

**59<sup>TH</sup> EUROPEAN SPACE SCIENCES COMMITTEE  
PLENARY MEETING**

**MAY 15, 2020**

C. Hartman  
Director, Space Studies Board  
Washington, DC

# Outline

- SSB Recent Reports List
- Update on Decadal Surveys underway
  - Planetary and Astrobiology
  - Astro2020
- Overview of the *Assessment of the Report of NASA's Planetary Protection Independent Review Board Report*
- Update on NASA lunar human & robotic plans Gateway
- Congressional and Presidential actions and the space program

# Recent SSB Reports

- Assessment of the Report of NASA's Planetary Protection Independent Review Board (2020)
- Report Series: Committee on Solar and Space Physics: Agile Responses to Short-Notice Rideshare Opportunities for the NASA Heliophysics Division (2020)
- Progress Toward Implementation of the 2013 Decadal Survey for Solar and Space Physics: A Midterm Assessment (2020)
- Review of the Draft 2019 Science Mission Directorate Science Plan (2019)
- Finding Hazardous Asteroids Using Infrared and Visible Wavelength Telescopes (2019)
- Continuous Improvement of NASA's Innovation Ecosystem: Proceedings of a Workshop (2019)
- Report Series: CAPS: Review of the Planetary Science Aspects of NASA SMD's Lunar Science and Exploration Initiative (2019)
- Report Series: CAPS: Review of the Commercial Aspects of NASA SMD's Lunar Science and Exploration Initiative (2019)
- Planetary Protection Classification of Sample-Return Missions from the Martian Moons (2019)
- Strategic Investments in Instrumentation and Facilities for Extraterrestrial Sample Curation and Analysis (2019)
- An Astrobiology Strategy for the Search for Life in the Universe (2019)
- Open Source Software Policy Options for NASA Earth and Space Sciences (2018)
- Exoplanet Science Strategy (2018)
- Visions into Voyages for Planetary Sciences in the Decade 2013-2022: A Midterm Review (2018)
- Review and Assessment of Planetary Protection Policy Development Processes (2018)

# Planetary & Astrobiology 2023 Decadal Survey Quick Update



# Planetary 2023 Decadal Survey Schedule

2020	
January to	Statement of Task posted, Funding proposal to NASA, NSF agreed to support, town hall and Early-career event
March	Survey officially began (20 March), website established, Whitepaper and nominations sites open
May	Nominations close (1 May), Early-career event 2 Chair(s) announced, other appointments begin
July	White paper deadline (4 July)
August	First meeting of steering group (virtual or in-person)
	September
	First meetings of panels (virtual or in-person)
2021	Complete draft of survey report (early 4 <sup>th</sup> quarter)
2022	Survey report released (no later than 31 March), dissemination starts
2023	End of dissemination/NASA contract

# Planetary White Papers

**Anyone can submit – all are read!**

- 7 pages or less total, single spaced
- Submission deadline 4 July, 2020
- It does not matter who the author(s) is: it matters what the ideas are!
- **Submit at [https:// www. Nas.edu/planetarydecadal](https://www.Nas.edu/planetarydecadal)**

# Update on Planetary Protection

- In December, 2018, the NAC adopted a RPC recommendation that SMD form a **task force to reassess PP guidelines**, called the Planetary Protection Review Board (PPRB).
- The NASA Administrator and SMD AA agreed that the NASEM would review the report.
  - NASEM completed and published *Assessment of the Report of NASA's Planetary Protection Independent Review Board*

# Areas of strategic importance (both reports)

1. Establishing a new advisory process.

2. Clarifying legal and regulatory issues.

3. Building the scientific and technical foundations of planetary protection policies for human missions to Mars.

# Establishing a New Advisory Process for Planetary Protection

Recommendation: NASA should establish a new, permanent, and independent advisory body formally authorized to provide NASA with information and formulate advice from representatives of the full range of stakeholders relevant to, or affected by, planetary protection policy.

