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

Committee on Astrobiology and Planetary Sciences

September 28, 2022

DART

Double Asteroid Redirection Test

Dimorphos

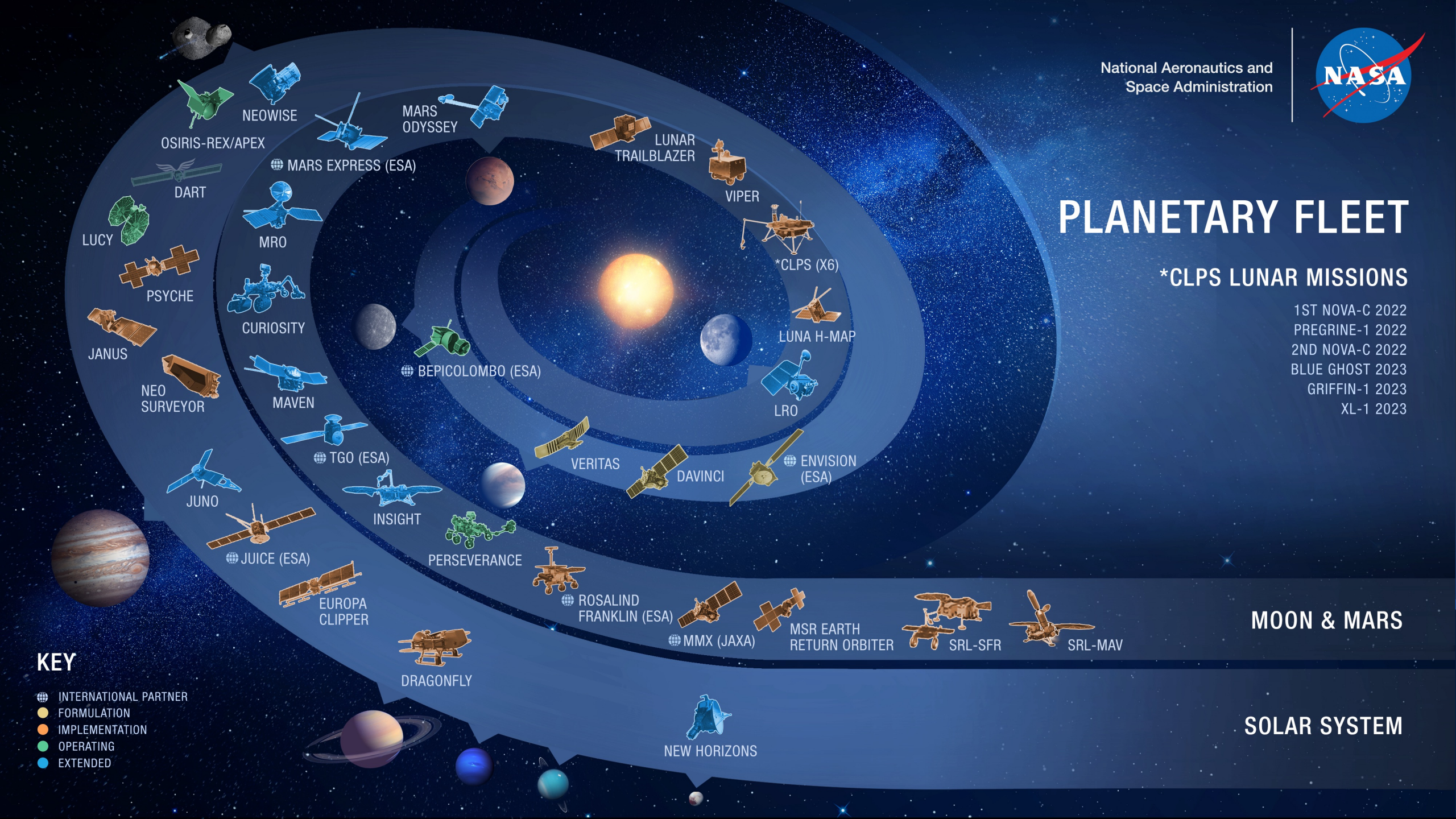
Impact:

Sep 26, 2022

7:14 pm Eastern!

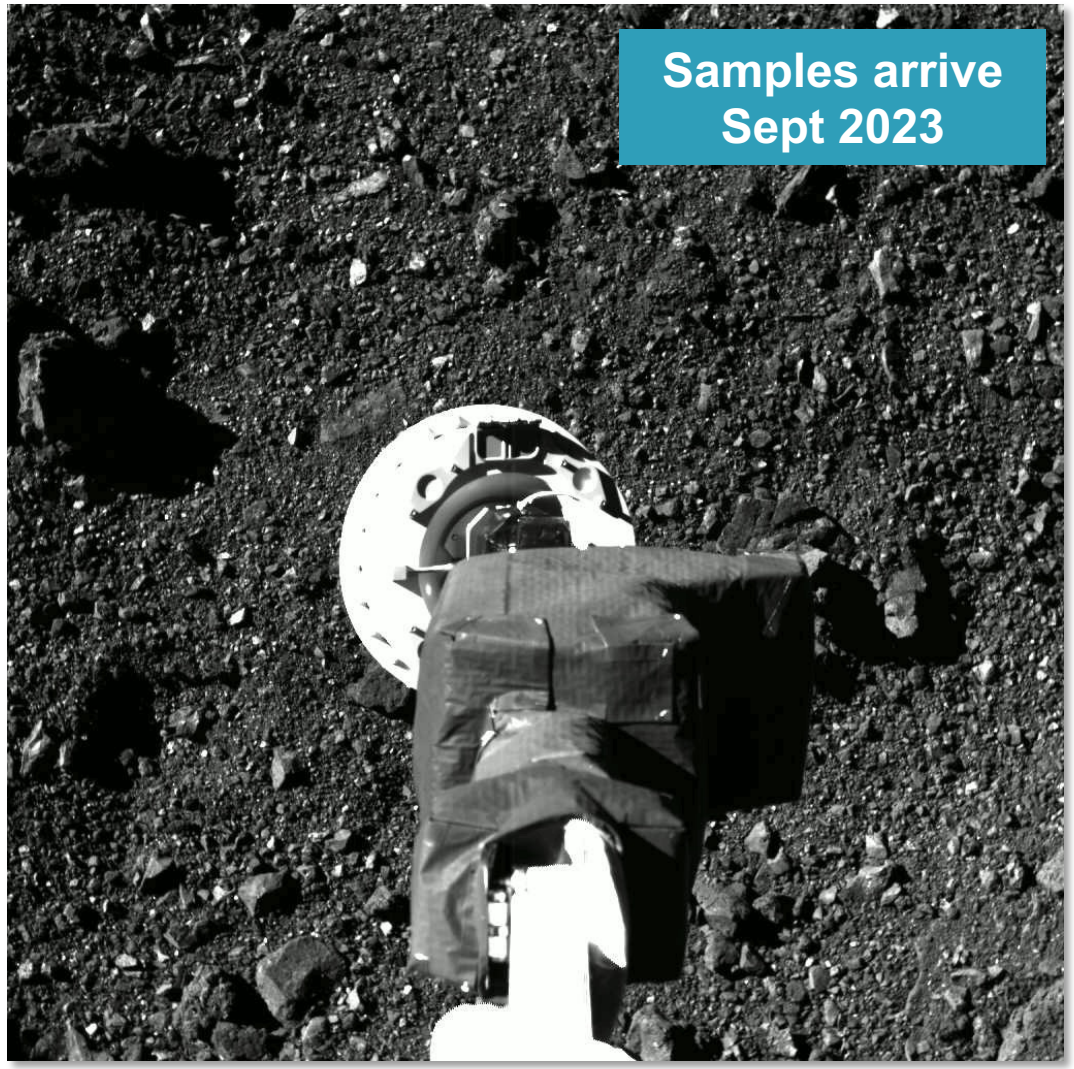
LICIACube image showing aftermath of DART impact (ASI/NASA)

