

# Science and Technology Office

## Science Project Management

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National Aeronautics and  
Space Administration



**MARSHALL**  
SPACE FLIGHT CENTER

# Science Research & Projects Division

## Planetary Science

- Planetary Surfaces, Interiors & Atmospheres
- Planetary Science Integration with MSFC Exploration Capabilities
- Instrument Technology development
- INSIGHT, Mars 2020, LRO, Planetary Mission Program Office

## Astrophysics

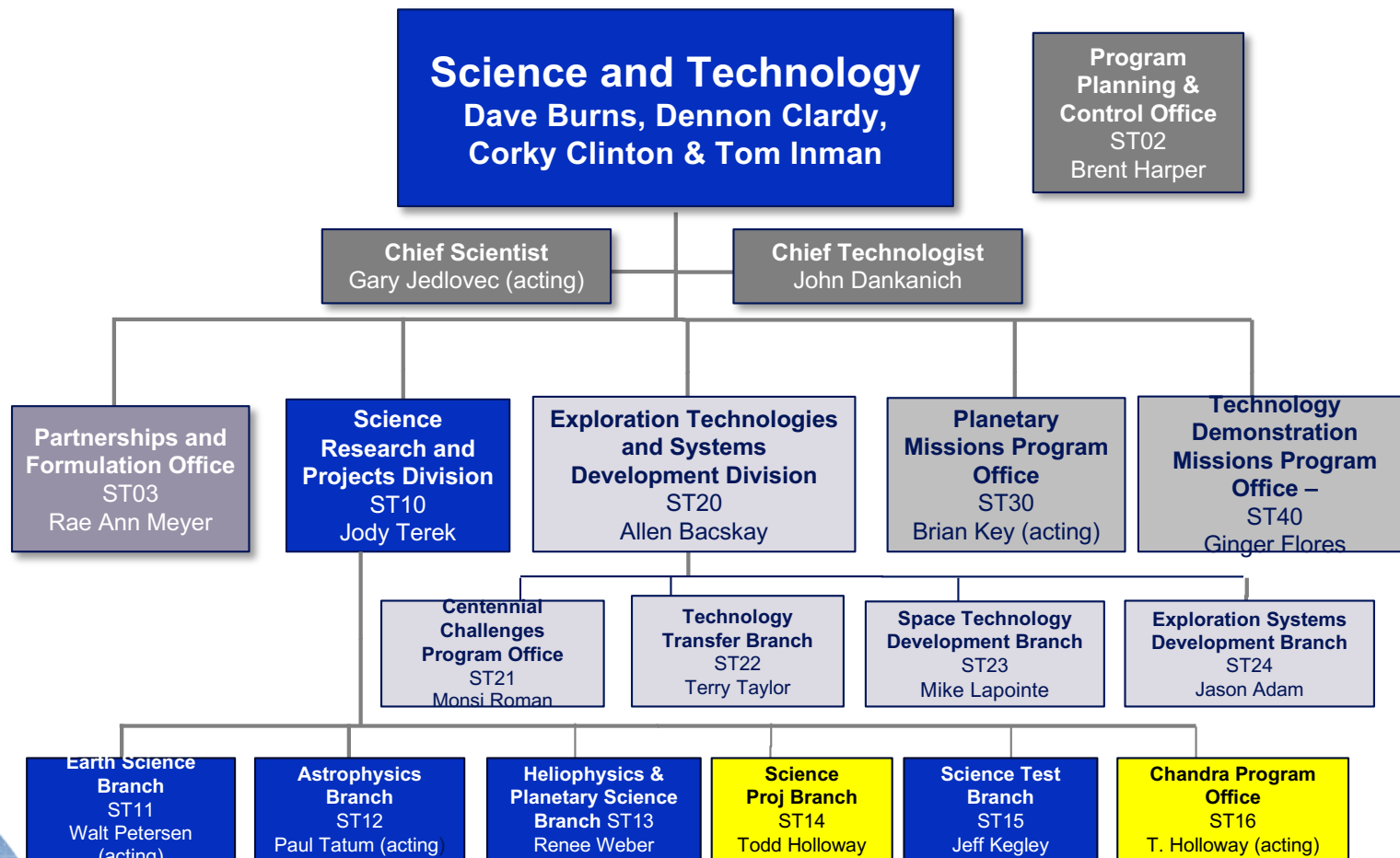
- Black Holes, Neutron Stars, Nebula, and Pulsars in the X-ray
- Gamma-ray Bursts
- Extreme-energy Particles and their Sources
- X-ray Detectors and Optics
- Chandra, IXPE, FERMI/GBM, ANS-ISS, EUSO, Lynx Decadal Study

