



JULY — SEPTEMBER 2009

INSIDE THIS ISSUE

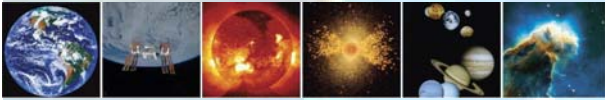


*I cannot believe I am writing this. I am about to argue that the scientific community ought to help rehabilitate the mission of the International Space Station.*

—Charles F. Kennel, Chair, SSB

<i>From the Chair</i>	2
<i>Director's Corner</i>	3
<i>SSB Activities</i>	4
<i>SSB Standing Committee Chairs</i>	4
<i>SSB Membership</i>	6
<i>Other News—Yvonne Brill named to the New Jersey Inventors Hall of Fame</i>	6
<i>Congressional Testimony</i>	7
<i>Summaries of Congressional Hearings of Interest</i>	10
<i>A Day Without Space: Economic Security Ramifications</i>	11
<i>Lloyd V. Berkner Space Policy Internships</i>	11
<i>Staff News</i>	12
<i>SSB Staff</i>	12
<i>SSB Calendar</i>	13
<i>Selected Reports Available from the SSB</i>	14

## SPACE STUDIES BOARD NEWS

*FROM THE CHAIR*

I cannot believe I am writing this. I am about to argue that the scientific community ought to help rehabilitate the mission of the International Space Station (ISS).

I have always been a critic of the International Space Station. When I was the chair of the NASA Advisory Council (NAC), we excoriated NASA's undisciplined management of the ISS project. Worse yet, NASA was unable to account for its costs and delays satisfactorily. NASA took our recommendation to limit its focus to completing the station and fulfilling the commitments to its international partners. In the event that this came at the expense of NASA's own plans to use the station.

The NAC also took NASA to task because NASA was not paying much attention to what to do with the station once it was built. The American public had no idea what the station was for. The situation got worse when NASA's Life and Microgravity Sciences Program was cannibalized in favor of ISS construction, and a long-suffering science community, which had been patiently waiting to fly its experiments on the station, was dispersed. The extraordinarily strained relations between the science and human spaceflight communities were a contributing factor leading to the departure of three scientific members, including me, from the NAC.

By then the *Columbia* tragedy had occurred, and in the aftermath President Bush announced the Vision for Space Exploration. NASA was to return the space shuttle to flight, complete the space station, fulfill its obligations to its international partners, and retire the shuttle in 2010. NASA was also to create a new architecture for human spaceflight that focuses on exploration beyond low Earth orbit—the Constellation program. Shuttle and station operations seemed repetitive and boring, but a landing on the Moon might reawaken the old passion for space exploration.

To its credit, NASA is completing construction of the station. Even when its own plans to use it were vague, it kept its commitments to its international partners, so they could carry out their plans. On the other hand, the absence of a forceful user community in the U.S. probably made it easier to plan to de-orbit the station in 2015, after only 5 years of full utilization of a project that was 25 years in the making. The station funding was needed after 2015 to complete the Constellation Program.

In May of this year, the President and NASA convened the “Augustine Commission” to develop options for the future of the human spaceflight program. As this newsletter is published, the Augustine Commission's final report has been released (available at <http://www.nasa.gov/offices/hsf/home/index.html>), and its general conclusions are known through its public presentations and Norman Augustine's testimony before Congress.

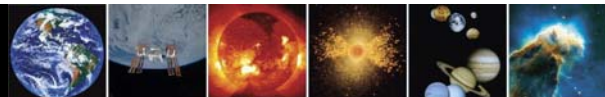
Had NASA received additional funding as promised, it might have been possible to complete the Constellation program. That funding did not materialize: Constellation cannot be executed within the present NASA budget. Another \$3B/year would be required for exploration beyond low Earth orbit in the next decade. This, the president will have to decide.

In the meantime, the International Space Station is one of the principal beneficiaries of the Augustine report. With the exception of the Constellation-based scenarios, all others discussed by the Augustine Commission recommend an extension of the station through at least 2020.

Why did the commission do this? Space exploration connects with the global public, and NASA's leadership in space promotes American leadership in the world. The ISS has proven that many nations can work together toward a distant and difficult goal. It expresses a U.S. leadership style adapted to today's multi-polar world and tomorrow's global challenges.

Aside from the space station itself, the most valuable asset produced by the ISS project has been the proven and tested working-level relationships among the partners. This partnership has weathered budget problems, changes in governments, lapses in commitments, and the *Columbia* tragedy. A good partnership already exists, and it could evolve the global partnerships that will be needed for human exploration beyond low Earth orbit, and, I may add, large science projects like Mars sample return.

I also believe extension of ISS operations to 2020 and beyond could be a game-changer. The few projects now on the drawing board might be flown by 2015, but new users would have no hope and would not even try. Because ISS did not have much of a future, people were not thinking of what they could do with it. At the same time, NASA, which never paid much attention to using the station, will have to change its ways to attract new science and technology users. It will need to



fund utilization generously. *And*, it will need to take utilization management out of the hands of the people who built the station.

The Space Studies Board's Decadal Survey on Biological and Physical Sciences in Space is the right place to identify the new scientific opportunities made possible by an open-ended ISS program. It can help define the new organization needed to manage the interface between the flight operations and user communities. Perhaps for the first time there will be people who really have to listen.

Now, I don't expect that the ISS will change science as we know it. People don't entertain that illusion any more, anywhere. But I do think it would be a mistake for the science community not to design a program that returns value to the American and global publics.

—Charles F. Kennel, Chair, Space Studies Board

## DIRECTOR'S CORNER



My tenure as acting director of the SSB and Aeronautics and Space Engineering Board (ASEB) is now in its eighth month. It has been a busy and interesting time. The SSB has been very active over this period, holding a total of 41 study committee meetings and releasing five reports. Two decadal surveys were started during this period:

planetary science and biological and physical science in space, the last is a joint project with the ASEB. In addition, several other projects were started so that we now have a total of seven ongoing projects.

Released reports addressed NASA's heliophysics program, planetary protection requirements for Mars sample-return missions, radioisotope power systems, America's future in space, and near-Earth objects mitigation strategies (interim report). The last three were done jointly with the ASEB. The last two reports were released during the July-September quarter. Several other studies are just now entering the review phase, and we expect more releases by the end of the year. Details of all of these reports are provided on the SSB website.

For the reports for which it was appropriate, briefings were provided to administration officials, NASA officials and staff, and congressional staff. Over a period of two days, we provided six briefings on *America's Future in Space* including to OSTP, OMB, both congressional authorizing committees, and Charlie Bolden, just before he was confirmed as NASA administrator by the Senate. In all cases, the report was very well received. In addition, testimony on this study was given by study committee chair Les Lyles before the House Science and Technology Committee in July (see a reprint of his testi-

mony later in this newsletter). Also, vice chair Ray Colladay (also chair of the ASEB) and study committee member Len Fisk will deliver testimony on the study in October to the House Science and Technology Committee and the Senate Commerce Committee, respectively. Dr. Colladay's testimony focuses on the report's recommendations about advanced technology development. NASA is initiating new activities in this area, in part in response to recommendations from *America's Future in Space* and other SSB/ASEB studies.