Last complete image (~100 ft across) from DRACO. Taken ~7 miles from impact and 2 seconds before impact

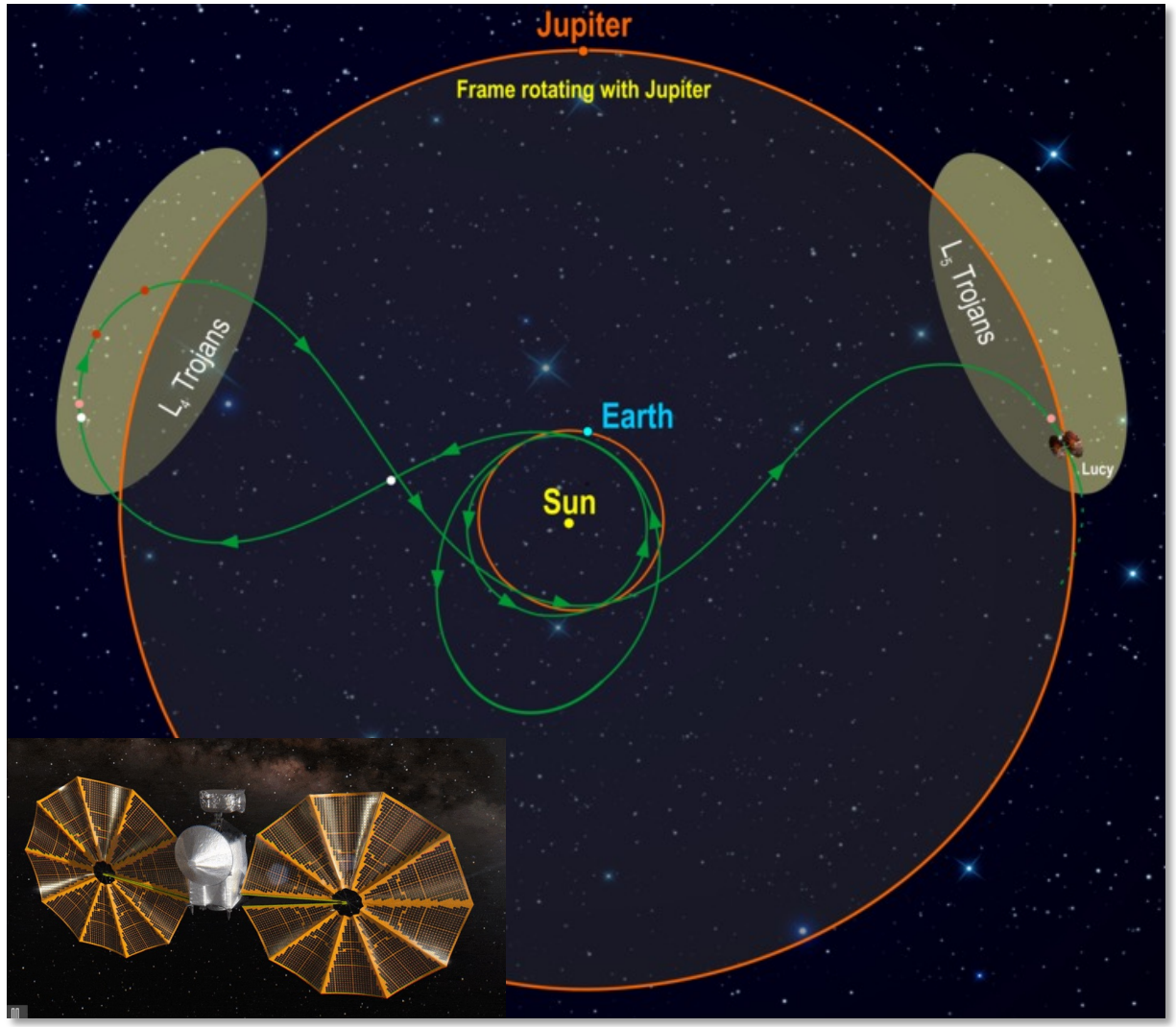

National Aeronautics and Space Administration
NASA
PLANETARY FLEET
*CLPS LUNAR MISSIONS
1ST NOVA-C 2022
PREGRINE-1 2022
2ND NOVA-C 2022
BLUE GHOST 2023
GRIFFIN-1 2023
XL-1 2023
NEOWISE
OSIRIS-REX/APEX
MARS ODYSSEY
MARS EXPRESS (ESA)
DART
LUCY
MRO
PSYCHE
CURIOSITY
JANUS
NEO SURVEYOR
MAVEN
BEPICOLOMBO (ESA)
TGO (ESA)
JUNO
INSIGHT
JUICE (ESA)
PERSEVERANCE
EUROPA CLIPPER
ROSALIND FRANKLIN (ESA)
DRAGONFLY
LUNAR TRAILBLAZER
VIPER
*CLPS (X6)
LUNA H-MAP
LRO
VERITAS
DAVINCI
ENVISION (ESA)
MMX (JAXA)
MSR EARTH RETURN ORBITER
SRL-SFR
SRL-MAV
NEW HORIZONS
MOON & MARS
SOLAR SYSTEM
KEY
INTERNATIONAL PARTNER
FORMULATION
IMPLEMENTATION
OPERATING
EXTENDED

