

National Aeronautics and
Space Administration



EXPLORE SCIENCE

**Lori S. Glaze, Ph.D., NASA Planetary
Science Division Director**

**Planetary Science and Astrobiology
Decadal Survey Initial Response
Townhall**

August 18, 2022

Thank You to All

Steering Group	Moon and Mercury	Venus	Mars	Small Bodies	Ocean Worlds & Dwarf Planets	Giant Planet Systems
Robin Canup*	Tim Grove	Paul Byrne	Vicky Hamilton	Nancy Chabot	Alex Hayes	Jonathan Lunine
Phil Christensen*	Brett Denevi	Larry Esposito	Bethany Ehlmann	Carol Raymond	Francis Nimmo	Amy Simon
Mahzarin Banaji	James Day	Giada Arney	Will Brinckerhoff	Paul Abell	Morgan Cable	Frances Bagenal
Steve Battel	Alex Evans	Amanda Brecht	Tracy Gregg	Bill Bottke	Alfonso Davila	Richard Dissly
Lars Borg	Sarah Fagents	Thomas Cravens	Jasper Halekas	Megan Bruck Syal	Glen Fountain	Leigh Fletcher
Athena Coustenis	Bill Farrell	Kandis Jessup	Jack Holt	Harold Connolly	Chris German	Tristan Guillot
James Crocker	Caleb Fassett	James Kasting	Joel Hurowitz	Tom Jones	Chris Glein	Matthew Heldman
Brett Denevi	Jennifer Heldmann	Scott King	Bruce Jakosky	Stefanie Milam	Candice Hansen	Ravit Helled
Bethany Ehlmann	Toshi Hirabayashi	Bernard Marty	Michael Manga	Ed Rivera-Valentin	Emily Martin	Kathleen Mandt
Larry Esposito	James Keane	Thomas Navarro	Hap McSween	Dan Scheeres	Marc Neveu	Alyssa Rhoden
Orlando Figueroa	Francis McCubbin	Joseph O'Rourke	Claire Newman	Rhonda Stroud	Carol Paty	Paul Schenk
John Grunsfeld	Miki Nakajima	Jennifer Rocca	Miguel San Martin	Myriam Telus	Lynnae Quick	Michael Wong
Julie Huber	Mark Saunders	Alison Santos	Kirsten Siebach	Audrey Thirouin	Jason Soderblum	
Krishan Khurana	Sonia Tikoo-Schantz	Jennifer Whitten	Amy Williams	Chad Trujillo	Krista Soderlund	
Bill McKinnon			Robin Wordsworth	Ben Weiss		
Francis Nimmo						
Carol Raymond						
Barbara Sherwood Lollar						
Amy Simon						

