Working Within NASA Policy & Directives

A collection of information intended for
new Project Managers and Principal Investigators
to identify key NASA requirements for flight projects and aid in successful project formulation.
(with a focus on PI-led science projects initiated by Announcements of Opportunity)

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Working Within NASA Policy & Directives

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- Key NASA Procedural Requirements for specific project application
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Working Within NASA Policy & Directives

Disclaimer

Note that the official versions of all NASA NPDs and NPRs are to be found in the NASA On-line Directives Information System. The NODIS Library is found at:

http://nodis3.gsfc.nasa.gov/

The information content in this presentation was accurate as of April 2010. If you are using this as a reference after that time, it is likely that one or more of the referenced documents have been updated. Please check the above website for the latest version.

Working Within NASA Policy & Directives

Presentation Objectives

- Identify key NASA documents needed to know for Formulation.
  - Selected documents only; To know them all would be a full time job.
  - General PI familiarity is sufficient; PI should depend on Project Mgr for details.
- Understand NASA governance model and how it is applied.
  - Roles of field centers and of HQ; Defines the Chain of Authority.
- Identify key parts of NPR 7120.5D for managing AO-type projects.
  - The key Agency-level document for implementing a project.
  - Defines project life cycles; gate reviews and principal products.
- Identify project-significant items from key NPDs and NPRs.
  - A suggested list of those that are most important to project success.
- Gain understanding of NASA Project Life Cycle.
  - And how The Science Mission Directorate interprets and expands it via its Management Handbook

Working Within NASA Policy & Directives

NASA's Governing Document Tree

Documents flow down from:

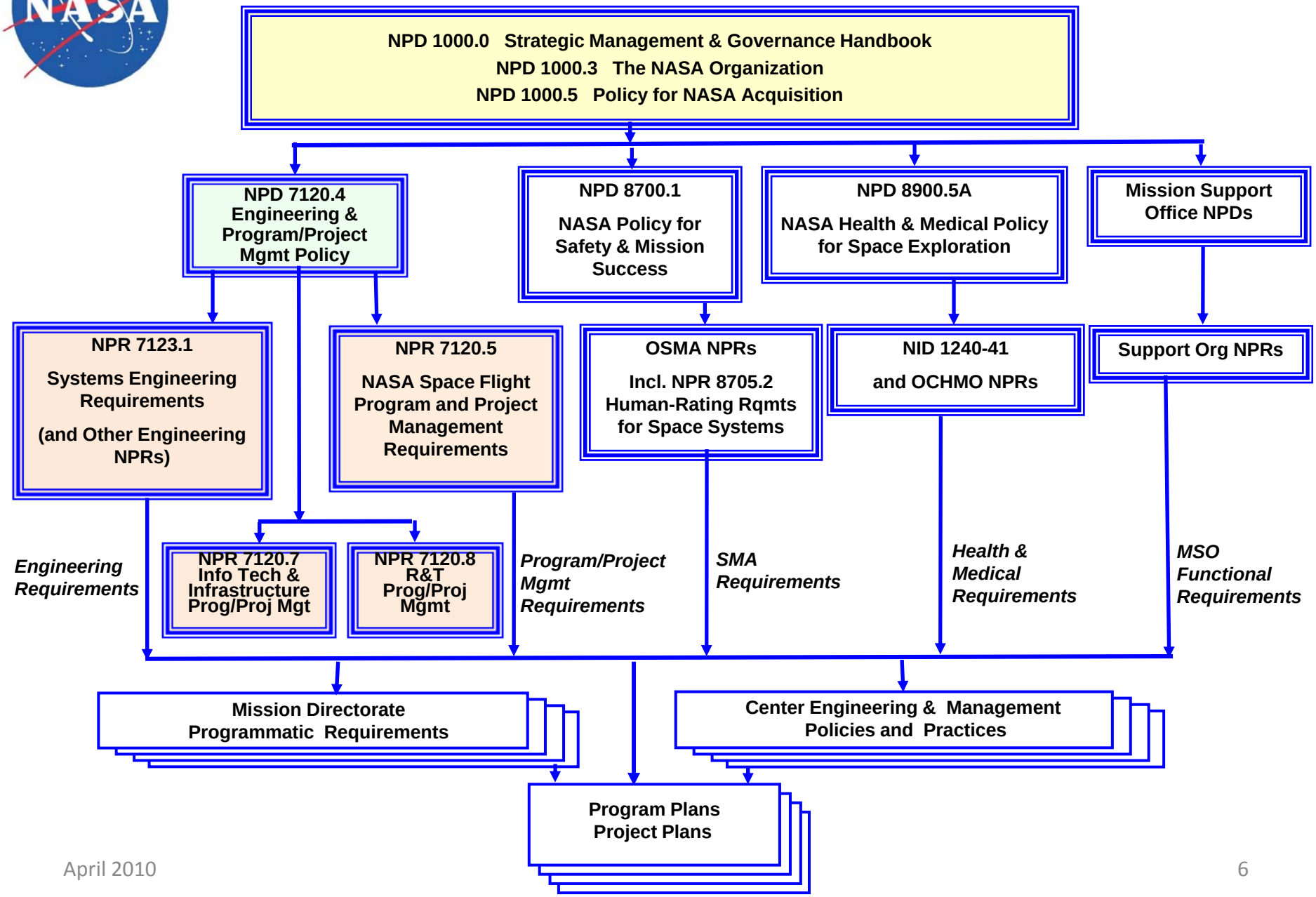
- NPD 1000.0 NASA Strategic Mgmt & Governance Handbook
- NPD 1000.3 The NASA Organization
- NPD 1000.5 Policy for NASA Acquisition

to specific NPDs and then to various NPRs.

- NPDs are **NASA Policy Directives** -- These are typically only a few pages and are high level, establishing overall policy and referring to constituent NPRs for implementing the directives through the allocation of specific requirements.

- NPRs are **NASA Procedural Requirements** -- These establish the Agency's requirements for implementation of its various elements, and in particular the programs and projects that implement its mission.
  - Specific requirements are delineated by "shall" statements.

NASA Governing Documents



Key NASA Policy Directives (NPD)

(Each of these selected NPDs are covered in subsequent charts)

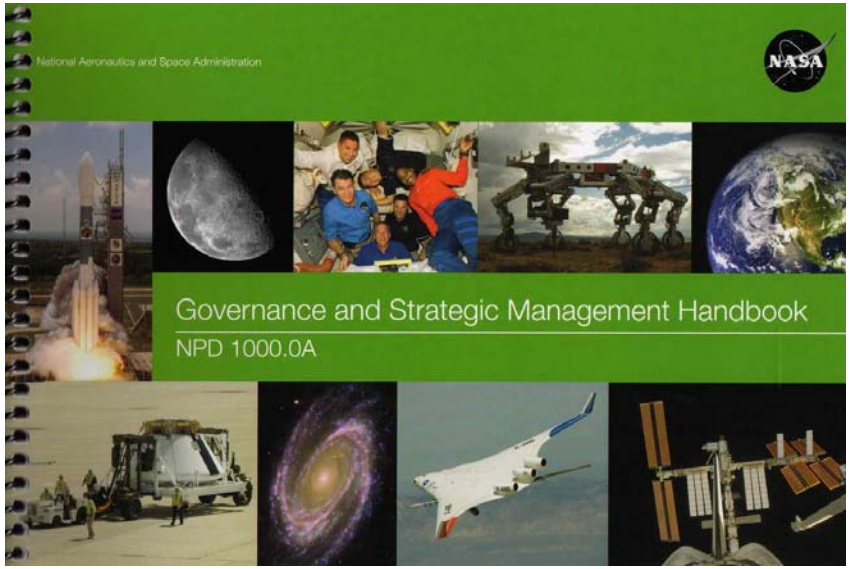
NPD 1000.0	for NASA's strategic management & governance
NPD 1000.5	for NASA's Acquisition policy
NPD 1001.0	for NASA's near term strategic plan
NPD 1080.1	for policy on conducting research and technology
~~NPD 2820.1~~	~~for NASA's software policy~~ *delete*
NPD 7120.4	for overall NASA Program & Project Mgmt
NPD 8610.7	for launch vehicle's acceptability for given payloads
NPD 8700.1	for safety and mission success policy
NPD 8010.3	for what to do to terminate missions

Caveat: All NPDs are NASA policy and every project should evaluate them for specific applicability.

Key NASA Policy Directives

NPD 1000.0A **NASA Strategic Mgmt & Governance Handbook**

- **Separates Programmatic and Institutional Authorities**
- **Describes Governing Councils**
- **Articulates Strategic Management Principles**
- **Establishes Technical Authorities**



Key NASA Policy Directives

NPD 1000.0A **NASA Strategic Mgmt & Governance Handbook**

Extracted from the document's Overview, this NPD presents:

- The governance structure by which the Administrator and senior staff provide leadership across the Agency.
- Governance principles by which NASA manages.
- NASA's organizational plan to conduct the Agency's Mission, including roles and responsibilities.
- Guidance for Mission Directorates and Centers for executing programs and projects.
- Guidelines for strategic planning, and identification of the Agency's key strategic planning roles.
- The process by which strategy is converted into implementation and outcomes.
- The process for establishing performance measures and providing feedback on progress.

Key NASA Policy Directives

NPD 1000.0A **NASA Strategic Mgmt & Governance Handbook**

Defines the Agency's core values:

Safety + Teamwork + Excellence + Integrity = Mission Success

NASA's decision making is executed through three councils; the Strategic Management Council, Operations Management* Council, and the Program Management Council.

Defines Directorate, Center, Program and Project Responsibilities

- Directorates are responsible for budgets, schedule, and top-level requirements for the Agency's programs. Programs and projects are delegated to the Centers to execute.
- Center Directors are responsible for managing the Center's institutional capabilities required for the execution of programs and projects assigned to their Center.
- Programs and projects are executed at the field centers under direction from Mission Directorate Associate Administrators.