Recommendation: The initial focus of the new advisory body should be on the needs of upcoming private sector and government missions.

# Clarifying Legal and Regulatory Issues

- Recommendation: NASA should work with other agencies of the U.S. government, especially the U.S. Department of State, to provide the private sector with a clear and authoritative explanation of the U.S. government's obligations under the Outer Space Treaty to authorize and continually supervise the space activities of non-governmental entities that raise planetary protection issues.
- Recommendation: NASA should work with other agencies of the U.S. government, especially the FAA, to produce a legal and regulatory guide for private-sector actors planning space activities that implicate planetary protection but that do not involve NASA participation. The guide should clearly identify:
  - Where legal authority for making decisions about planetary protection issues resides;
  - How the United States translates its obligations under the Outer Space Treaty into planetary protection requirements for non-governmental missions;
  - What legal rules apply to private-sector actors planning missions with planetary protection issues; and
  - What authoritative sources of information are available to private-sector actors that want more guidance on legal and regulatory questions.

# Building the Scientific and Technical Foundations of Planetary Protection Policies for Human Missions to Mars

- Recommendation: NASA should make the development and execution of a strategy to guide the adoption of planetary protection policy for human missions to Mars a priority, including:
  - A process to identify the most promising concepts for achieving planetary protection objective in the context of human missions, such as high-priority astrobiological zones and human exploration zones;
  - Establishment of an adequately funded program of research and development to answer questions and address challenges raised by the most promising concepts...for integrating planetary protection measures in human missions; and
  - A plan to develop planetary protection policy for human missions to Mars on a timeline that permits the integration of such research and development into mission planning and implementation at the earliest possible stages.

# Expediting the Development of New Approaches to Planetary Protection (SMALL, LOW COST MISSIONS)

## Recommendations:

1. Develop a broad-based, representative advisory process to inform the development of planetary protection policy for small, low-cost, spacecraft;
1. Identify, fund, and complete research and development priorities related to small, low-cost, spacecraft missions (e.g., on analyzing base costs for planetary protection compliance and on crafting a standard planetary protection template);
2. Clarify the legal and regulatory environment for small, low-cost, spacecraft used in missions that are not subject to agreements or contracts with NASA; and
3. Record, analyze, and communicate the lessons learned from specific small, low-cost, spacecraft efforts in order to inform the development and implementation of the new approach to planetary protection policy as recommended by the PPIRB and 2018 reports.

# COSPAR is already working on these issues

- It recently reformed and reorganized its Panel on Planetary Protection to broaden its membership beyond planetary protection experts and increase the frequency of its meetings.
- COSPAR will hold a virtual workshop next week on planetary protection and human exploration of Mars, open to the public.

