

Status Report: Planning for the Decadal Survey in Astrobiology and Planetary Science 2023-2032

Colleen N. Hartman, Ph.D.
Space Studies Board Director*

* David Smith, a member of my SSB staff, is the responsible staff officer for the Planetary Decadal

National Academy of Sciences

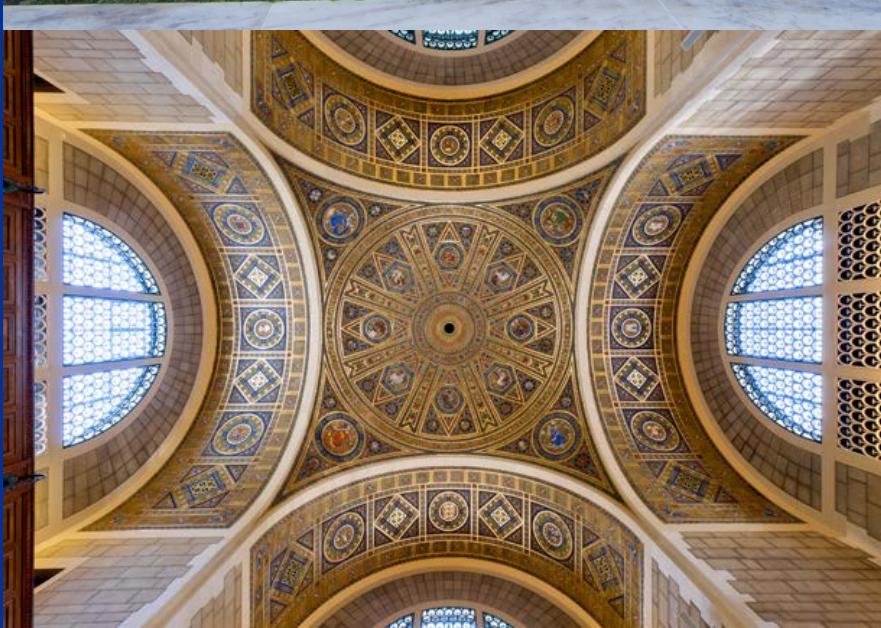
*On March 3, 1863 at
the height of the
US Civil War,
President Abraham
Lincoln signed an
Act of Congress to
create the National
Academy of
Sciences.*



NAS and Astrobiology/Planetary Science

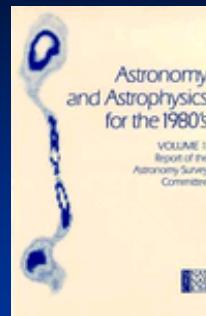
“... the primary scientific goals of this program are immense: a better understanding of the origins of the solar system & the universe, the investigation of the existence of life on other planets, & potentially, an understanding of the origin of life itself.”

1961 letter from the SSB to NASA Administrator James Webb

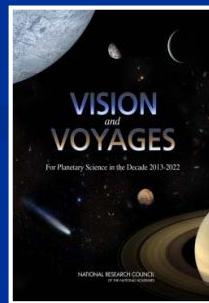
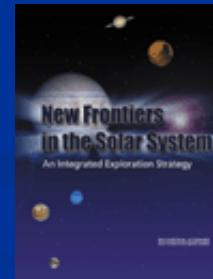


Space Science Decadal Surveys

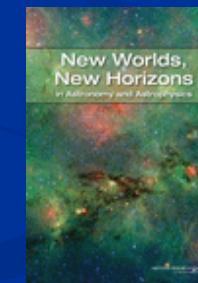
- Astronomy and Astrophysics
1963, 1973, 1982, 1991,
2001, 2010, (2020)



- Planetary Science
2003, 2011, (2022)



- Solar and Space Physics
2003, 2012, (2024)



- Earth Science and Applications from Space
2007, 2018, (2029)



- Biological and Physical Research in Space
2011, (2022)

What does a Decadal Survey do?