- Solar Transition Region and Magnetic Atmosphere
- Thermal Plasma/Plasmasphere Modeling, Analysis, and Instrument Development
- Analyses of Ionospheric Disturbances
- Instrument Technology development
- Hinode, PSP, Suborbital Instrument Deve, COSIE, FOXSI

## Heliophysics

## Earth Science

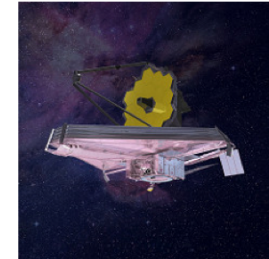
- Weather, Energy and Water Cycle Processes, Atmospheric modeling
- Precipitation and Lightning Measurements and Validation
- Research to Applications
  - SPoRT , SERVIR
- Earth Science Data Informatics and Data Science/Deep Learning
- Disaster Detection & Monitoring
- ISS-LIS, Suborbital Instrument Campaigns



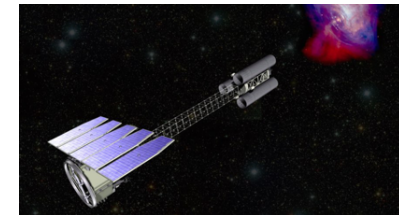
# MSFC's Science & Technology Office



- Project Management approach determined by a combination of “Project Category” and “Project Class”
- Category (Category 1-3)
  - Defines Agency expectations of project managers by determining the oversight council and the specific approval requirements
  - Determined by factors such as life Cycle Cost, human flight, radioactive material, NASA priority, international participation, technology uncertainty, HQ Mission Directorate recommendation
- Class (“Official” Risk Classifications A, B, C, D)
  - Risk Classification that enables project to define and apply the appropriate design and management controls, systems engineering, processes, mission assurance requirements, and risk management processes.
  - Determined by factors such as criticality to NASA, national significance, availability of alternative research or reflight opportunities, success criteria, magnitude of investment, and other relevant factors.
  - Additional or alternate classifications, or tailored approaches can be developed and applied to a specific payload/payload element



JWST  
Cat 1  
Class A



IXPE  
Cat 3  
Class D



Sounding  
Rocket  
Experiment  
“Less Than Cat  
3/Class D”

