

July 2008

Aeronautics and Space Engineering Board News



Welcome to the latest installment of the ASEB News! This newsletter will update you on ASEB events and activities, as well as policy items of interest to the aerospace community.

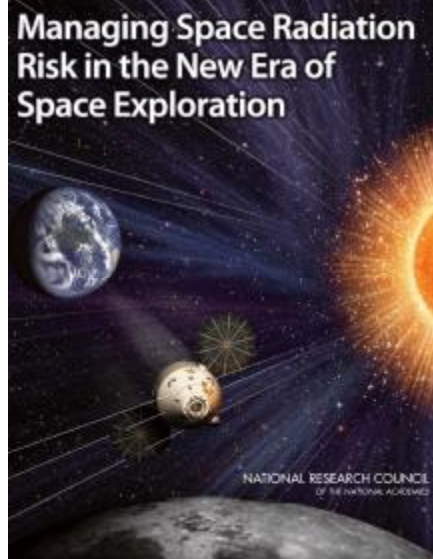
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New Report Evaluates Radiation Shielding for Space Exploration

At the request of NASA's Exploration Systems Mission Directorate, the ASEB formed a committee to evaluate the radiation shielding requirements for human spaceflight missions to the Moon and Mars, and to recommend a strategic plan for developing the necessary radiation mitigation capabilities to enable the planned lunar architecture. The Committee on Evaluation of Radiation Shielding for Space Exploration was tasked to review current knowledge of the space radiation environment, assess the understanding of risks associated with human lunar exploration activities, review shielding approaches and capabilities, and recommend a strategy for reducing these risks, including technology investments. These strategies were to address the radiation exposure limits specified by NASA and to be consistent with NASA's current timelines. The committee was also to consider the likely radiation mitigation needs of future human missions to Mars and give higher priority to research

and development alternatives that would enhance NASA's ability to eventually meet those needs. The committee, chaired by former astronaut James (Ox) van Hoften, was formed in fall 2006, and met four times during 2006 and 2007. The committee's report, *Managing Space Radiation Risk in the New Era of Space Exploration*, was released in April, 2008.



A copy of the Radiation Shielding report can be purchased, or downloaded as a PDF document for free, from http://www.nap.edu/catalog.php?record_id=12045.

The committee found that lack of knowledge about the biological effects of and responses to radiation is the single most important factor limiting the prediction of radiation risk associated with human space exploration. The committee strongly recommended that the permissible exposure limits specified in current NASA standards not be violated in order to meet engineering resources available at a particular level of funding, and also recommended that all elements of Project Constellation employ the necessary radiation protection and risk management limits.

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From the Chair: NASA's Advanced Space Technology Gone Missing



When people think of NASA, they should form an image of a can-do agency that is pushing the frontiers of advanced technology; a “game changer”; a national engine driving U.S. leadership in technology across the board. The Space Act, in fact, is quite explicit in

calling for this kind of leadership. But currently NASA is a long way from this image, at least from the standpoint of cutting-edge technology, and it should restore a robust independent research and advanced technology development mission, referred to hereafter as IR&T, as a priority. Over the short term, deferring or eliminating investment in IR&T might seem to be accommodated, but in the long term, there is a price to pay in less capable missions, cost overruns, or missed opportunities to accomplish something extraordinary.

We all know the reasons for the current situation: budget shortfalls across most of the agency, a belief that IR&T is a luxury that is unaffordable in times of tight budgets, a desire to tie technology development more closely to approved development program requirements and the corresponding belief that IR&T is license to play in a “sandbox”.

That said, I would make a few observations from having managed and led technology development efforts in many different organizations both in government and industry.

1. IR&T is most stable and effectively focused on long-term opportunities when it is separated and organizationally independent of ongoing development programs that would prefer to capture the technology budget exclusively for risk mitigation. That is not to say engineering development organizations do not need their own advanced technology portfolio for risk mitigation if the program is depending on advanced technology with a belief that it is available and “proven”.

2. An IR&T program in NASA should support not only the agency's own future missions, but also broader national space

interests including the commercial space industry, analogous to its aeronautics role.

3. The reasons for current cost overruns in development programs are many, including poor initial cost estimates, but one reason overruns will occur is inadequate technology in the bank or technology baselined in engineering development programs before it is ready.

4. The technology transition process from laboratory to application can be effectively managed.

5. There are effective metrics to measure progress and relevancy of products from IR&T to assure investments are not subsidizing “sandbox” efforts.

6. An IR&T mission is one of the best ways to assure that thinking is focused not so much on what today's program managers require, but on what future program managers would wish they could have if they knew they needed it or would want if they knew they could have it—in other words, technology that is truly enabling, that changes the game or disrupts conventional thinking. NASA needs a way of elevating this kind of thinking.

Deciding how to promote and organize advanced technology development requires facing what organizational problem to solve. There is no “right” or “wrong” answer. If the technology enterprise is independent, then there is a danger that the effort becomes less relevant to the pressing needs of the organization at large and encourages play in sandboxes. If the technology enterprise is too closely coupled to ongoing development programs and it is all there is in the organization at large, then the focus becomes more and more near term until it becomes no more than a management reserve for engineering risk mitigation. In my experience, the easier problem to manage is safeguarding against the sandbox problem, because I think it is easier to set up metrics to assure relevance than it is to foster and nurture an environment where creative ideas flourish, research projects to validate technology are effectively formulated, and competing research to answer challenging engineering questions is encouraged.