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# Astro 2020

Decadal Survey on Astronomy and Astrophysics

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ENGINEERING  
MEDICINE

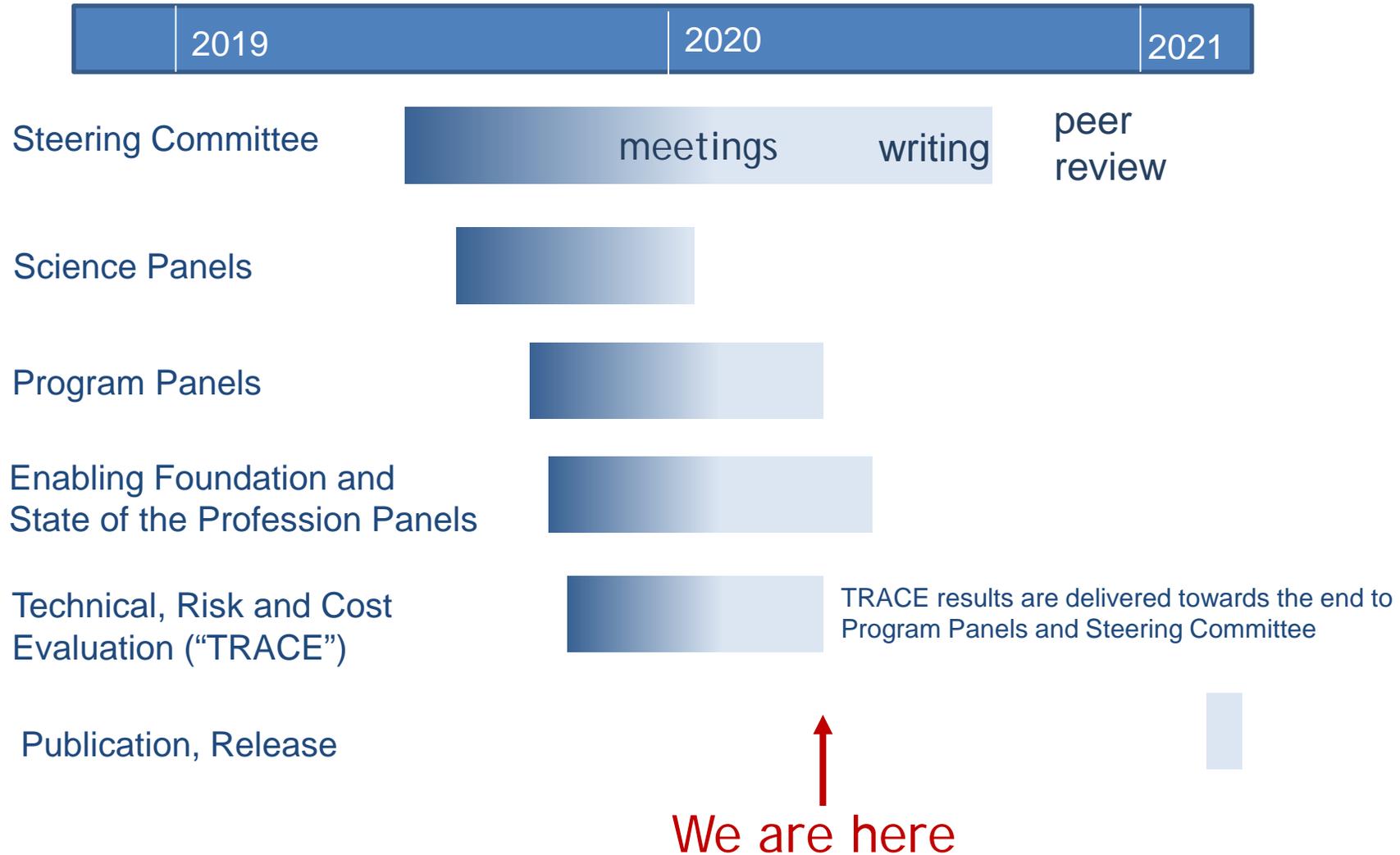
[nas.edu/astro2020](https://nas.edu/astro2020)



# Astro2020 Survey Structure

- Steering Committee (20 members)
  - plan overall review process, in consultation with NAS
  - synthesize outputs from the 13 science, program, and state of profession panels into an overall decadal strategy and survey report
  - member serves on each panel to facilitate communication, coordination
- Science Panels (6 panels, 8-11 members each)
  - review all science white papers, review science advances since Astro2010, identify high-priority scientific questions and discovery areas for the coming decade
- Program Panels (6 panels, 12 members each)
  - review relevant project/program APC's, assess proposed projects in terms of science return and priorities, technical readiness, risk, cost
- State of the Profession and Societal Impacts (1 panel, 15 members)
  - review health and demographics of the astronomy and astrophysics community, identify milestones and actions for the coming decade

# Astro2020 Decadal Survey Timeline (Pre-COVID)



# Astro2020 Status Report

- Six science panels completing their reports
  - preliminary reports presented to steering committee and program panels December 2019; 4 key science questions and 1 discovery area defined for each
  - draft reports delivered to steering committee in February, were reviewed by committee members; most issues raised presentational
  - 30 science questions and discovery areas encompass an exciting agenda for 2020's