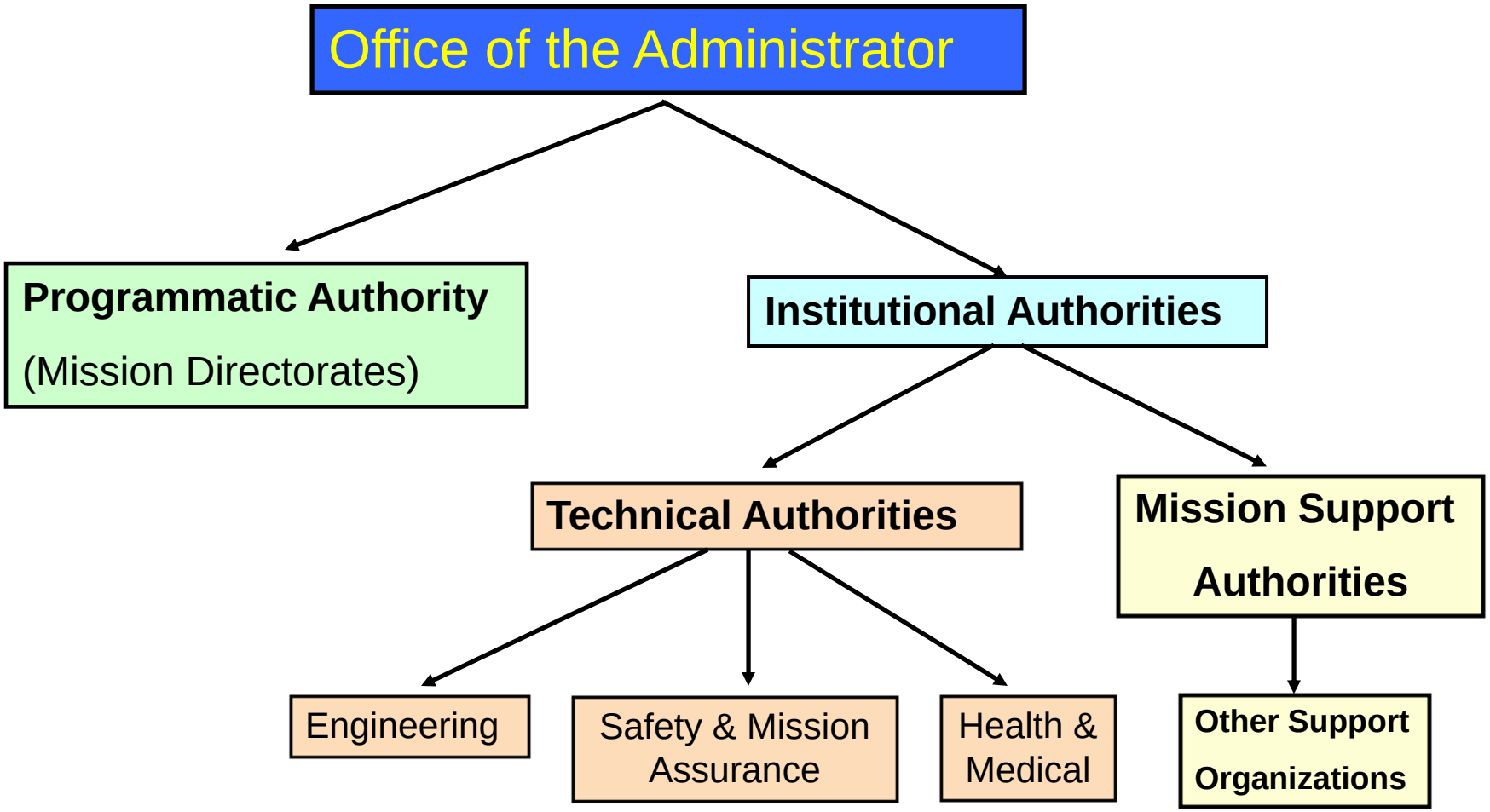
Institutes Checks & Balances -- a constructive tension between organizational elements.

- Success is dependent upon proper balance between the authorities vested in program and project managers, whose job it is to promote programmatic efficiency, and those vested in institutional managers, who ensure resource availability and compliance with applicable standards of professional practice, providing independent technical authority.

*Name recently changed to Mission Support Council

Governance Model

Separation of Authorities



Key NASA Policy Directives

NPD 1000.0A **NASA Strategic Mgmt & Governance Handbook**

Defines three Process-Related Checks and Balances:

1) Independent Life Cycle Review Process
- Provides a comprehensive review of programs and projects at each life cycle milestone by competent individuals who are not dependent on or affiliated with the program or project.

2) Process for Tailoring a Specific Prescribed Requirement
- Defined as the adjustment of prescribed requirements to the specific task.
- This tailoring is authorized through approval by the organization that established the requirement, with concurrence by appropriate programmatic and institutional authorities.

3) Dissenting Opinion Process
- Enables the full and open airing of issues including alternative and divergent views.
- Dissenting opinions based on a sound rationale can be taken upward through the next higher level of either Programmatic or Technical Authority, even to the NASA Administrator, if necessary.

Key NASA Policy Directives

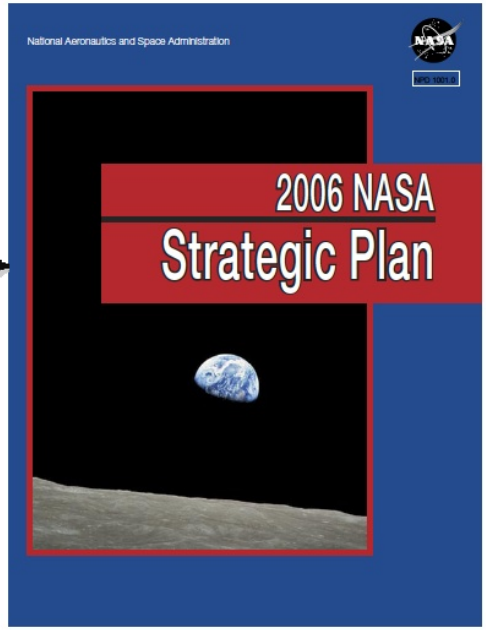
NPD 1000.5A **Policy for NASA Acquisition** (new in 2009)

- Provides overall policy framework for NASA's strategic acquisition process.
- Provides connection to NASA Planning, Programming, Budgeting and Execution (PPBE) process, which determines program/project budgets.
- Enables NASA to consider the full spectrum of acquisition approaches from full COTS procurements to total in-house design and build.
- Applies to all types of programs and projects.
  - (e.g. flight, infrastructure, IT, Research & Technology, etc)
- Defines the set of Acquisition Strategy meetings.
- Requires Joint schedule and cost Confidence Level (JCL) analysis to be developed and used for life cycle costs and schedules associated with establishment of program or project baselines.
  - Requires programs to be baselined and budgeted at 70% JCL and projects at a minimum of 50% JCL.
- Requires annual review by Mission Directorates of consistency of life cycle cost estimates, funding strategies and annual NASA budget submissions.
- Promotes competition and small business participation.

Key NASA Policy Directives

NPD 1001.0 **NASA Strategic Plan**

- New version produced every 3-4 years. (Current one →
- Establishes the overall goals for NASA as an Agency.
- Defines science goals to which Science Plan responds.
- Levies no requirements for project implementation.
- PI should know within which goal his project fits.



Key Science Goals from the 2006 NASA Strategic Plan

Strategic Goal 3:
Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.

Sub-goal 3A: Study Earth from space to advance scientific understanding and meet societal needs.

Sub-goal 3B: Understand the Sun and its effects on Earth and the solar system.

Sub-goal 3C: Advance scientific knowledge of the origin and history of the solar system, the potential for life elsewhere, and the hazards and resources present as humans explore space.

Sub-goal 3D: Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets

Key NASA Policy Directives

NPD 1080.1B **Policy for the Conduct of NASA Research & Technology**

- NPD for science management policies
- Establishes the policy and responsibilities for the conduct of NASA's R&T programs and associated research projects.
  - **Open competition & peer review.**
  - **Oversight & evaluation**
  - **Selection process & ground rules.**
  - **Partnerships**
  - **Data availability.**
- Doesn't directly affect flight projects.
- References NPR 1080.1 and NPR 7120.8 for requirements.

Key NASA Policy Directives

NPD 7120.4D **Engineering and Program/Project Management**

- Defines a Program and projects within programs.
- Requires risk management decision processes be used.
- Requires consideration of safety and security of personnel and assets.
- Defines four processes: Formulation, Approval, Implementation, Evaluation.
- Requires the application of systems engineering across the life cycle.
- Establishes NASA's software policies:
  - **How NASA expects projects to manage software development.**
  - **Mandates use of West Virginia Software IV&V organization.**
  - **Establishes intellectual property protection of software.**
- Establishes the use of Technical Standards across programs & projects
- Requires use of the metric system of measurement.
- Establishes policy for maintenance & dissemination of Lessons-Learned.

Is the parent umbrella NPD for the program/project mgmt document series.

NPR 7120.5 -	**Reqmts for Flight Program & Project Management (Jan '07)**
NPR 7120.6 -	**Reqmts for the NASA Lessons-Learned process (Jan '10)**
NPR 7120.7 -	**Reqmts for IT, infrastructure & facilities (Nov '08)**
NPR 7120.8 -	**Reqmts for research and technology (Feb '08)**
NPR 7123.1 -	**Reqmts for NASA Systems Engineering Processes (Nov '09)**
NPR 7150.2 -	**Reqmts for NASA Software Engineering (Nov '09)**

Key NASA Policy Directives

NPD 8700.1E **NASA Policy for Safety and Mission Success**

- Overall definition of S&MA rules for NASA.
- Protect the public, NASA workforce, high-value equipment & environment.
- Hold leaders accountable for safety and mission success.
- Maintain independent lines of communication for S&MA matters.
- Defines responsibilities for S&MA personnel across the Agency.
- Requires structured Risk Assessment techniques in developing information for making decisions.