*Co-Chairs

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

ORIGINS, WORLDS, AND LIFE

A Decadal Strategy for Planetary Science & Astrobiology
2023–2032

Initial Response – Part 1

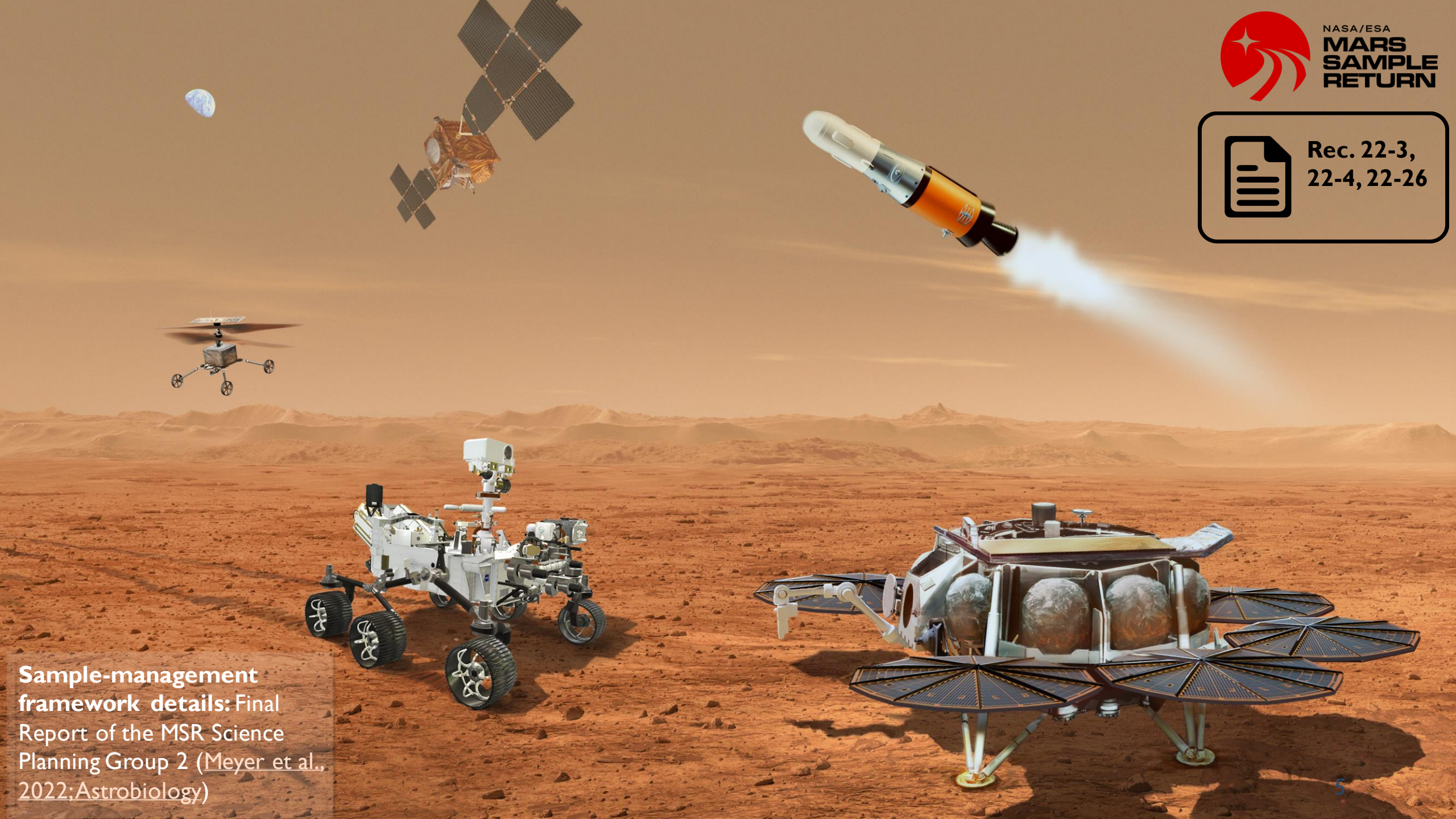




NASA/ESA
**MARS
SAMPLE
RETURN**

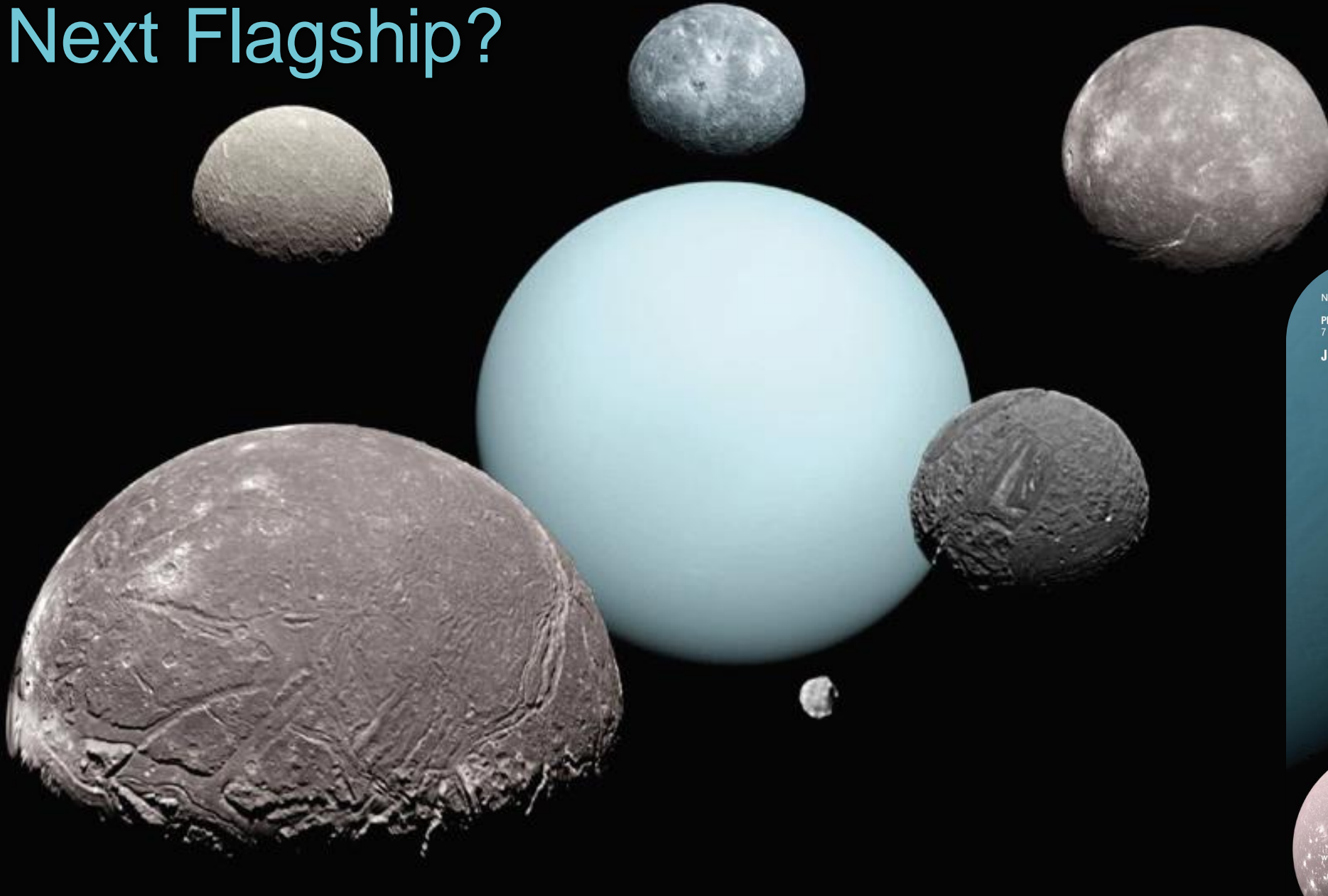


Rec. 22-3,
22-4, 22-26



**Sample-management
framework details: Final
Report of the MSR Science
Planning Group 2 (Meyer et al.,
2022;Astrobiology)**

Next Flagship?



Chapter 22

National Aeronautics and Space Administration

PLANETARY MISSION CONCEPT STUDY FOR THE 2023-2032 DECADAL SURVEY
7 June 2021



Journey to an Ice Giant System

URANUS
ORBITER & PROBE

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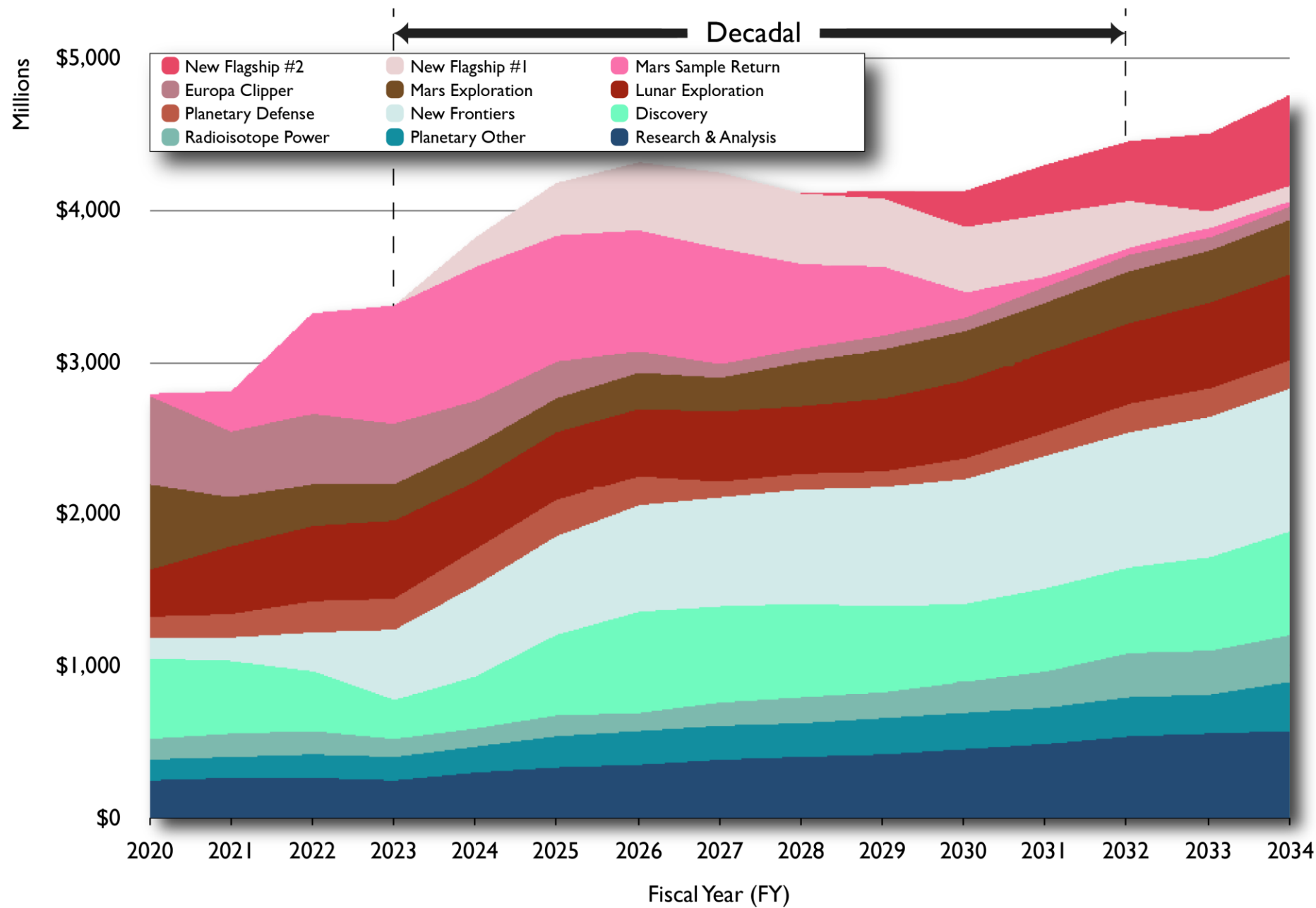
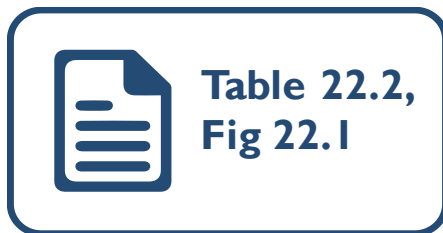
www.nasa.gov

