National Aeronautics and
Space Administration

NASA Cost and Schedule Symposium

4/23/2024

AMES RESEARCH CENTER | ARMSTRONG FLIGHT RESEARCH CENTER | GLENN RESEARCH CENTER | GODDARD SPACE FLIGHT CENTER | HEADQUARTERS | JOHNSON SPACE CENTER | KENNEDY SPACE CENTER | LANGLEY RESEARCH CENTER | MARSHALL SPACE FLIGHT CENTER | STENNIS SPACE CENTER

OCFO

OFFICE OF THE CHIEF FINANCIAL OFFICER

Agenda

- Welcome
- Logistics
- CADRe
- ONCE
- Corrective Action Plan
- Risk Management Tiger Team (Early Formulation)
- Conference Agenda

Welcome

Purpose and Rules of Engagement

Purpose

- This is the community's one time to come together and share ideas – New data, analysis, tools, etc…
- We strongly encourage you to meet new/legacy members of the community while you are here

Rules of Engagement

- Presentation Norms
- Agenda Norms

PM Symposium is happening this week too!

When and where will the presentations be available?

Logistics

Registration Desk

Restrooms / Emergency Exits

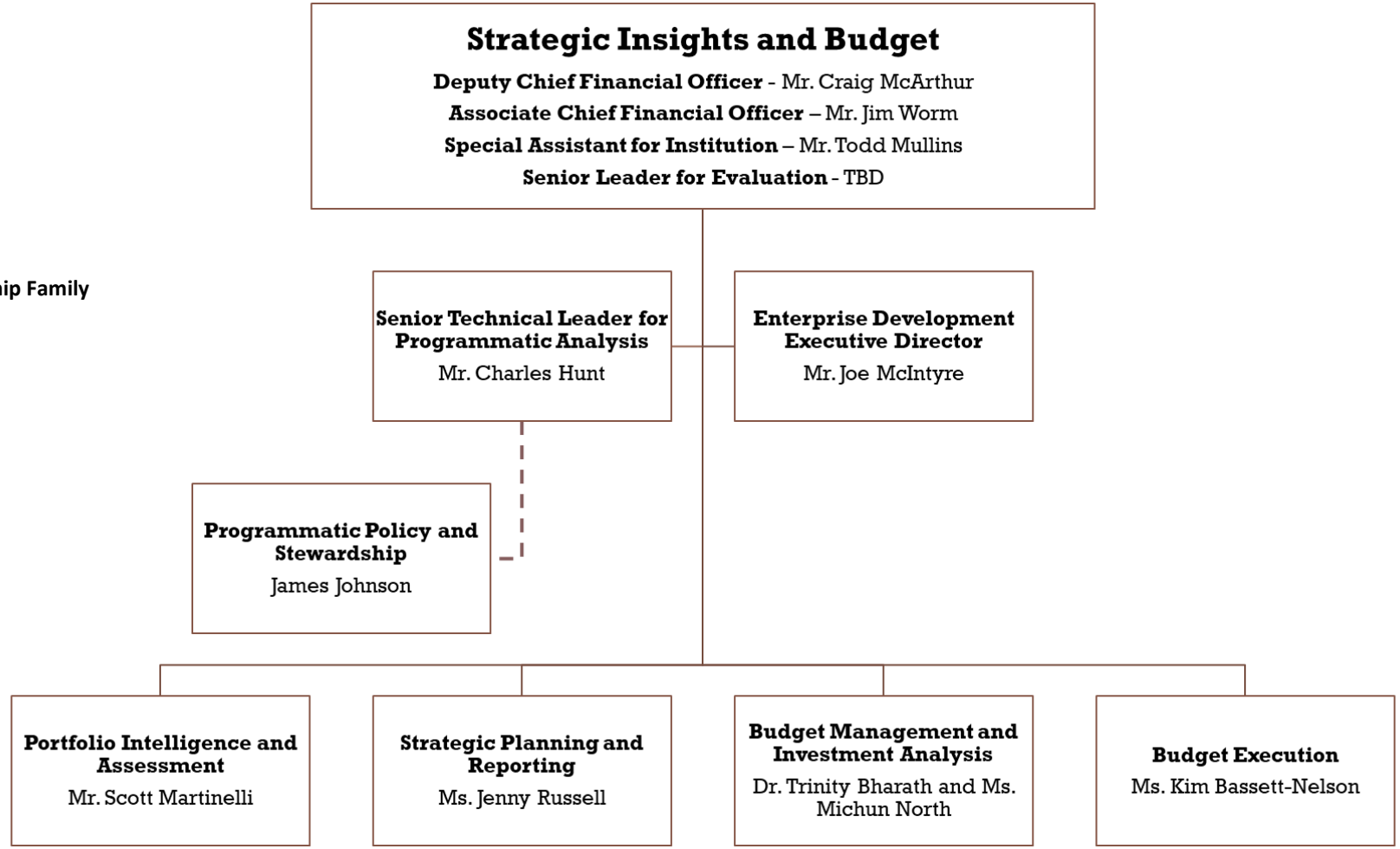
Coffee Shop / Lunch

Wireless

Awards Banquet

OCFO-SIB Re-org

Programmatic Policy and Stewardship Family
Mr. James Johnson, Team Lead
Mr. Jon Fleming
Ms. Kristen Kehrer
Ms. Michele King
Ms. Victoria Nilsen
Vacancy
Mr. Charles Hunt



New Programmatic Policy Stewardship (PPS) will perform same functions as legacy-APARC with same cast of characters

CADRe

CADRe In Transition

Since CADRe's inception in 2005, OCFO/SIB has subsidized 100% of the CADRe requirement on behalf of projects

Responsibility for completing the requirement per 7120.5F will be transitioning to MDs/Programs/Projects

OCFO will be releasing a memorandum shortly to document acceptable tailoring as responsibility transitions for CADRe in Fiscal Year (FY) 2024 and 2025 (Collect & Cache)

- Provides Mission Directorates, Centers, and Project time to embed anticipated CADRe implementation resources within their budget planning
- Serves as a blanket tailoring for CADRe for all NASA Procedural Requirements 7120.5 projects that has a CADRe deliverable in FY2024 and FY2025

OCFO will still be CADRe policy ownership

Issues and Waiver Actions