NPD 8610.7D **Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions**

- Addresses the process enabling NASA to take advantage of the full range of available launch capability while ensuring that the launch risks are consistent with the risk classification approved for individual payloads.
- Requires use of US Expendable Launch Vehicles for US Gov't payloads.
- Gives qualifications necessary for new alternate launch providers.
- Which ELV categories are permissible for a given classification of payload.
  - See table on next page.

Launch Vehicle Risk Category	Category 1 (High Risk)	Category 2 (Medium Risk)		Category 3 (Low Risk)		
NPR 8705.4 P/L Class	D	C and D, Sometimes B		A, B, C and D		
		Alternative 1	Alternative 2	Alternative 1	Alternative 2	Alternative 3
Quality Mgmt Systems	AS9100 or ISO 9001	AS9100 Compliant	AS9100Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant
Flight Experience (see notes)	• No previous flights required, can use the first flight of a common launch vehicle configuration, instrumented to prove design verification and flight performance data • Post Flight Operations/ Anomaly Resolution Process • Flight Data Assessment Process	• 1 successful flight of a common launch vehicle configuration, instrumented to prove design verification and flight performance data • Post Flight Operations/Anomaly Resolution Process • NASA Flight Margin Verification	• 3 (min 2 consecutive) successful flights of a common launch vehicle configuration, instrumented to prove design verification and flight performance data • Post Flight Operations/Anomaly Resolution Process • NASA Flight Margin Verification	• 14 consecutive successful flights of a common launch vehicle configuration, instrumented to prove design verification and flight performance data • Post Flight Operations/Anomaly Resolution Process • NASA Flight Margin Verification	• 6 successful flights (min 3 consecutive) of a common launch vehicle configuration, instrumented to prove design verification and flight performance data • Post Flight Operations/Anomaly Resolution Process • NASA Flight Margin Verification	• 3 (min 2 consecutive) successful flights of a common launch vehicle configuration, instrumented to prove design verification and flight performance data • Post Flight Operations/Anomaly Resolution Process • NASA Flight Margin Verification
System Safety	FMEA for all safety critical components. Prelim and Final Hazards Analysis. Compliance with applicable Range Safety Requirements	Demonstrated Compliance with Applicable Range Safety Requirements	Demonstrated Compliance with Applicable Range Safety Requirements	Demonstrated Compliance with Applicable Range Safety Requirements	Demonstrated Compliance with Applicable Range Safety Requirements	Demonstrated Compliance with Applicable Range Safety Requirements
Design Reliability	NASA assessment of LSC Design Reliability	NASA assmt of LSC Design Reliability	NASA assessment of LSC Design Reliability	NASA assessment of LSC Design Reliability	NASA assessment of LSC Design Reliability	NASA assessment of LSC Design Reliability
Quality, Mfg & Ops & Systems Engineering	NASA Audits, Documented ICD Process	NASA Audits	NASA Audits	No Additional Certification Requirements	NASA Audits	NASA Audits
Test and Verification	Acceptance Test Plans in Place, Ground and End to End Tests Completed	Comprehensive Acceptance Test Results	NASA Design Certification Review		NASA Design Certification Review	Comprehensive Acceptance Test Results
Flight H/W & S/W Qualification	Qualified Hardware for space application, testing complete	NASA ERB's on Vehicle Subsystems				NASA ERB's on Vehicle Subsystems
Launch Vehicle Analysis	Analysis Plan/Definition	Analysis Plan/Definition and NASA CLA IV&V	NASA IV&V		NASA IV&V	NASA IV&V
Integrated Analysis	None	None	None		None	Full Vehicle Fishbone
Risk Management	Risk Plan, Mitigated and Accepted Technical and Safety Risks	Risk Plan, Mitigated &Accepted Technical & Safety Risks	Risk Plan, Mitigated & Accepted Technical and Safety Risks	Risk Plan, Mitigated & Accepted Technical & Safety Risks	Risk Plan, Mitigated & Accepted Technical & Safety Risks	Risk Plan, Mitigated & Accepted Technical & Safety Risks

Notes: 1) Launch failures do not invalidate previous launch vehicle certification, if NASA Engineering Review Board concurs with cause and corrective action. Risk Category 3 certification requires participation in Launch Service Contractor's failure review process
2) Major launch vehicle upgrades may require additional technical penetration
3) Full NASA engineering insight per NPD 8610.23 applied to all risk categories, except for secondary payloads

Key NASA Procedural Requirements (NPR)

(Each of these selected NPRs are covered in subsequent charts)

NPR 1080.1	for science management requirements
NPR 5100.4	the NASA FAR Supplement for procurement regs
NPR 7123.1	for Systems Engineering
NPR 7150.2	for Software Engineering
NPR 8000.4	for general scope of Risk Management in NASA
NPR 8715.3	General Safety Reqmts - Chap 1, 2 and 6 only
NPR 7120.5	for NASA Program & Project Mgmt Requirements (augmented with discussion of SMD Mgmt Handbook)
NPR 7120.7 & 8	for programs & projects other than flight projects.
NPR 8715.6	for Orbital Debris requirements
NPR 8020.12	for planetary protection reqmts
NPR 8705.4	for payload classifications
NPR 7120.6	for Lessons Learned process
NPR 8621.1	for definitions of mishaps and reporting reqmts

Key NASA Procedural Requirements

NPR 1080.1A Requirements for the Conduct of NASA Research & Technology

Establishes requirements for R&T planning, solicitation and selection of R&T proposals, peer review, quality assessment and performance metrics, data protection and R&T misconduct.

- Establishes open competition and peer review as the expected method of selecting research investigations at NASA.
- Includes research done with the data being returned from flight projects in mission operations.

NPR 5100.4B NASA Federal Acquisition Regulation Supplement

- This voluminous document is **NASA's interpretation** of Federal regulations for application to its activities, including projects.
- A PI does NOT need to have more than a passing familiarity with it, however should ensure the contracts person on the Project Manager's team is intimately familiar with it.
- Contains sections on:
  - Competition and acquisition planning
  - Contracting methods and contract types
  - Socioeconomic programs (e.g. small business, environmental,etc)
  - Contracting requirements & Contracts management
  - Special categories of contracting (e.g. Earned Value Management)

Key NASA Procedural Requirements

NPR 7123.1A **NASA Systems Engineering Requirements**

Establishes a core set of common Agency-level technical processes and requirements needed to define, develop, realize, and integrate the quality of the system products created and acquired by or for NASA.

- Chap 1: Introduction: Framework for Systems Engineering
  - 3 elements: Common Technical Processes; Tools & Methods; Workforce.
- Chap 2: Institutional and Programmatic Requirements
  - Assigns systems engineering responsibilities.
  - Discusses permitted tailoring and waivers.
- Chap 3: Requirements for Common Technical Processes
  - Establishes core set of common technical processes/requirements to be used by projects in developing engineering system products. (Defines the "SE engine")
- Chap 4: NASA Oversight Activities on Contracted Projects
- Chap 5: Systems Engineering Technical Reviews
  - Defines the minimum set of required technical reviews and their objectives.
  - For each review, defines entrance and successful exit criteria.
- Chap 6: Systems Engineering Management Plan (SEMP)
  - Establishes early in Formulation the technical content of the engineering work.
  - Provides template for document construction.

Key NASA Procedural Requirements

NPR 7150.2A **NASA Software Engineering Requirements**

Implements software policies in NPD 7120.4 by addressing software acquisition, development, maintenance, operations, and management.

- Describes the S/W life cycle and requirements for each phase.
  - Reqmts, design, implementation, test, operations, maintenance, retirement.
- Defines the required software documentation.
- Describes S/W Verification and Validation and Independent V&V
- Defines S/W Configuration Management.
- Discusses tailoring and compliance measurement
- Describes how to handle categories other than developed S/W.
  - E.g. commercial, off-the-shelf, and gov't furnished S/W.

Key NASA Procedural Requirements

NPR 8000.4A **Risk Management Procedural Requirements**

Establishes the requirements for risk management (RM) for the Agency, its institutions, and its programs and projects.

- Chapter 1 discusses the Agency's RM framework in terms of two complementary processes:
  - Risk-informed Decision Making: To inform decision making through better use of risk information in establishing program/project baseline performance requirements (i.e., safety, technical, cost, and schedule requirements)
  - Continuous Risk Management: To mange risk associated with the implementation of baseline performance requirements
  - These processes are to be applied at a level of rigor that is commensurate with the stakes and complexity of the decision situation being addressed
- Chapter 2, under "Roles and Responsibilities", requires that program and project managers specify the organizational units and the hierarchy within their domains to which the requirements of the NPR apply.
- Chapter 3 contains the detailed RM requirements.

Key NASA Procedural Requirements

NPR 8715.3C **NASA General Safety Program Requirements**

Basis for the NASA Safety Program and serves as a general framework to structure more specific and detailed requirements.

(Chapters 1, 2 and 6 are the most applicable for Science projects.)

- Chapter 1. Introduction
  - Safety policies, responsibilities and strategies for the implementation and management of a comprehensive safety program.
  - Public safety, risk assessment, technical safety requirements, oversight, advisory groups, information systems and safety variances.
- Chapter 2. System Safety
  - Requirements for disciplined system safety processes to support decisions that ensure personnel safety, asset integrity, and mission success.
- Chapter 6. Nuclear Safety for Launching of Radioactive Materials
  - Requirements for characterization and reporting of potential risks associated with the use of radioactive materials in space and the request for launch approval in accordance with PD/NSC-25.

Key NASA Procedural Requirements

NPR 7120.5D* **NASA Flight Program & Project Mgmt Requirements**

Establishes the requirements by which NASA formulates and implements space flight programs and projects, consistent with the governance model contained in NPD 1000.0.