- **Assess the current status of an entire scientific discipline**
- **Define and prioritize the key scientific questions to be addressed in the next decade**
- **Define and prioritize the most important initiatives to address these priorities**
- **Make recommendations to the funding agency about R&A, and ground and space-based mission development, among other areas**

Decadal Surveys (cont)

- Conducted by the National Academies, independently of sponsoring agencies and organizations
- NASA is required by the Authorization Acts of 2005 and 2008 to engage with the National Academies and conduct decadal surveys in all major space science disciplines

How is a Decadal Survey Used?

- A Decadal Survey makes compromises between many disparate needs and desires within the science community.
- Congress, OMB, and Agencies, view decadal surveys as the formal statement of priority by the US space science community, and have repeatedly stated their intent to give highest priority to the missions identified in the survey

How is a Decadal Survey Used?

- Although lawmakers and Agencies take the Decadal seriously, they are not required to do so by law, but embrace its goals and spirit.
- Implementation depends upon many factors, and can be delayed due to agency funding limitations or evolving technology advances(e.g. Europa Orbiter from the 2011 Decadal Survey)

Decision Rules

- A resilient strategic implementation plan accommodates some level of deviation from the anticipated circumstances.
 - However, as time passes and conditions in the scientific, technical, political, and social environment change
 - Decision Rules have provided more robust advice.
- A formal request for **decision rules** in the **decadal survey** statement of task began with the 2010 astronomy and astrophysics

Decision rules serve several purposes

- 1) Simply by considering alternative scenarios, the survey committee can clarify its process for setting priorities.
- 2) Reality rarely matches expectations.
- 3) Decision rules provide agencies and policy makers with flexibility and insight.

More on Decision Rules

- Decision rules can be as simple as contingency planning, for example, what to do when an international partner makes a particular selection.
- Decision rules may define alternative strategies for handling a better or worse budget scenario.
- Decision rules can provide on-ramps and off-ramps for priorities that depend on anticipated scientific discoveries or technical advances.
- Decision rules are less helpful when attempting to prescribe responses to unforeseen circumstances (e.g. mission failure) when tactical Agency responses are more appropriate.

How is a Survey Typically Conducted?

- Experts are selected and appointed by the National Academies independently — a steering committee in overall charge and supporting panels – with NAS reviewing conflict of interest in each case before receiving the NAS President's approval
- Specific actions are taken to engage the community — an effort to achieve diverse inputs via a host of outreach mechanisms
- NASA often supports studies of promising mission concepts as study input

How is a Survey Typically Conducted? (cont)

- An independent assessment of the technical risk and cost evaluation (TRACE) process is used to determine realism of ground- and space-based projects
- The report is released after a rigorous review conducted by outside experts selected by the National Academies

Typical Ground Rules

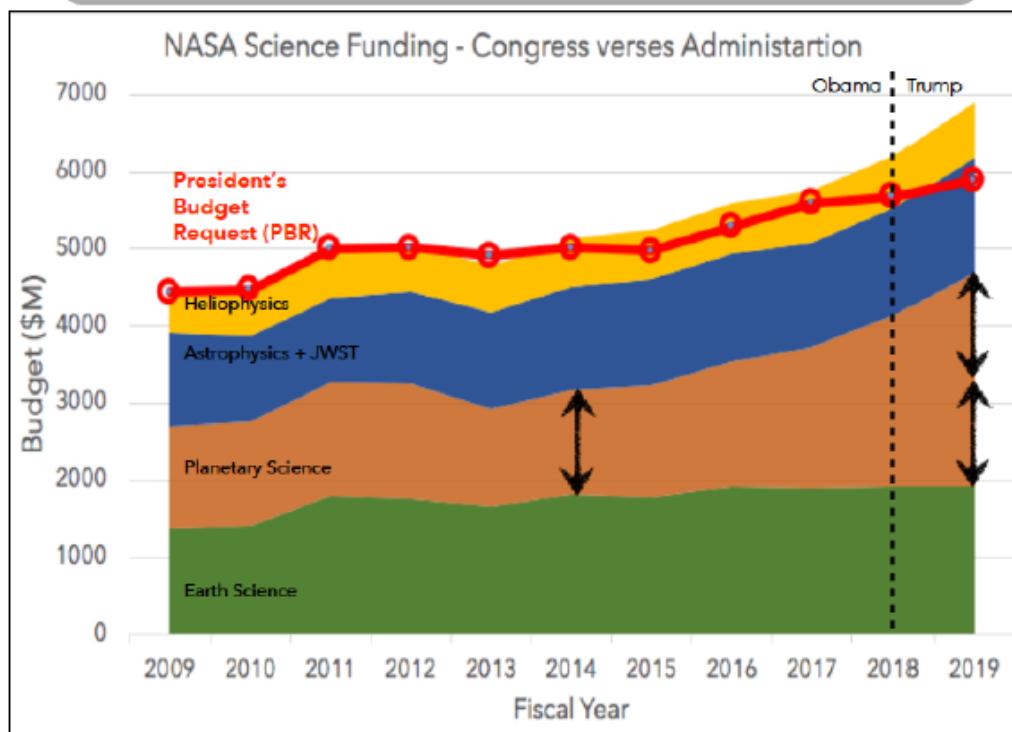
- Missions with a formal budgetary line were not reprioritized; everything else was within scope for prioritization
- Competitive mission lines (e.g., Discovery-class or smaller) or R&A-type activities were not prioritized
- Prioritization included missions that had not entered Phase A (e.g., EJSM, TSSM, Venus Flagship)