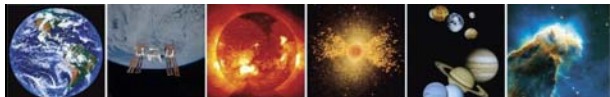
The two decadal surveys mentioned above, along with the astronomy and astrophysics survey (Astro2010) being carried out with the Board on Physics and Astronomy, are moving forward on schedule. They all involve substantial efforts to define the key science issues to be addressed as the basis for selecting mission priorities. This has resulted in significant participation by the research community—beyond those who are members of the many project panels and steering committees. Because of the importance of the decadal surveys for the research agenda in these fields, this participation will be critical to the acceptance of the studies' results.

As for the future, completion of the Augustine commission report adds another dimension to the outlook for the SSB. As NASA and the administration determine how to incorporate the recommendations provided in the report—along with those in the *America's Future in Space* study—there are likely to be implementation issues that will be the subject of future SSB studies. The upcoming meeting of the SSB will be taking a look at this possibility, as it spends the first day of its meeting on implementation, including the future utilization of the ISS.

On the staff front, we have identified two good candidates for the position of director of the ASEB and SSB and are in the final interview stages. We hope to announce a decision some time in November.

Finally, a great deal of thanks is in order for the entire SSB staff for the efforts it has given these past three months. The large number of committee and panel meetings planned and held, committee nominations prepared, and report reviews started along with the other operational activities of the Board have substantially taxed everyone. All of these tasks have been and continue to be performed with a high degree of excellence and intensity. And despite the overlay of uncertainty as we make the transition to a new Board director, staff morale has remained high through all of this. This is a credit to the professionalism and quality of the staff and the leadership of the previous Board directors that established such a fine organization.

—Richard Rowberg, Acting Director, SSB and ASEB



## SSB ACTIVITIES

### THE BOARD AND ITS STANDING COMMITTEES

The **Space Studies Board (SSB)** did not meet during this quarter; however, the SSB executive committee (XCOM) did meet on August 4-5 at the J. Erik Jonsson Woods Hole Center in Woods Hole, MA, for its annual strategic planning session. The XCOM meet with Jean Pierre Swings (ESSC Chair) and Jean-Claude Worms (ESF) for a discussion on emerging space powers. The committee also received status reports from Steve Squyres, chair of the Planetary Science Decadal Survey, and Betsy Cantwell, chair of the Decadal Survey on Biological and Physical Sciences in Space.

The board will meet next at the National Academies' Arnold and Mabel Beckman Center in Irvine, CA, November 3-4, 2009. The workshop originally planned for this meeting has been rescheduled to November 2010. It was the opinion of the planning committee that inadequate time was available this year to organize a workshop on the selected theme that would be the desired caliber.

The **Committee on Astronomy and Astrophysics (CAA)** is on hiatus until the completion of the astronomy and astrophysics decadal survey.

The **Committee on Earth Studies (CES)** did not meet during this quarter. The next meeting of the committee, scheduled for October 19-20 in Washington, DC, will include briefings by NASA Earth Science Division Director Michael Freilich and NOAA assistant administrator for satellite and information services, Mary Kicza. Committee discussions will focus on issues related to the implementation of the decadal survey, the status of NPOESS, and potential workshops or studies of interest to agency sponsors. The committee will also receive updates on several prospective and ongoing NRC studies.

The **Committee on the Origins and Evolution of Life (COEL)** met in Big Sky, MT, September 1-3 in order to allow for a site visit to Yellowstone National Park where the committee visited Lower Geyser Basin and Old Faithful. The committee also heard presentations from several local research groups, including the Idaho National Laboratory and Montana State University's NASA Astrobiology Institute's team and the Thermal Biology Institute. In addition, the committee heard about the latest developments in NASA's Astrobiology program and the NASA Astrobiology Institute. Finally, the committee heard several presentations relating to planetary protection issues for icy solar system satellites. The committee will hold a conference call on December 3 in lieu of their usual autumn meeting. The committee's next meeting will be held at the University of Southern California on February 17-19, 2010.

The **Committee on Planetary and Lunar Exploration (COMPLEX)** is on hiatus until the completion of the Planetary Science Decadal Survey.

The next meeting of the **Committee on Solar and Space Physics (CSSP)** is tentatively scheduled for December 3-4 at the National Academies Keck Building in Washington, DC. The main topic of discussion will be planning for the next decadal survey in solar and space physics.

### SSB STANDING COMMITTEE CHAIRS

**COMMITTEE ON ASTRONOMY AND ASTROPHYSICS (CAA)\***

**COMMITTEE ON EARTH STUDIES (CES)**

Chair: Berrien Moore III

Vice Chair: Ruth Defries

**COMMITTEE ON THE ORIGINS AND EVOLUTION OF LIFE (COEL)\*\***

Co-Chairs: Robert T. Pappalardo and J. Gregory Ferry

**COMMITTEE ON PLANETARY AND LUNAR EXPLORATION (COMPLEX)\*\*\***

**COMMITTEE ON SOLAR AND SPACE PHYSICS (CSSP)**

Chair: Daniel N. Baker

Vice Chair: Thomas H. Zurbuchen

\*Joint with the Board on Physics and Astronomy. CAA is on hiatus during the Astro2010 decadal survey.

\*\*Joint with the Board on Life Sciences.

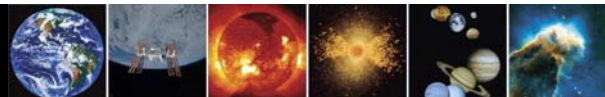
\*\*\*COMPLEX is on hiatus during the Planetary Science Decadal Survey.

### STUDY COMMITTEES

The ad hoc **Committee on the Assessment of Impediments to Interagency Cooperation on Space and Earth Science Missions** held its first meeting July 30-31 in Washington, DC. The committee examined experiences in a number of recent multiagency programs, including NPOESS, Landsat, GOES-R, GLAST/Fermi, and JDEM. Speakers at the meeting included Michael Freilich, Earth Science Division director, NASA HQ (via videoconference); A. Thomas Young, executive vice-president of Lockheed Martin Corp. (ret); Tom Karl, director, and Jeff Privette, NOAA National Climatic Data Center; Robert Winokur, technical director, oceanographer of the Navy; Anne Kinney, director, Solar System Exploration Division, NASA GSFC; Paul Hertz, chief scientist, Science Mission Directorate, NASA HQ; Robin Staffin, director for basic research, OSD; Kathy Turner, Office of High Energy Physics, DOE; Persis Drell, director, SLAC National Accelerator Laboratory (via teleconference); Pam Whitney, Space & Aeronautics Subcommittee, House of Representative Science and Technology Committee; Amy Kaminski, OMB; Damon Wells, OSTP; Phil DeCola, OSTP; Darrel Williams and Jim Irons, NASA GSFC; Paul Menzel, Univ. of Wisconsin (via videoconference); Colleen Hartman, George Washington University; Dana Johnson, Northrop Grumman; and Ron Sega, Colorado State University.

The committee's second meeting was held September 30-October 1 in Washington, DC. Speakers at the meeting include Richard Obermann, staff director, Space & Aeronautics Subcommittee, House of Representative Science and Technology Committee; Michael Freilich, Earth Science Division director, NASA HQ; Mary Kicza, NOAA assistant administrator for satellite and information services; and Geoffrey Pendleton, Dynetics Corporation. During closed session discussions, the committee finalized its report outline and discussed plans for completion of a short report in early 2010.

