

United States Senate
Committee on Commerce, Science, and Transportation
Subcommittee on Science and Space

Hearing

Challenges and Opportunities for Human Space Exploration

Statement

of

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Chairman Nelson, Ranking Member Cruz, and Members of the Committee -- I am once again honored to appear before you today to discuss our nation's space program. But before we begin, I would like to take a moment to note that we would not even be here today, you would not be holding this Hearing, but for the crucial work done back in 2010 by you, Senator Nelson, as well as by former Ranking Member Senator Kay Bailey Hutchison, by key Committee Staff Members Jeff Bingham and Ann Zulkosky, and by the House Science Committee under the leadership of then-Chairman Ralph Hall. It was your work in crafting the NASA Authorization Act of that year, which mandated the development of the Space Launch System and the Orion Multi-Purpose Crew Vehicle, which has allowed us to envision a robust future for NASA and the American space program. At a time when such bipartisan cooperation in Congress can be hard to find, your work stands as a shining example of what can be done when men and women of good will are willing to put aside their differences and work together in the larger service of our nation's interests. As a retired Air Force General Officer, former astronaut, and citizen of this country, I thank you.

Three and more years later, that 2010 Act still bears directly on the topics to be addressed in this Hearing, topics which are of critical importance to our space program today: the choice of resources, destinations, sensible mission planning and funding to reach them, the role of the heavy-lift SLS and the Orion crew vehicle in carrying out these missions. With the new technologies and systems which will be needed beyond SLS and Orion, and the manner in which NASA can most effectively collaborate with international and commercial partners in setting

and reaching national goals is certainly a broad and challenging range of issues. I will try to address them as best I can in the time I have for this opening statement, and then I will be pleased to respond to your questions.

To put my remarks in context, I would like for a moment to take us back to 1991 and the publication of "America at the Threshold: America's Space Exploration Initiative". This report was prepared by the Synthesis Group, a group I was asked by President George H. W. Bush with the honor to lead. Our charter was to examine in some detail exactly the questions that we are here to address today: destinations, missions, systems, technologies, collaboration. This was not the first such presidentially chartered assessment, and it wasn't the last. The vast majority have reached essentially the same fundamental conclusions. The essential core of national, and indeed international, critical thought on space policy has been remarkably consistent across several decades and among nearly all of the groups which have studied it. Possibly the best service I can perform for this Committee today is to remind us all of that fact, and to summarize these core conclusions. They can serve as a useful guide for us today, and in the future, if we would only heed them.

Leadership in space is, for any society that can aspire to attain it, a key to leadership on Earth and in human society, for all the generations to come. While leadership comes with obligations to partners and allies, it is nonetheless the only proper goal to which America should aspire. Strategies and policies based on this understanding have placed our nation in the role of the world's most influential nation. Failure to take this influence into space, failure to lead in the development of the next human frontier, will consign our nation to a backwater in which others, but not ourselves, will shape the destiny of human society in the generations to come. American leadership, power, and influence in the world of today were not, as some once thought, a matter of "manifest destiny". It was earned for us today by our ancestors. We must earn it anew for our descendants. It must be earned in many ways and in many places. One of those is space.

The choice of destinations has, in all humility, already been made for us. The surface of the Moon is by far the most interesting near-term challenge confronting mankind in space. It is our proper next frontier. We know so much more today than we did when the Synthesis Group published its report, and everything we know has served only to reveal the Moon to be ever more interesting. Regions of permanent sunlight, enormously valuable for supplying power to an early lunar base, and nearby regions of permanent shadow, valuable for the trapped water they contain, exist at each of the lunar poles. The lunar crust is rich in oxygen and other

materials which can be mined and used to develop a human future in space that will not always depend upon bringing supplies up from Earth. We know now that the Moon is far more than a dusty ball of rock. It is our nearest neighbor in space, and the key to the human future in space.