CADRe ‘Collect and Cache’

OCFO/SIB current plan is to implement a 2-year transition period

- Authorizes the tailoring of the CADRe requirement 7120.5F compliance matrix
- OCFO/SIB collects & caches project provided data at each milestone
- Applies to all milestone events not already covered by any remaining OCFO/SIB transition funding
- This will ensure valuable project data is collected and stored for future analysis
- Projects are encouraged to leverage the SRBs in-situ to collect data in parallel for the key milestone reviews (SRR, PDR, CDR, SIR, LRD, or similar)
- Sign off needed from PM, SRB Prog Analyst and SIB to ensure that the proper data has been cached.
- A representative list of source documents needed to assemble a CADRe

Transition Period 2024-2025

List of Documents for CADRe

Parts A,B,C

Representative list of source documents needed to assemble a typical CADRe

Documents for CADRe Part A:

- Project Plan
- Acquisition Plan
- Concept of Operations
- System Engineering Mgt Plan (SEMP)
- Architecture Description Document (ADD)
- Risk Mitigation Plan
- Software Management Plan
- Concept Study Proposal (if applicable)
- Milestone Briefing Packages (SRR, PDR, CDR, etc)

Documents for CADRe Part B:

- Master Equipment Lists (MEL)
- Power Equipment Lists (PEL)
- Other Mass Property Reports
- Software Metrics (Source Lines of Code or other)
- Technical Performance Measures (TPMs)

Documents for CADRe Part C:

- Project Life Cycle Cost Estimate LCCE (WBS, FY, Phase)
- Risk 5X5s and Risk Registers
- WBS Dictionary
- Schedules (Gantt Charts and IMS- MS Project Files)
- Work Force (FTEs and WYEs)

Amount of Documentation Varies with Project Size, Class, and Category

CADRe Forward Plan

Beginning in FY2026 the tailoring of the CADRe requirement expires, and MDs/Programs/Projects will assume funding and responsibility for completing CADRe reports

CADRe preparation may be centralized at MD level or completed on a project-by-project basis

OCFO/SIB will provide consultation as needed to help provide efficiency, lessons learned, and utilize the latest in data automation where possible