Congress directed NASA to arrange for an independent **Assessment of NASA Laboratory Capabilities**; as a result, the NRC's Laboratory Assessments Board, in collaboration with the SSB, formed an ad hoc committee of 20 members to carry out a review of NASA's laboratories to determine whether they are equipped and



maintained at a level adequate to support NASA's fundamental science and engineering research activities. The committee held its first meeting on September 8-9 in Washington, DC at which personnel from NASA HQ and seven NASA centers described their laboratories and associated research activities. In closed sessions, the committee laid out the guidelines for site visits to a series of NASA centers that will provide an opportunity to view firsthand the major laboratories and facilities involved in fundamental research. Taking advantage of its close proximity, a visit to Goddard Space Flight Center took place on September 9-10. Additional site visits have been organized to Glenn Research Center on October 15-16, Langley Research Center on October 21-22, and Ames Research Center and the Jet Propulsion Laboratory on November 9-10. Two additional full committee meetings will be held on November 11-13 and in January 2010.

The five Science Frontier Panels (SFPs) of the ad hoc **Astronomy and Astrophysics Decadal Survey Committee (Astro2010)** completed their third and final meetings and developed their draft reports on research priorities, which will enter the NRC's report review process next quarter. The survey's four Program Prioritization Panels (PPPs) also completed their third and final meetings and developed their draft program recommendations. The PPP chairs briefed their panels' draft program recommendations to the Survey Committee at its fourth meeting on October 4-6 in Washington, DC. The PPPs will develop their draft reports next quarter. The next meeting of the Survey Committee is scheduled for January 25-27, 2010. For further details, please see: [www.nationalacademies.org/astro2010](http://www.nationalacademies.org/astro2010).

The **Steering Committee for the Decadal Survey on Biological and Physical Sciences in Space** did not meet during this period but work continued on the member-appointment process for the seven study panels, planning for several town halls, solicitation of white papers through numerous announcements sent to various lists and organizations relevant to the NASA biological and physical sciences program, and the organization of a joint first meeting for the panels.

The Joint Meeting of the Panels was held on August 19-21 at the National Academy of Sciences Building in Washington, DC, and six of the seven panels participated. The panels attending the meeting were the Plant and Microbial Biology Panel, the Animal and Human Biology Panel, the Human Behavior and Mental Health Panel, the Applied Physical Sciences Panel, the Integrative and Translational Research for the Human System Panel, and the Translation to Space Exploration Systems Panel. Approximately 70 attendees were given an overview of the study by steering committee co-chair Betsy Cantwell and heard detailed background briefings on NASA's exploration needs, research capabilities, and program status and history. Panels then met separately in closed sessions where they discussed the task and the various information resources that were, or would become, available during the study. Each panel developed preliminary strategies for addressing their task items, chapter outlines, and writing assignments. The seventh panel, the Fundamental Physical Sciences Panel, was unable to attend the joint meeting, but met on September 8-9 with an agenda and activities similar to that of the joint meeting.

The Steering Committee will hold its next meeting on October 14-16, 2009 in Washington, DC, and each panel will meet two more times prior to the end of January 2010. Continuously updated information on the study, including meetings, town halls, and avenues for

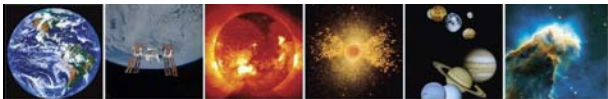
community input, are provided on the public website at [http://sites.nationalacademies.org/SSB/CurrentProjects/ssb\\_050845](http://sites.nationalacademies.org/SSB/CurrentProjects/ssb_050845).

The ad hoc **Committee on Cost Growth in NASA Earth and Space Science Missions** is reviewing existing cost growth studies related to NASA space and Earth science missions and identifying their key causes of cost growth and strategies for mitigating cost growth; assessing whether those key causes remain applicable in the current environment and identifying any new major causes; and evaluating the effectiveness of current and planned NASA cost growth mitigation strategies and, as appropriate, recommending new strategies to ensure frequent mission opportunities. The committee, chaired by former astronaut Ronald Sega, met in Washington, DC on September 1-2 and at the Jet Propulsion Laboratory on October 14-16. Its third and final meeting is scheduled for December 3-4 in Washington, DC.

The ad hoc **Committee on NASA's Suborbital Research Capabilities** held its second meeting on August 19-20 at the Laboratory for Atmospheric and Space Physics in Boulder, Colorado, where it heard presentations from several researchers who conduct research in the suborbital realm and then continued work on its draft report. The committee held its third and final meeting on September 23-25 at the National Academies' Arnold and Mabel Beckman Center in Irvine, CA. On the first day of that meeting, it heard from several more researchers on their suborbital work and received a briefing from Lennard Fisk, chair of the Committee on the Role and Scope of Mission-Enabling Activities in NASA's Space and Earth Science Missions, and staff officer Joseph Alexander.

The committee plans to have its draft report submitted for NRC review by mid-October; the deadline for delivery to NASA of a pre-publication version is December 15. The final, printed report is expected to be completed and released in the first quarter of 2010.

The **Planetary Science Decadal Survey** continues its 2-year study to define a new science and mission strategy for solar system exploration activities at NASA and NSF. The steering committee's first meeting was held in Washington, DC, on July 6-8. Subsequent meetings will be held on November 16-18 (Irvine, CA), February 22-24 (Irvine, CA), and May 25-27 (Washington, DC). Community outreach activities in support of the decadal survey were held at a variety of venues, including the meetings of the Outer Planets Assessment Group (Colombia, MD, July 14), NASA Lunar Science Institute (Moffett Field, CA, July 21-23), Mars Exploration Program Analysis Group (Providence, RI, July 29-30), European Planetary Science Congress (Potsdam, Germany, September 13-18), and the Division for Planetary Sciences of the American Astronomical Society (Fajardo, PR, October 4-9). Future outreach activities are currently scheduled for the American Geophysical Union (San Francisco, CA, December 14-18), Lunar and Planetary Sciences Conference (The Woodlands, TX, March 1-5, 2010), and the Astrobiology Science Conference (Houston, TX, April 26-28, 2010). The panels have held the following meetings: (1) Satellites Panel, August 24-26 in Washington, DC, and September 21-23 in Irvine, CA; (2) Giant Planets Panel, August 24-26 in Washington, DC, and October 26-28 in Irvine, CA; (3) Inner Planets Panel, August 26-28 in Washington, DC, and October 26-28 in Irvine, CA, (4) Primitive Bodies Panel, September 9-11 in Washington, DC, (5) Mars Panel, September 9-11 in Tempe, AZ, and November 4-6 in Pasadena, CA. The panel's future meetings have been scheduled: (1) Satellites Panel, April 12-14 in Boulder, CO, (2) Giant Planets Panel, May 5-7 in Boston, MA,



(3) Inner Planets Panel, April 21-23 in Boulder, CO, (4) Primitive Bodies Panel, April 26-28 in Knoxville, TN, (5) Mars Panel, April 14-16 in Boulder, CO. The third update from the steering committee chair Steve Squyres to the planetary community can be found at [http://sites.nationalacademies.org/SSB/SSB\\_054187](http://sites.nationalacademies.org/SSB/SSB_054187). The decadal survey is scheduled to be delivered to NASA and NSF by the end of March 2011.

