



National Aeronautics and
Space Administration

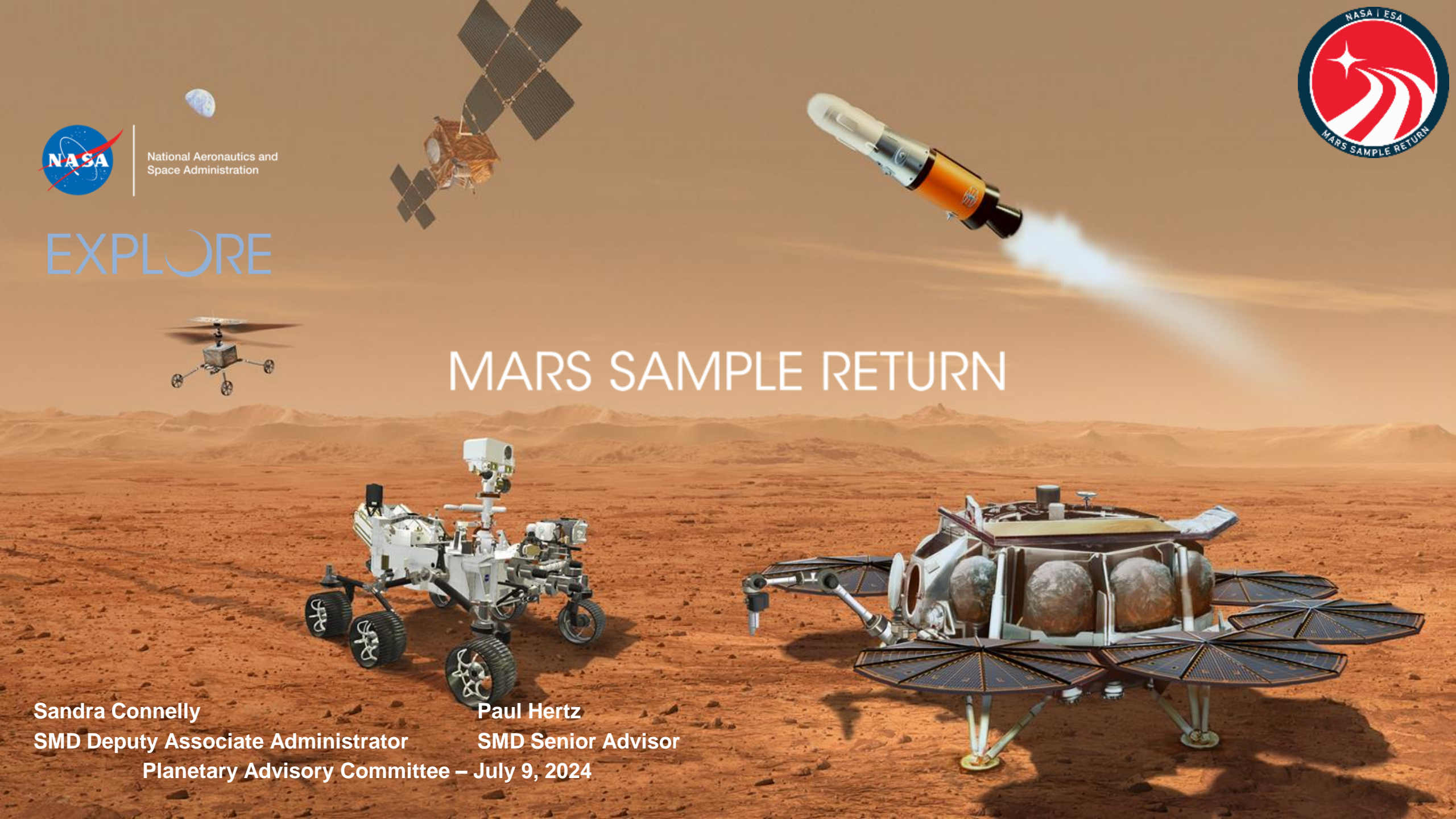
EXPLORE



MARS SAMPLE RETURN

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Importance of MSR

- For half a century, NASA has engaged in a systematic effort to determine the early history of Mars and to assess its biological potential as a pathway to understanding the formation and evolution of habitable worlds - including Earth.
- This joint campaign with the European Space Agency (ESA) is a pivotal step in a decades-long, carefully developed strategy to understand Mars, provide insight to planetary evolution, and understand the potential for life on other planets
 - MSR has been a top priority of the last two Planetary Science Decadal Surveys
- Perseverance has collected, and will continue to collect, highly valuable science samples that will answer key questions about the geological history of Mars, its climate, and whether life could have developed on Mars
 - Only state-of-the-art laboratories on Earth can fully analyze and detect the faint signatures that unlock the answers to these key questions in planetary evolution and astrobiology
- Samples from Mars are unique because it is the only planet in our solar system once capable of sustaining life which we can also readily explore on the surface through scientific investigations and future human explorers

MIRT Timeline and SMD Response Process

- MIRT efforts took place between October 2023 and March 2024
 - Conducted roughly 70 interviews with programmatic and science stakeholders
 - Approximately 20 architecture variations were analyzed
 - Conducted three formal Technical Integration Meetings (TIMs) and numerous lower-level studies and analyses
 - ESA and all other MSR organizations participated
 - Developed cost estimates for all architecture variations
- MIRT recommendations were developed for SMD decisions, which were presented for concurrence by the Agency
 - MIRT sub teams prepared final recommendations to the Core Team (CT)
 - MIRT CT deliberated on sub team reports and developed recommendations for the SMD AA
 - The SMD AA made final recommendations to Agency leadership
 - SMD AA briefed NASA Senior Leadership on determinations in response to IRB-2 recommendations

