



JAMES A. BAKER III INSTITUTE FOR PUBLIC POLICY
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CONGRESSIONAL BRIEFING FOR
UNITED STATES SPACE POLICY: CHALLENGES
AND OPPORTUNITIES GONE ASTRAY

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U.S. Space Policy: Challenges and Opportunities Gone Astray

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U.S. Space Policy: Challenges and Opportunities Gone Astray

Neal Lane's Remarks

- **Introduction**

- › I am very pleased to join George Abbey and our colleagues to talk about America's future in space. Thank you all for being here.
- › In 2005, George (former director of the Johnson Space Center) and I published a paper for the American Academy of Arts and Sciences titled "United States Space Policy: Challenges and Opportunities."
- › The paper that he and I will discuss today is an update—reflecting on the issues we raised four years ago, what has happened since, and how we think the space program should move forward—in a more positive direction.
- › I will comment on issues we raised in our earlier paper, provide some updates, and then turn it over to my partner, George Abbey, to highlight the most important findings and present our specific recommendations to the Obama administration—and the Congress.

- **Our Central Message**

- › The central message we want to get across to you today is a positive one.
- › The election of a new president with a progressive agenda for the country presents NASA, under its capable new leadership, with a unique opportunity to demonstrate that it is every bit as relevant in the post-Cold War world as it was in the days following *Sputnik*.
- › This will require that the Obama administration support NASA in doing three things:
 - restructuring its human spaceflight program to meet important and realistic objectives,
 - re-establishing a balanced overall set of space activities that retain science and aeronautics as top priorities,

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- focusing the agency’s legendary capabilities on some of the nation’s most critical needs, especially in the areas of energy (solar and fuel cell technology, low-carbon fuels and fuel efficiency) and the environment (Earth observation and modeling).
 - › We are proposing a new direction for NASA, a space program that is both progressive and conservative and can be carried out with existing capabilities and realistic budgets—and we are proposing an agency, NASA, that is as critical to meeting our needs on Earth as it is to probing the mysteries of space.
 - › The opportunities are there, but with opportunities come challenges.
 - › Let me give you two snapshots, represented by our two papers published by the American Academy of Arts and Sciences.
- **Some Background—Our 2005 Paper**
 - › In our 2005 paper, we observed that the Bush administration’s civilian space policy “presents a paradoxical picture of high ambition and diminishing commitment.”
 - › You will recall that the Bush administration’s space program had a timetable for the following goals and priorities: complete the Space Station and retire the shuttle (2010); develop a new spacecraft (2008) and fly it (2014); return to the Moon (2020); and prepare for a future trip to Mars.
 - › President Bush promised modest increases in NASA’s budget and NASA quickly reset its priorities, becoming, in our view, a single-focus, Moon-Mars mission agency.
 - › In our earlier paper, we expressed the view that the new plan was indeed bold, but that it was incomplete (science was missing) and unrealistic (the money appeared to be missing).
 - › In addition, we made the point that any such bold plan for the U.S. space program—indeed more generally, future American leadership in space—will require a robust commercial space industry, a well trained science and

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engineering (SE) workforce, a credible plan for science and human exploration, and expanded international cooperation.

- ▶ To be more specific, we listed four “barriers” to progress, as we saw them at the time:

- **First Barrier: The Impact of Export Controls, International Traffic in Arms Regulations (ITAR) in particular, on Space Commerce.** The United States cannot have a successful space program without a strong commercial space industry. Your company knows it is in trouble when foreign companies advertise their services as “ITAR free” (meaning that not a single component was made in the United States) and then walk away with the space commerce business. Moreover, these costly regulations, which were intended to benefit national security, have had the opposite effect (January 2009, National Academies’ National Research Council (NRC) report “Beyond ‘Fortress America’: National Security Controls on Science and Technology in a Globalized World”).
- **Second Barrier: The Projected Shortfall in the U.S. Science and Engineering Workforce.** This is an issue that threatens U.S. leadership in more areas than space, as has been made clear by reports by the National Science Board, and the National Academies’ “Rising Above the Gathering Storm” report as well as the testimony of such business leaders as Bill Gates.
- **Third Barrier: Inadequate Planning for the Future of NASA and the U.S. Civilian Space Program.** Unrealistic objectives, lack of planning, and inadequate budgets appeared to us to guarantee that the U.S. human exploration program and science would be set back many years.
- **Fourth Barrier: A Loss of International Cooperation (and Trust).** By labeling the Moon-Mars program as entirely a U.S.-led operation and bowing out of the Space Station without any consultation with other nations, our credibility as a reliable international partner took a big hit. In addition, the previous administration’s posture on the military use of space

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reinforced the impression abroad that the United States had no interest in cooperation.