After the Moon, when we have learned something of how to live on a world other than our own, we will be prepared to venture farther out, to go more than three days away from home. That next exploration will be to Mars, a place we can be by the early- or mid- 2030s, if only we can summon the required consistency of policy and purpose for more than the length of a single presidential administration.

There has been debate in the last few years about a human mission to an asteroid, or about robotic missions to bring an asteroid back to cis lunar space, where it can be studied by astronauts and scientists without venturing too far from home, too soon. These ideas do have some inherent scientific interest. They should not be the central theme of any sensible long-term human spaceflight program. Such missions are an interesting adjunct to the far more interesting theme of human presence of the Moon and, later, and expedition to Mars. These enterprises can, and should, occupy our energies for the foreseeable future in space.

Regarding technologies and systems, every credible study concerning how to go about expanding our reach in space focuses, inevitably, on the need for heavy-lift launch capability, along the lines of the 130 metric ton capability planned for SLS, or more. This is the floor of useful capability for interplanetary exploration, not the ceiling.

For the development of cislunar space and the Moon, this heavy-lift launch capability must be topped with a large, liquid-hydrogen fueled upper stage. This is simply the most efficient approach to space exploration of which we know, today and for the foreseeable future.

To go to Mars, we need more. We need an upper stage powered by a nuclear thermal rocket. Yes, it is possible to get to Mars without a nuclear rocket, but why would we try to do so? Far from being an artifact of a science fiction movie, a nuclear upper stage is something we once had -- a working, space qualified nuclear rocket lacking only a flight test. It was meant to fly on the Saturn 5, the launch vehicle that took me and twenty-three of my colleagues to the Moon. That combination could have taken us to Mars; instead, it was scrapped in 1973, four decades ago now, because President Nixon decided that we weren't going to venture beyond the Moon, and indeed that we were not even going to stay there, would not consolidate the gains for which three of my friends had given their lives.

I have said that we should make it the nation's business to lead in space. We should. But I have also noted that leaders need partners and allies. I personally commanded our nation's first international space mission, Apollo-Soyuz, a mission designed and carried out at the height of the Cold War. From that mission came, after the fall of the Soviet Union, the Shuttle-Mir program and, later, full Russian partnership in the International Space Station with ourselves and a dozen other spacefaring nations. In the very long run, the greatest legacy of the space program will be the international partnerships we have forged to build the International Space Station, and will forge again when we are ready to return to the Moon and go on to Mars.

Last year at a joint meeting with the ISS advisory task force and our Russian counterparts, the Roscosmos Advisory Expert Council, the independent groups that together review and identify major issues for the ISS, our Russian counterparts asked to give us a separate briefing. This briefing outlined their initial proposed next 20-30 years of human space flight exploration. It was interesting to note, that they proposed the exploration be based on an international partnership which would be managed by the same process that the present International Space Station is managed. They outlined the use of the SLS and Orion spacecraft and their space hardware which would include their new Angara booster along with the ESA Ariane booster and the Japanese H-2 booster. The Russians said they consider the moon another continent which to explore and eventually an expedition to Mars which would be powered out of LEO by a nuclear thermal rocket. This planning is now working its way up for approval in the Russian government.

Concerning the value of such partnerships, I will say this: we are simply less likely to fight with those nations and societies with whom we seek partnerships in the pursuit of challenging enterprises. Space exploration is an ideal venue for such partnerships and such enterprises. I was a military man for my entire career, one way or another, and I will tell you what every veteran knows: no military man wants to see his friends fight and die if there is any possible way to avoid it. Partnership in space exploration offers us one of those ways.

The Apollo-Soyuz mission was the shining light during the cold war era in our relationship with the Soviet Union. Today, the ISS is the shining light of our partnership with our 15 partners, and the people of their countries, even though other issues between our countries may wax and wane. Our future of human space exploration beyond LEO to the moon and eventually to Mars can also be a shining light to all of the countries who are our partners in this great endeavor.

Chairman Nelson, Ranking Member Cruz, Members of the Committee: this concludes my opening remarks. I stand ready to answer your questions.