opinion and when/where the presentation will be held. In this urgent mode, the oral presentation follows the document format discussed above. Representatives of the affected organizations are in attendance, and their positions are heard. The presentation and resulting

actions are documented and are distributed as noted above. This documentation becomes part of the project record.

- 10.9 In either the normal or urgent process, if the dissenting team member is not satisfied with the process or the outcome, the dissenter may request the issue be referred to the next level of engineering and safety Technical Authorities. Ultimately the dissenting team member has the right to take the issue up the organization for resolution including to the NASA Administrator, if necessary.

11 Center Policy and Procedures Supporting Technical Authority

- 11.1 Center policies and procedures for institutional requirements are documented in the Langley Management System (LMS), e.g., LPR 7130, Project and Task Review Procedural Requirements.

12 Configuration Control of Technical Authority Implementation Plan

- 12.1 Once signed by the signatories on the front page, this implementation plan will be put under configuration control and maintained in the Langley Management System. Any major changes to the plan will be approved by the NASA Chief Engineer, NASA Safety and Mission Assurance Director and the Langley Center Director prior to implementation. Revisions after the initial baseline that remain compliant with NASA policy directives will be approved by the Center Director. The NASA Chief Engineer and NASA Safety and Mission Assurance Director will be informed of the change by the LaRC Chief Engineer.

13 Technical Authority Budget

- 13.1 NASA Langley's Chief Engineer and Director, SMAO are responsible for the Engineering and Safety Technical Authority's budgets, respectively. The status of these budgets will be reported periodically to the Center Management Council and/or Center Leadership Council, as required.

14 Listing of Langley Technical Authorities

- 14.1 The Chief Engineer and the Director, SMAO shall develop and maintain a list of the respective Technical Authority designees. This list will be updated as new programs and projects are added or completed and at least quarterly to account for personnel changes. These lists will be maintained on the Langley Nx Web site in the Langley Office of Chief Engineer folder (Nx, Home, Projects and Programs, OCE: <https://nx.larc.nasa.gov/dsweb/View/Collection-18461>)

Appendix A: Definitions

- A.1. Technical Authority -The delegation of responsibility for setting and enforcing institutional requirements from the Office of the Administrator to the Center Director, and then down through the Langley organization to an individual program or project.
- A.2. Dissenting Opinion-Unresolved issues of any nature.

Appendix B: Acronyms

ASO	Aviation Safety Officer
ASRB	Airworthiness and Safety Review Board
ATD	Advanced Technology Development
BAR	Basic and Applied Research
CEV	Crew Exploration Vehicle
CHMO	Chief Health and Medical Officer
CMC	Center Management Council
CSO	Program/Project Chief Safety and Mission Assurance Officer
ETA	Engineering Technical Authority
FMEA	Failure Mode and Effect Analysis
FS&GS	Flight Systems and Ground Support
HMA	Health and Medical Authority
IRB	Institutional Review Board
LMS	Langley Management System
MAB	Mission Assurance Branch
NPD	NASA Policy Directive
OSMA	Office of Safety and Mission Assurance
PCE	Program/Project Chief Engineer
RSD	Research Services Directorate
SMA	Safety and Mission Assurance
SMAO	Safety and Mission Assurance Office
SMO	Systems Management Office
STA	Safety and Mission Assurance Technical Authority

Appendix C: Verification Matrix

Req's Para	Requirement	Compliant	Not Compliant
3a	Director shall delegate specific Engineering Technical Authority (ETA) responsibilities to members of the Langley engineering and technical communities.		
3b	The Center Director shall delegate specific safety and mission assurance technical authority (STA) responsibilities to members of the Langley SMAO. Only those individuals designated as Technical Authorities can exercise technical authority.		
3c	The CMC shall assess program and project compliance with technical authority		
3d	The CMC shall provide recommendations to the Center Director for the application of technical authority to non-FS&GS activities outside the scope of this plan.		
4b	The Technical Authorities for the project and project element shall integrate the appropriate institutional requirements from the two Centers.		
4c	Project personnel shall document deviations in the project files.		
4d	Technical Authorities where a deviation is required shall work the disposition per the documented procedures at their Centers.		
5b	The Technical Authorities for the project and project element shall integrate the appropriate institutional requirements from the two Centers.		
5c	Project personnel shall document deviations in the project files.		
5d	Technical Authorities where a deviation is required shall work the disposition per the documented procedures at their Centers.		
8a	The Center Chief Engineer shall maintain a listing of all Langley Technical Authorities		
8b	The NASA Chief Engineer shall approve the selection of Engineering Directors, Program Engineering Technical Authorities, and category 1 (as described in NPR 7120.5) Project Technical Authorities		
8c	The Center Chief Engineer shall notify the NASA Chief Engineer annually, at a minimum, of any changes to the Langley listing of Technical Authorities.		
8e	For any program and larger projects/elements, the Branch Head, Mission Assurance Branch (MAB) shall assign a CSO.		
8f	The Langley Director, Safety and Mission Assurance Office shall approve the selection of CSO for any program or larger projects/elements.		
8g	The NASA Chief Safety Officer shall approve the selection of a program CSO		
8h	For smaller projects/elements, the Branch Head, MAB shall serve as the CSO and assign a Mission Assurance Manager to implement day-to-day safety and mission assurance activities.		

Req's Para	Requirement	Compliant	Not Compliant
9a	The Director of the Systems Management Office (SMO) shall maintain a current listing of these mandatory standards		
9b	The Langley Chief Engineer shall provide information updates and guidance to the Engineering Directorates as revisions occur.		
9c	Technical Authorities shall approve deviations/waivers from requirements at their levels		
9d	The Technical Authority granting a deviation from the requirement shall notify the Program/Project Manager, the Engineering Director, Chief Engineer, and S&MA Director to maintain a common understanding and proper documentation of the requirements.		
9e	Program/Project Managers shall approve the deviation consistent with their responsibilities to implement technical authority requirements.		
9g	The Systems Management Office (SMO) shall maintain these delegation letters for reference.		
10b	Personnel with dissenting opinions shall present to the appropriate engineering and safety Technical Authorities in a timely manner with all relevant facts, the technical, including risk, rationale for the differing views, and the recommendations resulting from each view.		
10c	Technical Authorities shall inform management in the technical authority, project/program, and safety and mission assurance chains of accountability in a timely manner of the existence of a dissenting view and the disposition of the dissent.		
10d	The Technical Authority shall document the concern in a memorandum.		
14a	The Chief Engineer and the Director, SMAO shall develop and maintain a list of the respective Technical Authority designees		

Appendix D: Reference Documents

- D.1. NPR 7123.1, "Systems Engineering Procedural Requirements"
- D.2. NPR 8020.12C, "Planetary Protection Provisions for Robotic Extraterrestrial Missions"
- D.3. NPR 8705.2A, "Human-Rating Requirements for Space Systems"
- D.4. LPR 1710.15, "Wind-Tunnel Model Systems Criteria"
- D.5. LPR 1710.40, "Langley Research Center Pressure Systems Handbook"
- D.6. NASA-STD-5002, "Load Analysis of Spacecraft and Payloads"