# Astro2020 Status Report (2)

- **Six program panels and State of the Profession panel final meetings mostly complete**
  - final sets of presentations from projects
  - TRACE analyses presented for most projects
  - panels for ground, space, and particles/gravitation assembling draft findings and advice to steering committee, for presentation at a face-to-face meeting in DC on March 24
  - State of the Profession (SoP) and Enabling Foundation for Research (EFR) panels completing information gathering and drafting of findings/advice to steering committee, for presentations at face-to-face meeting on May 4-6

# Astro2020 Status Report (3)

*PRE-COVID*

- Steering Committee
  - bi-weekly Zoom meetings in addition to face-to-face meetings, ramping up to weekly after March 24-26 meeting
  - review, feedback on draft science panel reports
  - cross-survey TRACE working group
  - coordinating working groups on cross-cutting topics
  - main deliberative and prioritization discussions beginning from late March

# Astro2020 Impacts and Response to COVID-19

- From mid-March all panel meetings conducted remotely
  - some panels directly affected but completed meetings
  - result was a wide range of readiness for presentation of results to the steering committee
  - TRACE activities continued but some studies not ready in time
- Astro2020 Co-Chairs decided to delay presentation of program panel reports until after March 24
  - it is important for program balance that all panels achieve comparable levels of readiness
  - impacts at home (professional and family) imposing peak stress on participants during exactly this time frame
  - deadlines for other panels on hold while we reassess the situation

# Astro2020 Planning Forward

- Core Principle: Balance the wish to maintain momentum with consideration for the well-being of survey participants and NAS staff. This translates to continuing work but reduced efficiency.
- March 24-26 steering committee meeting was conducted remotely over two days
  - presentations from international agencies (ESA, ESO, JAXA)
  - reports of working groups and committee planning discussion
- Program panel presentations completed in June.
- In April, Co-chairs and NAS discussed the overall survey schedule with the agencies: Spring 2021 delivery of Survey predicted.

# Astro2020

## Technical, Risk, & Cost Evaluation (TRACE)

### The Aerospace Corp

- Independent evaluation of project/activity concepts for technical risk, maturity and cost/schedule
- TRACE process will provide an analysis of technology development needs and an independent cost assessment
- Analysis (and the survey) recognizes most concepts evaluated are early stage (pre-Phase A)
- Process is accommodating the varying levels of definition and maturity of implementation plans



## MAY 27<sup>TH</sup> LAUNCH OF SPACEX CREWED DRAGON TO ISS: DEMO-2

- 1st launch from U.S. since 2011 (last Shuttle flight)
- Astronauts Doug Hurley and Bob Behnken will be aboard. They entered quarantine yesterday.
- Length of time at ISS still TBD.
- Failure concern
  - of one of the nine Merlin engines in SpaceX's Falcon 9 rocket during a launch on March 18.
  - The other eight were sufficient to put the payload, 60 SpaceX Starlink satellites, into the correct orbit, .



# Update on NASA lunar human & robotic plans Gateway

# Space Policy Directive 1: To The Moon, Then Mars



“Lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities. Beginning with missions beyond low-Earth orbit, the United States will lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations...”