Mission Updates

OSIRIS-REx

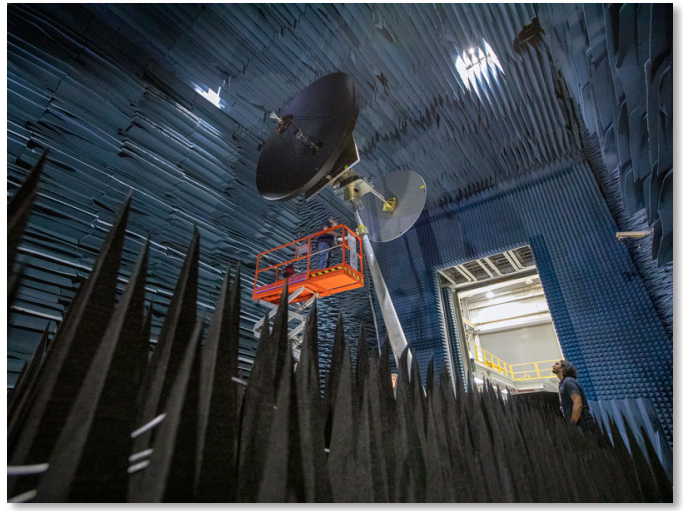


Lucy

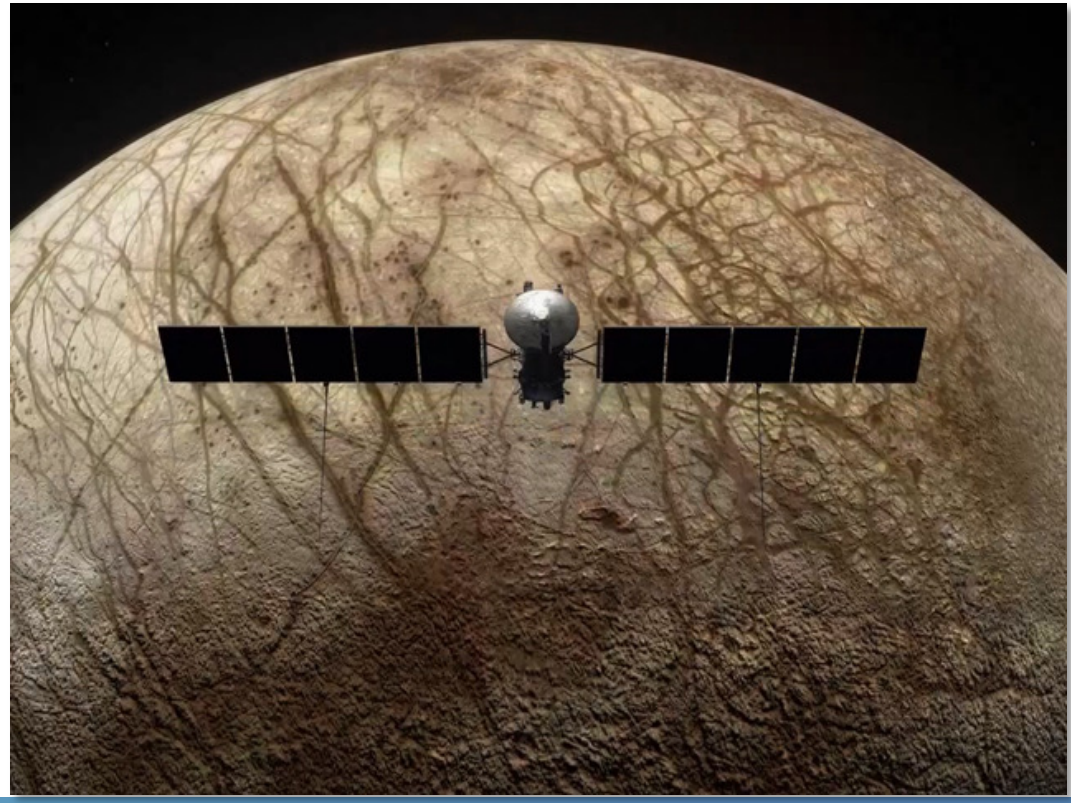


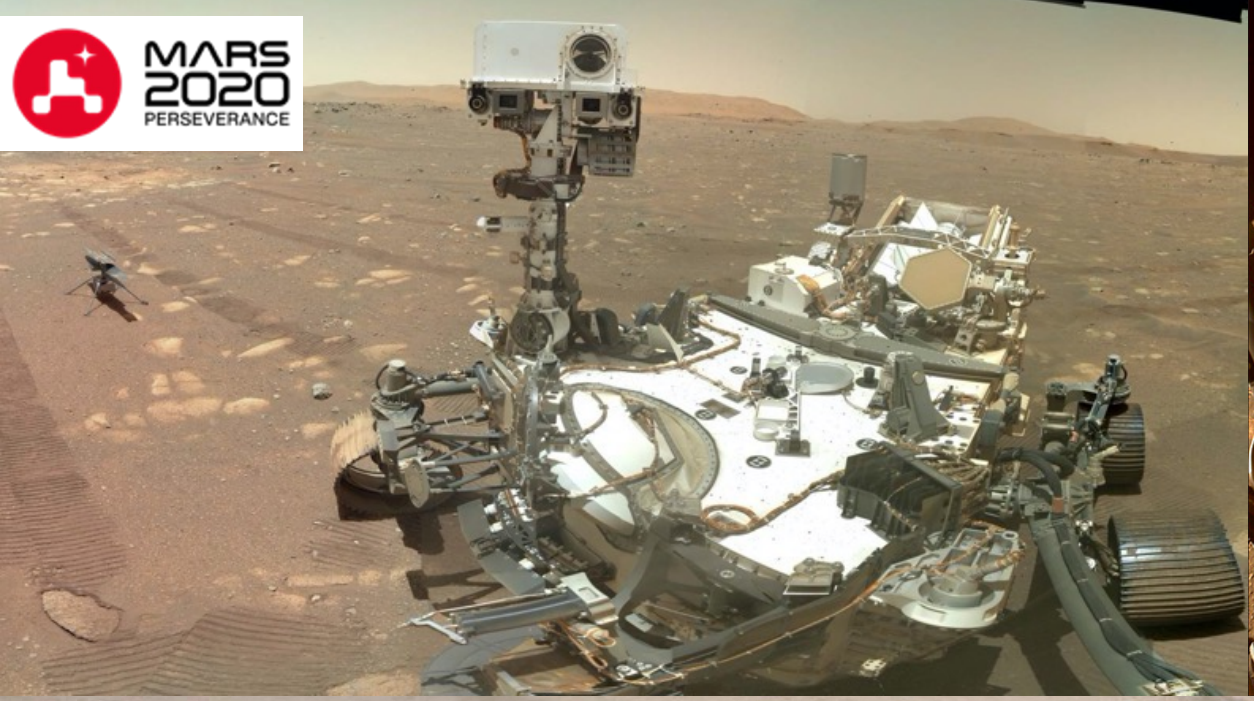
Europa Clipper

- ATLO pace is accelerating: live feed from High Bay
- Five (of nine) science instruments have been delivered:
  - Plasma Instrument for Magnetic Sounding (PIMS)
  - Europa Imaging System Wide-Angle Camera (EIS WAC)
  - Europa Thermal Emission Imaging System (E-THEMIS)
  - Europa Ultraviolet Spectrograph (E-UVS)
  - Surface Dust Analyzer (SUDA)
- More hardware and science instruments expected by end of 2022
- Target launch: October 2024
- Jupiter Orbit Insertion: April 2030