The steering group of the ad hoc **Committee for the Review of Near-Earth Object (NEO) Surveys and Hazard Mitigation Strategies** held its third meeting at Woods Hole, August 10-11, and its fourth meeting September 1-2 at Irvine, CA. The committee's Survey/Detection Panel held its fourth meeting, devoted to writing its final report, July 13-15 in Santa Fe, NM. The committee's Mitigation Panel held its third meeting, devoted primarily to writing the final report, July 29-31 in Boulder, Colorado. The committee and its panels undertook a two-phase study to provide recommendations addressing two major tasks: determining the best approach to completing the NEO census required by Congress to identify potentially hazardous NEOs larger than 140 meters in diameter by the year 2020 and determining the optimal approach to developing a deflection strategy and ensuring that it includes a significant international effort. Both tasks will include an assessment of the costs of various alternatives, using independent cost estimating. The committee's interim report was released in early August. The committee's final report is entering the review phase and is due for release by the end of 2009.

The **Committee on the Role and Scope of Mission-Enabling Activities in NASA's Space and Earth Science Missions** completed its draft report and submitted it for external NRC review in September. The final report should be completed and released in the fourth quarter of 2009.

## OTHER ACTIVITIES

The **Committee on Space Research (COSPAR)** scientific assembly will be held in Bremen, Germany, on July 18-25, 2010. The membership term of Edward Stone, the current U.S. representative to COSPAR ends on July 1, 2010. A search for a new representative has been conducted and a candidate has been identified. The appointment of the new U.S. representative is awaiting approval by the NRC's leadership.

## OTHER NEWS



**Yvonne Claey's Brill**, member of the Space Studies Board, was inducted into the New Jersey Inventors Hall of Fame. Ms. Brill effectively expanded the frontiers of space through innovations in rocket and jet propulsion. Her most important contributions have been in advancements in rocket propulsion systems for geosynchronous communication satellites. As a result of her innovative concepts for satellite propulsion system

and her breakthrough engineering solutions, Ms Brill has earned an international reputation as a pioneer in space exploration and utilization.

## SSB MEMBERSHIP JULY 1, 2009—JUNE 30, 2010

**CHARLES F. KENNEL, CHAIR**  
Scripps Institution of Oceanography, University of California, San Diego

**A. THOMAS YOUNG, VICE CHAIR**  
Lockheed Martin Corporation (ret.)

**DANIEL N. BAKER**  
University of Colorado

**STEVEN J. BATTEL**  
Battel Engineering

**CHARLES L. BENNETT**  
Johns Hopkins University

**YVONNE C. BRILL**  
Aerospace Consultant

**ELIZABETH R. CANTWELL**  
Oak Ridge National Laboratory

**ANDREW B. CHRISTENSEN**  
Dixie State College and The Aerospace Corporation

**ALAN DRESSLER**  
The Observatories of the Carnegie Institution

**JACK D. FELLOWS**  
University Corporation for Atmospheric Research

**FIONA A. HARRISON**  
California Institute of Technology

**JOAN JOHNSON-FREESE**  
U.S. Naval War College

**KLAUS KEIL**  
University of Hawaii at Manoa

**MOLLY K. MACAULEY**  
Resources for the Future, Inc.

**BERRIEN MOORE III**  
Climate Central, Inc.

**ROBERT T. PAPPALARDO**  
Jet Propulsion Laboratory

**JAMES PAWELCZYK**  
Pennsylvania State University

**SOROOSH SOROOSHIAN**  
University of California, Irvine

**JOAN VERNIKOS**  
Thirdage, LLC

**JOSEPH F. VEVERKA**  
Cornell University

**WARREN M. WASHINGTON**  
National Center for Atmospheric Research

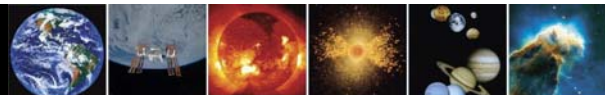
**CHARLES E. WOODWARD**  
University of Minnesota

**ELLEN G. ZWEIBEL**  
University of Wisconsin, Madison

LIAISON  
U.S. REPRESENTATIVE TO  
COSPAR

**EDWARD C. STONE**  
California Institute of Technology

For more information on the membership of the SSB please visit our website at [www.nationalacademies.org/ssb](http://www.nationalacademies.org/ssb).



## CONGRESSIONAL TESTIMONY

**Enhancing the Relevance of Space to Address National Needs Before the Subcommittee on Space and Aeronautics of the House Committee on Science and Technology July 16, 2009**

*At the July 16 hearing before the House Committee on Science and Technology's Subcommittee on Space and Aeronautics, General Lester L. Lyles, chair of the NRC's Committee on the Rationale and Goals of the U.S. Civil Space Program testified on enhancing the relevance of space to address national needs. His prepared statement is reprinted here (without references, notes, appendices, tables, or figures). Ms. Pattie Grace Smith, Board of Directors, The Space Foundation; Ms. Debbie Adler Myers, General Manager, Science Channel/Discovery Communications; and Mr. Miles O'Brien, journalist also testified. Their prepared statements are available at [http://science.house.gov/publications/hearings\\_markups\\_details.aspx?NewsID=2544](http://science.house.gov/publications/hearings_markups_details.aspx?NewsID=2544).*



*(from L to R): General Lester L. Lyles, Ms. Patti Grace Smith, Ms. Debbie Adler Myers, and Mr. Miles O'Brien*

*Photo courtesy of the House Committee on Science and Technology*

### General Lester L. Lyles

Madam Chair and members of the Subcommittee, I appreciate the opportunity to appear before you today. My name is Lester Lyles, I am a retired USAF four-star general and during my 35 years with the U.S. Air Force, I served as commander of the Space and Missile Systems Center at Los Angeles AFB in California, director of the Ballistic Missile Defense Organization, vice chief of staff at USAF/HQ, and commander of the U.S. Air Force Materiel Command.

Today, I speak to you as the chair of the National Research Council's Committee on the Rationale and Goals of the U.S. Civil Space Program, which recently released the report *America's Future in Space: Aligning the Civil Space Program with National Needs*. The committee's 14 members included distinguished experts in science, engineering, economics, political science and public policy, national security, and of course, space systems and space exploration.

With your permission, I would like to submit my prepared testimony for the record and summarize my views for you here this morning, leaving sufficient time to answer any questions you may have.

Before addressing the questions posed by the subcommittee, let me summarize our report.

### CONTEXT OF THE REPORT

Without a doubt, the first 50 years of the space age have been transformed the nation and the world. Astronauts have stood on

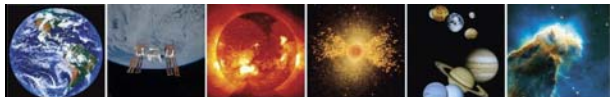
Earth's moon while millions watched. Commercial communications and remote sensing satellites have become part of the basic infrastructure of the world. Satellites support worldwide communications, providing a critical backbone for daily commerce—carrying billions of global financial transactions daily, for example. Our understanding of every aspect of the cosmos has been profoundly altered, and in the view of many, we stand once again at the brink of a new era. We have discovered that the expansion of the universe continues to accelerate, driven by a force that we do not yet understand and that there are large amounts of matter in the universe that we cannot yet observe. We have discovered planets around other stars, so many that it is ever more likely that there are other Earths comparable to our own.