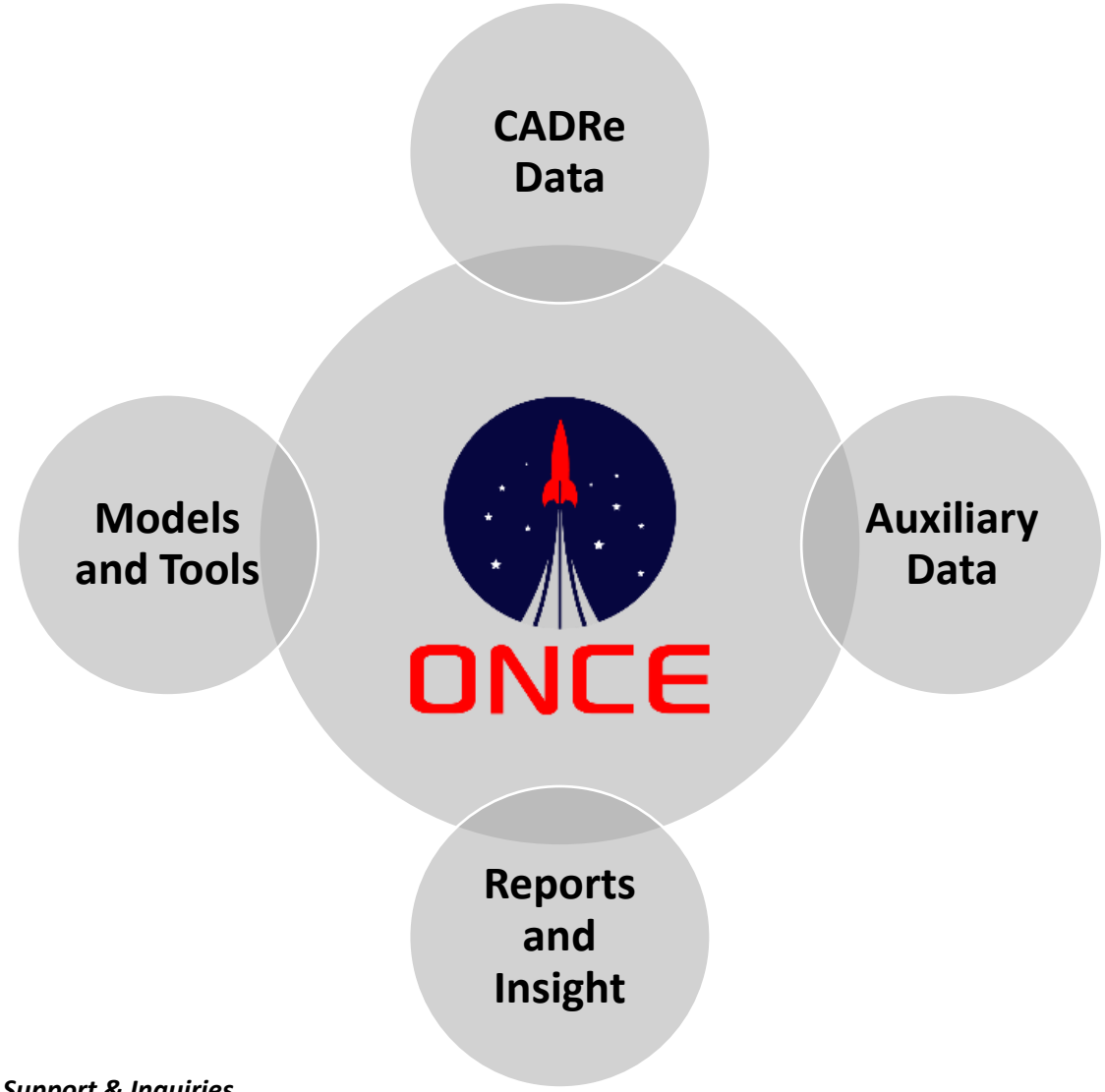
- Anticipate updating guidance in 2025 to prep programs/projects

OCFO/SIB shall continue to fund all institutional costs associated with maintaining the CADRe database (ONCE) and provide CADRe policy support

FY2026 and Beyond

ONCE

ONCE Database at the Center



- The ONCE database (https://oncedata.hq.nasa.gov) is at the center of OCFO SIB efforts to build and improve the NASA community.
- ONCE empowers analysts and improves estimating at NASA by providing access to:

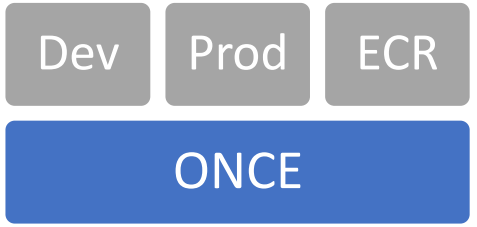
  - **CADRe Data**
    - Active filtering for custom user reports
    - CADRe Library
  - **Auxiliary Data**
    - Normalized datasets
    - Multiple Electronic Libraries (Symposium, KDP Memo, etc.)
  - **Reports and Insight**
    - Dynamic graphical & tabular reports
    - Structured database reporting
    - PowerBI export format
  - **Models and Tools**
    - Model Portal sharing access across community
    - Online Models
    - Container Hosting