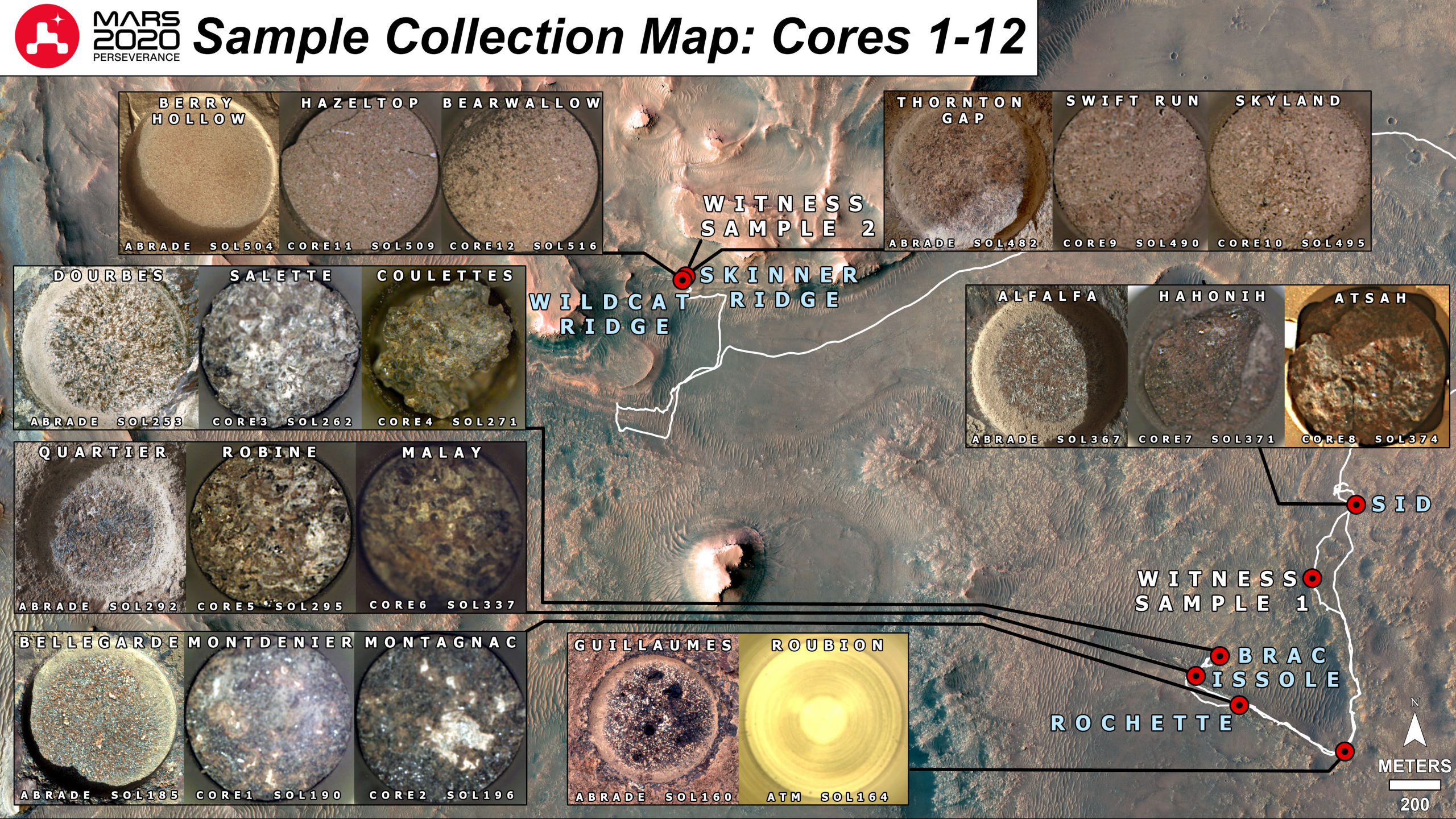


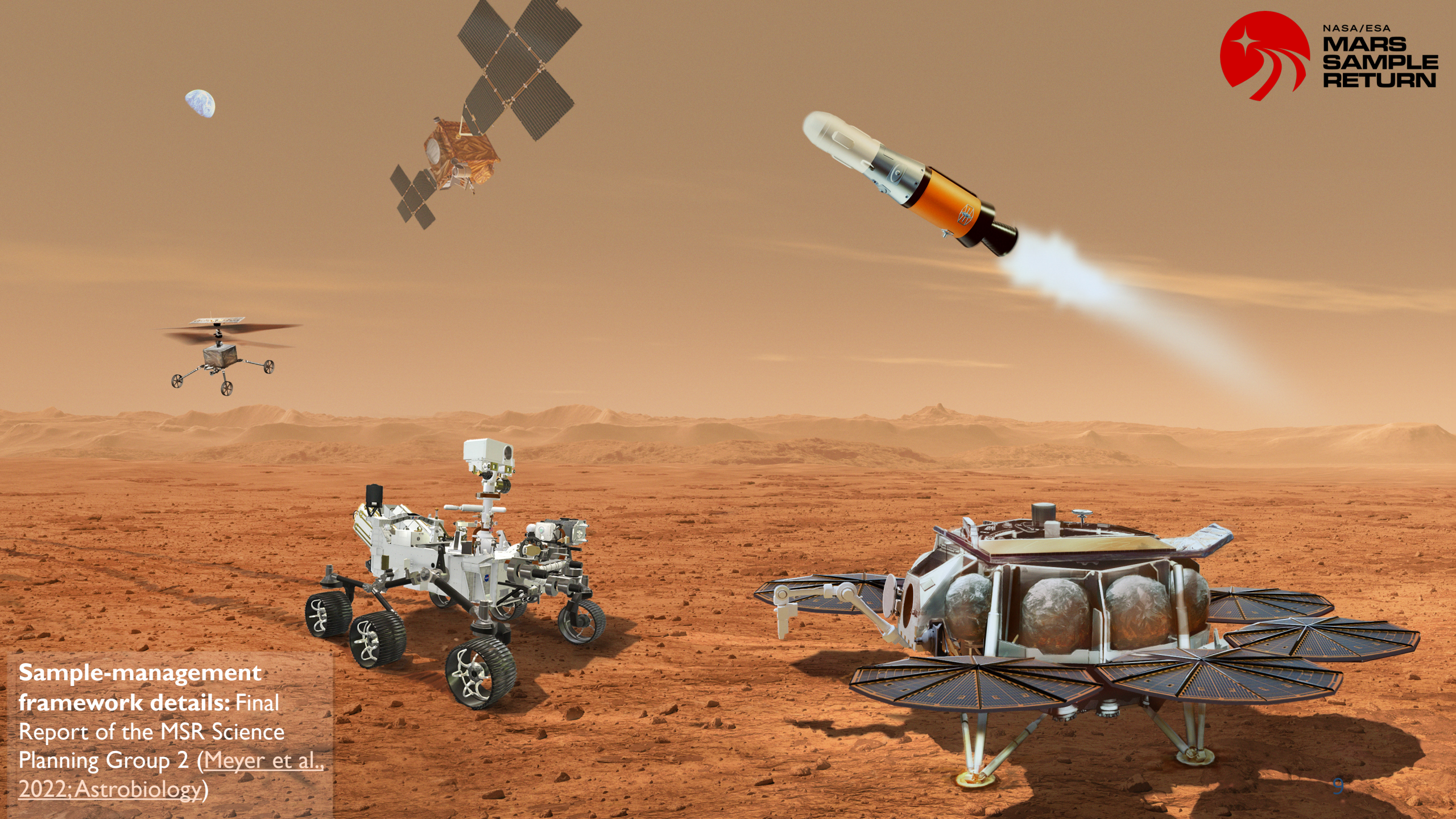
Top left: *Spacecraft main body inspection at JPL.*
Top right: *High-gain antenna testing at Experimental Test Range, NASA Langley Research Center*