- Briefly, these were the barriers we saw four years ago. So, where are we today?

- **Current Status**
 - The title of the new paper you have before you today includes the phrase “Challenges and Opportunities Gone Astray,” which pretty well summarizes what has happened over the past four years.
 - With regard to export controls, the good news is that there is increased recognition that the application of ITAR to all forms of space research and space commerce has had serious unintended consequences and the system needs an overhaul.
 - With regard to the projected shortfall in the U.S. science and engineering workforce, we have made little progress, while other nations, e.g. China, forge ahead.
 - With regard to NASA and the U.S. civilian space program, and international cooperation, the situation is even worse than we anticipated four years ago.
 - The modest infusion of new money the president promised never arrived, but NASA still had deadlines to meet.
 - Progress on the proposed shuttle replacement “*Constellation*” (new crew exploration vehicle, or capsule, *Orion* to ride on a new rocket *Ares I*) has been disappointing, making it likely that the United States will not have its own space transportation for five, possibly 10, years.
 - The previous NASA leadership felt compelled to cut back on science (astronomy, Earth observations, life science and space medicine, aeronautics) and other activities in its attempt to follow the president’s directives with inadequate funds.
 - The highly successful Hubble Telescope was nearly left to wither and die until community and Congressional pressure caused NASA to reverse its decision to abandon it.

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- The previous NASA leadership also made the decision not to fly an innovative astrophysics experiment, the Alpha Magnetic Spectrometer (AMS), to the Space Station. The instrument has already been constructed and paid for by DOE (\$1.5 billion) and involved 16 other countries. It was going to be left for scrap. Again, community pressure and help from some members of Congress caused NASA leadership to reverse its position. The AMS is now scheduled to go up on the last shuttle flight.
 - The purpose of the AMS is to sort out cosmic rays and help us understand the apparent absence of antimatter in the universe and perhaps shed light on “dark matter.” This experiment, under the direction of Nobel laureate Sam Ting, involved over 500 scientists from 56 institutions in 16 countries (including both China and Taiwan), all of whom contributed funds.
 - In short, NASA has been trapped by expectations it could not meet and promises not kept. Understandably, morale at NASA is at a low point, and talented people—many of whom brought you *Apollo*, the extraordinary planetary missions, the Mars rovers, the Earth observation satellites, the Hubble, and the Space Station—are retiring or bailing out.
- But, all that said, we believe there is reason for optimism. Our central message today is that NASA has shown over and over again that it is incredibly resilient; and in spite of years of disappointments and shifting priorities, it has a cadre of truly outstanding people who are dedicated, even passionate, about what they do. We believe that NASA and the U.S. civilian space program can indeed have a future every bit as grand as has been its past.
- While the challenges to America’s space program are large, so are the opportunities. It is clear that the Obama administration recognizes that there is a need for a careful review and a new direction for NASA. And we are heartened by the president’s choice of NASA’s new administrator, Charles Bolden, and the appointment of such a distinguished blue ribbon committee, under the leadership

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of Norm Augustine, to offer guidance to the Obama administration on the future of humans in space.

- I now want to turn it over to my colleague, George Abbey, to highlight some of the most important findings and describe our recommendations to the Obama administration and Congress.

George Abbey's Remarks

Thank you, Neal.

This past week, the nation celebrated the 40th anniversary of the successful lunar landing. In our paper, we have made recommendations that we believe will help to overcome the four barriers we have identified and will help to make NASA, as Neal Lane has said, “an agency that can demonstrate that it is every bit as relevant in this post-Cold War world as it was 40 years ago in the days following *Sputnik*.”

- With respect to the first barrier, (“**The Impact of Export Controls on Space Commerce**”), we believe it is essential to implement the recommendations of the NRC’s January 2009 report, “Beyond ‘Fortress America.’”
 - This report presents a clear case for changing the present export control rules.
 - It calls on the new administration to promptly revise export control policies by issuing an executive order that affirms “a strong presumption for openness.”
 - The report’s 20 pages of recommendations should be implemented at the earliest possible date if the United States is to overcome this barrier to realizing the great potential of its present and planned activities in space, as well as to strengthen the nation’s university research activities and the nation’s aerospace industry.
 - We are encouraged that the Committee on Science and Technology of the House has held hearings in February to discuss the findings and recommendations of the report.
 - Committee Chairman Bart Gordon commented that, “Our nation’s export controls were supposed to help strengthen our national security by protecting America’s

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sensitive technologies from falling into the wrong hands. However, in recent years there has been a growing chorus of concern that the current system of export controls is undermining our nation's competitiveness in the global economy, undermining our science and technology enterprise, and weakening our national security—not strengthening it.”