Typical Elements of a Survey Report

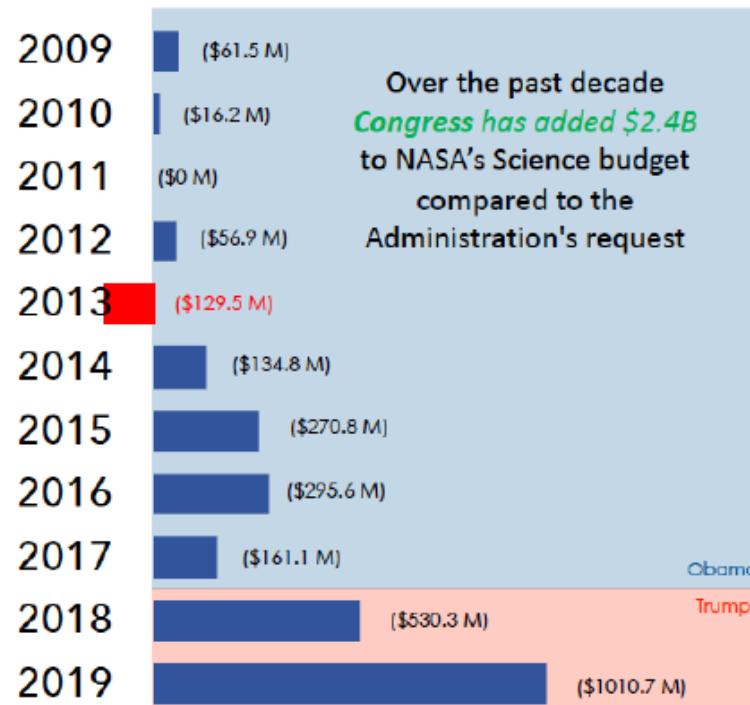
- Overview of relevant discipline
- Broad survey of the current state of knowledge
- Inventory of the top-level science questions
- Recommendations on optimum balance between target bodies,
large/medium/small missions, ground versus space, etc.
- Assessment of infrastructure
- Discussion of strategic technology development needs
- Prioritized list of recommended strategic space missions,
ground-based facilities and supporting research

PSD's Budget Doubled Since 2014

NASA's *Planetary Science Division budget* has been **doubled** in just 5 years (since FY14)



Annual Congressional funding levels for NASA Science (SMD) by Division



Comparison of annual outcome – enacted versus PBR for NASA's SMD budget

How is NASA PSD Organized?

- ❖ NASA PSD major budgetary endeavors:
 - Flagship missions (large)
 - New Frontiers missions (medium)*
 - Discovery missions (small)
 - Research and Analysis
 - Technology development
- ❖ A balance between these priorities and program is crucial to success.