Money Talk



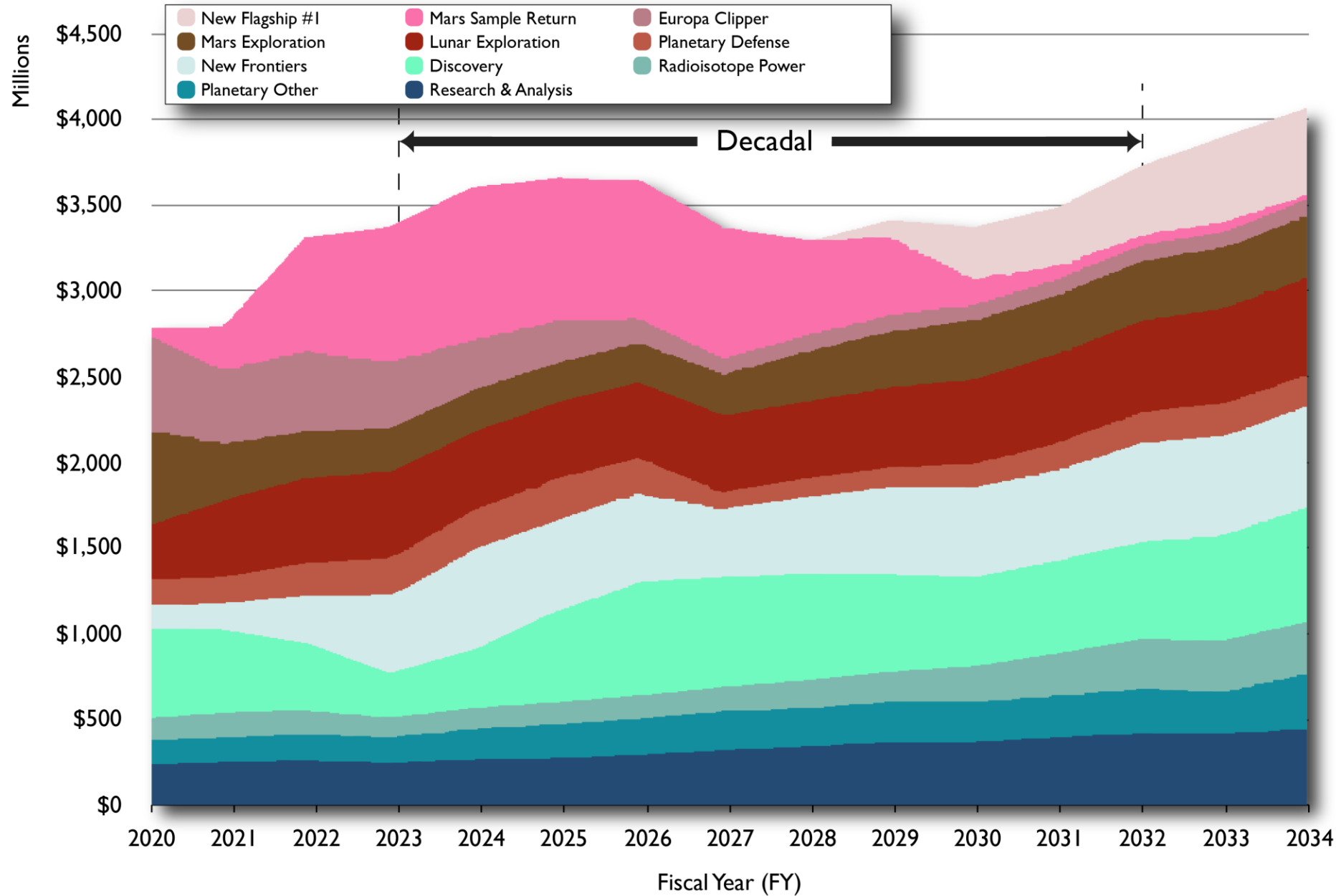
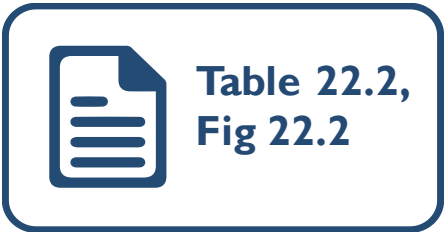
Recommended Program