# NASA Project Classification

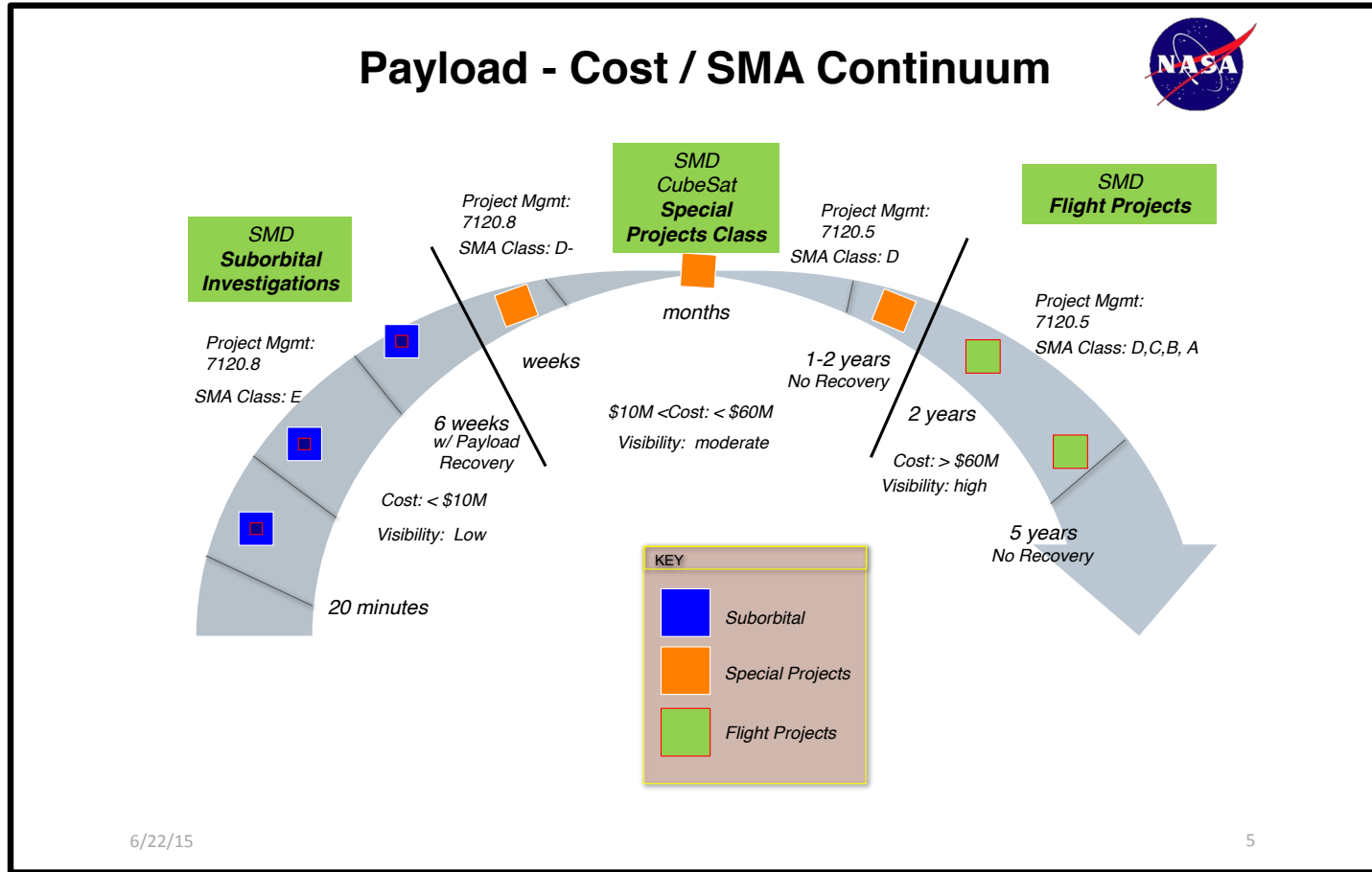


PROJECT - a specific investment having defined requirements, a life-cycle cost, a beginning, and an end.

*Spaceflight projects are instrument, system, or spacecraft mission investments that are to result in a system placed and operated in earth orbit or beyond*

NASA defines implementation requirements for spaceflight projects

- NPR 7120.5, *NASA Space Flight Program and Project Management Requirements*; or
- NPR 7120.8, *NASA Research and Technology Program and Project Management Requirements*



# NASA Project Management Requirements

NASA Life-Cycle Phases	Approval for Formulation		Approval for Implementation		IMPLEMENTATION		
Project Life-Cycle Phases	Pre-A Concept Studies	A Concept & Technology Development	B Preliminary Design & Technology Completion	C Final Design & Fabrication	D System Assembly, Integration & Test, Launch & Checkout	E Operations & Sustainment	F Closeout
Key Decision Points	A	B	C	D	E	F	
Project Life-Cycle Reviews		▲ Mission Concept Review	▲ System Requirements Review ▲ Mission Definition Review/ System Definition Review	▲ Preliminary Design Review ▲ Critical Design Review	▲ Systems Integration Review ▲ Operational Readiness Review	▲ Flight Readiness Review/Mission Readiness Review ▲ Post-Launch Assessment Review ▲ Post-Flight Assessment Review	▲ Decommissioning Review ▲ Disposal Readiness Review

# Project Life Cycle



## One Project, Two Phases

Formulation - Identifying project goals, objectives, and ties to Agency objectives. Working with customers and stakeholders to turn goals and objectives into measurements, requirements, a concept of operations, and mission success criteria. Deriving a technical approach and alternatives, as well as assessing and reducing risks. Organizing work and developing preliminary cost and schedule estimates. Developing roles and responsibilities, organizational structures, and building teams. Writing and submitting proposals per requirements of relevant solicitations.

Implementation - Executing procurements, design, manufacturing, integration, testing, and launch site activities to deploy a successful system that meets project goals and objectives. Conducting operations and sustainment to obtain measurements or complete activities required to meet project goals and objectives. Controlling project execution to approved plans and requirements while responding to issues that arise. Adjusting the project as resources and requirements change.



# Project Life Cycle

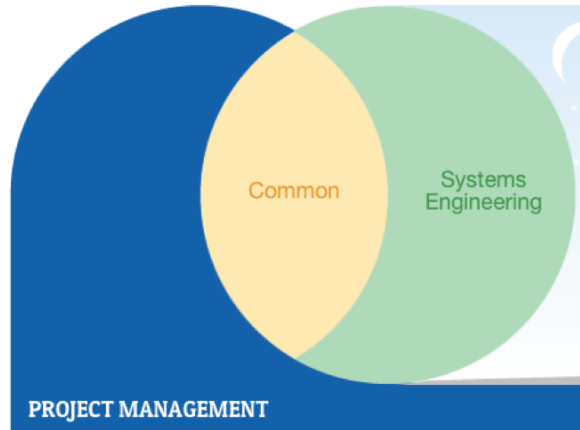
- SMD-solicited projects tend to be specified as Principal Investigator (PI) Led. MSFC's approach to PI-led projects with Project Managers relies on clear definition of roles and how decision authority is exercised.