The next 50 years of civil space will occur in a globalized world of societies and nations characterized by intertwined economies, trade commitments, and international security agreements. Mutual dependencies are much more pervasive and important than ever before. Many of the pressing problems that now require our best efforts to understand and resolve—from terrorism to climate change to demand for energy—are also global in nature and must be addressed through mutual worldwide action.

In the judgment of the Committee on the Rationale and Goals of the U.S. Civil Space Program, the ability to operate from, through, and in space will be a key component of potential solutions to 21st century challenges. As it has before, with the necessary alignment to achieve clearly articulated national priorities, the U.S. civil space program can serve the nation effectively in this new and demanding environment. (The committee considered "civil space" to include all government, commercial, academic, and private space activities not directly intended for military or intelligence use.)

In the committee's view, our study needed to address the top-level goals of the civil space program and the connection between those goals and broad national priorities. These connections form a foundation on which the nation, both now and in the future, can devise sustainable solutions to nearer-term issues in the implementation of the civil space program. Therefore, the committee focused on the long-term, strategic value of a U.S. civil space program, and our report does not address nearer-term issues that affect the conduct of U.S. space activities other than to provide a context in which more tactical decisions might be made.

The national priorities that informed the committee's thinking include ensuring national security, providing clean and affordable energy, protecting the environment now and for future generations, educating an engaged citizenry and a capable workforce for the 21st century, sustaining global economic competitiveness, and working internationally to build a safer, more sustainable world. A common element across all these urgent priorities is the significant part that research and development can play in solving problems and advancing the national enterprise in each area. Instruments in space have documented an accelerating decline in arctic sea ice, mapped the circulation of the world's oceans, enabled the creation of quantitative three-dimensional data sets to improve the quality of hurricane forecasting, and created new tools to address a host of agricultural, coastal, and urban resource management problems, to cite only a few examples. Such capabilities demonstrate what can be achieved when technologically challenging space problems stimulate innovation that leads to long-term advances with applications beyond the space sector. Civil space activities are central to the R&D enterprise of the nation, often in a transformational way, and thus present powerful opportunities to help address major national objectives.



The committee's overall conclusion is that a preeminent U.S. civil space program with strengths and capabilities aligned for tackling widely acknowledged national challenges—environmental, economic, and strategic—is a national imperative today, and will continue to grow in importance in the future

## GOALS FOR THE CIVIL SPACE PROGRAM

For the United States to be a strategic leader in a globalized world, its civil space program must be of a breadth, competence, and accomplishment so that U.S. leadership is demonstrated, accepted, and welcomed. The committee identified six strategic goals that it regards as basic for guiding program choices and resources planning for U.S. civil space activities. The goals all serve the national interest, and steady progress in achieving each of them is necessary. These goals address such issues as U.S. leadership in science and technology, understanding climate change and protecting Earth's environment, providing economic and societal benefits, inspiration of future generations, strategic leadership in space, and human spaceflight, and they are articulated in more detail in the written report.

## FOUNDATIONAL ELEMENTS

While the breadth of the civil space program has grown, there is also a sense that the program has been unfocused, sometimes at the expense of the effectiveness of the organizations and institutions that support it. The United States can no longer pursue space activities on the assumption of its unchallengeable dominance—as evidenced by the view of other nations that the United States is not the only, or in some cases even the best, option for space partnerships. U.S. leadership in space activities and their capacity to serve urgent national needs must be based on preeminent technical capabilities; ingenuity, entrepreneurialism, and a willingness to take risk; and recognition of mutual interdependencies. The time has come to reassess, and in some cases reinvent, the institutions, workforce, infrastructure, and technology base for U.S. space activities.

The committee identified four foundational elements critical to a purposeful, effective, strategic U.S. space program, without which U.S. space efforts will lack robustness, realism, sustainability, and affordability. Those elements (which are described in greater detail in the written report) are coordinated national strategies, a competent technical workforce, an effectively sized and structured infrastructure, and a priority investment in technology and innovation.

## RECOMMENDATIONS

The committee found that, in spite of their promise and utility, components of the civil space program are not always aligned to fully capitalize on opportunities to serve the larger national interest. Decisions about civil space priorities, strategies, and programs, and the resources to achieve them, are not always made with a conscious view toward their linkages to broader national interests. The committee made recommendations addressing a broad variety of civil space issues, from Earth stewardship to human space exploration to scientific and technological innovation. For the purposes of today's hearing, I would like to highlight two recommendations.

Recommendation 1 states that emphasis should be placed on aligning space program capabilities with current high-priority national imperatives, including those where space is not traditionally

considered. The U.S. civil space program has long demonstrated a capacity to effectively serve U.S. national interests. This recommendation provides a broad policy basis on which the committee's subsequent recommendations rest.

Recommendation 7 uses a broader perspective on civil space to highlight that the success of all of the recommendations in the report relies upon the alignment of the various elements of the civil space program.

National space policy too often has been implemented in a stovepipe fashion that obscures the connection between space activities and other pressing needs of the nation. Consequently, senior policymakers with broad portfolios have not been able to take the time to consider the space program in the broader national context. Rather, policies have been translated into programs by setting budget levels and then expecting agencies to manage to those budgets. This has resulted in the much-repeated assertion, with which the committee agrees, that agencies like NASA are being asked to do too much with too little. The committee believes that the process of aligning roles and responsibilities for space activities, making resource commitments, and coordinating across departments and agencies needs to be carried out at a sufficiently high level that decisions are made from the perspective of the larger national issues regarding which space activities play roles. How this process is accomplished might change from administration to administration, but the need for an approach that will elevate attention to the proper level remains essential.

Therefore, the committee's recommendation is that the President of the United States should task senior executive-branch officials to align agency and department strategies; identify gaps or shortfalls in policy coverage, policy implementation, and resource allocation; and identify new opportunities for space-based endeavors that will help to address critical issues now confronting the United States and, to a considerable extent, the world as well.

The effort should include the Assistant to the President for National Security Affairs and the Assistant to the President for Science and Technology, and should consider such elements as budgetary guidance, resource allocation, the space industrial base, the aerospace workforce, long-range technological needs, international space relationships, elimination of unnecessary duplication of space efforts, and regular coordination of national space strategies and their success in implementing overall national space policy.

U.S. space activities—both national security and civil—are not isolated elements of the national enterprise. They interact with the broader aspects of our nation's commerce, transportation, education, and international relations. Civil space activities always have been, and will continue to be, excellent vehicles for educating future scientists and engineers, promoting positive international relations, and supporting the nation's foreign policy objectives.

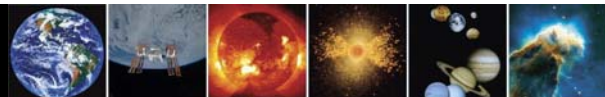
At this time, I would like to address the subcommittee's questions.