**Total PSD budget
FY23– FY32:
\$41,120M**



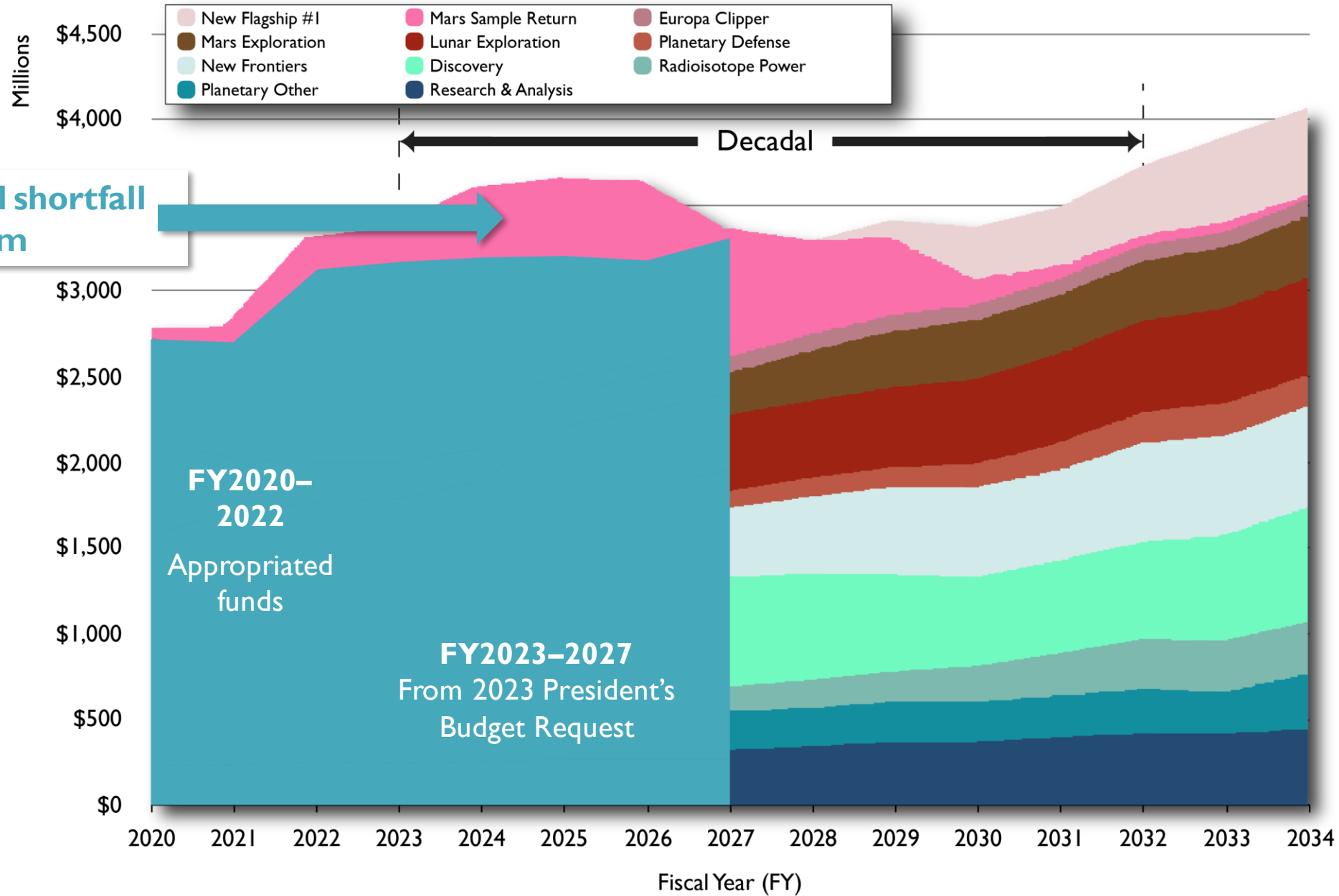
Level Program

Total PSD budget
FY23– FY32:
\$34,990M



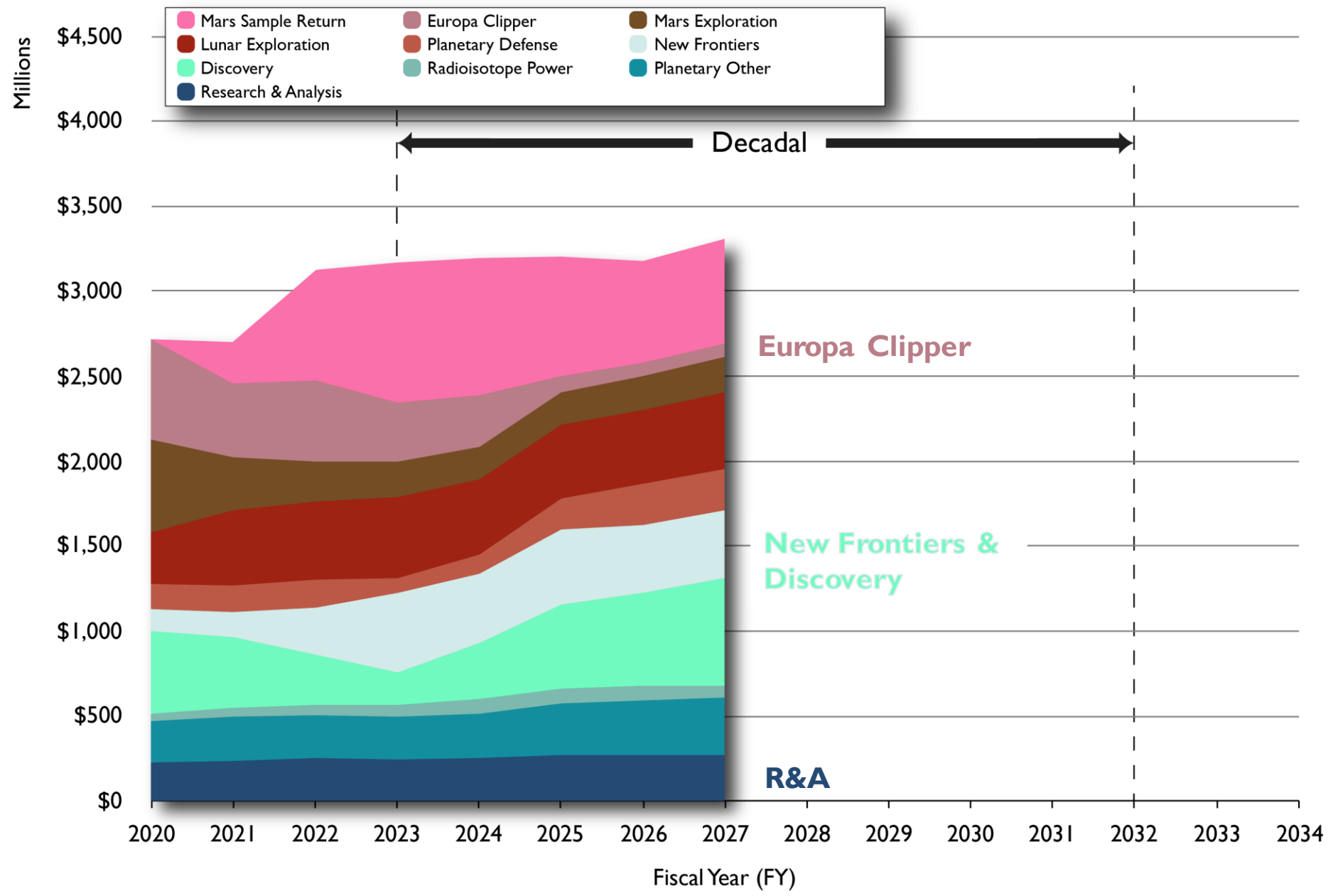
Current Planning Budget

Substantial shortfall in near term



Other Budget Things

 Rec. 22-2, 17-11



Budgetary Decision Rules

Priority order:

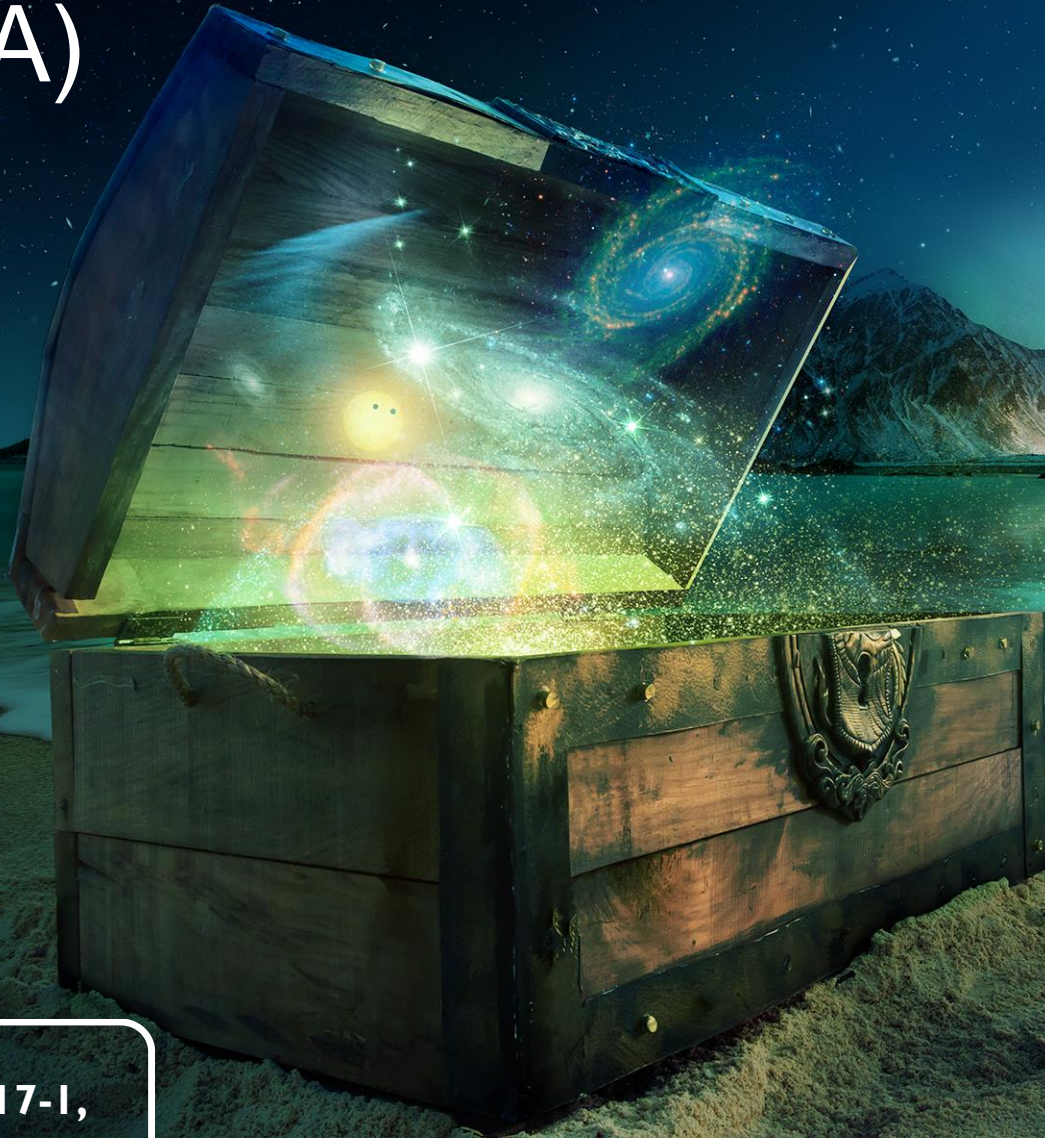
1. Delay the start of the next Flagship mission;
2. Reduce the number of new Discovery missions to four;
3. Reduce the funding level for Planetary Defense by removing the new-start mission after NEO Surveyor;
4. Reduce the cadence of New Frontiers in the coming decade;
5. Reduce the funding level for LDEP with a late-decade start of Endurance-A;
6. Reduce the funding level for MEP below the Level program;
7. Reduce the number of new Discovery missions to three; and
8. Reduce R&A funding.



Initial Response – Part 2



Research & Analysis (R&A)



What is “R&A”?

- *Planetary R&A Portfolio*: all activities funded under the R&A Budget line
- *Planetary Research Program*: all research activities funded within the R&A Portfolio and those funded under mission lines
- Openly competed programs: solicitation is publicly announced and available, but may have eligibility requirements

ISFMs

- A key principle of Internal Scientist Funding Model (ISFM): “*ISFM work may also involve contractors and external collaborators*”
- More information **available online**