- Chap 1: Introduction
  - Defines requirements levels & the 4-part management process of:
    - Formulation, Approval, Implementation, Evaluation
- Chap 2: NASA Life Cycles for Space Flight Programs and Projects
  - Defines life cycle of phases, milestones and Key Decision Points
- Chap 3: Program and Project Management Roles and Responsibilities
  - Program/project team members and their interrelationships.
- Chap 4: Program and Project Requirements by Phase
  - Management requirements on programs and projects by life-cycle phase (I.e. the "shall" statements)
  - Specifies the gate products required to transition between phases.
- Appendices: Definitions, Document templates, WBS

- Current version is 2009 NID version (NM_7120-81) valid thru Sept 2010, when "E" version should become available.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes 4 types of programs:

- Single-project programs (e.g., JWST)
  - Long development and/or operational lifetimes, large investment of Agency resources in one program/project, and contributions to that program/project from multiple organizations/agencies.
- Uncoupled programs (e.g., Discovery)
  - Implemented under a broad scientific theme and/or a common program implementation concept.
- Loosely coupled programs (e.g., Mars Exploration)
  - Address specific scientific or exploration objectives through multiple space flight projects of varied scope.
- Tightly coupled programs (e.g., Constellation)
  - Multiple projects that execute portions of a mission or missions. No single project is capable of implementing a complete mission. Typically, multiple NASA Centers contribute to the program.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes the programmatic requirements hierarchy

Direction	Content	Governing Document	Approver	Originator
Needs, Goals, Objectives	Agency strategic direction based on higher-level direction	Strategic Plan and Strategic Planning Guidance	Administrator	Support Organizations
Agency Requirements	Structure, relationships, principles governing design and evolution of cross-Agency Mission Directorate systems linked in accomplishing Agency needs, goals, and objectives	Architectural Control Document (ACD)	Administrator	Host MDAA with inputs from Other Affected MDAAs
Mission Directorate Requirements	High-level requirements levied on a Program to carry out strategic and architectural direction including programmatic direction for initiating specific projects	Program Commitment Agreement (PCA)	AA	MDAA
Program Requirements	Detailed requirements levied on a Program to implement the PCA and high-level programmatic requirements allocated from the Program to its projects	Program Plan	MDAA	Program Manager
Project Requirements	Detailed requirements levied on a Project to implement the Program Plan and flow-down programmatic requirements allocated from the Program to the Project	Project Plan	Program Manager	Project Manager
System Requirements	Detailed requirements allocated from the Project to the next lower level of the Project	Systems Requirements Document	Project Manager	Responsible System Lead

MDAA = Mission Directorate Associate Administrator
AA = NASA Associate Administrator

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes Project Categorization, based on:

1) Use, or not, of nuclear power sources (Cat 1 if Yes)
2) System being developed, or not, for human space flight (Cat 1 if Yes)
3) The project life-cycle cost (LCC) estimate
4) Project priority level, which is determined by the:
   - Importance of the activity to NASA
   - Extent of international or interagency participation
   - Degree of uncertainty surrounding the application of new technologies
   - Spacecraft/payload development risk classification per NPR 8705.4

MDAA may recommend other categorization. NASA AA approves all.

Priority Level	LCC < $250M	$250M ≤ LCC ≤ $1B	LCC > $1B, use of nuclear power source, or human space flight
High	Category 2	Category 2	Category 1
Medium	Category 3	Category 2	Category 1
Low	Category 3	Category 2	Category 1

Note: The threshold values in Table 2-1 are updated annually as part of the Agency's strategic planning guidance.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

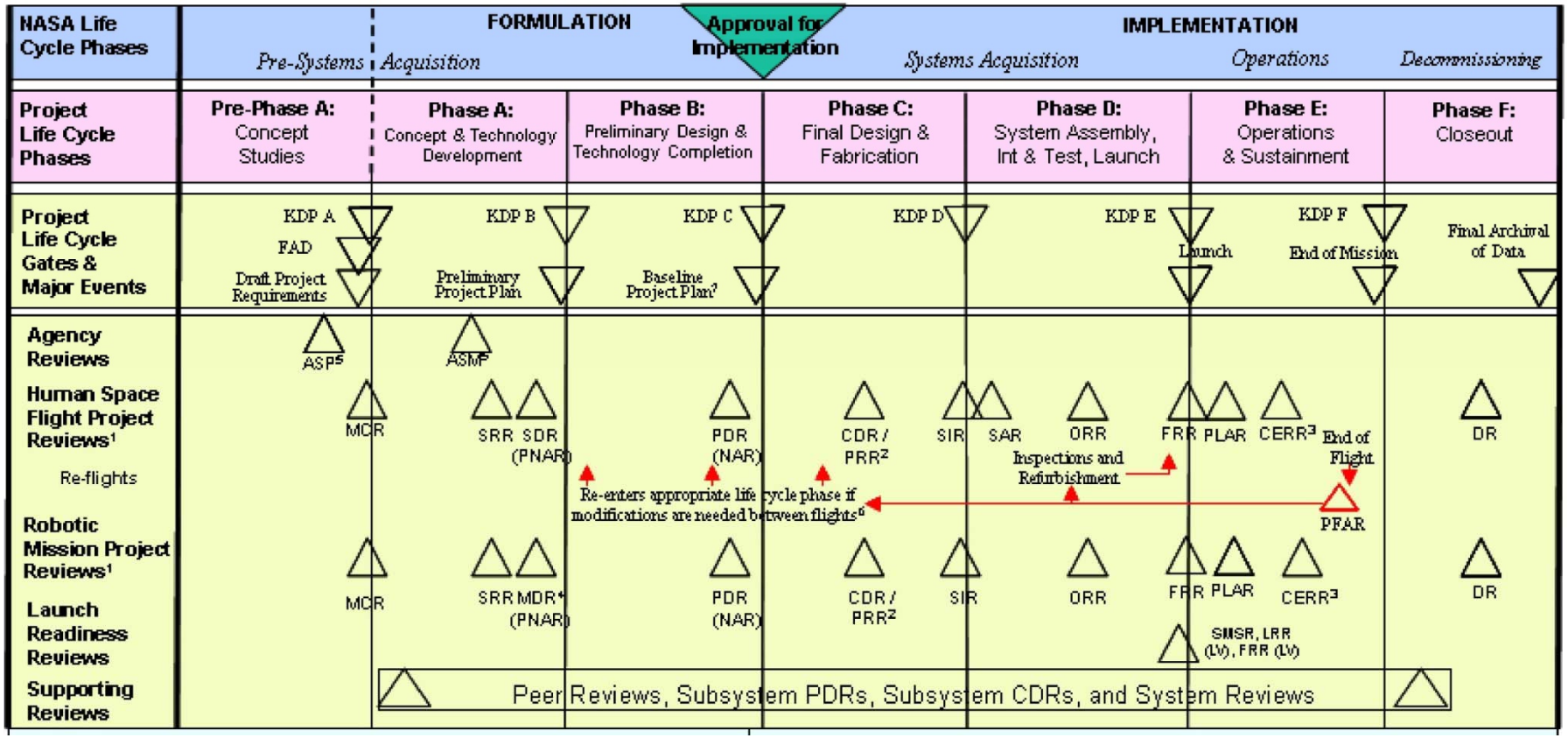
Establishes Program and Project Life Cycles:

- Provides a uniform life cycle for human and robotic missions
  - Common process flow, uniform phases, and KDPs
  - Disciplined review structure for technical requirements and implementation plans
- 5 key elements in execution of the life cycle:
  - Key Decision Points (KDP)
  - Required independent reviews
  - Required life cycle gate products
  - CMC and governing PMC oversight
  - Decision Authority role as gatekeeper

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes the Project Life Cycle, built around Key Decision Points (KDP)



Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes the Project Life Cycle, built around Key Decision Points (KDP)

- Key Decision Point (KDP) - The point in time where the Decision Authority decides on the readiness for next phase of the life cycle.
- Decision Authority
  - NASA Associate Administrator for Programs and Category 1 projects
  - Mission Directorate Associate Administrator for Category 2 and 3 projects

KDPs and the Decision Authority are defined for throughout the life cycle.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes management review councils, e.g. governing PMCs:

- Agency PMC
  - Governs all programs and Category 1 projects
  - Chaired by the NASA Associate Administrator (the Decision Authority)

- Mission Directorate PMC
  - Evaluates all programs/projects executed within the Mission Directorate
  - Governs Category 2 and 3 projects
  - Provides recommendations to the Agency PMC for programs and Category 1 projects
  - Chaired by the MDAA or delegate. (In SMD, the DPMC is chaired by the Deputy AA for Programs, who is not the Decision Authority. Therefore, the KDP occurs after the DPMC meeting.)

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes Center Management Councils (CMC) for technical oversight.

CMCs:

- Evaluate All program and project work executed at that Center.
- Focus on whether Center's technical and management policies and practices are being followed and whether the Center's resources support program/project requirements.
- Assess program and project risk.
- Evaluate performance and provide findings and recommendations to Program and Project Managers.
- Provides recommendations to the appropriate PMCs in support of KDPs.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes Independent Standing Review Boards (SRB)

SRBs are established for every Project. The SRB:

- Must be independent from the project.
- Has a Chairman, membership and Terms of Reference established with approval of MDAA and Center Director, and for Category 1 and 2 projects, the AA of PA&E, and for Category 1 projects, the Chief Engineer and NASA AA.
- Conducts all life cycle reviews, including gate reviews.
- Conducts Independent cost estimates at appropriate gate reviews.
- Is advisory to the program, project and convening authorities and does not have authority over project content.
- Presents findings to project, CMC, DPMC, and, if necessary, the Agency PMC.
- Remains intact for Phases A through D and through KDP-E.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