## THE RELEVANCE OF SPACE TO NATIONAL NEEDS

As mentioned above, U.S. space activities are not isolated elements of the national enterprise. Civil space activities, within which the committee includes academic, commercial and private sector activities, are a central part of the nation's research and development portfolio and interact with the broader aspects of our nation's commerce, transportation, education, and international relations

Our report cites numerous examples of the importance of space





in addressing important national needs. For example:

- Observations of the Earth from space provide scientists and policymakers with essential data on a wide variety of subjects, from the path and behavior of major storms to the regional consequences of global climate change.
- Space science missions have, among other discoveries, identified new effects that indicate our understanding of the basic laws of physics is incomplete. The impact of this discovery has stimulated research efforts across the country, supported by the National Science Foundation and the Department of Energy as well as by NASA directly.
- The construction of the International Space Station has provided significant experience in leading a large, international engineering project. Lessons learned in this endeavor have important implications in a future that is sure to include more frequent and complex international cooperative efforts.
- Communications satellites are a vital piece of the nation's telecommunications infrastructure.
- The GPS system, though built and operated by the US Air Force, has provided significant civilian benefits and has opened entirely new economic markets.
- Civil space efforts are an important part of the national system of innovation, which forms the basis of our economic strength and lays the foundation for our nation's continued prosperity.

**MAXIMIZING THE BENEFITS FROM SPACE**

The committee's report provides seven detailed recommendations which, if implemented, well maximize the civil space program's ability to benefit the nation. In particular, I would like to take this opportunity to highlight those recommendations where Congressional leadership could have significant impact.

The committee recommends that NASA should continue its excellent program of scientific exploration and discovery, as a central component of the nation's research and development enterprise. Continued Congressional recognition of the civil space program's role in this area, alongside agencies such as the Department of Energy, the National Science Foundation, and the National Institutes of Health, will help to keep these programs aligned with national goals and objectives.

The committee recommends several areas where NASA and NOAA should work collectively to improve our understanding of the Earth and communicate this knowledge broadly, both domestically and internationally. The Congress could assist in these efforts by continuing to recognize that the two agencies each have vital, complementary roles to play and by providing the necessary resources, guidance and flexibility for the agencies to smoothly transition new capabilities from NASA's R&D environment to NOAA's operational responsibilities.

The committee recommends that NASA establish an independent technology development program, modeled after the Defense Advanced Research Project Agency. This program should be independent of the agency's flight programs and should focus on nascent technologies that could be broadly applicable to the space industry at large. It should support the best ideas and research, regardless of where the research team is found. In the near term, Congressional leadership in the establishment and support of this effort will be crucial for its initial success. Over the longer term, Congressional over-

sight will undoubtedly be necessary to ensure that the program remains true to these principles in the face of inevitable programmatic and budgetary pressures.

As part of its recommendation on how to use the civil space program to further U.S. strategic leadership, the committee highlights the need for reform of the International Traffic in Arms Regulations (ITAR), in order to prevent the inappropriate transfer of sensitive technologies to our adversaries while eliminating barriers to international cooperation and commerce that do not effectively contribute to national security. Congressional action is essential to this reform effort.

Finally, I would like to emphasize the necessity for the Executive Branch to align agency and department strategies. The committee recommends a broad outline for how this should be accomplished and the range of issues that should be covered. Congressional attention to, and oversight of, this effort will help to ensure that the goal of a maximally and efficiently beneficial civil space program is achieved.

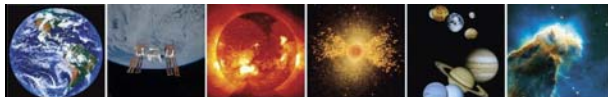
**DRAWING INSPIRATION FROM SPACE ACTIVITIES**

As the committee states in the report, a space program that achieves its programmatic goals but does stimulate educational opportunities or inspirational moments would fail to achieve its full potential. The committee did not directly address the most effective ways to motivate future generations, but did point out that a successful space program demands advances in a wide range of activities, from biomedicine to the physical sciences to aerospace engineering.

**COMMUNICATING THE RELEVANCE OF THE CIVIL SPACE PROGRAM**

The committee believes that the fundamental role that space programs play in daily life has often been overlooked. Discussions of the space program are generally focused on the accomplishments of the 1960's and not on the broad, relevant program that exists today. Though seldom explicitly stated, there seems to be a national consensus that to be successful the space program needs to replicate the Apollo Program, either literally or figuratively. Our report argues that the Apollo Program is inextricably tied to the Cold War environment. The nation needs to recognize that in our increasingly globalized world a broad, vigorous civil space program provides essential solutions to many of the challenges we face.

This completes my prepared remarks. Thank you for your attention to this report, and I would be pleased to take questions if you have them.



## SUMMARIES OF CONGRESSIONAL HEARINGS OF INTEREST

### Review of U.S. Human Space Flight Plans

*Attended and summarized by Lewis Groswald, Research Associate, and Elena Amador, Lloyd V. Berkner Space Policy Intern*

#### House Science and Technology Committee, September 15, 2009

*Options and Issues for NASA's Human Space Flight Program: Report of the "Review of U.S. Human Space Flight Plans" Committee*

##### **Witnesses:**

**Panel 1:** Norman Augustine, chairman, Review of U.S. Human Space Flight Plans Committee; Dr. Edward Crawley, professor, Massachusetts Institute of Technology

**Panel 2:** Vice Adm. Joe Dyer (Ret.), Chairman, Aerospace Safety Advisory Panel, NASA; Michael Griffin, professor of mechanical and aerospace engineering, University of Alabama in Huntsville

**Representatives in attendance:** Bart Gordon (D-TN), David Wu (D-OR), Brad Miller (D-NC), Gabrielle Giffords (D-AZ), Donna Edwards (D-MD), Marcia Fudge (D-OH), Parker Griffith (D-AL), Alan Grayson (D-FL), Suzanne Kosmas (D-FL), Ralph Hall (R-TX), Dana Rohrabacher (R-CA), Vernon Ehlers (R-MI), Michael McCaul (R-TX), Pete Olson (R-TX)

#### Senate Subcommittee on Science and Space, September 16, 2009

*Options from the Review of U.S. Human Space Flight Plans Committee*

**Witness:** Norman Augustine

**Senators in attendance:** John D. Rockefeller (D-WV), David Vitter (R-LA), Bill Nelson (D-FL), Kay Bailey Hutchison (R-TX)

On Tuesday, September 15 the House Science and Technology Committee held a hearing to review a summary report from the Review of U.S. Human Space Flight Plans Committee, chaired by Norman Augustine. On September 16, Mr. Augustine made a similar presentation to the Science and Space Subcommittee of the Senate Committee on Commerce, Science and Transportation. The review committee, frequently referred to as the Augustine Commission, was tasked by the administration earlier this year to review NASA's current human space exploration architecture and propose alternatives. The current space shuttle successor program, Constellation, consists of the Ares 1 human life vehicle, the Ares V heavy lift vehicle, the Orion crew exploration vehicle, and the Altair lunar lander.

A summary of the "Augustine report" was released on September 8, giving members of Congress time to prepare their thoughts and concerns prior to the hearing. Mr. Augustine presented the report's findings to the members of Congress and said that they had outlined five options for the future of human spaceflight.