Tech Support & Inquiries
Hq-oncesupport@mail.nasa.gov

Summary Metrics

- ONCE has over 700 active Users
  - Available NASA-wide via NAMS/IDMax with formal ATO hosted in the HQ MCE
- Many different types of Users
  - Estimators, analysts, schedulers, systems engineers, finance managers, resource analysts, SRB/IRB/IRTs, project managers, instrument managers, procurement, scientists, engineers, formulation teams, evaluators, …
- Over 80,000 documents and files available via ONCE
  - Search, custom query, dashboards, reports, libraries, etc.
- CADRe information on over 215 NASA Projects
  - Human, Earth Science, Planetary, Helio, Astro, ARMD, STMD, Instrument Only, Balloon, CubeSat, etc.
- More than 660 completed CADRe's in the database
  - Part A narrative document, Part B technical, Part C programmatic
- 11 Models and Tools available for Users
  - Includes Online and available for Download
- 2700+ Total Downloads of Models and Tools
  - Commercial and In-House tools available for scheduling/SRA, cost, JCL, etc.

Infrastructure



Average Number of Downloads for a NASA Project CADRe = 1,000+

ONCE QA Activities Completed

- **# of Spacecraft:** Added Number of Spacecraft filter and scrubbed all data records for “0” and other issues.
- **Program Filter:** Cleaned-up and re-mapped all Projects to the correct Programs so Filters will work correctly. The program listing in ONCE is now taken from the Metadata Manager (MDM) tool.
- **File Name Formats:** Reviewed source document file names for special characters to prevent issues when downloading from the ONCE website.
- **6-Digit Project Numbers:** Populated all missions with their 6-digit WBS code and added a filter for that data to the ONCE User Reports.
- **Mission Data:** Reviewed all missions to update and populate Spacecraft Contractor, Mission Class, and Mission Category.
- **Status Reports:** A gigabyte of project monthly status reports were uploaded to the appropriate mission source document folder within the CADRe Library.
- **Instrument Builder:** Reviewed and updated Instrument builders previously designated as "Collaboration" to identify the actual builder.
- **Instrument Types:** Reviewed all instruments to populate and/or edit the assigned instrument types.
- **Decision Memos:** Expansion and update of the KDP File Library to include Decision Memo’s and Datasheets along with a new Dashboard

Corrective Action Plan

Background

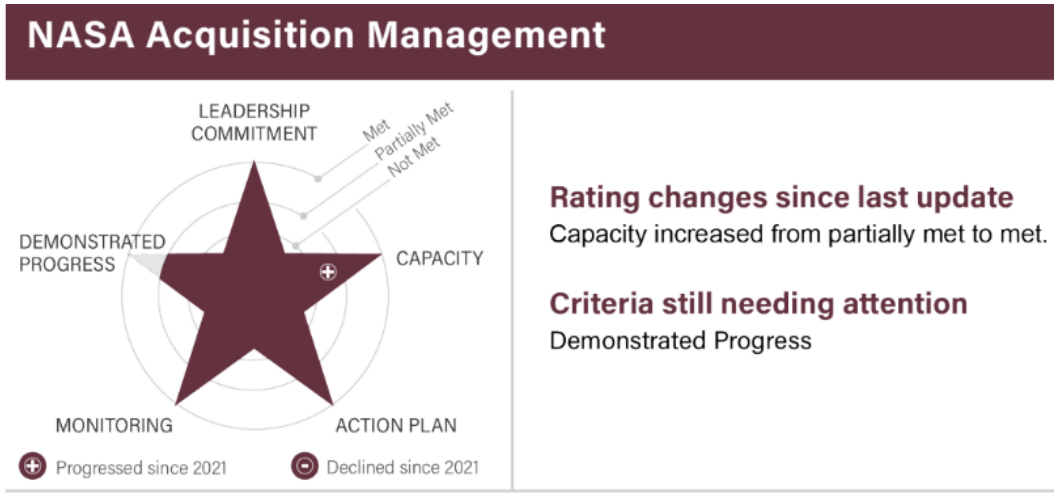
- Since 1990, the Government Accountability Office (GAO) has routinely tracked areas of the federal government deemed high risk for fraud, waste, abuse, and mismanagement, or that need transformation. NASA's acquisition management has been designated as a *High Risk* area since the first High Risk Report in 1990.

- NASA's High Risk designation undermines Congressional and public confidence in our ability to responsibly and efficiently spend taxpayer dollars. Removal of the High Risk designation would be a major victory for NASA leadership, representing dedicated and long-lasting improvement to our acquisition management processes.

- The GAO publishes an updated High Risk List at the start of each odd-numbered year to coincide with the start of the newly elected Congress.

- There are five criteria GAO uses to assess progress toward eventual removal of the High Risk designation. As of the 2023 report, NASA has one remaining criteria to meet – demonstrated progress.