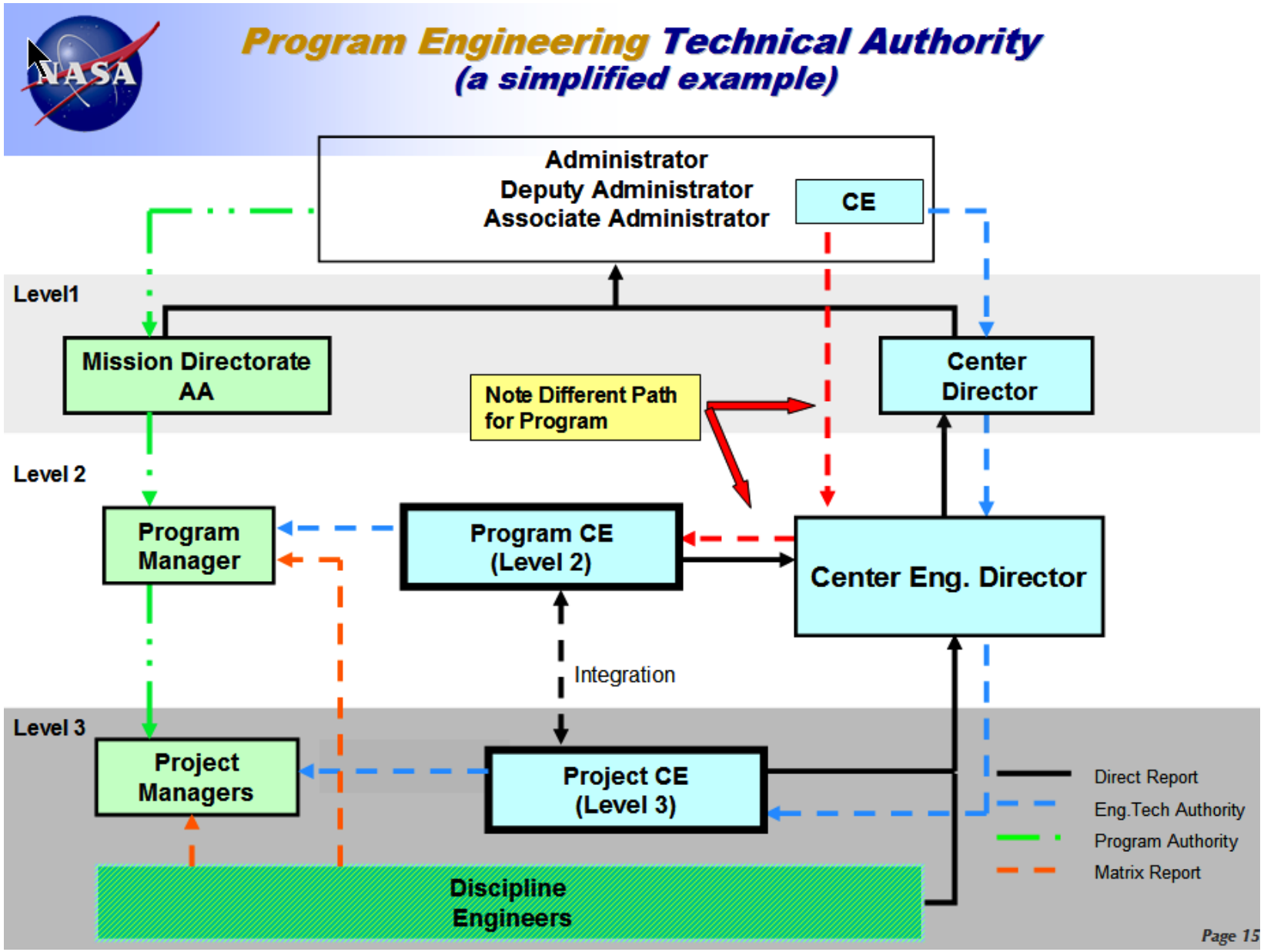
Establishes Independent Technical Authority

- The technical authority process provides a means of independent oversight of programs and projects through the establishment of a defined line of technical authority individuals at various levels of management.

The Three Technical Authorities:

- **Engineering,**
- **Safety and Mission Assurance, and**
- **Health and Medical**

- Technical Authorities are funded independently of the program/project.
- Provides an independent path for raising and resolving technical concerns and dissenting opinions.
- The Project Manager remains responsible for the safe conduct and successful outcome of the project in conformance with governing requirements.


Program Engineering Technical Authority
(a simplified example)
Administrator
Deputy Administrator
Associate Administrator
CE
Level1
Mission Directorate AA
Note Different Path for Program
Center Director
Level 2
Program Manager
Program CE (Level 2)
Center Eng. Director
Integration
Level 3
Project Managers
Project CE (Level 3)
Discipline Engineers
Direct Report
Eng.Tech Authority
Program Authority
Matrix Report
Page 15

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Independent Technical Authority at project level supports the project by:

- Being the point of contact at the program, project, or element level for Technical Authority matters at the level of the delegated Technical Authority.
- Serving as members of program/project boards
  - Control boards, change boards, and internal review boards.
- Approving changes board actions and deviations or waivers to Technical Authority requirements.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes Process for Tailoring Requirements via Deviations & Waivers

- The organizations and the organizational levels that agreed to the establishment of a requirement must agree to the change or waiver of that requirement, unless this has been formally delegated elsewhere.
- The next higher level of programmatic authority and Technical Authority are informed in a timely manner of change requests, deviations or waivers that could affect that level.
- Waivers to NPR7120.5 require approval of the NASA Chief Engineer, as the "owner" of the document.
  - Table for minimum attributes of deviation or waiver given in the NPR.
  - Table of required approvers of deviations and waivers is also indicated.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Establishes a basic set of required documentation

Formulation Authorization Document (Program or Project)

- **Initiated when program or project ready to begin Formulation (Phase A)**
- **Governing document for Formulation.**
- **Highest level signature: Associate Administrator.**
- **Needed before any procurements can be issued.**

Program Commitment Agreement

- **Commitment between Administrator and MD Associate Administrator.**
- **Written during Formulation (Phase B)**
- **Contains very high-level (SMD level 0) requirements (Technical, Schedule, Budget)**
- **Needed for Approval to enter Implementation (Phase C)**
- **Updated annually, if required, in the springtime along with budget submittal.**
- **Reviewed bi-annually by SRB (& IPAO) as part of Program Implementation Review (PIR)**

Program Plan

- **Commitment between MDAA, Center Director and Program Manager.**
- **Contains top-level plan for program Implementation.**
- **Written during Formulation (Phase B)**
- **Needed for Approval to enter Implementation (Phase C)**
- **Documents the Program level (SMD level 1) requirements.**
  - **Requirements Appendices (SMD level 1) are added for each new Project.**

Project Plan

- **Commitment between Project Manager and Program Manager.**
- **Contains Project Implementation details.**
- **Headquarters review at division level. MDAA approval delegated to division directors.**

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Exceptions for "AO-driven" projects. (Excerpt from the NPR)

2.3.2.2 For competed missions, some Mission Directorates have chosen to establish several new space flight programs that use a one or two-step Announcement of Opportunity (AO) process to initiate projects. In a one-step AO process, projects are competed and selected for implementation in a single step. In two-step competitions, several projects may be selected in Step 1 and given time to mature their concepts in a funded Phase A before the Step 2 down-selection to one or more projects for further formulation. Program resources are invested (following Step 1 selections) to bring these projects to a state in which their science content, cost, schedule, technical performance, project implementation strategies, safety and mission assurance strategies, and management approach can be better judged.* These projects are often referred to as *competed* or "*AO-driven*."

* From the point of view of the selected AO-driven project, the proposing teams are clearly doing formal project formulation (e.g., putting together a detailed WBS, schedules, cost estimates, and implementation plan) during the funded Phase A concept study and the preparation of the Step 2 proposal. From the point of view of the program, no specific project has been chosen, a FAD is not written, the cost is unknown, and the project-level requirements are not yet identified, yet formulation has begun. The first KDP is the down selection process, and following selection, the process becomes conventional.

Key NASA Procedural Requirements

NPR 7120.5D **NASA Flight Program & Project Mgmt Requirements**

Exceptions for "AO-driven" projects.

NPR Paragraph 2.3.2.2 Translation:

• A Project FAD is not needed for a selected proposer's project for a competitive Phase A study. This is because the project's proposal, and any additional instructions in the selection letter from the MDAA, provide the necessary guidance to the project for Phase A.

• A Project FAD is not usually needed for a winning project downselected for Phase B. The Concept Study Report, and any additional instructions in the selection letter from the MDAA, serves as the guidelines for Phase B.

• However SMD has imposed some additional rules beyond NPR 7120.5D in certain cases:

A winning project selected for an extended Phase A will be asked to write a FAD defining the guidelines for Formulation. This can be done for any of several reasons:

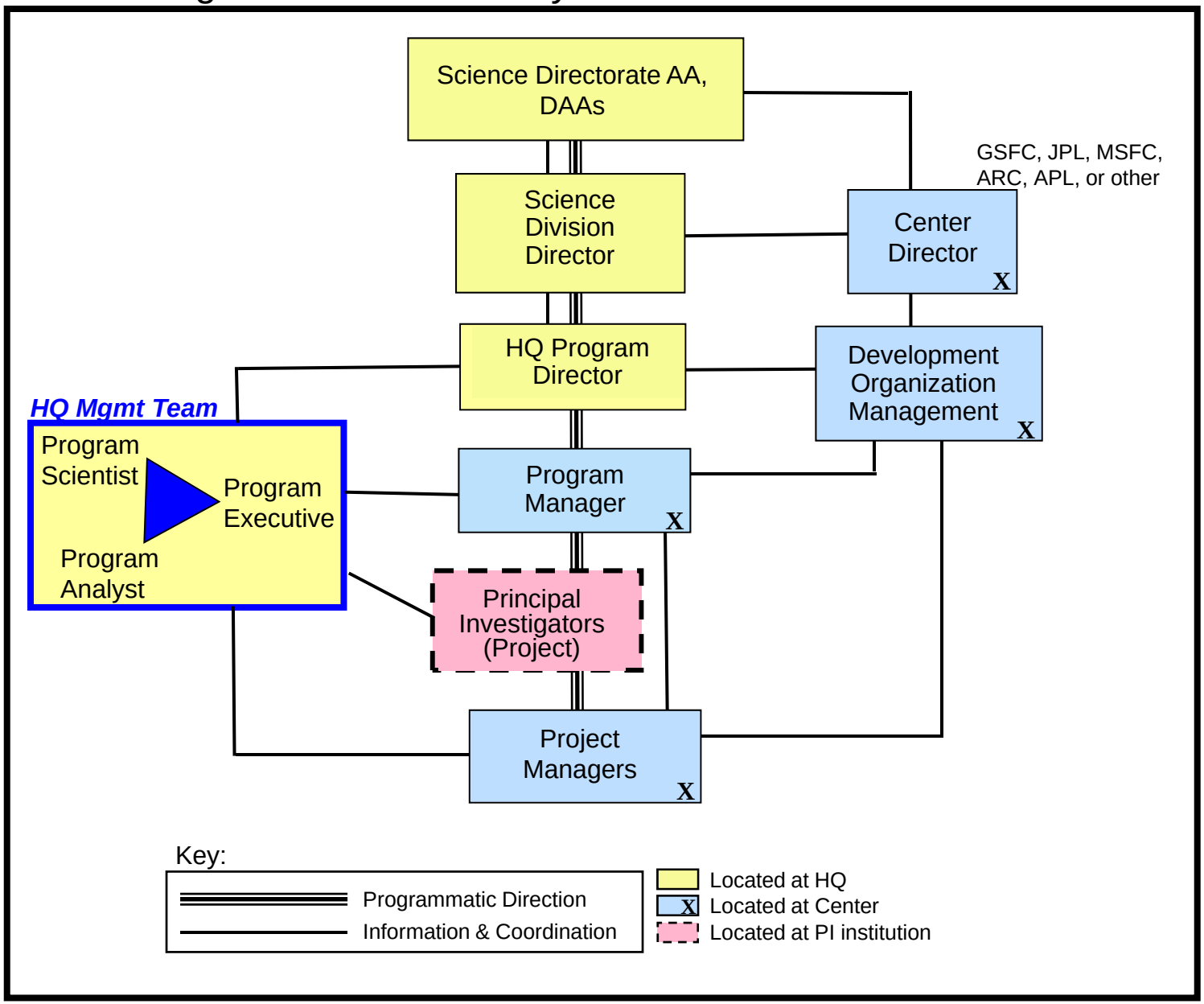
- **The project's implementation plan is not mature.**
- **The technology needed for implementation requires further development.**
- **The necessary funding for immediate project implementation is not available and the project is asked to begin formulation at a low level and stretch out the schedule to a later launch opportunity.**

The project will also be subject to a KDP-B to enter Phase B.

SMD Management Handbook

- SMD's Mgmt Handbook covers all functions SMD does; (however, every step of each function is not detailed.)
- It serves as a guide to SMD team members, and SMD's partners, on how SMD implements NASA's and its own policies and processes.
- It describes the "how" for those who are planning and overseeing programs and projects from NASA Headquarters.
- Chapters 4 and 5 are the core of the Handbook, describing processes and
- responsibilities for research management (4) and flight program management and assessment (5).
- Chapter 5 Interprets NPR 7120.5D for SMD.
  - The existence of Science Divisions is not recognized in the NPR.
  - Handbook's Table 5-1 takes the Roles & Responsibilities Table 3-1 from NPR 7120.5D and sub-allocates the MDAA's responsibilities down to SMD divisions and functional positions with the Directorate.
  - e.g. "Program Executive" is mentioned in NPR 7120.5D only once, in Section 3.1.2.h, where it notes that an MDAA may designate such a position to assist in performance of SMD responsibilities.

SMD Management Accountability



Quotes from the SMD Management Handbook

Authority:

In Section 5.2:

- For AO-selected missions, a Principal Investigator (PI) is given authority, as described in the AO, over the direction and conduct of the mission. The PI proposes these types of missions to focus on specific science objectives and assembles a pre-defined team of organizations to carry out the project. The PI reports programmatically to the Program Manager and scientifically to the MDAA.

And:

- Program direction flows from a Division Director through a HQ Program Director to the Program Manager at the Center and then to the Project Manager through the PI if it is an AO-initiated mission.

Level 1 Requirements:

In Paragraph 5.4.1: A Phase A goal is to have a consensus draft of the HQ-controlled, program-level requirements document ready by the Systems Requirements Review and to place this document under configuration control as a baseline early in Phase B. This applies to AO-initiated projects in competitive Phase A studies as well, although drafting the document usually cannot be done until Phase B is initiated, but should be a priority early in that phase, and based on requirements as proposed in the Concept Study Report (CSR).

In Paragraph 5.4.4.4: For AO-initiated projects, PEs and PSs work with the PI to convert requirements from the winning Phase A CSR into a PLRA as soon as Phase B begins, after which the Science Division Director places it under configuration control.

SMD Management Handbook

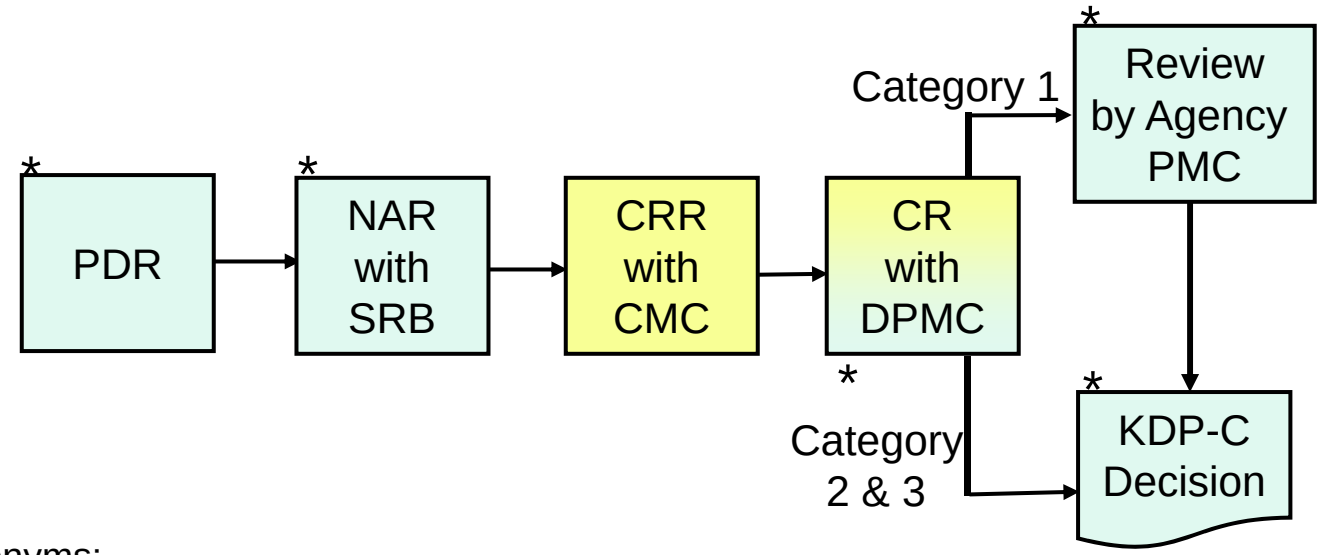
- SMD's Management Handbook Chapter 5 defines:
  - The Headquarters processes and products to be accomplished by or for projects in each Life Cycle Phase.
  - What needs to be achieved in order to satisfy the KDP transitions between Phases.

- It satisfies the required tasks and processes specified in NPR 7120.5D, but adds detail as to HOW these are to be accomplished.
  - The NPR always has the priority in identified differences.

- There are additional SMD-imposed requirements not recognized by the NPR.

  - EXAMPLE: "Confirmation" or the "Confirmation Process" isn't mentioned in NPR 7120.5D at all. It is an internal SMD process, documented in the Management Handbook.

SMD Confirmation Process for KDP-C



Acronyms:
CMC = Center Management Council
DPMC = Directorate Program Mgmt Council
CR = Confirmation Review
CRR = Confirmation Readiness Review
KDP = Key Decision Point
PDR = Preliminary Design Review
PMC = Program Management Council
NAR = Non-Advocate Review
SRB = Standing Review Board

*** NPR 7120.5D required**

From the SMD Management Handbook

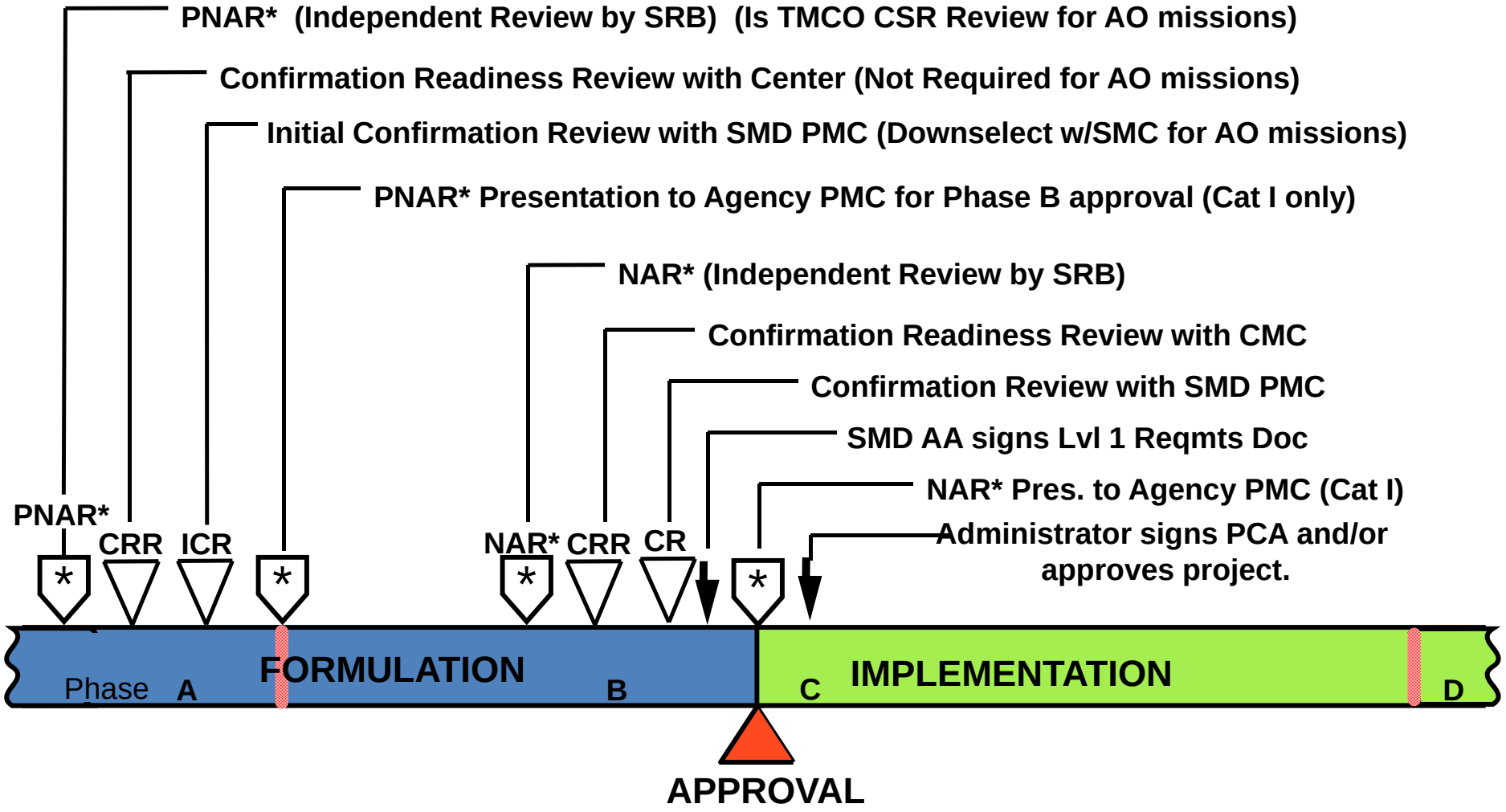
However, the nominal A-to-B transition process for AO missions is different.

