

The Role of International Partnerships in
Sustainability of Human Space Exploration:
Some Results from the NRC Human Spaceflight
Committee “Pathways To Exploration” Report

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The NRC Committee on Human Spaceflight

- The study was requested in the 2010 NASA Authorization Act
- The committee addressed a multi-part, multi-disciplinary task statement via meetings and investigations of the main committee, a Technical Panel, and a Public and Stakeholders Opinion Panel
- A call to the public to submit white papers addressing the role of human spaceflight and its suggested future was made in July 2013, and the committee opened the study to a public input in October 2013 via Twitter
- The Public and Stakeholders Opinion Panel also conducted a survey of key stakeholders
- Representatives of past and current NASA and international programs, experts from academia and industry, all provided briefings to the Technical Panels and the committee

Primary Findings of the Report

- If the United States is to have a human space exploration program, then it must be worthy of the considerable cost to the nation and great risk of life.
- “Stepping stone” approach with feed-forward technical development and aggressive pursuit of partnerships is recommended to help manage planning, costs, and developmental risk
- Given the expense of any human spaceflight program and the significant risk to the crews involved, in the committee’s view the only pathways that fit these criteria are those that ultimately place humans on other worlds.
- Mars is the “horizon goal”

Pathway Principles (excerpts) - NASA should:

- Commit to design, maintain, and pursue the execution of an exploration pathway beyond low Earth Orbit toward a clear horizon goal that addresses the “enduring questions” for human spaceflight
 - “How far from Earth can humans go?” - and
 - “What can humans discover and achieve when we get there?”
- *Engage international space agencies early in design and development of the pathway on the basis of their ability and willingness to contribute*
- *Define steps on the pathway that foster sustainability and maintain progress on achieving the pathway’s long-term goal of reaching the horizon destination*
- *Seek continuously to engage new partners that can solve technical or programmatic impediments to pathway progress*

Relevance to International Partnerships & GER

- The report:
 - Stresses the need for partnerships - both international and commercial
 - Notes the increasing interest in space activities among nations
 - Recommends early engagement of international space agencies in planning and cost-sharing
 - Recommends developing pathways that have profound “scientific, cultural, economic, inspirational, or geopolitical benefits”
 - Notes the stabilizing effect of international collaboration on large programs
 - Notes the challenges to maintaining partnerships over decades and suggests ways to help

Additional recommendations...

- #4: “Vigorously pursue opportunities for international and commercial collaborations in order to leverage financial resources and capabilities of other nations and commercial entities. International collaboration would be open to the inclusion of China and potentially other emerging space powers in addition to traditional international partners. Specifically future collaborations in major new endeavors should seek to incorporate:
 - A level of cost-sharing that is appropriate to the true partnership that will be necessary to pursue pathways beyond LEO
 - Shared decision-making with partners, including a detailed analysis, in concert with international partners, of the implications of human exploration of continuing the ISS beyond 2024.

International Partnerships and Sustainability: The International Space Station

- International collaboration has stabilized ISS support and funding
- Working together on the ISS extends existing technological and policy cooperation in peaceful setting
- The partnership supports development and practice of key technical competencies among spacefaring nations of the world
- Provides a framework for ongoing collaboration in space exploration (manifested in the GER and in the work of ISECG)
- In tension: Ongoing operations after 2024 has negative impact on beyond Low Earth Orbit program risk (cost)

International Collaboration as a Framework for Beyond Low Earth Orbit Exploration

- International Space Exploration Coordination Group is actually a “network” that contributes (among other networks) to peaceful relationships between the nations
- GER serves as a framework to coordinate planning for future missions beyond Low Earth Orbit, with ultimate goal of Mars
- Each agency envisions contributions ranging from large-scale systems to robotic missions, landers, cargo vehicles, etc.
- Provides basis for existing competencies to be strengthened and new ones to be developed

However...

- “The nation’s near-term goals for human exploration beyond LEO are not aligned with those of our traditional international partners”
 - Near-term goal for partners is lunar surface operations
 - Relying on the U.S. to assume a leadership role
 - The Committee found that pathways that do not include lunar surface operations have “higher development risk” across the entirety of the program (many decades) than those that do

And...

- The committee found that the prohibition on bilateral collaboration with China has left open opportunities that are being filled by other space-faring nations

Additional Considerations...

- Commercial approaches to and international collaboration in Beyond Earth Orbit exploration will have to greatly exceed previous levels of cost sharing (or reduction) in order to substantially impact budget profiles for various pathways
- The report recommended that NASA continue to seek partnerships (of all types) in order to advance development and exploration on the path to Mars

Some observations...

- Together with “competition-driven innovation at the industrial and scientific level”, international collaboration is key to many of the spaceflight achievements of the past half-century (Dep. Sec. of State William Burs, ISEF, January 2014)
- Collaboration requires satisfaction of the core interests and needs of all partners - these will be different, but nations contribute because it meets their national needs, not from altruism
- Noticeable proliferation in number of spacefaring countries is increasing the opportunities for collaboration
- Nations that are new to space activities will seek partnerships with experienced nations to soften the barriers to entry to space initiatives
 - Provides opportunities for leadership
- International collaboration is thought to provide resilience for long-term, large-scale programs and space missions
 - *Reciprocity is an important source of stability*

...and some final thoughts

- Sustainability will benefit not only from “feed forward” technologies and operations, and stepping stones with inherent (and diverse) value, but from self-sustaining activities such as are found in commercial markets and the consensus-building power of “enlightened self-interest” among nations
 - Requires time, vigilance, and constant effort to address these human variables in human space exploration, including international collaboration
- The importance of patience and the “long view”
 - National collaboration and beyond Low Earth Orbit exploration are both “long-lead” enterprises
 - Realistic expectations and planning are most likely to encourage persistence and lead to eventual success

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The NRC “Pathways to Exploration: Rationales and Approaches for a U.S. Program of Human Space Exploration” can be accessed at:

<http://www.nap.edu/catalog/18801/pathways-to-exploration-rationales-and-approaches-for-a-us-program>

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