

Humans to Mars and the Mars Science Community

Dr. G. Scott Hubbard
Stanford University

**Former NASA Ames Center Director
and NASA Mars Program Director**

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First Human Mars Mission Concept Overview



WHO



Current analysis includes 4 crew
Some could potentially remain in Mars orbit while others explore surface

WHAT



Mars Transit



Landing and Surface Exploration



Mars Ascent and Earth Return

WHERE



Cislunar, Deep Space and Mars orbit



Mars Surface

WHEN



As early as 2030s



Crew away from Earth ~2 years



~30 sols on Mars

WHY



Science, Exploration, and U.S. leadership

HOW



1

Pre-Deployed Cargo Phase



2

Crewed Surface Exploration Phase



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MEPAG VM 11

Key Take-Away: First mission emphasis is a relatively short (~30 sol) surface stay for a ~2 year round-trip first mission, with pre-deployed cargo but minimal infrastructure build-up, leveraging systems developed for lunar exploration.



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- The Human Exploration community and the Mars science community have very different cultures.
 - HEOMD (and all its predecessors) are largely top-down hierarchical organizations.
 - The human exploration community is dominated by NASA, major industry and relatively few academics (exception: human health)
 - Space Science is grassroots, dependent on peer review, open discussion and consensus building.
 - The Mars community consists of hundreds of PIs, students and researchers, plus NASA and industry.
- Bridging these cultures must be a conscious effort perhaps modeled on the work required to establish the NASA Astrobiology Institute

1953





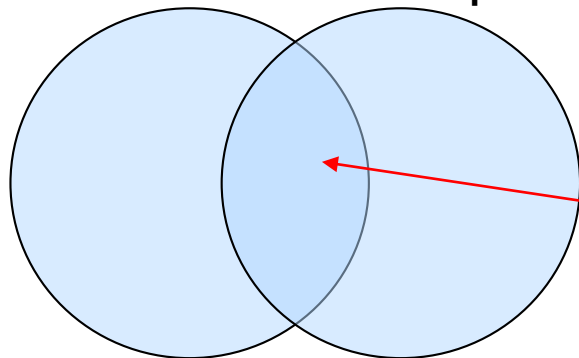
- **RELATIONSHIP TO NASA'S HUMAN EXPLORATION PROGRAM (summary page 63)**
- Although humans are not required for the return of samples from the Moon, asteroids, or Mars, if humans are going to visit these bodies, collecting and returning high-quality samples are among the most scientifically important things they can do.
- The robotic and human exploration of space should be synergistic, both at the program level (e.g., science probes to Mars and humans to Mars) and at the operational level (e.g., humans with robotic assistants). Both drive the development of new technologies to accomplish objectives at new destinations.
- However, this effort must proceed without burdening the space science budget or influencing its process of peer-review-based selection of science missions.

I believe this advice is still true



- Per the current Decadal, plan to use human adaptability to rapidly identify scientific samples for return
 - >Samples might include near surface ice, selected rocks, others
- Prioritize and shape MEPAG Goal 4 measurements into a program
 - Include science-driven “knowledge of the environment” (e.g., high-resolution remote sensing, retiring risk such as soil toxicity)
 - Derive lessons learned from end-to-end systems engineering of MSR
- Support technology of mutual benefit (e.g., precision landing, propulsion, telecom, drilling, infrastructure, etc.)
- In a short stay, define experiments that can remain (heat probe, seismometer, weather station)

Mars Science Goals Human Exploration Goals



Suggest using AOs, NRAs, workshops to engage both Mars and HEO communities – An Exploration Science Institute?

Commercial Interest: MASWG Selected and Annotated Summary Of Findings (chart 24)

- Purely commercial or commercial-government partnerships for exploring or supporting the exploration of Mars, where the private entity bears a reasonable fraction of the investment risk are in their formative stages but do not currently exist for Mars. A Mars-focused CLPS-like (*commercial lunar payload services**) program could allow technology development for future exploration as well as delivery of science payloads.
 - *Suggest NASA explore RFI or other acquisition tools to gauge interest and potential business plans**

**Italics mine - Hubbard*

The Future of Space Exploration, Searching for Life with Humans and Robots Together