- The second barrier (“**The Projected Shortfall in the U.S. Science and Engineering Workforce**”) will not be immediately overcome.
 - The NRC report “Rising above the Gathering Storm” best defines the problem.
 - The FY2009 American Reinvestment and Recovery Act and the FY2009 regular appropriations have provided funding.
 - The NRC report “Beyond ‘Fortress America’” supports the visa policy recommendations of “Rising above the Gathering Storm,” stating the present visa policy inhibits collaboration with foreign experts and the absorption of foreign students into the U.S. work force.
 - It is important to implement the recommendations made by both the NRC reports “Rising above the Gathering Storm” and “Beyond ‘Fortress America.’”
 - It is equally important to pass an updated version of the 1958 National Defense Education Act providing financial aid for education in the United States at all levels, both public and private.
 - The present state of the U.S. educational system and the shortfall in engineering and science graduates coming out of U.S. universities should generate the same concern that was felt by the nation 50 years ago when the Russians launched *Sputnik*. The United States should be as motivated to solve contemporary problems as it was in 1958.
 - Working with the nation's universities and drawing on their knowledge and expertise, NASA should provide support for a large, strong, and effective graduate student program. A new act, combined with an active and meaningful partnership between NASA and the nation's universities, establishing a new National Defense Fellowship program could help to address the potential shortage of young U.S. scientists and engineers. A key stated objective of all NASA

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research and technology programs should be to excite a new generation of scientists and engineers and rebuild scientific and technical expertise within NASA and across the nation. NASA's research center structure should be reestablished with this objective in mind, creating a strong link to the nation's universities.

- Regarding the third barrier (“**Inadequate Planning for the Future of NASA and the U.S. Civilian Space Program**”):
 - The U.S. Civilian Space Program has taken NASA in a direction that impacts its ability to continue to contribute to research and science—including providing a better understanding of the earth's environment—and has thus created an almost unrecoverable crisis in human spaceflight.
 - NASA needs to prove its relevance in the post-Cold War world while restructuring its human spaceflight objectives.
 - A new direction is proposed for NASA: a five-point plan that can be carried out with existing capabilities and realistic budgets. By not investing in a unique *Ares I* Earth-to-orbit human launcher, NASA would be positioned to take full advantage of emerging commercial Earth-to-orbit transportation services, should opportunities develop in the 2015–2020 timeframe.
 1. **Shift the near-term focus from the moon to the International Space Station (ISS) followed by building a capability for a deep-space asteroid or comet intercept based on an *Ares V* heavy-lift vehicle.**
 - The *Ares V* heavy-lift launch capability is critical to any further deep-space exploration. By canceling *Ares I*, NASA should be able to focus all its launch vehicle development capability on designing the one launcher needed by the nation for future deep-space work and not anticipated to be provided by the private sector. To advance this and other concepts, a joint NASA-Department of Defense propulsion research program should be initiated because propulsion is a limiting factor in space exploration.
 - A restructured human spaceflight exploration initiative should involve and be supported by the capabilities of other U.S. federal agencies,

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universities, and industries, and be fully international in scope. The proven international partners from the ISS—Canada, Europe, Japan, and Russia—should be invited to participate in a restructured human space-exploration program.

2. Deliver short-term payoffs (within four years) in energy and the environment, especially climate change.

- The implementation to deliver short-term payoffs (within four years) in energy and the environment, especially in the area of climate change, takes advantage of the unique capabilities and skilled workforce of each NASA center. The efforts and unique capabilities of the various NASA centers should be refocused and commensurate with their expertise. The short-term payoffs would involve initiatives to fully understand and optimize the aerodynamics, structures, and mechanisms of large-scale wind turbines; to fully understand and optimize high-efficiency, large-scale solar cells and small-scale fuel cell technology applications; to improve aerodynamic and propulsion efficiency of general aviation and commercial aircraft; and to develop and evaluate alternative aviation fuels and aircraft power plants.
- Initiatives should be implemented to fully employ NASA's ability to monitor, model, and predict long-term climate, utilizing NASA instruments, aircraft, spacecraft, computers, and communications. This effort could include enhanced use of the ISS for monitoring the Earth, as well as expansion of the current Earth Observing System (EOS).

