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NSS Policy Committee

HUMANS TO MARS: WHY & HOW

In both the near-term and long term, Mars offers immense promise for our society and all of humanity.

The true legacy of the Apollo program has been the thousands of engineers, scientists, and technicians who were inspired to stay in school and achieve. These are the high-tech dynamos that have driven our technology economy. So, too, will the challenge of Mars inspire and drive the next generation. Meeting these challenges will force us to stretch our technology, prove our talent, advance our science, and, as with every frontier, evolve new ways of thinking and living together. No other focused effort promises so much benefit. Further, Mars exploration will provide an increased understanding of the planet – how and why its climate changed over time and whether Mars ever did, or does, hold life – answering some of our deepest questions and providing timely guidance as to public policies that we may very well need in order to preserve the biosphere of our own planet. These are the short-term rationales for humans exploring Mars.

Long-term, Mars beckons as a future home to humanity. Human exploration of Mars is the next frontier for the new pioneers. The overarching goal for Mars is human settlement. While both the Moon and Mars have the natural resources for human survival, Mars' near-24-hour day and atmosphere offer future potential for ameliorating its harsh environment. And as the program moves forward towards permanent human habitation of Mars, we will continue to reap scientific and technological benefits from Mars exploration.

The major barriers to Mars exploration have been psychological as much as technical. Inflated cost estimates have been glibly popularized, and Mars exploration has been widely perceived as excessively costly relative to short-term benefits. With new concepts, such as using resources from Mars instead of bringing them from Earth, such perceptions already lag far behind reality. Further, Mars exploration missions described by NASA several years ago unnecessarily assumed development of expensive heavy lift launchers designed exclusively for the Mars mission. Revised NASA scenarios already project substantially lessened costs, and new, modular and reusable technologies and modern space operations can achieve even more dramatic reductions, even to the point that human Mars missions could be effected without huge increases in NASA's budget.

To these ends, architectures for Mars should be designed in an ongoing process to incorporate advancing and reusable technology and to be compatible with reusable lower-cost launchers as they are developed. Common infrastructures for Moon and Mars activities should be adopted where practical. These infrastructures should incorporate space operations lessons learned from the International Space Station. Such measures will further reduce costs substantially, to levels likely to elicit the longer-term public funding that will be needed.

It should be clearly understood that obtaining much of key data we seek from Mars will require a human presence, not just robotic missions. Accordingly, recurring Mars robotic missions should be oriented towards learning not just what is scientifically interesting, but what is necessary for humans to reach, survive, explore and work on Mars. These early missions need to include testbeds of human-enabling technologies. Deferral of these

vital first steps would be contrary to, and would eviscerate much of the benefit from, a vigorous program of Mars exploration.

A comprehensive Mars program should be promptly defined, integrating robotic and human exploration goals. International cooperation should be sought. Mars missions should be defined in measured increments, each lasting a few years, with clear interim goals. The Mars effort should move expeditiously to human landings and then permanent outposts.