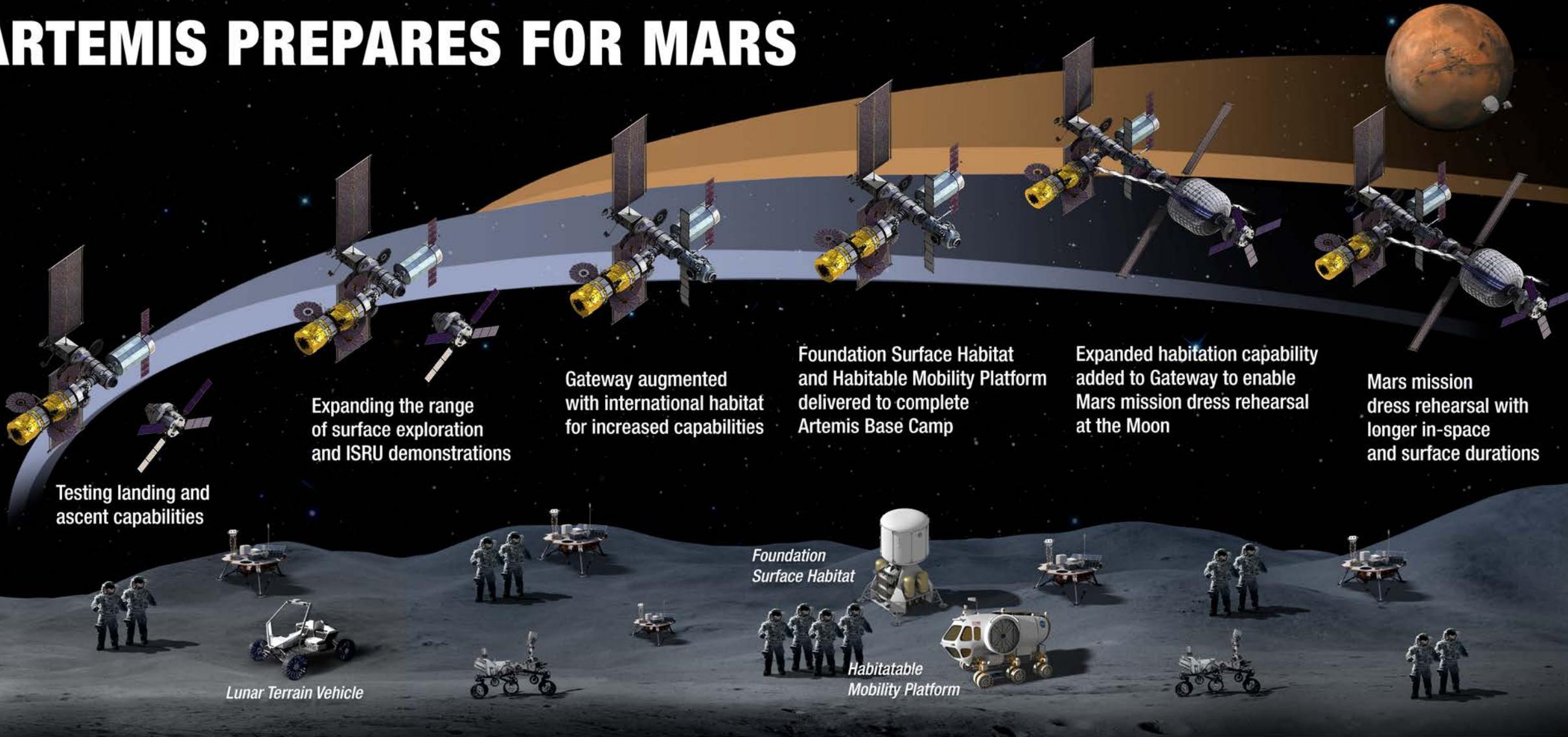
**In April, NASA unveiled an ambitious long-term agenda for crewed exploration of the Moon that focuses on demonstrating astronautical capabilities and supports scientific work.**

**First human mission scheduled for 2024.**

# Artemis Base Camp: NASA permanent south pole facility

- Artemis Base Camp will one day include a stationary habitat, vehicles enabling long-distance work, and infrastructure such as power generators and equipment for lunar resource utilization.
- Demonstrates capabilities and technologies enabling a sustained lunar presence and eventual crewed missions to Mars.
- Science is included: astronauts at Artemis Base Camp could operate a radio telescope installed on the Moon's far side and remotely pilot a "hopper" to deliver science instruments all over the Moon.