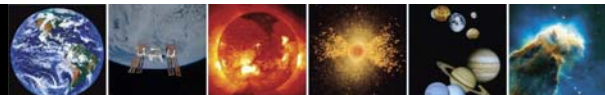
The first two of the possible options remain on the current FY2010 budget and do not provide for a meaningful human spaceflight program, according to Mr. Augustine. The remaining three call for an increase of \$3 billion per year for NASA's budget. These three options are traveling to the martian surface first, traveling to the lunar surface first, and a flexible-path plan which involves spending increasingly more time in zero gravity while exploring the inner solar system. The Augustine Commission immediately ruled out the possibility of going to Mars first for technological reasons, stating that the U.S. was simply not prepared to visit Mars safely in the near future.

Some representatives expressed consternation and disappointment at the preliminary findings of the committee. Representative Giffords said she was, "very angry" about the results. She and many of her colleagues in the room expressed concern that no new information had been brought forth by the Augustine Commission. The task of the committee had not been to make recommendations, Mr. Augustine explained, but to lay out options for Congress. Other members of Congress praised the Augustine Commission for their hard work and honesty in the report and declared it Congress' duty to find the money to continue human spaceflight, calling it an asset for our country—one that brings us respect as well as a sense of national security. Ranking Member Ralph Hall even called for a "march on Washington" to get the support needed to continue the program. The Senate hearing, on the other hand, was a bit less lively than the hearing on the House side.

Several of the Augustine report's options call for an extension of shuttle operations to minimize the length of the space access gap. Adm. Dyer presented a different perspective to the members of Congress during his questioning. It was his recommendation that the current space shuttle not extend its flight time to close the gap in access to space for U.S. astronauts due to safety issues, given the space shuttle's current retirement date of 2010. During the Senate hearing, Sen. Vitter expressed concern over retirement of the shuttle and associated workforce issues.

Dr. Griffin was extremely supportive of the report's findings with the exception of allowing the commercial space sector to fly U.S. astronauts to the International Space Station during the gap. Three of the Augustine Commission options called for commercial space flights to take astronauts into low Earth orbit so that NASA could focus its resources on developing the Ares rockets. Many members of Congress expressed their concern over this as well, saying that it was not worth "betting the farm" on a commercial sector that is unproven.

Representatives and senators alike acknowledged the task before them of crafting a viable human exploration program. Senator Bill Nelson agreed that while Congress has a job to do, ultimately "...it's going to be up to the president." The senator closed by saying "I believe the president is a visionary, and I believe the president is going to make a bold stroke not unlike President Kennedy. He set this nation on a course that was extraordinary, and it is my belief that President Obama will do that."



**A Day Without Space:  
Economic Security Ramifications  
George Marshall Institute and the  
Space Enterprise Council of TechAmerica  
July 28, 2009**

*Attended and summarized by Abigail Fraeman and Angie Wolfgang,  
Lloyd V. Berkner Space Policy Interns*

The third installment of the “A Day Without Space” series addressed the economic security implications of losing access to space-borne assets and information, and what steps might be taken to safeguard them.

Scott Pace of George Washington University’s Space Policy Institute delivered the keynote address. Arguing that space should no longer be a discretionary funding item, Pace described how the United States is dependent on space applications for both military and commercial applications. Specifically he pointed to several ways in which space technology saves lives: accurate GPS locator devices enable more precise warfare, allow 911 operators to track cell phone calls, and help rescuers find stranded victims. Pace also discussed the challenges of space policy today. Calling attention to our most formidable challenge—our heavy reliance on space as a “global commons”—he tied the needs and priorities of the U.S. space program to the necessary, proactive protection of free movement in air, sea, space, and cyberspace. Finally, Pace concluded his talk with a discussion about human spaceflight. In the way that the Apollo mission answered the question “Is there a way we can beat the Soviets?” the present-day human spaceflight program should continue to work towards finding answers. Pace suggested we ask the questions Is there a human future in space? Can we ‘live off the land’? and Can we engage in commercially useful activities in space?

Andrea Maleter of the Futron Corporation and Micah Walter Range of the Space Foundation discussed the economic impact of space-based assets. Maleter emphasized that a day without space would be a day without television, radio, GPS, and credit card transactions. She presented data that indicated growth in nearly all sectors of the space industry. Range discussed the findings of the 2009 edition of *The Space Report* (<http://www.thespacereport.org>), an “authoritative guide” on space activities, published every year by the Space Foundation. While acknowledging the difficulties of the study and the possible uncertainties presented in the report, Range highlighted the post-2007 growth in space revenue and concluded that space is a growing industry with a bright outlook for business and science in the coming years.

Charles Baker of the Department of Commerce (DOC) Office of Space Commercialization and Daniel Hurley of the DOC National Telecommunications and Information Administration discussed how businesses use space. Baker gave an overview of the NOAA weather-satellite system and emphasized its importance for monitoring and predicting the weather, noting in particular the central role these satellites play in aiding hurricane evacuations. Hurley argued for the necessity of space-based communication systems in all instances of natural disasters, as these communication systems are historically more likely to be quickly restored after such a disaster than land-based systems.

Transcripts of the presenters’ speeches and their presentation slides are posted online at <http://www.marshall.org/article.php?id=728>.

**LLOYD V. BERKNER  
SPACE POLICY INTERNSHIPS**

**WE ARE CURRENTLY ACCEPTING APPLICATIONS  
FOR INTERNSHIPS FOR 2010.**

The goal of the program is to provide promising undergraduate and graduate students with the opportunity to work in the area of civil space research policy in the nation's capital, under the aegis of the SSB.

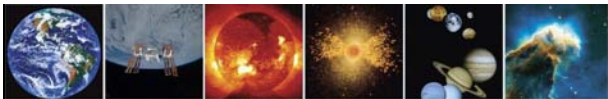
Established in 1958 to serve as the focus of the interests and responsibilities in space research for the National Academies, the SSB provides an independent, authoritative forum for information and advice on all aspects of space science and applications, and it serves as the focal point within the National Academies for activities on space research. It oversees advisory studies and program assessments, facilitates international research coordination, and promotes communications on space science and space science policy between the research community, the government, and the interested public. The SSB also serves as the U.S. National Committee for the International Council for Science Committee on Space Research.

The Lloyd V. Berkner Space Policy Internships, named after the first chair of the SSB, are offered twice annually. The summer program is restricted to undergraduates and the autumn program is open to both undergraduate and graduate students. The deadline for applications for the summer 2010 program is February 1, 2010. The deadline for applications to the autumn program is June 14, 2010. Successful candidates for the summer and autumn programs will be contacted no later than March 1 and July 2, respectively.

Individuals seeking a Lloyd V. Berkner Space Policy Internship must have the following minimum qualifications:

- Be a registered student at a U.S. university or college;
- Completed his/her junior year, majoring in physics, astronomy, chemistry, biology, or geology (other areas considered on a case-by-case basis);
- Have long-term career goals in space science research, applications, or policy;
- Possess good written and verbal communications skills and a good knowledge of his/her particular area of study;
- Be capable of responding to general guidance and working independently;
- Be familiar with the internet, world wide web and basic research techniques; and
- Familiarity with Microsoft Word and HTML is highly desirable, but not essential.

NOTE: SELECTION OF INTERN AND INITIATION OF PROGRAM IS DEPENDENT ON AVAILABILITY OF FUNDS. Visit [http://sites.nationalacademies.org/SSB/ssb\\_052239](http://sites.nationalacademies.org/SSB/ssb_052239) to learn more about the internship program and to get application information.