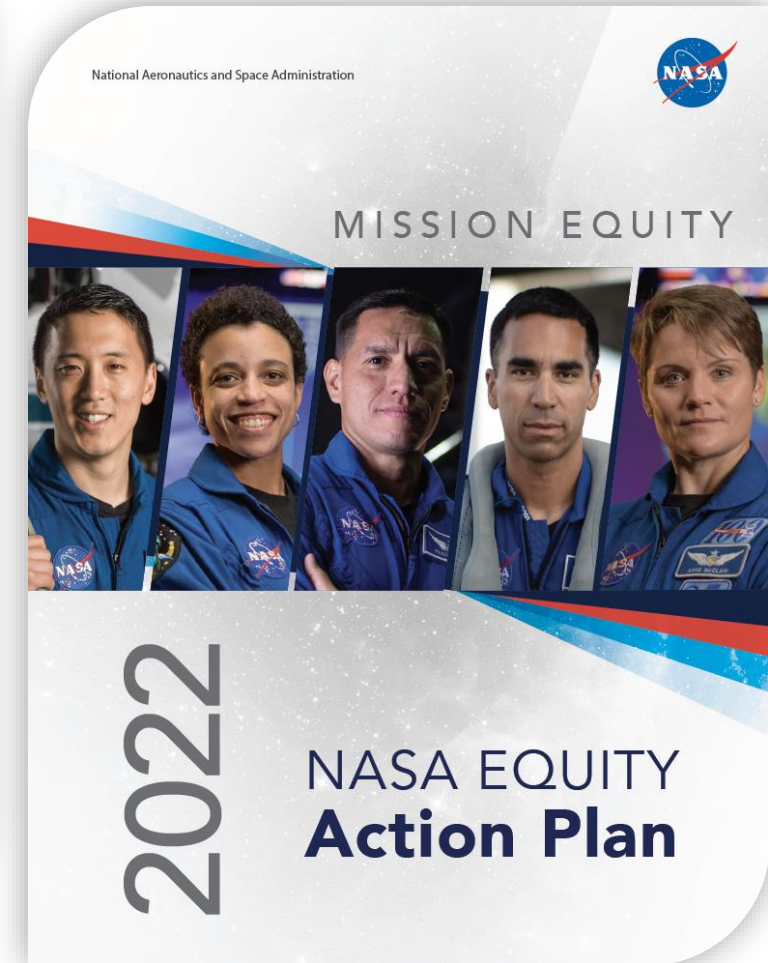


Rec. 17-1,
17-2

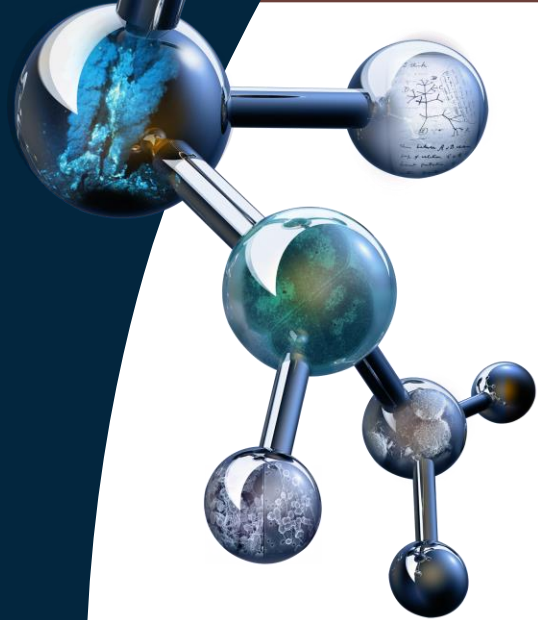
State of the Profession



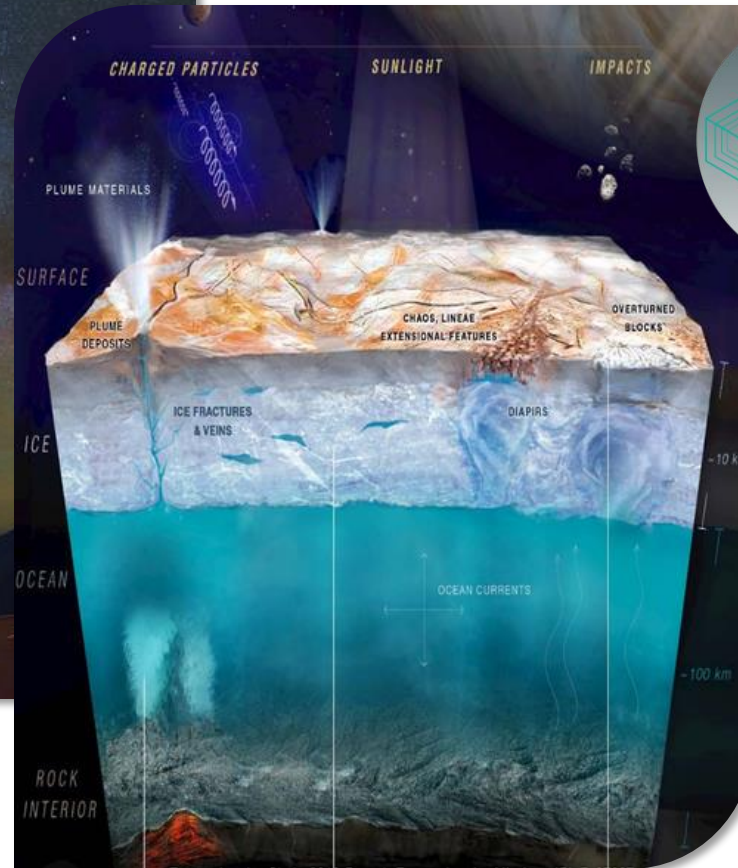
Chapter 16



Astrobiology



Rec. 22-16,
22-17



Research
Coordination
Networks



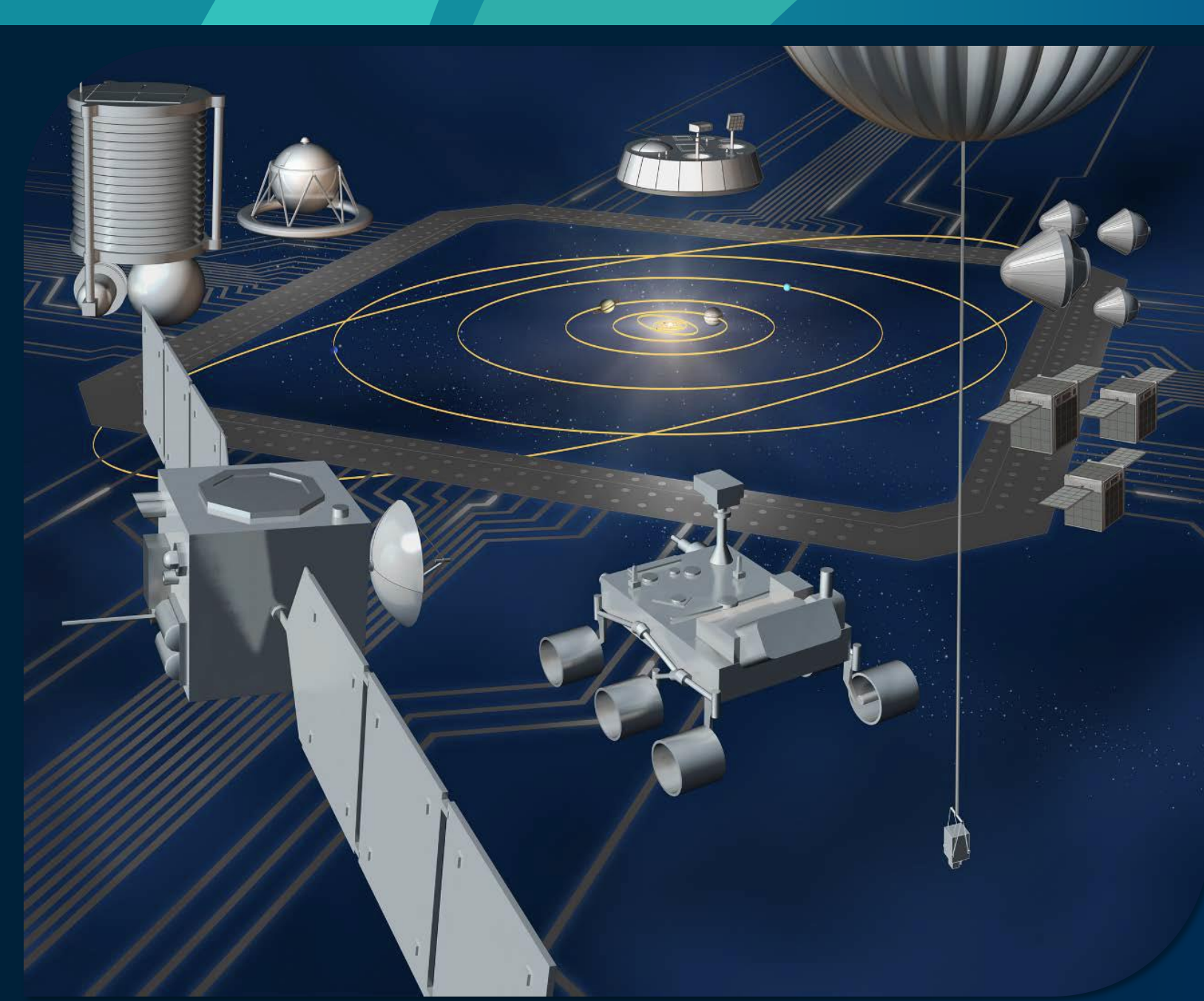
Scientific Exploration Strategies?