* Recall that New Frontiers was created by the first planetary Decadal Survey and NASA grandfathered New Horizons into the budget line

Outcomes



Notional Schedule for Decadal Survey

- 9/2019 Organizing meeting and town hall at EPSC-DPS
- 11/2019 LPI launches white paper proposal web site*
- 12/2019 Decadal Survey town hall at AGU meeting
- 1/2020 National Academies adopts Statement of Task

https://sites.nationalacademies.org/SSB/SSB_198165

- Jan 2020 Proposals submitted to NASA and NSF and funded
First of a series of community/early-career webinars
- Feb 2020 White paper submission website opens
- 3/15/2020 Early-career event at LPSC; Town Hall time TBD
- Spring Deadline for submission of white papers
- Spring Survey committee and panel meetings begin
- Summer First complete draft of survey report assembled
- Autumn Survey report released

Decadal Early-Career Event at LPSC

**Sunday, March 15, 10:00 a.m. - 12:00 p.m.
Woodlands Waterway Marriott Hotel and
Convention Center.**

**Learn about surveys, engage with experts,
ask questions. Please attend!**

**Free registration at
<http://sgiz.mobi/s3/Early-Career-Event>**

Note: LPSC registration is NOT required

Thank You Questions Welcome!

Additional information:

The Space Studies Board

<http://sites.nationalacademies.org/SSB/index.htm>

The Space Studies Board Decadal Surveys

http://sites.nationalacademies.org/SSB/SSB_052297

Planetary Decadal Statement of Task

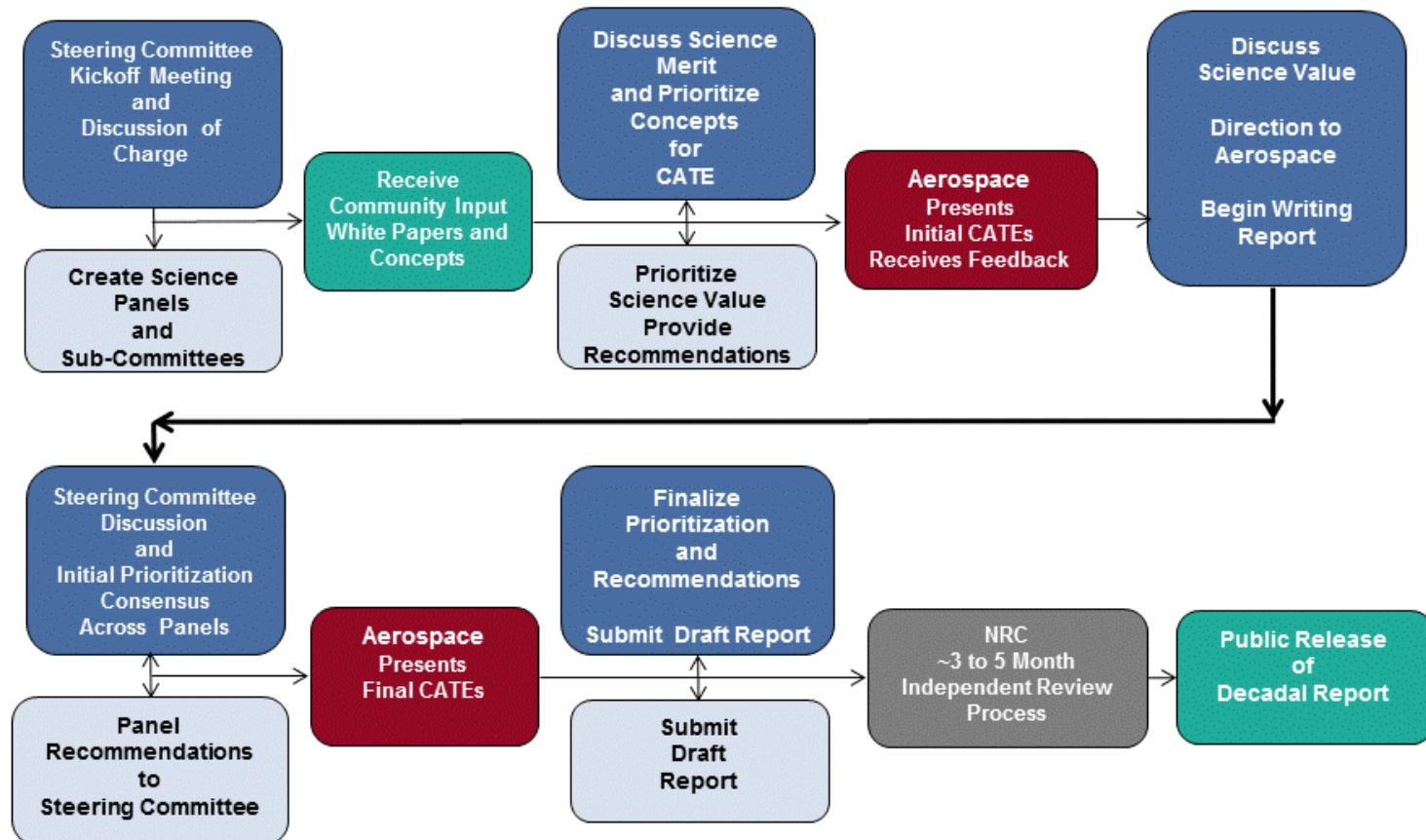
https://sites.nationalacademies.org/SSB/SSB_198165