MARS
2020
PERSEVERANCE

MARS 2020 PERSEVERANCE Sample Collection Map: Cores 1-12



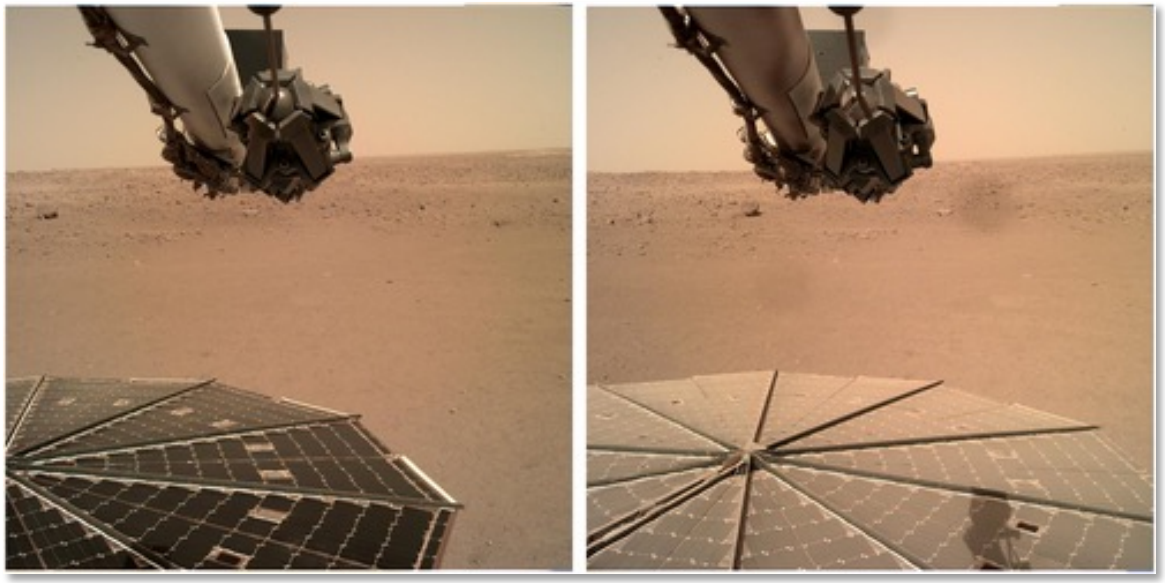


Sample-management framework details: Final Report of the MSR Science Planning Group 2 (Meyer et al., 2022; Astrobiology)

InSight

- Continuing to map Mars seismic activity: more than 1,300 ‘marsquakes’ detected to date
- Available power stable for the last ~100 sols, but expected to begin dropping again around early October
- Science operations expected to cease sometime in the fall
  - Current SEIS strategy: ~24 hours on / ~24 hours off
  - Available energy stressing SEIS on-time
- Detected seismic waves from four meteoroid impacts in 2020 and 2021
- For latest updates: https://blogs.nasa.gov/insight/

Craters formed by a Sept. 5, 2021 meteoroid impact on Mars detected by SEIS (white lines: crater outlines; blue: enhanced color of disturbed soil)

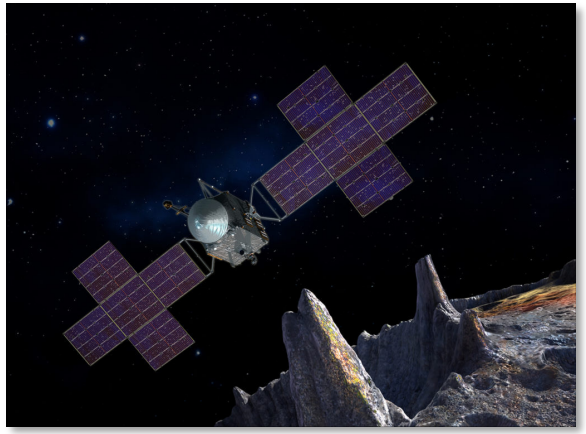


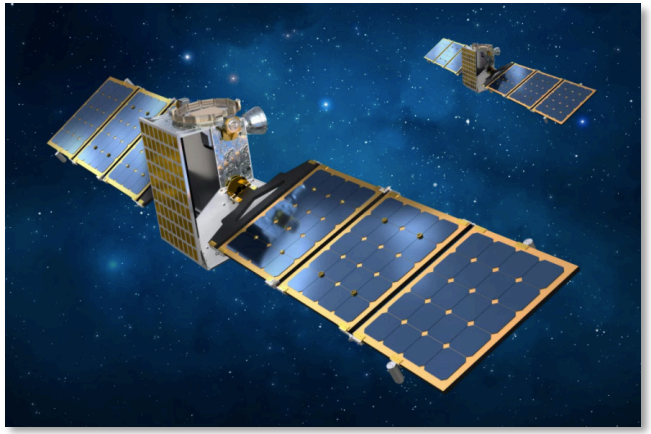
Accumulation of dust on InSight’s solar arrays: stressing energy levels

PSD Challenges

Psyche (Janus)

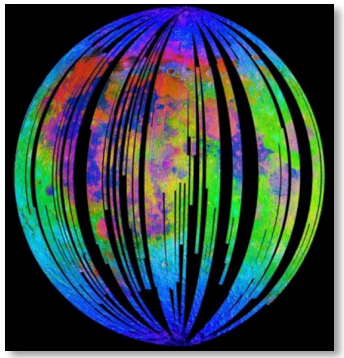
- Continuation/termination review early November
- NASA has commissioned an Independent Review Board to:
  - Examine issues that led to missing planned 2022 launch opportunity
  - Review the mission's path forward





