

## An Alternate Vision for Space Exploration<sup>1</sup>

Premise 1. Human exploration and habitation beyond Earth orbit will be the work of many generations. The tasks of this generation must be viewed in a context of centuries.

Premise 2. Human travel beyond Earth orbit is not a feasible objective for the current generation as evidenced by (i) the extraordinary cost of the Apollo Program<sup>2</sup> which achieved only a small fraction of the tasks required for lunar habitation and human travel to Mars and (ii) the failure of the massively expensive Shuttle and International Space Station programs to develop an adequate package of enabling technologies<sup>3</sup>.

Premise 3. Embarking on a program of human space travel at this time would have several undesirable results. First, it would delay scientific progress in exploring the solar system in ways that are clearly feasible with robotic missions.<sup>4</sup> Second, it would squander opportunities for scientific and technological advances that are necessary for ultimate success and are achievable here on Earth [see 5]. Finally, the evident failure of such a program would undermine our ability to recruit the next generation of exploration-oriented scientists, engineers, political leaders, and supportive citizens.

Premise 4. Setting aside human space travel for the next few decades will allow us to focus on realistic objectives and lay the foundation for long-term success. Such a decision will require maturity and resolution. However, it will have immediate benefits in providing a wealth of critical and achievable projects to engage our best minds.

Premise 5. The pursuit of human habitation beyond Earth must be based on a thorough understanding of the conditions for habitability. This has two aspects with immediate applications. (i) Study the conditions on Earth that allowed life, complexity, and civilization to emerge. (ii) Develop the capability to operate closed ecosystems (e.g. the Biosphere II concept) under a range of challenging conditions on Earth such as subtropical deserts, polar deserts, and the ocean bottom. Tremendous technological and scientific spin-offs from these activities are likely.

Premise 6. The export of political conflict and military technology into space is inherently undesirable, running contrary to the moral precepts of all major religions and schools of ethical thought. The 1967 Treaty for the Peaceful Uses of Outer Space should be reaffirmed and strengthened.<sup>5</sup>

Premise 7. Because we do not know or understand what is "out there", we must explore with caution, humility, and a sense of reverence. Exploration and development activities here on Earth have often resulted in the destruction of species, ecosystems, and human cultures. We must bear this history in mind and strive to avoid such unintended consequences.

Premise 8. The human species is in a critical and vulnerable period where the exponential growth of our combined environmental impact is beginning to confront global limits. As a many-generation project, exploration and habitation of the solar system will be successful only if sustainability on Earth is achieved. Thus, the preeminent goal for science and technology in this generation must be to facilitate the transition to sustainability.

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<sup>1</sup> Jan 13, 2005 draft by Tad Anderson with helpful comments from Conway Leovy, Bob Charlson, and Woody Sullivan all at the University of Washington. My goals are to refine this vision [for example, strengthen the arguments and develop appendices that defend the factual assertions] and to promulgate it as an alternative to the Bush Administration's Moon-Mars Program. If you have critical comments and/or would like to contribute to this effort, please contact me at: tadand@u.washington.edu.

<sup>2</sup> At its peak, the Apollo Program cost 3.7% of the total federal budget. Overall, it cost somewhere between \$100 and \$200 billion adjusted to 2004 dollars.

<sup>3</sup> The U.S. is currently planning to abandon both programs as soon as it can get out of its international commitments; however, this will take another decade or more at a cost of well over \$60 billion (additional).

<sup>4</sup> Damage to space science by the Bush Moon-Mars initiative has already begun, as documented in a report by the American Physical Society [Nov., 2004; [http://www.aps.org/public\\_affairs/index.cfm](http://www.aps.org/public_affairs/index.cfm) "Moon Mars Report".]

<sup>5</sup> The Bush Moon-Mars plans envisions abrogation of this treaty in order to develop the commercial potential of extraterrestrial territory. [Aldridge Report, p. 33; [http://www.nasa.gov/pdf/60736main\\_M2M\\_report\\_small.pdf](http://www.nasa.gov/pdf/60736main_M2M_report_small.pdf)]

## The Bush/O'Keefe Space Vision<sup>6</sup>

key points ("findings") of the Aldridge Report on Space Exploration Policy, June, 2004  
[[http://www.nasa.gov/pdf/60736main\\_M2M\\_report\\_small.pdf](http://www.nasa.gov/pdf/60736main_M2M_report_small.pdf)]

Finding 1. The Commission finds that the long-term, ambitious space agenda advanced by the President for robotic and human exploration will significantly help the United States protect its technological leadership, economic vitality, and security.

Finding 2. The Commission finds that the space exploration vision must be managed as a significant national priority, a shared commitment of the President, Congress, and the American people.

Finding 3. The Commission finds that NASA's relationship to the private sector, its organizational structure, business culture, and management processes - all largely inherited from the Apollo era - must be decisively transformed to implement the new, multi-decadal space exploration vision.

Finding 4. The Commission finds that successful development of identified enabling technologies will be critical to attainment of exploration objectives within reasonable schedules and affordable costs.

Finding 5. The Commission finds that sustaining the long-term exploration of the solar system requires a robust space industry that will contribute to national economic growth, produce new products through the creation of new knowledge, and lead the world in invention and innovation. This space industry will become a national treasure.

Finding 6. The Commission finds that international talents and technologies will be of significant value in successfully implementing the space exploration vision, and tapping into the global marketplace is consistent with our core value of using private sector resources to meet mission goals.

Finding 7. The Commission finds implementing the space exploration vision will be enabled by scientific knowledge, and will enable compelling scientific opportunities to study Earth and its environs, the solar system, other planetary systems, and the universe.

Finding 8. The Commission finds that the space exploration vision offers an extraordinary opportunity to stimulate mathematics, science, and engineering excellence for America's students and teachers - and to engage the public in a journey that will shape the course of human destiny.

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<sup>6</sup> Critiques of this vision are available. American Physical Society: [http://www.aps.org/public\\_affairs](http://www.aps.org/public_affairs) (click on "Moon-Mars Report") and physicist Steven Weinberg: <http://www.nybooks.com/articles/17011>.