# STAFF NEWS

## DEPARTURES

*Jordan Bock completed her assignment with the SSB as a Summer 2009 Lloyd V. Berkner Space Policy Intern. Her reflections on her experience with the SSB appear below.*

Walking into the Keck Center on the first day of my internship last May, I had no idea what to expect. I expected to learn a lot, to be sure, but I certainly did not expect that I would be able to sit in on steering committee meetings for the Planetary Science Decadal Survey, attend hearings on the Hill or travel to Woods Hole, MA, for the Space Studies Board Executive Committee meeting. I also learned far more than I would have imagined about everything from the National Academies to the Office of Management and Budget to NASA's human spaceflight program. The breadth of topics that I was exposed to provided a fantastic opportunity to gain a multi-dimensional perspective on a field in which I am very interested. It seemed that every agency and process that I was curious about intersected at the National Research Council.

What was different and exciting about this internship, as compared to other summer jobs that I have held, was the variety of work. Instead of working on the same task for three months, I was able to engage with a huge variety of topics in a number of different ways. From writing a summary of the Review of U.S. Human Space Flight Plans Committee to preparing panelist nomination memos to working with my fellow interns to facilitate white paper submissions, I was never working on the same thing for long. Each time I changed topics, I became completely fascinated by and absorbed in the new project. Every new challenge was different and exciting.

Now that I am in the middle of my somewhat frenetic senior year job search, I continue to rely on the perspective that I gained from my summer internship. I have a much better feel for what kind of work I would like to do and what various jobs might actually entail. In addition to everything I learned and experienced over the summer, I absolutely loved interning at the Space Studies Board, and I hugely appreciate all the guidance and support I received while I was there. The internship was a very inspiring, fulfilling experience which will not soon fade from memory.

*Abigail Fraeman completed her second assignment with the SSB as a Space Policy Intern. Her reflections on her experience with the SSB appear below.*

I had so much fun returning to the Space Studies Board for a second summer internship! My internship at the SSB taught me more about space policy and the ways of Washington than I ever could have learned in the classroom. I was able to attend several congressional hearings, listen in to the Augustine committee meetings, and go to a conference discussing the economic ramifications of a day without space. I also had the unique opportunity to learn about careers in space policy with the policy makers themselves, including staff from the SSB, ASEB, and Office of Management and Budget.

On the science side, it was particularly exciting to have a front row seat in watching decisions being made that will shape my field of study for years to come. This fall I entered the Ph.D. program in Earth and Planetary Science at Washington University in St. Louis, so I was thrilled to be able to get a "behind the scenes" view of the first meeting of the Planetary Science Decadal Survey. The results of this survey will have a large impact on my career, so I am very glad to have had the opportunity to

better understand the process behind writing and producing this report.

I would once again like to thank everyone on the SSB staff for being incredibly welcoming, friendly and encouraging. I am so pleased to have had another wonderful opportunity to work with such a good group of people this past summer!

## NEW FACES

**Elena Amador**, the SSB's Autumn 2009 Lloyd V. Berkner Space Policy Intern, is currently completing her final year at the University of California, Santa Cruz, where she will receive a B.S. in Earth Sciences with a concentration in Planetary Sciences and a minor in Astrophysics. She spent last summer working at NASA's Johnson Space Center researching the prospect of mud volcanoes on Mars using spectroscopic data and high-resolution images from the Mars Reconnaissance Orbiter. Prior to that she spent a year and a half as a student research assistant at the SETI Institute in Mountain View, CA where she worked with spectroscopic data from Mars. In late 2008 she was named by NASA the California Student Ambassador for the 2009 International Year of Astronomy; with this position she has done numerous public outreach programs that aim to bring space sciences to the fingertips of her community. As the Ambassador for CA she became increasingly interested in how space missions are prioritized and the methods for making policy decisions at NASA. The Lloyd V. Berkner Space Policy Internship has been the perfect place for her to experience space policy first hand. Ms. Amador hopes to attend a graduate program in planetary science research next Fall.

## SSB STAFF

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### BRANT SPONBERG

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Senior Program Officer

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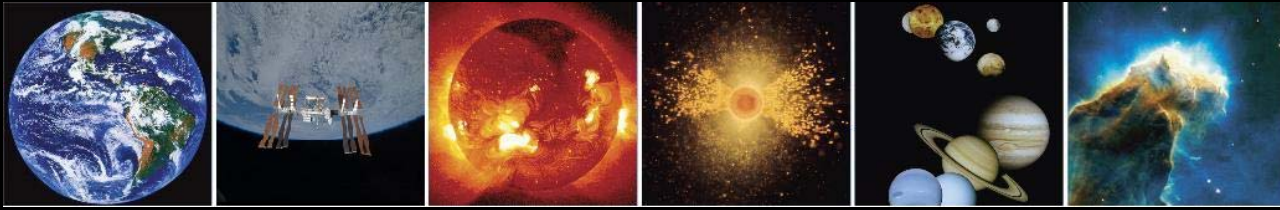
### ELENA AMADOR

Autumn 2009 Lloyd V. Berkner Space Policy Intern

\*Staff of other NRC Boards who are shared with the SSB

\*\*Left the ASEB August 2009

\*\*\*Left the SSB August 2009



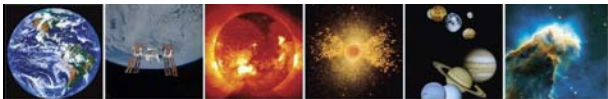
## SSB CALENDAR

OCTOBER						
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- October 5-6      *Astro2010-Steering Committee—Washington, DC*
- October 8-9      *Decadal Survey on Biological and Physical Sciences in Space-Plant and Microbial Biology Panel—Washington, DC*
- October 14-16      *Committee on Cost Growth in NASA Earth and Space Science Missions—Pasadena, CA*
- October 14-16      *Decadal Survey on Biological and Physical Sciences in Space-Steering Committee—Washington, DC*
- October 19      *Committee on Earth Studies—Washington, DC*
- October 26-28      *Decadal Survey on Biological and Physical Sciences in Space-Animal and Human Biology Panel—Washington, DC*
- October 26-28      *Planetary Science Decadal Survey-Inner Planets Panel—Irvine, CA*
- October 26-28      *Planetary Science Decadal Survey-Giant Planets Panel—Irvine, CA*
- October 28-30      *Decadal Survey on Biological and Physical Sciences in Space-Integrative and Translational Research for the Human Systems Panel—Washington, DC*
- October 28-30      *Planetary Science Decadal Survey-Primitive Bodies Panel—Irvine, CA*
- November 3-4      *Space Studies Board—Irvine, CA*
- November 4-6      *Decadal Survey on Biological and Physical Sciences in Space-Applied Physical Sciences Panel—Washington, DC*
- November 4-6      *Planetary Science Decadal Survey-Mars Panel—Pasadena, CA*
- November 9-10      *Decadal Survey on Biological and Physical Sciences in Space-Fundamental Physical Sciences Panel—Irvine, CA*
- November 11-13      *Decadal Survey on Biological and Physical Sciences in Space-Translation to Space Exploration Systems Panel—Washington, DC*
- November 11-13      *Committee on the Assessment of NASA Laboratory Capabilities—Irvine, CA*
- November 16-18      *Planetary Science Decadal Survey-Steering Committee—Irvine, CA*
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