# ARTEMIS PREPARES FOR MARS



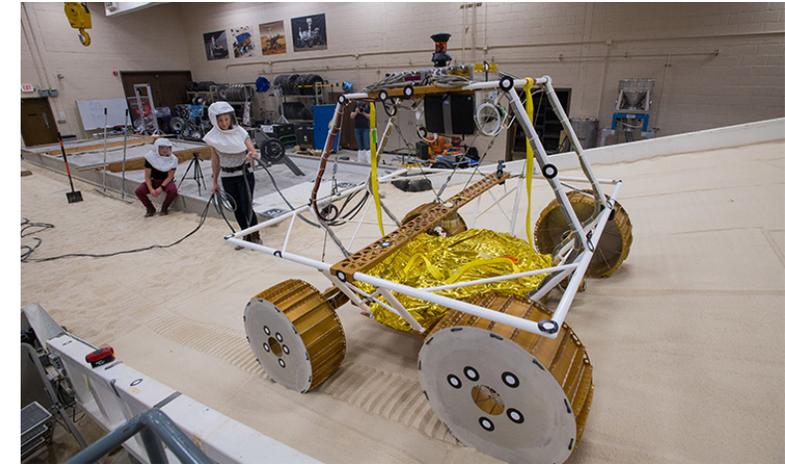
## SUSTAINABLE LUNAR ORBIT STAGING CAPABILITY AND SURFACE EXPLORATION

MULTIPLE SCIENCE AND CARGO PAYLOADS | INTERNATIONAL PARTNERSHIP OPPORTUNITIES | TECHNOLOGY AND OPERATIONS DEMONSTRATIONS FOR MARS

- Gateway was removed from the first landing mission architecture but remains a central component of long-term plans.
- The agency is also moving ahead with robotic lunar surface missions planned at a rate of two per year beginning in 2021.

# Commercial Lunar Payload Services (CLPS)

- Two science and technology payloads for lunar landers scheduled to launch fall 2021, but Covid-19 delay.
- On April 8, a third lander was selected for the Aiken basin region.
- The Polar Exploration Rover Volatiles Investigating Polar Exploration Rover (VIPER) is being built to withstand 100 days and nights. Task order due shortly, launch in 2023.



# The US Congress and NASA's Budget

- Phase 1, the “Coronavirus Supplemental”
- Phase 2—targeted relief for individuals, including paid family leave—has become law.
- Phase 3—broader economic stimulus designed to deliver cash to individuals to help them weather the downturn, as well as industry-specific relief—is being crafted
- FY 2021 President’s Proposal (Congress may use if they like it) increases NASA by 12% over FY 2020 to \$25.2 B

# Update to 2010 National Space Policy?

- 2010 US National Space Policy issued under Obama.
- The National Space Council (Chair VP Pence) developed and the President has signed four Space Policy Directives, a National Space Strategy, and an Executive Order on space resources.
  - Reuters reports that the Administration is developing “the Artemis Accords”
    - To establish safety zones around lunar bases
    - To protect rights to resources mined on the Moon.

*Thank You, ESSC Members!*  
*Please join the*  
*Virtual SSB and ASEB/SSB Board Meeting*  
*June 8 - 11, 2020*  
*June 8 - ASEB*  
*June 9 - Joint ASEB/SSB*  
*June 10, 11 - SSB*

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# BackUp: President Trump's SPDs (Slide 1 of 2)

- President Trump signed Space Policy Directive-1 (SPD-1) on December 11, 2017 replacing one paragraph in the Obama National Space Policy regarding NASA's human spaceflight program. It restores the goal of returning astronauts to the Moon and eliminates the goal of sending them to asteroid.
- On March 23, 2018, he issued a National Space Strategy covering civil, commercial, and national security space activities.

# Backup: President Trump's SPDs (2 of 2)

- Space Policy Directive-2 (SPD-2, regarding commercial space regulation) was signed on May 24, 2018.
- Space Policy Directive-3 (SPD-3, regarding space situational awareness and space traffic management) at the third meeting of the Space Council on June 18
- Space Policy Directive-4 (SPD-4, regarding national security space and the Space Force) on February 14, 2019.