“NASA should develop scientific exploration strategies, as it has for Mars, in areas of broad scientific importance, e.g., Venus and ocean worlds, that have an increasing number of U.S. mission and international collaboration opportunities”



Rec. 22-5



Technology

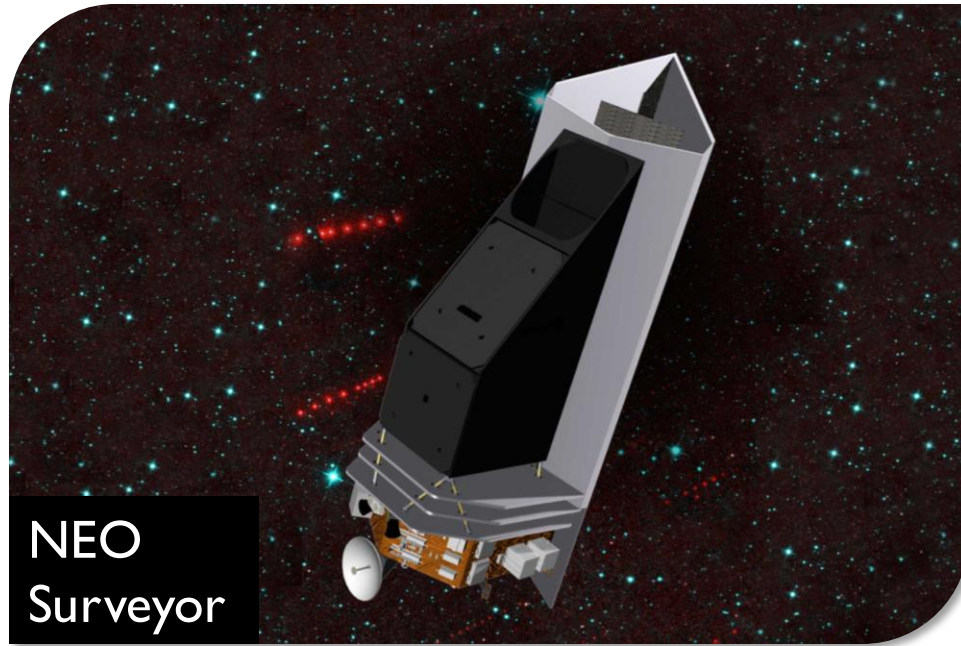


Rec. 21-2

2015 PSD Technology
Plan [available online](#)



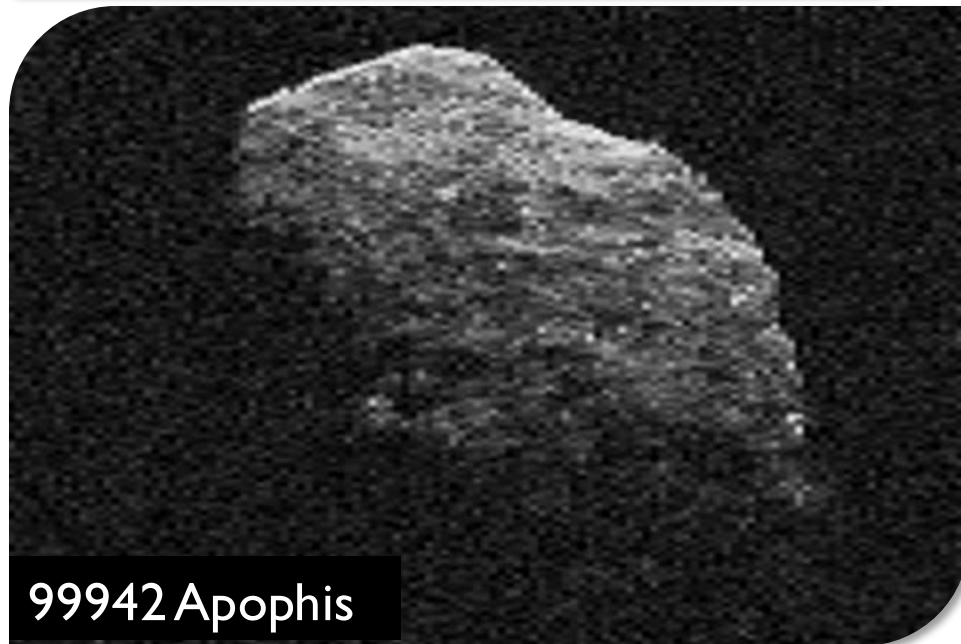
Planetary Defense



NEO
Surveyor



Rec. 18-2,
18-4, 18-6,
18-9



99942 Apophis



LUNAR SURFACE EXPLORATION

2022-2026

NASA AWARDED CLPS DELIVERY GOALS

PEREGRINE-1/2-AB / ASTROBOTIC

- Regolith volatiles composition
- Local radiation environment

1ST NOVA-C / 2-IM & 20C / INTUITIVE MACHINES

- Plume/surface interactions, charged particles near surface
- Lander prop tank gauge test

2ND NOVA-C / PRIME-1/INTUITIVE MACHINES

- Drilling for volatiles

XL-1 / 19C / MASTEN

- Regolith volatiles composition
- Surface terrain & mineralogy

BLUE GHOST-1/19D / FIREFLY

- Characterize Earth's magnetosphere and Moon's interior

GRIFFIN-1/20A / ASTROBOTIC

VIPER / NASA

- Search for volatiles, below surface and in permanently shadowed regions

3RD NOVA-C / CP-11 / INTUITIVE MACHINES

- Characterize Earth's magnetosphere and Moon's interior

SERIES-2 / CP-12 / DRAPER

- Characterize geophysical properties of the lunar interior as well as electric and magnetic properties

KEY

- HUMAN EXPLORATION
- SCIENCE
- SPACE TECHNOLOGY
- ★ CLPS DELIVERY



Rec. 22-10,
22-11

SOUTH POLE SURFACE MISSIONS



1 2ND NOVA-C
SHACKLETON
CONNECTING RIDGE
★★



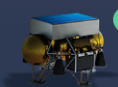
4 CP-22
SOUTH POLE
★



3 GRIFFIN-1
& VIPER
NOBILE CRATER
★★



5 UNCREWED
LANDER DEMO
SOUTH POLE



2 XL-1
HAWORTH CRATER
★★





HUMANITY'S RETURN TO THE MOON

Planned launches:

Artemis I: Aug 29, 2022

Artemis II: 2024

Artemis III: 2025

Artemis IV+: 2027 and beyond



Rec. 19-2,
19-4

Stay Engaged!

A composite image of a night beach scene. In the background, there are mountains, a crescent moon, and a bird flying. A vibrant green aurora borealis is visible in the sky. In the foreground, two children are crouching on a sandy beach, looking at a glowing red treasure chest. The chest is emitting a bright green light that illuminates the children and the surrounding area.

NASEM Committee on Astrobiology and Planetary Sciences (CAPS)

Next meeting:
September 28 and 29,
2022 (Irvine, CA/hybrid)

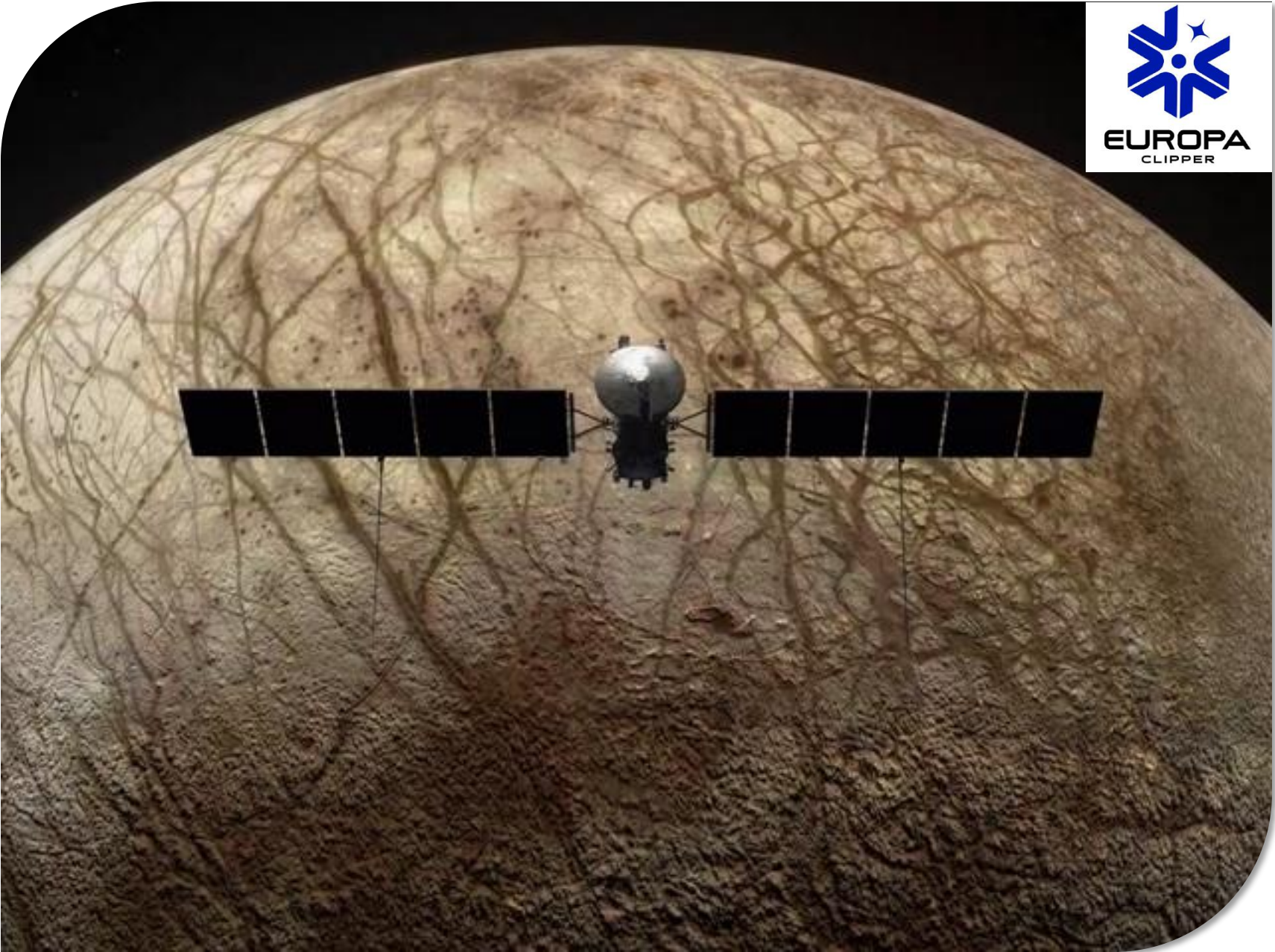
Planetary Science Assessment/Analysis Groups