- NASA has a High Risk Corrective Action Plan (CAP) in place containing initiatives associated with High Risk concerns that, if completed, should contribute to improved agency acquisition management practices.

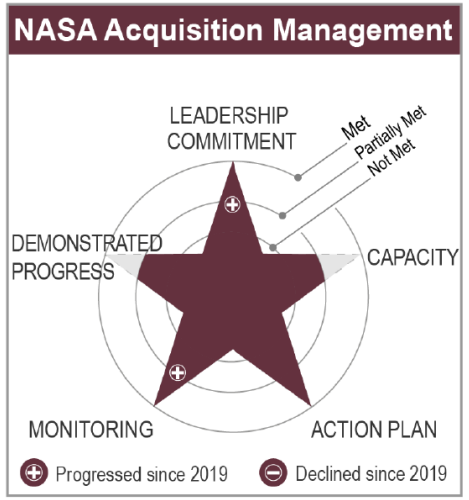


High Risk Removal Criteria

2019 Report

Source: GAO analysis. | GAO-19-157SP

2021 Report

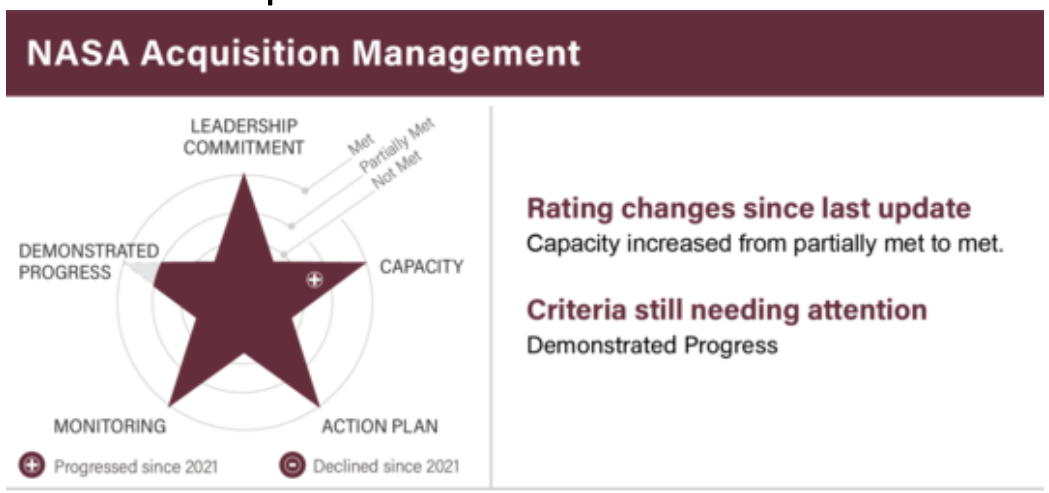


Source: GAO analysis. | GAO-21-119SP

2022 Report

Source: GAO analysis. | GAO-22-105184

2023 Report



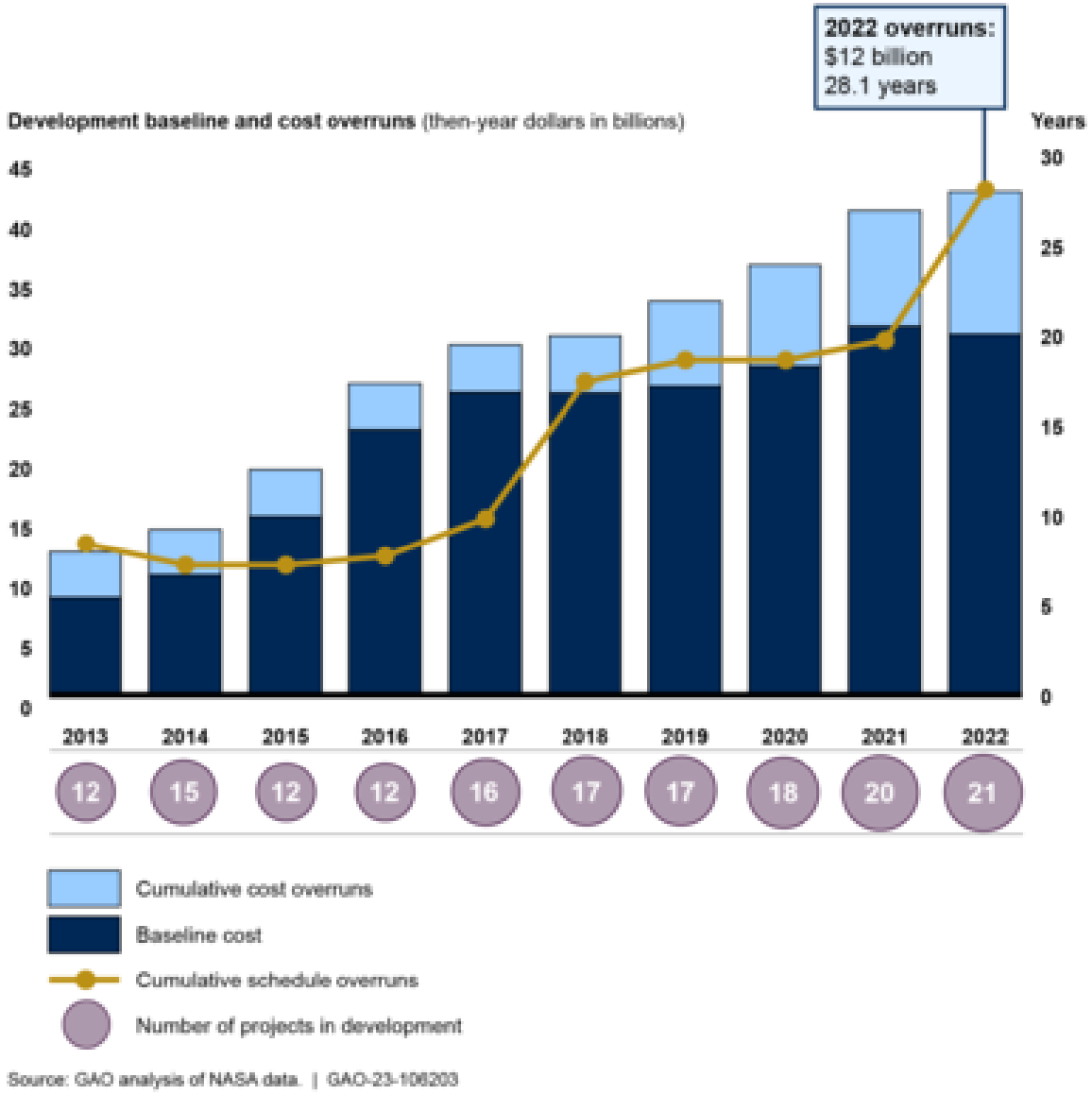
- In 2018, NASA learned that GAO would be downgrading NASA on the High Risk List in its 2019 High Risk Report, one of only two high risk areas backsliding that year. In response, NASA established a new High Risk Corrective Action Plan.
- In 2020, NASA updated the Corrective Action Plan to continue the drive toward improvement.
- In its 2021 High Risk Report, NASA saw improvement in its removal criteria and was highlighted as an area of significant progress in the federal government.
- 2022, NASA saw improvement for leadership commitment and incorporating changes recommended by GAO to acquisition management. Desire for increased transparency for human spaceflight development programs.
- 2023, *NASA has increased its capacity by completing initiatives in its action plan intended to strengthen its cost and schedule estimating workforce. The agency, however, continues to face challenges in its ability to manage and oversee its most expensive and complex projects. Specifically, NASA has had difficulty controlling cost growth and schedule delays for projects that exceed $2 billion in life-cycle costs. These include projects needed for NASA to conduct Artemis missions. These missions will return astronauts to the moon, build a sustainable lunar presence, and ultimately bring humans to Mars.*

2023 High Risk Report Selected Language

Since March 2021, NASA has launched or completed nine projects. Two of these projects launched within both their cost and schedule baselines. One launched within its schedule baseline, but not its cost baseline. Six projects exceeded both their cost and schedule baselines. Most notably during this period, NASA successfully launched the James Webb Space Telescope, one of the agency's most complex science missions. It also launched the Orion crew capsule and NASA's newest rocket, the Space Launch System, as part of efforts to return to the moon.

The overall cost and schedule performance of NASA's portfolio of major projects continues to decline. ***We reported in June 2022 that the cost growth had deteriorated for the sixth consecutive year while the average schedule delay increased for the second consecutive year.*** *NASA's most expensive and complex projects, known as category 1 projects, drove the cumulative development cost overruns and schedule delays. Each category 1 project has a life-cycle cost estimate of more than $2 billion, uses significant radioactive material, or is intended for human spaceflight. Nearly all of the $12 billion in cumulative development cost overruns we reported in June 2022 are attributed to cost overruns on the nine category 1 projects out of a total of 21 projects in the portfolio.*