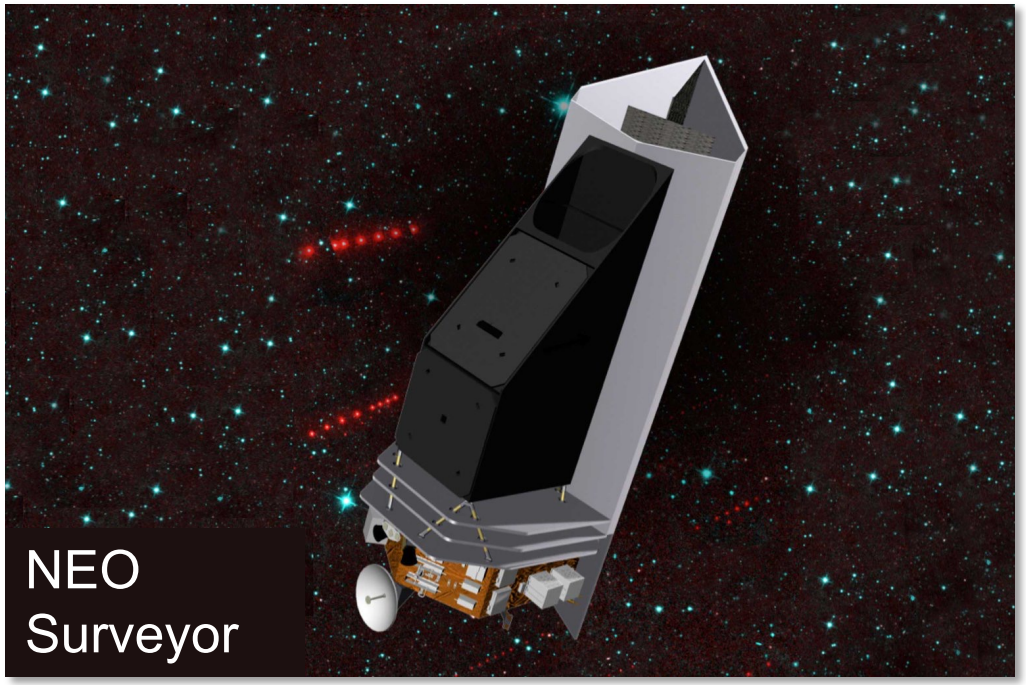
Lunar Trailblazer (SIMPLEx-2)

- Removed from IMAP manifest, now set to launch on Intuitive Machines-2 (IM-2) PRIME-1 CLPS delivery
- Cost review will take place in early November
- Mission goal: understand the form, abundance, and distribution of water on the Moon and the lunar water cycle
- Two instruments: High-resolution Volatiles and Minerals Moon Mapper (HVM^3) and Lunar Thermal Mapper (LTM)



NEO Surveyor

- Dedicated Planetary Defense Mission
- Space-based infra-red telescope designed for NEO detection, tracking, and characterization
- Mission Objectives:
  - Find 2/3 of Potentially Hazardous Asteroids >140m in 5 years (goal: >90% in 10 years)
  - Characterize the frequency of impacts from asteroids >50m and from comets
  - Provide capability to collect and verify additional observations, to derive improved orbital and physical characterizations of specific objects of interest
- Preliminary Design Review (PDR) held September 20–24, 2022
- KDP-C scheduled for late November 2022
- FY23 PBR delays launch to NET 2028



Community Updates

New Frontiers 5

- Fifth Community Announcement released September 1, 2022
  - Shares some policies under consideration for the AO and invites public comment to NASA
- Current planned schedule:
  - Estimated release of draft AO: November 2022
  - Estimated release of final AO: November 2023
  - Estimated proposal due date: March 2024
- Draft mission themes:
  - Comet Surface Sample Return
  - Lunar South Pole-Aitken Basin Sample Return
  - Ocean Worlds (only Enceladus)
  - Saturn Probe
  - Io Observer
  - Lunar Geophysical Network
- Comments and questions should be addressed to Curt Niebur, New Frontiers Program Scientist (curt.niebur@nasa.gov)
  - More information during his presentation at this meeting

Research

Scientific Information Policy for Science Mission Director (SPD-41a)

- Community feedback on proposed changes was gratefully received
- Policy is now going through the process of being updated and finalized before public release

Research and Analysis (R&A) Programs – Low Proposal Pressure

- Submissions for nearly all programs over the past year are down by 30% or more – and particularly low for No Due Date programs

Astrobiology

- All five Research Coordination Networks are now up and running
- More information during Astrobiology presentation at this meeting

Recent Solicitations

Solicitation	Step-1 Due Date	Step-2 Due Date
SSERVI CAN-4	10/18/2022	12/15/2022
C.26 Apollo Next Generation Sample Analysis Program (ANGSA)	10/17/2022	01/19/2023
C.27 Precursor Science Investigations for Europa	11/01/2022	12/16/2022
F.10 Payloads and Research Investigations on the Surface of the Moon	10/24/2022	12/20/2022

What’s Next?

