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Senate Committee on Commerce, Science and Transportation

"The Case for Space: Examining the Value"

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Thank you, Mr. Chairman, for providing an opportunity to discuss this important topic. Understanding the value proposition of space, from low Earth orbit to geosynchronous orbit, to the Moon and beyond, is of fundamental importance to many national interests. Our national security and public safety, global economic competitiveness and scientific capabilities, are all reliant on access to space and space-based capabilities. There is no question as to the important of unmanned space activity, but the future of U.S. human space exploration is in the balance and will be the focus of my remarks today.

Globalization and Space

Last week I attended the annual meeting of the International Astronautical Federation in Daejeon, South Korea. There was a statute of South Korea's first astronaut, Yi So-Yeon, on the main boulevard. The President of South Korea, Lee Myung-bak, spoke at the opening ceremony and said, "Space technology is already being applied in various areas of our daily lives. Space technology is the growth engine that will open the future of the mankind, and it has become a necessary tool for our own survival." Representatives from Europe, Japan, Russia, China, India, and Korea presented their increasingly specific plans for explorations of the Moon and missions to Mars.

NASA also presented current U.S. plans for replacing the Space Shuttle, and the images of the hardware being built and tested were quite impressive. Just as impressive was the expressed spirit of international cooperation and coordination, not only among International Space Station partners, but rapidly rising space powers such as India, China, and Korea. This spirit has been in development for three years, based on an inclusive U.S. diplomatic strategy that resulted in 14 space agencies agreeing to a common Global Exploration Strategy.

Let me quote from that strategy:

> *Space exploration follows a logical set of steps, starting with basic knowledge and culminating, it is hoped, in a sustained human presence in space. This journey requires a variety of both robotic and human missions. The Global Exploration Strategy provides a framework to coordinate the efforts and contributions of all nations so that all may participate in the expansion into space and benefit from it.*

Unfortunately, the internal U.S. debate this past summer, combined with the realities of the Fiscal Year 2010 NASA budget have created an air of uncertainty over U.S. intentions. To borrow from Norm Augustine, it's hard to get others to work on a garden if we're pulling up flowers to check the roots. It's hard for many of our international friends to secure support

for human spaceflight from their governments if we appear to have doubts about the value of the effort.

The United States is a founding member of the space club, but we're at risk of shifting to emeritus status while others with more energy step up. The Chinese in particular have laid out a careful, logical approach in which they plan to launch a mission in 2011 to test docking and rendezvous techniques, followed by a man-tended laboratory in 2015, and a three-man space station by 2020. The selection of 45 new taikonauts is underway along with plans for a lunar sample return missions and Mars orbiter by 2013. To be clear, I welcome peaceful Chinese space exploration efforts. However, I don't want them and other nations to be on the frontier of space without us. We may not be in a race, but we need to keep up.

The Apollo program was intentionally a unilateral U.S. effort. The whole point was to beat the Soviet Union to the Moon. The Space Shuttle included international contributions such as the Canadian robot arm and a European Spacelab. The space station began as a U.S.-centered international effort but evolved into the fully integrated partnership that is the International Space Station (ISS) today. After the loss of the Columbia, sustaining the ISS would not have been possible without the international partners.

Questions for Space

Today, we have the Global Exploration Strategy as an international common approach to human and robotic exploration of the Moon, Mars, and beyond. As I noted at the beginning, there is no question about the practical, scientific, and even diplomatic value of space exploration and this is recognized by other spacefaring nations as well. What about humans in space? That is the key question for our nation's civil space policy.

What are the questions that will drive and sustain a human space exploration effort, if nation are not beating each other in Cold War-like competitions for prestige?

Challenger forced the question of whether we should risk humans flying payloads that could be launched in other ways. The answer was no and we moved satellites to expendable launch vehicles operated by private companies.

Columbia forced the question of why are we risking humans at all. The Columbia Accident Investigation Board (CAIB) said that travel beyond Low Earth Orbit was necessary if we were to justify the risks involved. The current U.S. Space Exploration Policy, past NASA authorizations by Congress, and Global Exploration Strategy are consistent with the views of the CAIB.

If we are not planning for what comes after the ISS, the government is, in effect, getting out of the human spaceflight business. There may be space tourists launched by U.S. companies – I certainly hope so – but tourism cannot sustain a major international cooperative human space exploration effort. If we are not going beyond low Earth orbit, we are ignoring both the recommendations of the CAIB and the reality of the increasing globalization of space activity.

We should take a page from our science colleagues in asking simple, but profound questions to shape an implementation strategy. In science, questions such as "Does life exist elsewhere in the solar system?" or "What is dark energy?" help shape and sustain scientific

strategies and programs over long periods.

What is the question for human spaceflight? I believe it's asking whether there is a human future beyond the Earth.

Dr. Harry Shipman posed two questions in his 1989 book *Humans in Space* whose answers lead to very different human destinies. The first is, "Can extraterrestrial materials be used to support life in locations other than Earth?" And the second is, "Can activities of sustained economic worth be carried out at those locations?" Or as I shorten it: "Can we live off the land?" and "Can we make it pay?"