Link



2024 CAP Update

- Approval to update the CAP for 2024 was issued on January 25, 2024
- The goal of the 2024 CAP is to continue to mature the Agency's cutting-edge program and project management efforts and improve the Agency's accountability and transparency for NASA's stakeholders.
- A Steering Committee was convened, comprised of senior leaders from ESDMD, SOMD, SMD, STMD, ARMD, OP, OCFO, and the Chief Program Management Officer. The Steering Committee meet during the CAP update period for status updates and to provide any necessary mid-course corrections.
- A Corrective Action Plan Working Group (CAPWG) was convened. The CAPWG collaborates with the assigned leads for each CAP candidate initiative to ensure cross-agency coordination and vetting of the candidate initiatives as they are developed. The CAPWG is comprised of representatives from ESDMD, SOMD, STMD, ARMD, SMD, CPMO, OCFO, OP, LaRC, GSFC, JSC and MSFC. The CAPWG will interface with the Technical Authorities and other subject matter experts as needed.
- Final approval of the updated CAP will be routed through the Agency Program Management Council (APMC), with a decisional briefing to occur at the APMC in October 2024

Working Group	
Elyssa Malin	OCFO SIB/CAP Team Lead
Kevin Gilligan	CPMO/Strategic Initiatives Manager
Jenny Russell	OCFO SIB/SPaR Branch Chief
Tanye Coleman	SMD/Portfolio Performance Management Lead
Fay Collier	ARMD/IASP/Associate Director for Flight Safety
Mary Duncan	MSFC/OSAC PP&C Office Manager
Vickie Gutierrez	JSC/Strategic Business Integration Office Manager
Charley Hunt	OCFOCFO/Senior Technical Leader for Programmatic Analysis
Alicia McPhail	SOMD/Program Strategic Integration Supervisor
Andre Sheppard	OP/Director, Procurement Strategic Operations Division
Matthew Ritsko	GSFC/OCFO/Chief for Resource Management
Justin Hornback	CPMO/Detailee
Christine Solga	ESDMD/ALR Detailee
Robin Smith	LARC/Deputy CFO PP&C
David Walters	STMD/Deputy Director for Integration, Strategic Planning and Integration

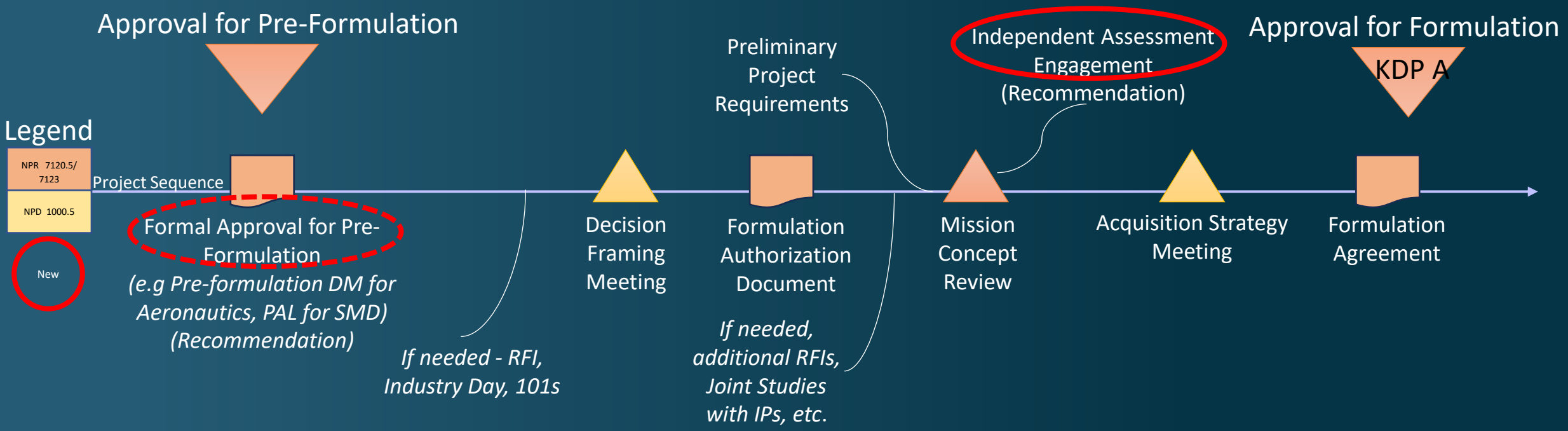
Risk Management Tiger Team

Early Formulation Optimism Findings and Recommendations

Findings
• **Optimism exists in pre-formulation regardless of mission category.**   • Optimism is not always driven by “can do” optimism - political, international, etc.
• **Mission complexity is inherent in Agency Flagship / Category I projects.**   • No standardized measurement for pre-formulation maturity.
• **Pre-formulation process is not as disciplined as Announcement of Opportunity (AO) and post KDP-A processes (7120.5).**   • Lack of independent scrutiny / realism check before KDP B.
• **Lack of connectivity between pre-formulation PM Policy (7120.5) and Acquisition Policy (1000.5) activities.**