FY25 President's Budget Request for Planetary Science

	Actual 2023	PBR 2024	Enacted 2024	Request 2025	2026	<u>Out-Years</u>		
						2027	2028	2029
Science	\$7,791.5	\$8,260.8	\$7,334.2	\$7,565.7	\$7,717.0	\$7,871.3	\$8,028.7	\$8,189.3
Planetary Science	\$3,216.5	\$3,383.2	\$2,716.7	\$2,731.5	\$2,850.5	\$2,911.6	\$2,976.8	\$3,042.5
Earth Science	\$2,175.0	\$2,472.8	\$2,195.0	\$2,378.7	\$2,396.3	\$2,446.1	\$2,489.7	\$2,543.4
Astrophysics	\$1,510.0	\$1,557.4	\$1,530.0	\$1,578.1	\$1,587.0	\$1,613.6	\$1,647.1	\$1,673.4
Heliophysics	\$805.0	\$750.9	\$805.0	\$786.7	\$791.9	\$807.0	\$820.3	\$833.4
Biological and Physical Sciences	\$85.0	\$96.5	\$87.5	\$90.8	\$91.3	\$93.0	\$94.8	\$96.6

Executive Summary of SMD MIRT's Response (1 of 3)


SMD MIRT Responses

- Revise MSR mission design with improved resiliency, risk posture, and reduced complexity
 - Maintain NASA's MSR Memorandum of Understanding with ESA and launch Earth Return Orbiter(ERO)/Capture Containment and Return System(CCRS) in 2030, launch Sample Retrieval Lander(SRL)/Mars Ascent Vehicle (MAV) from Earth in 2035, and return samples to Earth in 2040
 - Returns carefully selected, diverse samples collected by Perseverance
 - Balances programmatic and technical risk, and decouples launch readiness dates
 - Adds Radioisotope Thermoelectric Generators (RTG) to SRL to improve reliability and MAV thermal environment
 - Refreshes telecommunications prior to SRL arrival
 - Provides more time to mature SRL and MAV designs
 - Finalizes Orbiting Sample design early to stabilize overall mission design
 - Parametric Lifecycle Cost estimate of \$8-11B; and is consistent with IRB-2

Executive Summary of SMD MIRT's Response (2 of 3)

- Improve lines of accountability and authority
 - Keep the Mars Exploration Program (MEP) and Mars Sample Return (MSR) as separate programs ✓
 - Empower the NASA HQ MSR Program Office with all programmatic capabilities including system engineering and PP&C responsibilities ✓
 - Elevate Mars Ascent Vehicle (MAV) and Mars Orbiting Sample system (OS) to Level 2 Projects ✓
 - Establish Standing Review Boards (SRBs) for the MSR Program and MSR Level 2 Projects ✓
- Improve communications and coordination within the Agency and with external stakeholders
 - Expand the frequency of engagement between the MSR Program Director (PD) and NASA Senior Leadership ✓
- Competitively select one world-class Mars Chief Scientist to span MEP and MSR ✓

Executive Summary of SMD MIRT's Response (3 of 3)

- Explore out-of-the-box architecture and mission element options by releasing a competitive industry study solicitation as soon as possible. 
- Innovative or alternate architectures could offer lower overall cost, lower annual cost, earlier sample return, and/or less complex/lower risk.
- Since OS and MAV drive overall mission size, complexity, and cost, studies should include alternative MAV designs.
- In parallel, engage with NASA Centers and JPL for additional out-of-the-box architecture solutions.
- The architecture must be capable of returning samples collected by Perseverance from the surface of Mars to Earth

Path Forward

- ✓ ROSES solicitation released April 16th
- ✓ Industry day April 22nd
- ✓ Due date for proposal submission May 17th
- ✓ Selections June 7th
 - Anticipated awards date in mid-July
 - Anticipated interim written reports due 45 days after award
 - Anticipated final written report and oral presentations by end of October
 - Independent report evaluations completed by end of December
 - Agency path forward determination in early 2025

What is Happening in FY24 and FY25

- Given the budgetary constraints across government, NASA will focus MSR funding on:
 - Advancing formulation of mission components and capabilities that have a high likelihood of being used in any future sample return architecture such as:
 - Maintaining critical heatshield critical analysis and development
 - Continuing Back Planetary Protection development
 - Maintaining Entry, Descent, and Landing critical analysis and development
 - Evaluating and appropriately incorporating relevant findings from funded industry and Center architecture studies

Summary

- MSR is a critically important mission; it has been a top priority of the past two Planetary Science Decadal Surveys and NASA is determined to find a path forward to return the valuable samples from Perseverance.
- The HQ MSR Program Office is beginning to implement specific programmatic recommendations from the MIRT e.g., enhancing PP&C capabilities, shifting campaign level systems engineering to HQ, and competitively selecting one world-class Mars Chief Scientist to span MEP and MSR.
- In order to move forward under government-wide budget constraints, MSR is pursuing out-of-the-box architecture solutions.