If the answer to both questions is yes, we will see space settlements and the incorporation of the Solar System into our economic sphere as former Science Advisor Jack Marburger has suggested. If the answer is no, then space is a form of Mount Everest – good for personal challenge and tourism but nobody really lives there. Other answers might see Antarctica-like outposts or perhaps a North Sea oil platform exploiting space resources but without sustainable human communities in space.

Many people seem to have faith-based answers to these questions but I would suggest a greater humility in admitting that we don't really know. And therefore our efforts should be to answer these questions as in the course of human and robotic exploration beyond the Earth. The quest to do so will teach us much of practical benefit as we seek to do things that are hard. The experiences we gain in exploration will give us new insights into what humans can do and who we are.

Value from Space

The practical benefits of sending humans beyond the Earth are the "acceptable reasons" of supporting national interests in science, technology development, and international relations. For many countries, these reasons are not just "nice to do" but serious reasons of state. For India, ambitious space efforts attract new human capital to the strategic aerospace sector, which must compete with a growing information technology industry. For China, human spaceflight experiences are training a new generation of technical specialists in many fields and raising the quality level of industrial suppliers. For Japan and Europe, space flight demands interdisciplinary skills that can increase competitiveness in aerospace and non-aerospace sectors. The sophisticated systems engineering demanded by human space flight are part and parcel of what a great nation does, and more importantly, what it is capable of doing.

Human spaceflight is the most demanding space activity, technically, financially, and organizationally. From the beginning it has also been the most symbolic activity, both at home and abroad. In the past, it responded to the question of who we were as Americans in the Cold War. Today, it is a powerful symbol of cooperation among former adversaries on the International Space Station. The deep international relationships built through the ISS are among its most impressive and perhaps most enduring achievements to date.

The question of whether there is a human future beyond the Earth will not be answered in a decade or five decades. It is a question that will evolve, challenge, confound, and test us for a long time as we try to answer it.

For the future, we need to continue efforts to bind friends and allies to us in a multi-partner world in which space capabilities are globalized.

We need friends and allies to help secure the global commons of space upon which we depend, to ensure that the space environment remains free of interference and open to peaceful uses by all.

We need to inspire a new generation of Americans to take of the many demands of a globally competitive environment driven by scientific and technical innovation. The interdisciplinary demands of space flight and human space flight in particular can be a highly effective school for meeting those challenges.

It is not just our machines or even our DNA that travel into space but our values as well. What values to we want to see be the norm in human activities beyond low Earth orbit? The international norms for human space activity will be shaped by those who are there, not by those who stay behind. If we want to see a human future in space that reflects our values then we must be part of that effort.

What will the United States do?

Ambitious goals and rhetoric require difficult actions and serious resources or the symbolism and actuality of human spaceflight will be hollow. The President is critical to effectively setting space policy priorities in budget requests to the Congress. All Presidents have put their stamp on the nation's space efforts, from Kennedy and Nixon to Clinton and Bush. Their actions have typically reflected the broader international approach the United States seeks to play in the world.

The United States is facing a generational transition away from the period represented by the Space Shuttle that is just as profound as the transition from Apollo was. We are facing a transition not just of hardware and contracts, but also of leadership and values. The transition is upon us at home and abroad, just as we see that others are not delaying their entries into space. What will this nation do?

Thank you for your attention. I would be happy to answer any questions you might have.

Scott Pace

Dr. Scott Pace is the Director of the Space Policy Institute and a Professor of Practice in International Affairs at George Washington University's Elliott School of International Affairs. His research interests include civil, commercial, and national security space policy, and the management of technical innovation. From 2005-2008, he served as the Associate Administrator for Program Analysis and Evaluation at NASA.

Prior to NASA, Dr. Pace was the Assistant Director for Space and Aeronautics in the White House Office of Science and Technology Policy (OSTP). From 1993-2000, Dr Pace worked for the RAND Corporation's Science and Technology Policy Institute (STPI). From 1990 to 1993, Dr. Pace served as the Deputy Director and Acting Director of the Office of Space Commerce, in the Office of the Deputy Secretary of the Department of Commerce. He received a Bachelor of Science degree in Physics from Harvey Mudd College in 1980; Masters degrees in Aeronautics & Astronautics and Technology & Policy from the Massachusetts Institute of Technology in 1982; and a Doctorate in Policy Analysis from the RAND Graduate School in 1989.

Dr. Pace received the NASA Outstanding Leadership Medal in 2008, the U.S. Department of State's Group Superior Honor Award, *GPS Interagency Team*, in 2005, and the NASA Group Achievement Award, *Columbia Accident Rapid Reaction Team*, in 2004. He has been a member of the U.S. Delegation to the World Radiocommunication Conferences in 1997, 2000, 2003, and 2007. He is a past member of the Earth Studies Committee, Space Studies Board, National Research Council and the Commercial Activities Subcommittee of the NASA Advisory Council. Dr. Pace is a currently a member of the Board of Trustees, University Space Research Association.