Astrobiology Research Coordination Networks

Planetary Science Advisory Committee

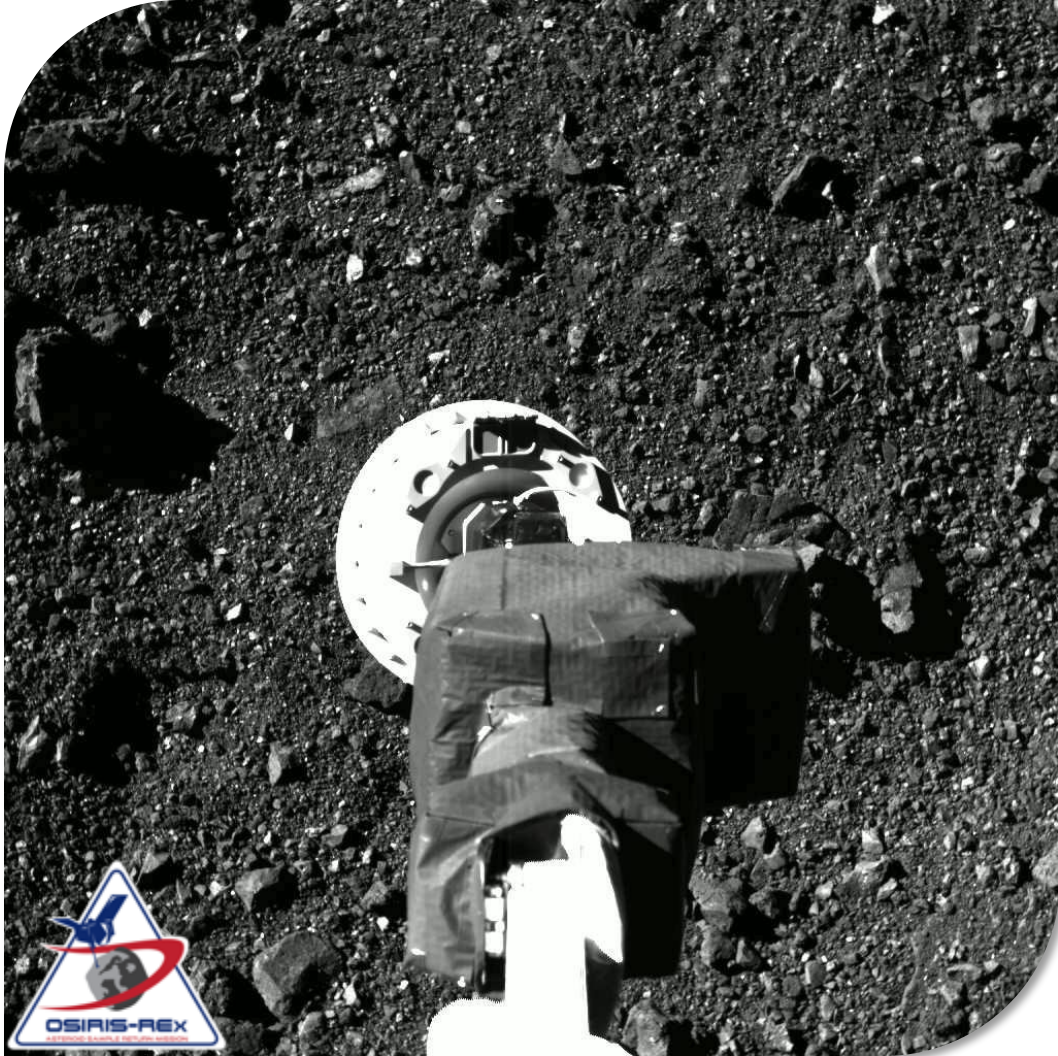
Next meeting (TBC):
December 5 and 6, 2022

Coming Soon in
PSD



Targeted Launch:
October 2024
Jupiter Orbit
Insertion: April 2030
Science Instruments: 9