Entering Phase B:

5.4.2.2 Transition Process for AO-initiated Projects

For new projects initiated using an AO process, the Phase A-to-B transition for KDP-B is a down-select from several competing Phase-A concept studies. In this case, there is no ICR or pre-NAR, but instead each parallel study result, as documented in the CSR, is subjected to critical evaluation by peer review teams. The evaluation teams present to the SMaC, rather than the DPMC, for a decision per Table 2-2 on which projects will continue into Phase B. Once chosen for continuation, the project enters Phase B, and a letter is sent to the PI and the implementing Center directing them into Phase B. The beginning of Phase B may be delayed pending completion of necessary documentation. In some cases, particularly if a specific technology is not quite ready, an AO mission may be selected for an extended Phase A, with the duration of the extension defined in the announcement letter from the AA. When this happens, the project must subsequently pass through the ICR/KDP-B process described above and be initially confirmed to enter Phase B just as if it were a strategic mission.

Approval Process for SMD Programs & Projects



*Req'd by NPG 7120.5D process for Category I programs and projects.

Table 5-2. Formulation Checklist for KDP-C

☐	1.	Proposed PCA for a new program, ready for signature, or proposed updates to an approved PCA, for a new project, showing the project's cost baseline and top-level schedule milestones.
☐	2.	Signed Program Plan containing program requirements, for a new program, or a valid existing Program Plan covering a new project.
☐	3.	Signed PLRA, containing program-level requirements, for a new project in a multi-project program, including measurement requirements, success criteria, and cost and schedule targets.
☐	4.	Approved Project Plan for project seeking entry into Phase C of Implementation.
☐	5.	Science instruments selected and PIs and Co-Investigators identified.
☐	6.	De-scope plans for implementation in the event of cost, schedule or technical difficulties. See Section 5.8.2, "Budget Control, Descoping, and Cancellation."
☐	7.	Written and agreed upon performance metrics for Phases C/D/E, including defined cancellation review criteria. See Section 5.8.2.
☐	8.	Agreement between the Program Manager, Project Manager and the NASA HQ PE on program reporting method, content, and frequency during Implementation.
☐	9.	Plan for independent reviews during Implementation.
☐	10.	Results from an accomplished NAR, available for presentation at the meetings leading up to and including the KDP-C Review/Approval meeting.
☐	11.	Approved Technology Development Plan, which includes identification of required enabling technology and a verification of its maturation to TRL 6 or beyond (except for NMP).
☐	12.	Signed or final drafts of Implementation LOAs with other NASA and non-NASA organizations whose support is required to achieve program objectives.
☐	13.	Final drafts of any proposed MOU or MOA with domestic and international partners.
☐	14.	Determination of launch vehicle needed for the mission. Launch vehicle requirements for NASA or non-NASA Expendable Launch Vehicles (ELV), including for secondary payloads, should be fully defined in the project requirements documentation. SMD should be ready to provide to SOMD an Approval To Proceed for ELV acquisition after the CR.
☐	15.	An agreement between the project and the provider of the selected tracking service (e.g., DSN, GN) stating the project's tracking requirements and provider's capability to provide the required service. This agreement should specify costs to the project for providing the needed service including any engineering upgrades that the provider must make in order to meet project requirements.
☐	16.	Notice of Intent for environmental impact. Evidence that the environmental assessment process (and planetary protection), if required, has begun.
☐	17.	Draft NEPA compliance documentation. See Section 5.6.2, "Launch Preparation and Support."
☐	18.	Draft schedule for Nuclear Launch Safety Approval, if required. See Section 5.6.2.
☐	19.	Draft Orbital Debris Assessment report.
☐	20.	Approved acquisition plan for major project components.
☐	21.	Risk Management Plan, documenting a thorough assessment of technical, cost, and schedule risks.
☐	22.	Draft Project Data Management Plan, including data-archiving and data-rights policies. See Section 4.2.7.5.2, "Data from Flight Programs."
☐	23.	Draft plan for a Science Data Center, if applicable.
☐	24.	Final Mission Operations Concept document.
☐	25.	Defined budget for Mission Operations and Data Analysis (MO&DA), agreed upon by the PS and DD. For AO-selected missions this budget is an element of the overall mission total cost cap.
☐	26.	Project-level education and public outreach plan to be approved by NASA HQ.
☐	27.	A list of proposed waivers to NPR 7120.5, for approval by the governing PMC, documented in the form specified in NPR 7120.5D, Section 3.6, "Waiver Approval Authority."
☐	28.	Final set of Project Control Plans in accordance with NPR 7120.5 Table 4-4, to include the Export Control Plan with a Technology Transfer Control Plan appendix.

Key NASA Procedural Requirements

NPR 7120.7 Information Technology & Infrastructure Program and Project Management Requirements

Requirements for managing programs and projects in the areas of information technology and institutional infrastructure.

- Institutional infrastructure includes construction of facilities, environmental compliance, and other mission support investments.
- Defines life cycles, project phases, independent assessment, roles & responsibilities, gate products and waiver authority.

NPR 7120.8 Research & Technology Program and Project Management Requirements

Requirements for managing programs and projects in all areas of research and technology development.

- Includes scientific research, aeronautics research, other types of research, and technology development for space activities.
- Defines life cycles, portfolios, project phases, roles & responsibilities, technical authority, independent assessments, and waiver authority.

Key NASA Procedural Requirements

NPR 8715.6A **Requirements for Limiting Orbital Debris**

NASA's policy for limiting orbital debris generation per the U.S. National Space Policy of 2006, Section 11.

- Requires project to conduct formal assessments and write plans for the disposition of spacecraft that re-enter Earth's atmosphere, are disposed of in-orbit, or are anticipated to reach the surface of the Moon.
- All spacecraft placed in orbit about Earth or the Moon shall be designed to preclude, to the extent feasible, a self-initiated unintentional orbit breakup.
- Spacecraft could require re-design in order to:
  - Reduce debris footprint upon re-entry to an acceptable level.
  - Permit required End-Of-Mission subsystem passivation to prevent a breakup, either by explosion or disassembly, from internally stored energy.
  - Avoid posing a risk to humans in space.
- Requires development of an Orbital Debris Assessment Report
  - Preliminary due prior to S/C PDR; Update due 45 days prior to S/C CDR.
  - Final due 30 days prior to the opening of the launch window.
- Requires development of an End-of-Mission Plan for proper disposal of the spacecraft after the end of its useful life.
  - Initial draft due 45 days prior to spacecraft CDR.
  - Pre-launch version due 30 days prior to the opening of launch window.
- Requires monitoring and notification of situations in orbit where risk of debris has increased.

Key NASA Procedural Requirements

NPR 8020.12C **Planetary Protection Provisions for Robotic Missions**

Addresses requirements for:

- Missions to planetary surfaces.
- Planetary orbiters to avoid surface contact after their EOM.
- Missions that return samples to the Earth or Moon.

1) The control of terrestrial microbial contamination associated with robotic space vehicles intended to land, orbit, fly by, or otherwise encounter extraterrestrial solar system bodies.
2) The control of contamination of the Earth and the Moon by extraterrestrial material collected and returned by robotic missions.

NPR 8705.4 **Risk Classification for NASA Payloads**

Establishes baseline criteria that enable users to define the risk classification level for NASA payloads.