LPI white paper proposal site

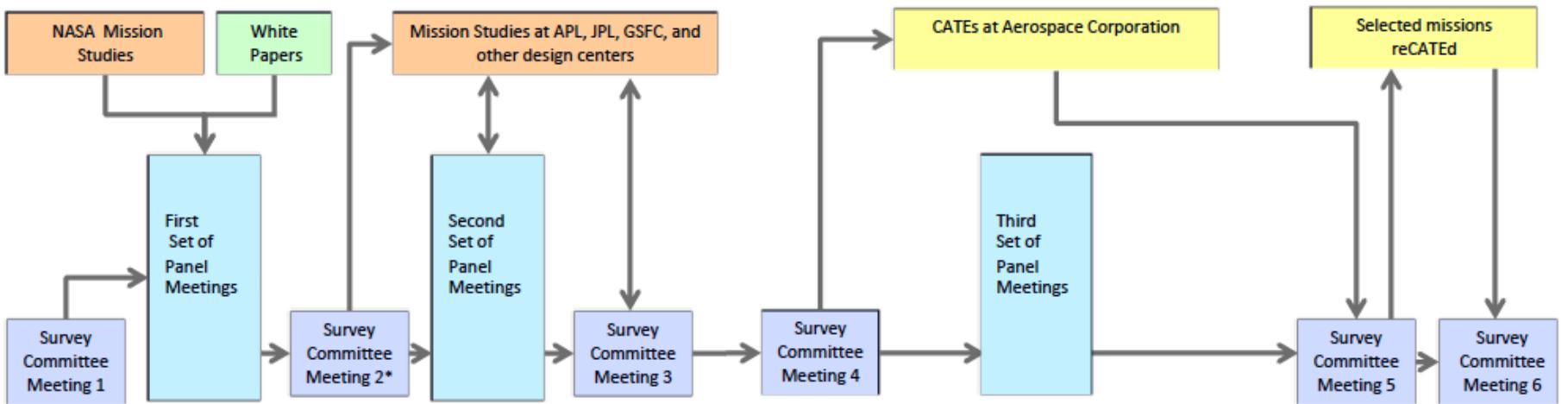
https://www.lpi.usra.edu/decadal_whitepaper_proposals/

BACKUP

Steps in a Typical Survey



Timeline for Second PSDS



July 2009	August 2009	September 2009	October 2009	November 2009	December 2009	January 2010	February 2010	March 2010	April 2010	May 2010	June 2010	July 2010	August 2010	September 2010
7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Months														

Panels formulate science goals and begin to define potential mission concepts based on prior NASA-planning activities and community white papers. Advocates for key mission concepts and other activities are invited to make presentations at panel meetings.

Panels nominate most promising mission concepts for technical studies at design centers. Panel-appointed "science champions" work with their design team to ensure fidelity to the science goals of each mission concept. In some cases, rapid mission architecture studies are followed by more detailed point-design studies.

Mission design reports inform panels as to the technical realism and likely cost of the initial list of priority mission concepts. Panels down-select missions and report back to survey committee.

Panel-nominated mission concepts are assessed by the survey committee, and most, if not all, were forwarded to Aerospace Corporation for independent cost and technical evaluation (CATE). When in doubt, the survey committee deferred to the panels as to the relative priorities within the respective panels areas of responsibility.