3. Deliver longer-term payoffs (within four to eight years) for energy and the environment.

- The implementation to deliver longer-term payoffs (four to eight years) for energy and the environment as a potential long-term energy solution could involve an effort to demonstrate—initially on a small scale—wireless power transmission from orbit to the Earth using the shuttle and the ISS. Additional small-scale efforts could be initiated to demonstrate other

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potential technologies for healing the planet that are tied to NASA's ability to monitor, model, and engineer large-scale complex systems.

4. **Ensure an ongoing and effective robotic space science program.**
 - NASA supports an outstanding community of researchers making pathbreaking discoveries about the workings—past, present, and future—of the universe, solar system, and earth through space-based telescopes, observations, satellites, and planetary rovers.
5. **Reinvigorate and pursue an effective aeronautical research program, with particular attention to low-carbon fuels and efficiency.**
 - A reinvigorated and more effective aeronautical research program must include a review of the present status of the nation's aeronautical test facilities and should identify the upgrades and new construction needed to ensure the support of a revitalized aeronautical research program.
 - Our proposed five-point plan takes the agency in a direction that will significantly contribute to the future in two vital areas: energy and the environment, particularly climate change. At the same time, NASA should continue to fly human beings in space, complete the ISS, meet its commitments to the United States' international partners, and re-establish a balanced set of activities featuring science, engineering, aeronautics, research, and technology. NASA should also build a foundation for a human space exploration program that involves other agencies and the nation's universities, and is based on international cooperation.

- The fourth barrier (**“Erosion of International Cooperation in Space”**) has affected the nation's creditability as a reliable international partner. The goals of the human space exploration initiative need to be restructured by de-emphasizing an early focus on the U.S.-led moon and Mars program in favor of enhanced support for the ISS and a clearly stated objective of peaceful cooperation in space based on scientific research. And the space shuttle flights need to be extended through 2015, thereby providing the large up-and-down mass capability needed by all ISS partners.

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- ▶ **Change the focus from an early moon and Mars mission to enhanced support of the ISS past 2015.**
- ▶ A clearly stated rationale for the ISS, such as continued international cooperation on the peaceful uses of space, scientific research in particular, is important.
- ▶ Encourage participation in a restructured human space exploration initiative by other federal agencies, the university community, and scientists in other nations—including the United States' ISS partners, but expanded to include all interested countries.
- ▶ China has joined the United States and Russia in having the capability to fly human beings in space, and China is planning for its own space station. The benefits to the United States of cooperation in space with Russia, and of working with it and the other international partners on the ISS, could be extended by making China a partner on the ISS, thus encouraging and turning China's aspirations in space toward cooperation and the peaceful use of space. As a prelude to such discussions, the United States should initiate discussions with China on the use of a common docking system that would enhance and enable space rescue missions. We understand that both the United States and China have strategic national security interests in space. But, in our view, the peaceful uses of space should be the ultimate goal of both nations, and the surest way to achieve that objective is to begin serious discussions on cooperative scientific and human space exploration activities that the two countries, in cooperation with other nations, can plan and carry out in the coming decades.

Conclusion

NASA has a unique opportunity to demonstrate that it is every bit as relevant in the post-Cold War world as it was in the days following *Sputnik*. By focusing the agency's legendary capabilities on some of the nation's most critical needs while restructuring its human spaceflight objectives and establishing a more balanced overall set of programs that retain science as a top priority, NASA could emerge a stronger agency than at any time in recent decades.

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The result would be a civil space program that would allow the United States to maintain the leadership envisioned by President John F. Kennedy in his historic Rice University speech in 1962:

“The vows of this nation can only be fulfilled if we in this nation are first, and, therefore, we intend to be first. In short, our leadership in science and in industry, our hopes for peace and security, our obligations to ourselves as well as others, all require us to make this effort, to solve these mysteries, to solve them for the good of all men, and to become the world’s leading spacefaring nation.”

Today, with the Cold War far behind us, the United States can be the leading spacefaring nation by making the necessary investments in research, education, and human space exploration, and by leveraging those investments through meaningful cooperation with other nations.

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Appendix I

American Academy of Arts and Sciences

Space Policy Briefing

Thursday, July 30, 2009, Washington, D.C.

Attendees

Note: Tentative attendees are noted in italics.

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