Role	Responsibility
Principal Investigator (PI)	The PI is responsible to the sponsoring SMD Division (i.e., relevant Program Office) and the STO management for the overall conduct and success of the investigation within cost and schedule constraints. The PI leads the science activities, and serves as the primary point of contact for all external partners and science stakeholders. The PI establishes the Level 1 requirements with NASA HQ, and may exercise control of the lower level requirements.
Project Manager (PM)	The PM is responsible to the MSFC and STO management for the day to day execution of the project/activity. This responsibility is delegated from and in partnership with the PI when the activity is PI-led. The PM develops the project plan; develops and maintains the schedule; plans, controls, and executes the budget with PI concurrence; oversees risk management; executes configuration management activities and COR responsibilities; and serves as the activity's primary interface with MSFC's engineering management.



## PI-Led Projects





<b>PM 1.0</b> Project Proposal	<b>PM 2.0</b> Stakeholder Management	<b>PM 3.0</b> Requirements Development & Management	<b>PM 4.0</b> Acquisition Management	<b>PM 5.0</b> Project Planning
<b>PM 6.0</b> Cost Estimating	<b>PM 7.0</b> Risk Management	<b>PM 8.0</b> Earned Value Management	<b>PM 9.0</b> Safety & Mission Assurance	<b>PM 10.0</b> Project Lifecycle
<b>PM 11.0</b> Budget & Resource Management	<b>PM 12.0</b> Contract Management	<b>PM 13.0</b> Systems Engineering	<b>PM 14.0</b> Tracking/Trending of Project Performance	<b>PM 15.0</b> Project Control
<b>PM 16.0</b> Project Review & Evaluation	<b>PM 17.0</b> Technology & Engineering Development	<b>PM 18.0</b> Decommissioning/Disposal & Archival of Data		

## COMMON

### C 1.0 NASA INTERNAL & EXTERNAL ENVIRONMENTS

<b>C 1.1</b> Agency Structure, Mission, & Internal Goals Management	<b>C 1.2</b> NASA Project Management/ Systems Engineering Procedures & Guidelines	<b>C 1.3</b> External Relationships
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### C 2.0 HUMAN CAPITAL MANAGEMENT

<b>C 2.1</b> Staffing & Performance	<b>C 2.2</b> Team Dynamics & Management
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### C 3.0 SECURITY, SAFETY, & MISSION ASSURANCE

<b>C 3.1</b> Security	<b>C 3.2</b> Workplace Safety	<b>C 3.3</b> Safety & Mission Assurance
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### C 4.0 PROFESSIONAL & LEADERSHIP DEVELOPMENT

<b>C 4.1</b> Mentoring & Coaching	<b>C 4.2</b> Communication	<b>C 4.3</b> Leadership	<b>C 4.4</b> Ethics
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### C 5.0 KNOWLEDGE MANAGEMENT

<b>C 5.1</b> Knowledge Capture & Transfer	<b>C 5.2</b> Knowledge Sharing
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# NASA PM “Competency” Model



- Know **WHAT** your team is responsible for delivering and **WHY** you are doing it, and keep your team focused (Define and Manage your Project Content).
- Know **WHEN** you will get it done, and own making sure you and your team know when that is and where you stand on your plan at any given time (Develop and Manage your Schedule)
- Make sure you have the **RESOURCES** you need to get the “WHAT” done, and maintain the conscience of your project in using these resources wisely to deliver value to the customer, creating opportunities along the way to strengthening our capabilities for what comes next (Define and Manage your Budget)
- Your “triple constraint” of COST-SCHEDULE-TECHNICAL, Safety considerations, and external constraints and obstacles that you operate under, are all drawn and adjusted on a canvas of **RISK**. Use this canvas daily to understand and communicate the how these are tied together, and the possibilities and hazards behind every decision, opportunity, and event. (Define and Manage your Risk)
- Value and pursue clear and open **COMMUNICATION** with your team (including their management), PI, customers, and stakeholders.
- Manage your resources, schedule, content, and relationships with integrity, promoting **SUSTAINABLE** project execution, organizational health, and respect for each other.



## SRPD PM Values & Expectations