- Defines four payload risk levels or classes: A thru D (See next page)
- Provides guidance for programmatic options based on class.
  - E.g. S/C redundancy; materials & parts classes; Qual program; Reviews required; risk management flexibility; etc. (See second page)

Payload Risk Classes (from NPR 8705.4 Appendix A)

Characterization	Class A	Class B	Class C	Class D
Priority (Criticality to Agency Strategic Plan) and Acceptable Risk Level	High priority, very low (minimized) risk	High priority, low risk	Medium priority, medium risk	Low priority, high risk
National significance	Very high	High	Medium	Low to medium
Complexity	Very high to high	High to medium	Medium to low	Medium to low
Mission Lifetime (Primary Baseline Mission	Long, >5years	Medium, 2-5 years	Short, <2 years	Short < 2 years
Cost	High	High to medium	Medium to low	Low
Launch Constraints	Critical	Medium	Few	Few to none
In-Flight Maintenance	N/A	Not feasible or difficult	Maybe feasible	May be feasible and planned
Alternative Research Opportunities or Re-flight Opportunities	No alternative or re-flight opportunities	Few or no alternative or re-flight opportunities	Some or few alternative or re-flight opportunities	Significant alternative or re-flight opportunities
Achievement of Mission Success Criteria	All practical measures are taken to achieve minimum risk to mission success. The highest assurance standards are used.	Stringent assurance standards with only minor compromises in application to maintain a low risk to mission success.	Medium risk of not achieving mission success may be acceptable. Reduced assurance standards are permitted.	Medium or significant risk of not achieving mission success is permitted. Minimal assurance standards are permitted.
	Class A	**Class B**	**Class C**	**Class D**
Examples	HST, Cassini, JIMO, JWST	MER, MRO, Discovery payloads, ISS Facility Class Payloads, Attached ISS payloads	ESSP, Explorer Payloads (MIDEX), ISS complex subrack payloads	SPARTAN, GAS Can, technology demonstrators, simple ISS, express middeck and subrack payloads, SMEX

Recommended NASA Payload Requirements (from NPR 8705.4 Appendix B) (1 of 3)

Development Topic	Class A	Class B	Class C	Class D
Single Point Failures (SPFs)	Critical SPFs (for Level 1 requirements) are not permitted unless authorized by formal waiver. Waiver approval of critical SPFs requires justification based on risk analysis and implementation of measures to mitigate risk.	Critical SPFs (for Level 1 requirements) may be permitted but are minimized and mitigated by use of high reliability parts and additional testing. Essential spacecraft functions and key instruments are typically fully redundant. Other hardware has partial redundancy and/or provisions for graceful degradation.	Critical SPFs (for Level 1 requirements) may be permitted but are mitigated by use of high reliability parts, additional testing, or by other means. Single string and selectively redundant design approaches may be used.	Same as Class C.
Engineering Model, Prototype, Flight, and Spare Hardware	Engineering model hardware for new or modified designs. Separate prototype and flight model hardware. Full set of assembled and tested "flight spare" replacement units.	Engineering model hardware for new or significantly modified designs. Protoflight hardware (in lieu of separate prototype and flight models) except where extensive qualification testing is anticipated. Spare (or refurbishable prototype) hardware as needed to avoid major program impact.	Engineering model hardware for new designs. Protoflight hardware permitted (in lieu of separate prototype and flight models). Limited flight spare hardware (for long lead flight units).	Limited engineering model and flight spare hardware.
Qualification, Acceptance, and Protoflight Test Program	Full formal qualification and acceptance test programs and integrated end-to-end testing at all hardware and software levels.	Formal qualification and acceptance test programs and integrated end-to-end testing at all hardware levels. May use a combination of qualification and protoflight hardware. Qualified software simulators used to verify software and system.	Limited qualification testing for new aspects of the design plus full acceptance test program. Testing required for verification of safety compliance and interface compatibility.	Testing required only for verification of safety compliance and interface compatibility. Acceptance test program for critical performance parameters.
EEE Parts *http://nepp.nasa.gov/index_nasa.cfm/641	NASA Parts Selection List (NPSL)* Level 1, Level 1 equivalent Source Control Drawings (SCDs), and/or requirements per Center Parts Management Plan	Class A requirements or NPSL Level 2, Level 2 equivalent SCDs, and/or requirements per Center Parts Management Plan	Class A, Class B or NPSL Level 3, Level 3 equivalent SCDs, and/or requirements per Center Parts Management Plan	Class A, Class B, or Class C requirements, and/or requirements per Center Parts Management Plan

Recommended NASA Payload Requirements (from NPR 8705.4 Appendix B) (2 of 3)

Development Topic	Class A	Class B	Class C	Class D
Reviews	Full formal review program. Either IPAO external independent reviews or independent reviews managed at the Center level with Mission Directorate participation. Include formal inspections of software requirements, design, verification documents, and code.	Full formal review program. Either IPAO external independent reviews or independent reviews managed at the Center level with Mission Directorate participation. Include formal inspections of software requirements, design, verification documents, and peer reviews of code.	Full formal review program. Independent reviews managed at Center level with Mission Directorate participation. Include formal inspections of software requirements, peer reviews of design and code.	Center level reviews with participation of all applicable directorates. May be delegated to Projects. Peer reviews of software requirements and code.
Safety	Per all applicable NASA safety directives and standards.	Same as Class A	Same as Class A	Same as Class A
Materials	Verify heritage of previously used materials and qualify all new or changed materials & applications or configurations. Use source controls on procured materials and acceptance test each lot/batch.	Use previously tested/flown materials or qualify new materials and applications or configurations. Acceptance test each lot of procured materials.	Use previously tested/flown materials or characterize new materials. Acceptance test sample lots of procured materials.	Reqmnts are based on applicable safety standards. Materials should be assessed for application and life limits.
Reliability NPD 8720.1	Failure mode and effects analysis/critical items list (FMEA/CIL), worst-case performance, and parts electrical stress analysis for all parts and circuits. Mechanical reliability, human, and other reliability analysis where appropriate.	FMEA/CIL at black box (or circuit block diagram) level as a minimum. Worst-case performance and parts electrical stress analysis for all parts and circuits.	FMEA/CIL scope determined at the project level. Analysis of interfaces. Parts electrical stress analysis for all parts and circuits.	Analysis requirements based on applicable safety requirements. Analysis of interface.
Fault Tree Analysis	System level qualitative fault tree analysis.	Same as Class A.	Same as Class A.	Fault tree analysis required for safety critical functions.

Recommended NASA Payload Requirements (from NPR 8705.4 Appendix B) (3 of 3)

Development Topic	Class A	Class B	Class C	Class D
Probabilistic Risk Assessment NPR 8705.5	Full Scope, addressing all applicable end states per NPR 8705.5	Limited Scope, focusing on mission-related end-states of specific decision making interest per NPR 8705.5	Simplified, identifying major mission risk contributors. Other discretionary applications.	Safety only. Other discretionary applications.
Maintainability NPD 8720.1	As required by NPD 8720.1	Application of NPD 8720.1 determined by program. (Typically ground elements only.)	Maintainability considered during design if applicable.	Requirements based on applicable safety standards.
Quality Assurance NPD 8730.5 NPR 8735.2 (NPR 8735.1)	Formal quality assurance program including closed-loop problem reporting and corrective action, configuration management, performance trending, and stringent surveillance. GIDEP failure experience data and NASA Advisory process.	Formal quality assurance program including closed-loop problem reporting and corrective action, configuration management, performance trending, moderate surveillance. GIDEP failure experience data and NASA Advisory process.	Formal quality assurance program including closed-loop problem reporting and corrective action, configuration management, tailored surveillance. GIDEP failure experience data and NASA Advisory process.	Closed-loop problem reporting and corrective action, configuration management, GIDEP failure experience data and NASA Advisory process. Other requirements based on applicable safety standards.
Software	Formal project software assurance program. Independent Verification and Validation (IV&V) as determined by AA OSMA	Formal project software assurance program. IV&V as determined by AA OSMA.	Formal project software assurance program. IV&V as determined by AA OSMA.	Formal project software assurance insight. IV&V as determined by AA OSMA.
Risk Management NPR 8000.4	Risk Management Program. Risk reporting to GPMC.	Same as Class A.	Same as Class A.	Same as Class A.
Telemetry Coverage ^	During all mission critical events to assure data is available for critical anomaly investigations to prevent future recurrence.	Same as Class A.	Same as Class A.	Same as Class A.

^ Mission critical events in the operation of a spacecraft are those which, if not executed successfully (or recovered from quickly in the event of a problem), can lead to loss or significant degradation of mission.

Key NASA Procedural Requirements

NPR 7120.6 **NASA Lessons Learned Process**

Establishes requirements for the collection and submission of lessons learned by individuals, directorates, programs, projects, and any supporting organizations and personnel.

- Defines the Lessons Learned Steering Committee (LLSC)
- Promotes the use of the lessons learned process and use of the Lessons Learned Information System (LLIS) located at: http://llis.nasa.gov/

Does **not** cover:

- How to input lessons learned.
- How to access, select and incorporate past lessons.

NPR 8621.1B **Mishap & Close Call Reporting, Investigating, & Recordkeeping**

- Definitions of Mishaps (type A thru D) and Close Calls.
  - Type A: damage >$2M or loss of life or permanent total disability or loss of crewed aircraft or its unexpected departure from controlled flight.
  - Type B: $2M > damage > $500K or personnel permanent partial disability.
  - Type C: $500K > damage > $50K or injury causing missed work or transfer.
  - Type D: $50K > damage > $1K or any recordable injury not qualifying for Type C.
  - Close Call: $0 > damage > $1K or possesses a potential to cause a mishap.
- How to respond, from discovery through corrective action and closure.
- Mishap Investigation Process
- Conducting Failure & Mishap Reviews
- MIB Reports and Corrective Action Plans (CAP)

Key NASA Procedural Requirements

End of Mission Activities

- Senior Review (Held by each science division every 2 or 3 years)
  - Proposals for extended mission funding received.
  - Evaluations determine scientific merit of extended mission objectives/capabilities.
  - Intent to maximize the scientific return within finite resources.
  - Panel produces a ranked list of the projects based on assessment of the science value per dollar needed to extend the mission. Top projects are funded.

- Considerations for extended missions
  - Reduced staffing and attendant risk
  - Simplified procedures
  - Risks resulting from changes in the way mission is conducted
    - (e.g. MGS Failure Review Board findings)

NPD 8010.3B **Notification of Intent to Decommission or Terminate Operating Space Systems and Terminate Missions**

- What to do when missions are finally terminated.
- For missions that have reached the end of useful life, due to:
  - Loss of capability or
  - Depletion of consumables
  - Failure to pass Senior Review

Working Within NASA Policy & Directives

Hopefully, this presentation has helped you to:

- Know what key NASA documents are needed for Formulation.
- Understand the NASA governance model and how it is applied.
- Identify the key concepts of NPR 7120.5D for managing flight projects.
- Identify project-significant items from key NPDs and NPRs.
- Gain an understanding of the NASA Project Life Cycle.
- Understand how to categorize and classify new projects.
- Understand how SMD interprets and expands NPR 7120 for science missions, via its Management Handbook.