Recommendations	Status
Strengthen sequence and discipline of pre-formulation milestones for Cat. I and select Cat. II projects. *See graphic on next page.*	**DA and AA approval for implementation**
Strengthen Mission Concept Review (MCR) execution to identify project’s potential optimism and associated risk. *See graphic on next page.*	
Strengthen ASM risk conversation by augmenting ASM template with MCR findings and identified; include 5x5 risk matrix; and establish an independent evaluation of cost estimate.	
Mission Directorates brief on potential future acquisitions 1, 2, and 3 years out for the annual ASC forecast meeting. For the acquisitions that are 2 years and out, MDs brief on their pre-formulation efforts as well as significant partnerships	

Early Formulation Optimism: Recommendations Pictorial

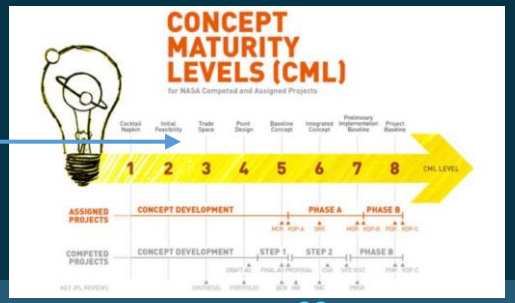


Project Risks are identified / matured / assessed refined throughout process

RFIs inform risk posture for DFM and MCR; MCR informs risk posture for ASM; all inform KDP-A

Mission concept matures throughout process

Agency develop a framework to measure pre-formulation maturity. Framework should extend to PDR. (Recommendation)



Conference Agenda

Unique ID	TIME	Title	Author/Presenter (s)	Org	Time (mins)
	8:00 - 9:00	Doors open, Registration, Informal Meet and Greet	SID	NASA HQ	60
15	9:00 - 9:15	LaRC VIP Opening Remarks	Lisa Ziehmann	LaRC	15
63	9:15 - 9:45	Opening Remarks CADRe, ONCE, CAP and much more!,	James Johnson, Eric Plumer, Charles Hunt	HQ	30
1	9:45 - 10:15	Venture = a risky or daring journey or undertaking. Is NASA's Earth Venture Class of	Justin Hornback, Mark Jacobs, Shawn Hayes	LaRC	30
33	10:15 - 10:45	Using Schedule Metrics to Provide Insight into Project Performance	Tanyé M. Coleman, Angela M. Vu, Kimberlee Sakai Alvarez	HQ / Aerospace	30
500	10:45 - 11:00	BREAK	All	All	15
13	11:00 - 11:30	Lessons learned from NASA Goddard Space Flight Center's Product Development Lead Training Schedule and Cost Development Workshop: Continuous Improvement	Geraldine Robbins, JW McKeever, Lindsay MacLeod, Rebecca Derro, Phyllis Hestnes, James Marsh	GSFC	30
61	11:30 - 12:00	NASA OIG Cost and Schedule Analytics	Michele Schaeffer, Tahir Hafeez, Gerardo Saucedo, John Schultz, Tyler Martin & Jiang Yun Lu	HQ	30
44	12:00 - 12:30	Gateway Key Decision Point (KDP) 1 – Navigating the Programmatic aspects of the first Tightly Coupled Program and first Joint Confidence Level (JCL) Analysis on a Program utilizing Firm Fixed Price Contracts	Ethan Miller	JSC	30
501	12:30 - 13:30	LUNCH BREAK	All	All	60
57	13:30 - 14:00	Advancing Cost Estimation in Space Exploration: The Canadian Space Agency's Strategic Approach	Mireille Bedirian	Canadian Space Agency	30
45	14:00 - 14:45	Large Space Hardware System Development Under Firm-Fixed Price Contracts	Madison McCall, Nicole Ames, Will Hopkins, Ashley Varma, Mike Stelly, Steve Wilson	JSC	45
60	14:45 - 15:45	Boldly Going Where No SRA Has Gone Before: Automating and Assimilating Schedule Risk Analysis	Jessica Clarke, Eric Zander	HQ / BAH	60
500	15:45 - 16:00	BREAK	All	All	15
16	16:00 - 16:30	Standardization of JCL Value Selection	Louis Fussell	JSC	30
7	16:30 - 17:00	EVM Year in Review	Jon Fleming, Kristen Kehrer	HQ	30
54	17:00 - 17:45	Supply Chain Risk Management | 2 Case Studies – European Space Agency	Ola Oluyinka, Clare Sant	Moody's	45