Planetary Science and Astrobiology Decadal Survey 2023–2032

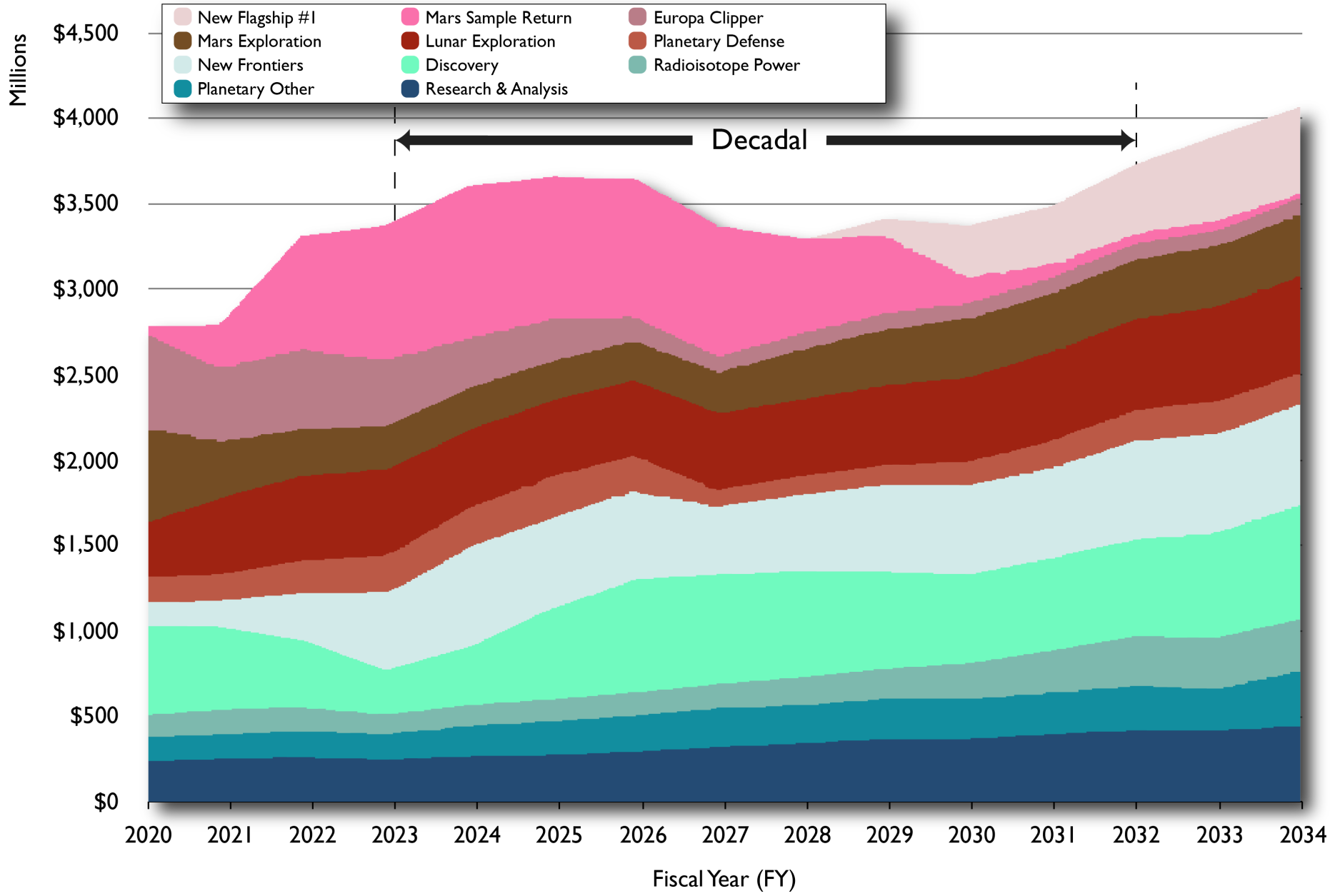
- ***Origins, Worlds, and Life*** released April 19, 2022
- Initial written and public townhall response available online
- Will report to CAPS on progress going forward

Level Program

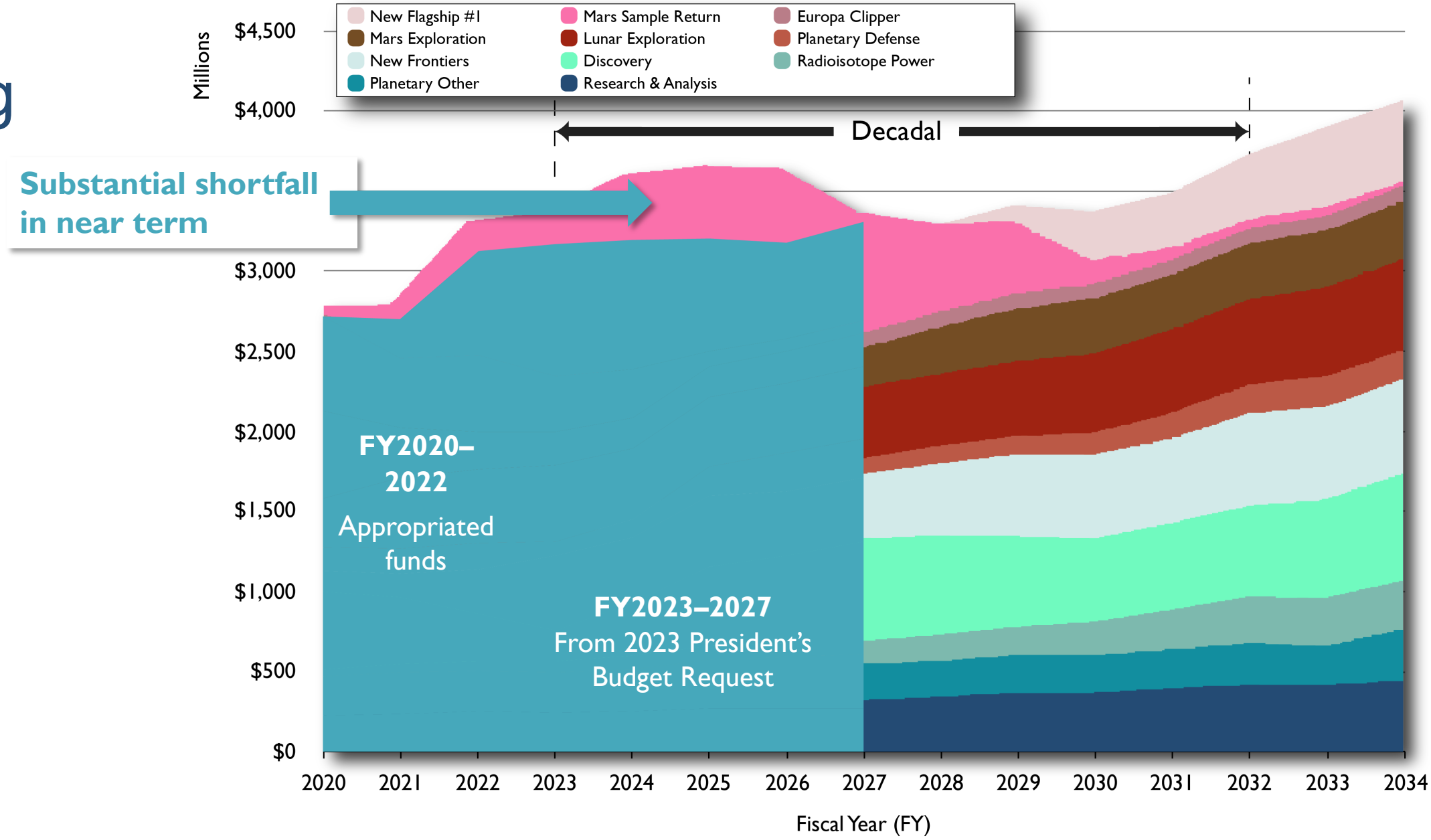
Total PSD budget FY23– FY32:

$34,990M

Table 22.2, Fig 22.2

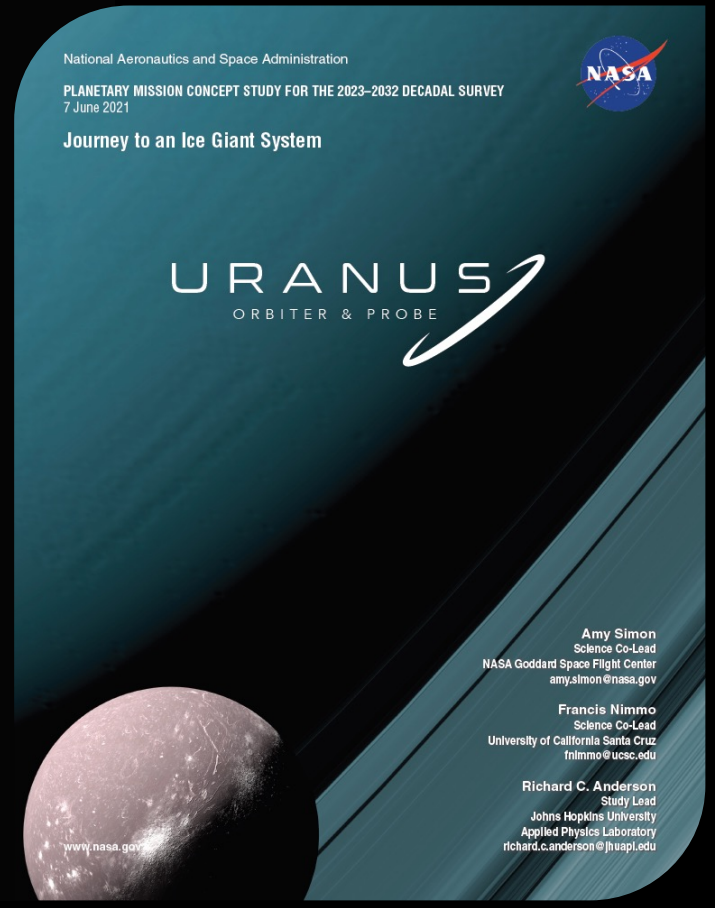


Current Planning Budget



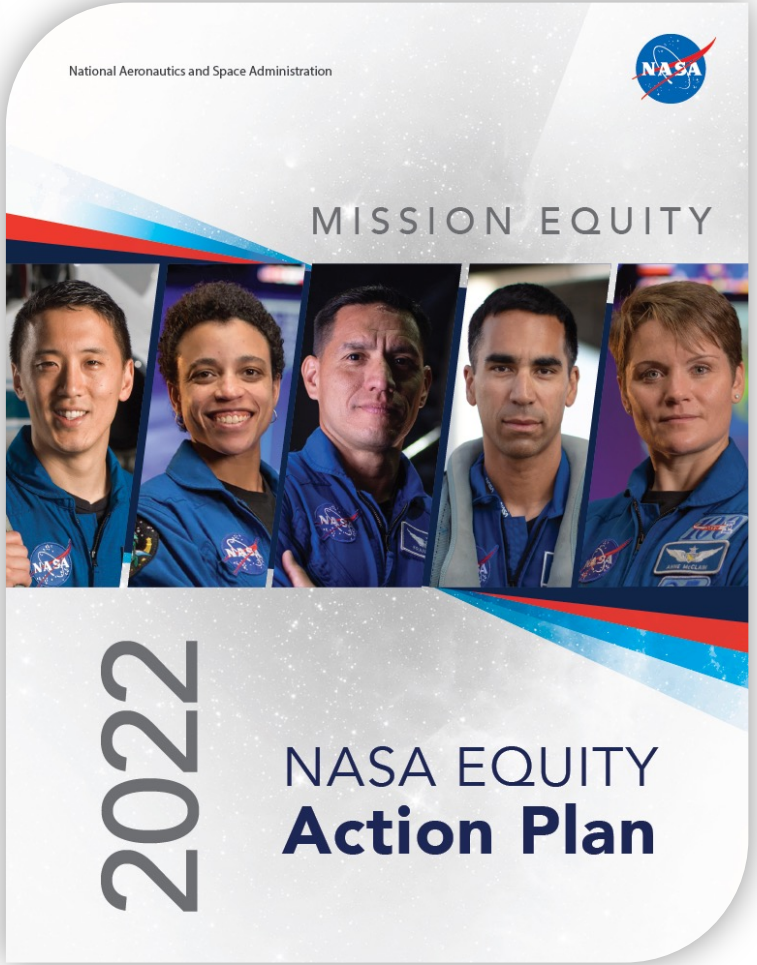
Next Flagship?

Chapter 22



State of the Profession

Chapter 16



Mars Exploration Strategy

Mars is our nearest habitable planetary neighbor – providing a continuous source of scientific information for understanding our solar system and home planet

- The Mars Exploration Program (MEP) is developing a strategy to:
  - Revalidate/update MEP Science Objectives
  - Refresh communication and imaging infrastructure at Mars
  - Define technology investment priorities that map to science objectives
  - Utilize low-cost initiatives to meet science priorities
  - Explore airborne missions (helicopters, balloons, etc) to advance science
  - Leverage collaborations – commercial and international partners
  - Capitalize on rideshare opportunities
  - Establish synergies with human exploration of Mars (prepare for, and science operations)
  - Inspire current and future generations to explore space
- Program Science Goals:
  - Search for past and present microbial life and habitable environments
  - Discover dynamic Mars (system science of geologic and climatological processes)
  - Advance human exploration of Mars

Lunar Strategy

The Moon plays a critical role in Solar System science: many of our highest priority goals can be achieved at the Moon

- PSD and ESSIO are working together to develop an integrated lunar strategy
- PSD/ESSIO lunar strategy team:

Sarah Noble (PSD/ESSIO)	Amanda Nahm (PSD/ESSIO)
Brad Bailey (ESSIO)	Ryan Watkins (ESSIO)
Debra Needham (ESSIO)	Bo Trieu (PSD)
Jeff Grossman (PSD)	Bobby Fogel (PSD)
Kathleen Vander Kaaden (PSD)	Shoshana Weider (PSD)

- Building an implementation strategy that encompasses:
  - Top-level lunar science questions and goals for the next decade
  - Lunar orbital mission strategy
  - CLPS/Artemis strategy
  - R&A strategy

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 and mineralogy

BLUE GHOST-1 / 19D / FIREFLY
- Characterize Earth's magnetosphere and the structure & thermal properties of the 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
- Study lunar swirl to address the origin of magnetized crust, swirls, & space weathering on airless bodies

SERIES-2 / CP-12 / DRAPER
- Characterize Schrödinger basin structure; understand Moon's interior & evolution to current state

KEY

HUMAN EXPLORATION
SCIENCE
SPACE TECHNOLOGY
★ CLPS DELIVERY

Rec. 22-10, 22-11

SOUTH POLE SURFACE MISSIONS

1. 2ND NOVA-C — SHACKLETON CONNECTING RIDGE — ★★
2. GRIFFIN-1 & VIPER — NOBILE CRATER — ★★
3. XL-1 — HAWORTH CRATER — ★★
4. CP-22 — SOUTH POLE — ★
5. UNCREWED LANDER DEMO — SOUTH POLE


ARTEMIS
HUMANITY'S RETURN
TO THE MOON
Planned launches:
Artemis I: Next launch attempt TBD
Artemis II: 2024
Artemis III: 2025
Artemis IV+: 2027 and beyond


EXPLORE
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