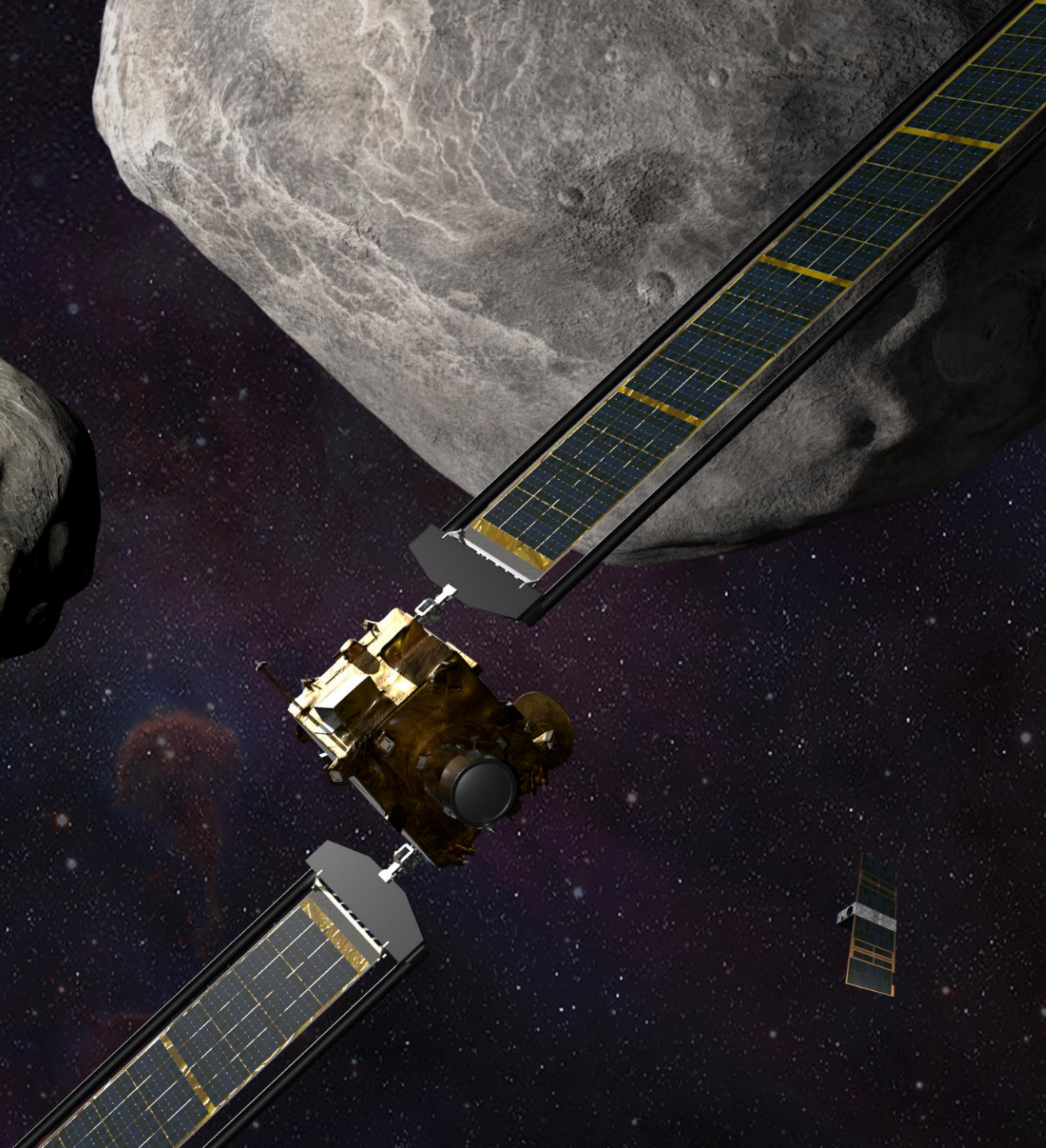
OSIRIS-REx / APEX





DART

Double Asteroid Redirection Test



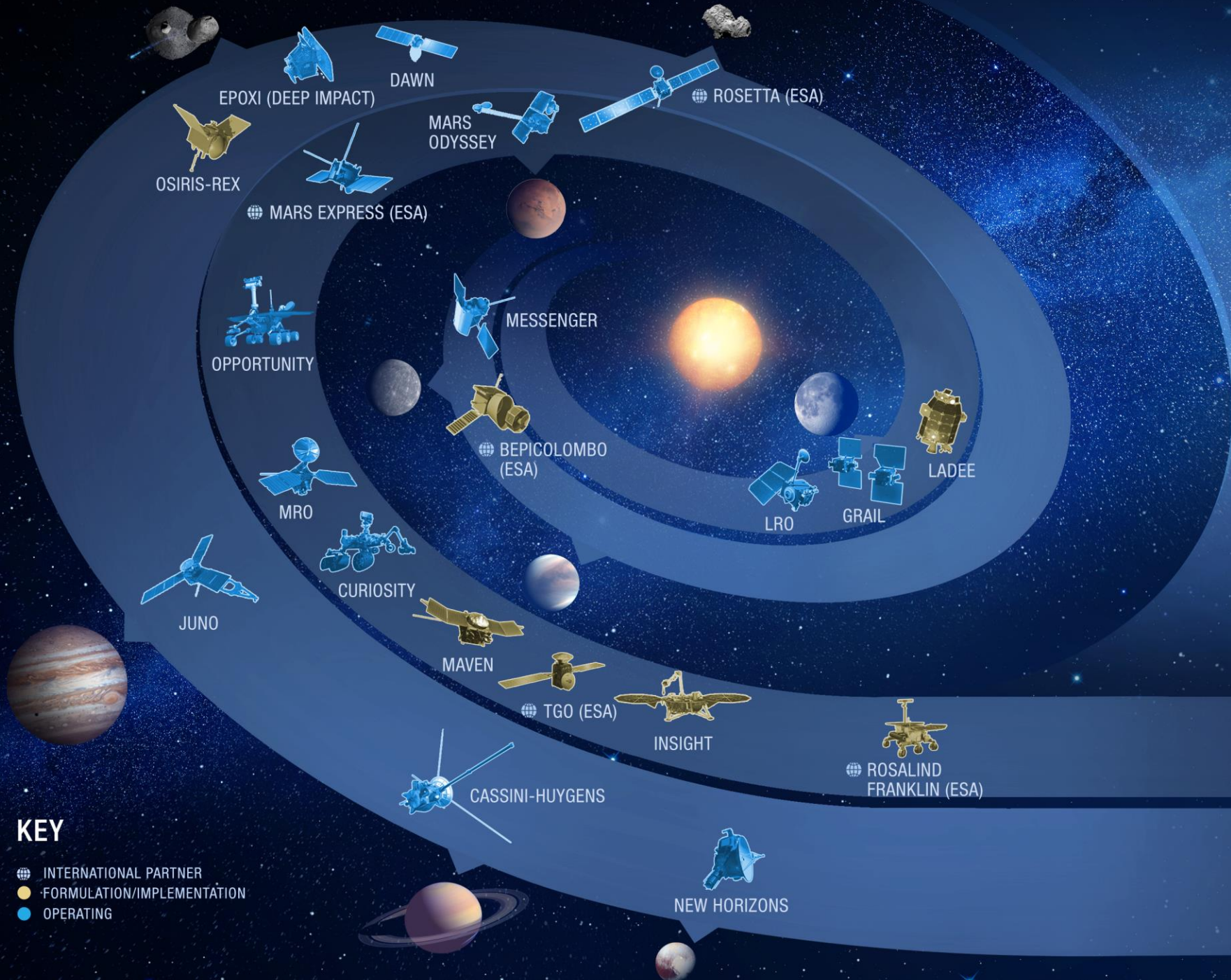
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7:14 pm Eastern**

Wind the Clock





PLANETARY FLEET 2012



MOON & MARS

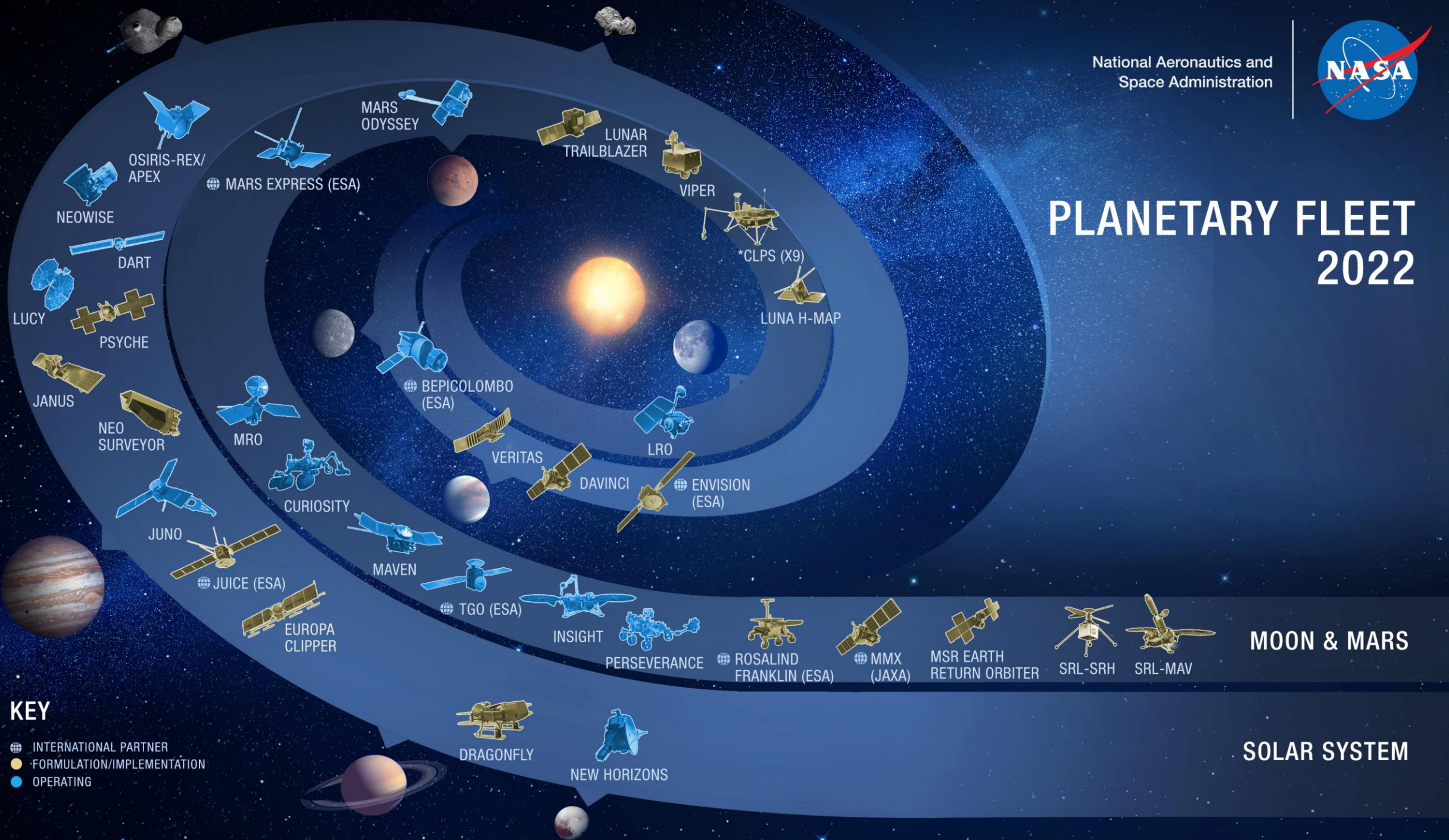
SOLAR SYSTEM

KEY

- INTERNATIONAL PARTNER
- FORMULATION/IMPLEMENTATION
- OPERATING



PLANETARY FLEET 2022



KEY

- INTERNATIONAL PARTNER
- FORMULATION/IMPLEMENTATION
- OPERATING

MOON & MARS

SOLAR SYSTEM

EXPLORE



With Us