Results of Aerospace Corporation's CATEs are briefed to the survey committee, and the CATE reports are forwarded to their respective nominating panels. In two cases, CATEd missions were descoped by their nominating panel and re-CATED. The survey committee determined the relative priorities between the panel-nominated missions.

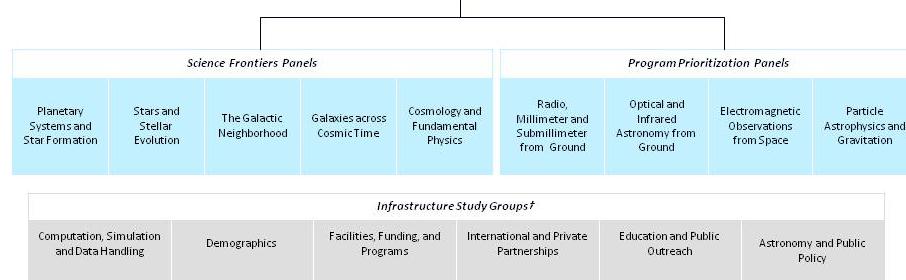
Prior White Paper Specifications

White papers should be consistent with the following guidelines:

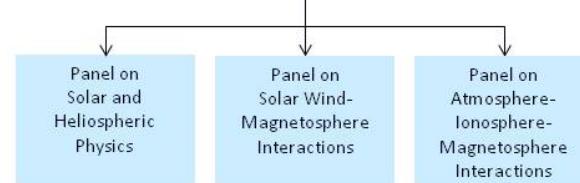
- May not be more than 7 pages in length, single spaced, including all figures, tables, references and appendices. Papers can include web links to other documents among the references;
- Should include a cover page (beyond the 7-page limit) containing the title of the white paper, the primary author's name, phone number, institution, and email address, and a list of co-authors with their respective institutions;
- Use a 12-pt font with 1-inch margins on all sides of the document;
- Papers in Microsoft Word (.doc), Adobe Acrobat (.pdf) formats will be accepted. No other formats will be accepted; and
- White paper file sizes should be as small as possible. White papers larger than 50 Mb in size cannot be accepted, and files much smaller than this are encouraged. For file management purposes, please compress your figures as much as possible. You can provide hyperlinks to higher resolution versions of illustrations if you wish."

No Two Surveys Are the Same

Committee for a Decadal Survey of Astronomy and Astrophysics*



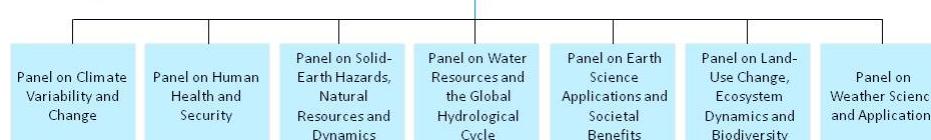
Committee on a Decadal Strategy for Solar and Space Physics



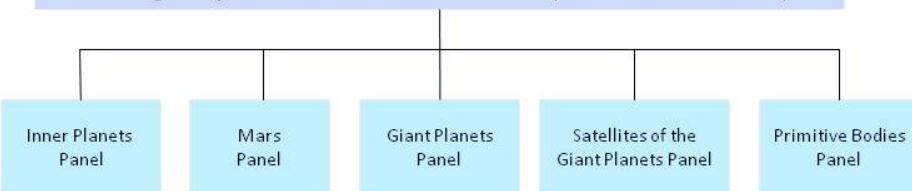
National Capabilities Working Groups*



Committee on Earth Science and Applications from Space



Steering Group of the Committee on the Planetary Science Decadal Survey



Planetary2011 Decadal Decision Rules: An Early Example

- Recommend 2 scenarios: an optimistic scenario and a cost-constrained program matched to the budget guidance provided by NASA.
 - By the time of publication, both assumptions proved too optimistic.
- Guidance: Descope or delay flagship missions. Changes to the NF or Discovery programs should be considered only if adjustments to flagship missions cannot solve the problem. High priority on preserving funding for research and analysis programs and for technology development.