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“[NASA] should restore a robust independent research and advanced technology development mission as a priority.”

Director's Corner

This issue's column was written by Alan Angleman, ASEB Senior Program Officer

The Future



The trouble with our times is that the future is not what it used to be.—Paul Valéry (1871-1945)

The future often defies common wisdom. Rather than yield to simple extrapolations of the past and present, the future often charts its own course, like the

Mississippi breaking through an old, worn-out levee. Whether the topic is the weather, the economy, geopolitics, or technology, the reality that we encounter each day often varies quite substantially from the future that was expected just a few months or a few years in the past. This does not mean that we should surrender in our efforts to understand the future. Rather, a sober assessment of how hard it is to predict and shape the future should motivate us to redouble our efforts to address this important problem with the wisdom and resources worthy of the task.

I joined the National Research Council in 1993, on the eve of a symposium celebrating the ASEB's 25th anniversary. At the time, President Bill Clinton had been in office for just five months. John H. "Jack" Gibbons was the Science Advisor to the President and the Director of the Office of Science and Technology Policy. He addressed the symposium, saying that the new President was "convinced that we must first reduce our deficit, or we will be so loaded with its cost that we will have no capability to create a long-term, resilient future We have staked out our future on the promise that technology, supported by science, can be an ultimate engine of growth that provides new resources and better capabilities for meeting our needs for goods and services in a more environmentally-friendly way. One question before you, and before us, is how aeronautics and the space program fit into this kind of strategy I would like to share with you some of the principles that I think should guide our future actions.

"First we believe that the aeronautics and space program will result in new knowledge and increase our understanding not only of how things work here on earth, but also in the universe

"Second, aeronautics and space investments must make important contributions to the U.S. economy

"The third principle holds that, if you do it right,

research in aeronautics and space helps build good international relations. . . .

"The fourth principle is that the space program is important because it generates and sustains interest in math and science education."

Much has changed in the last 15 years. Each of us may have our own ideas about whether the principles enumerated by Dr. Gibbons in 1993 were valid at the time, and whether they remain valid. We may each have our own ideas about what principles should be guiding U.S. aeronautics and space endeavors today. Regardless, the ASEB continues to adhere to the same charter that it has had from the day it was established in 1967: "to focus talents and energies of the engineering community on significant aerospace policies and programs." This is a broad charter that gives the membership of the ASEB the freedom to consider the past, gaze into the future, and define for itself the principles that it will use to guide its own actions, now and in the future.

In just a few months, a new President will take the helm, and he will be surrounded by a new team of senior advisors. Like past presidents, he will face recurring economic challenges. He will also face some challenges of a more recent vintage. In the aeronautics and space arena, these include transforming the air transportation system to meet future needs through implementation of the Next Generation Air Transportation System (NextGen) and the transformation of human space flight from the Space Shuttle to Ares and Orion. For the ASEB and others who care about aeronautics and space, this is a time to consider how we can best work together to realize a future that will benefit us all. This is a time to consider if we can maximize our contribution to the future by continuing as we are, or if it is a time for a change, so that as we step into the future of aeronautics and space, it becomes everything that we always hoped it would be.

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"For the ASEB and others who care about aeronautics and space, this is a time to consider how we can best work together to realize a future that will benefit us all."



The 2006 ASEB report **Decadal Survey of Civil Aeronautics: Foundation for the Future** can be purchased, or downloaded as a PDF document for free, from http://www.nap.edu/catalog.php?record_id=11664. The 2008 NASA authorization bills in the House and Senate require NASA to align the fundamental aeronautics research program to address high-priority technology challenges of the Decadal Survey.

New Report Assesses NASA's Aeronautics Research

On April 7, the Aeronautics Assessment Committee released its report assessing NASA's aeronautics research program. The committee evaluated NASA's aeronautics portfolio using a very specific benchmark: the 2006 *Decadal Survey of Civil Aeronautics*. Most of the findings and recommendations are centered around this comparison. However, the report also assesses workforce and facility issues, which were not part of the *Decadal Survey*.



A copy of the **Aeronautics Assessment report** can be purchased, or downloaded as a PDF document for free, from http://www.nap.edu/catalog.php?record_id=12182.

Challenges, NASA is effectively addressing some areas, but not others, and the overall assessment of these challenges is best described as "mixed."

The authors of the *Decadal Survey* were not bound by budget considerations, and NASA does not have the resources necessary to address all of the *Decadal Survey's* 51 challenges simultaneously in a thorough and comprehensive manner. In addition, NASA's research program was developed independently and on a parallel path without regard to

The following summarizes the committee's key findings and recommendations. The staff of NASA's Aeronautics Research Mission Directorate (ARMD) is both dedicated and competent. Nevertheless, there is room for improvement in both the direction and execution of the ARMD research program. The *Decadal Survey* identified 51 high priority research and technology challenges. NASA's efforts to achieve 20 of these challenges will substantially advance the state of the art with no significant shortcomings or with only minor shortcomings that are recoverable within the overall project concept. Seven of the 51 challenges have major shortcomings that would be difficult to recover from within the current project concept. For the 24 remaining chal-

lenges, there is much overlap as there is between the *Decadal Survey* and ARMD's research plans. Even so, it does not seem that ARMD has responded in any significant way to the recommendations found in the *Decadal Survey*. In addition, some ARMD projects seem to lack an adequate sense of urgency, perhaps because some researchers seem to assume that the ultimate consumer of the fruits of their labor is NASA itself. For example, one of ARMD's three operating principles states: "We will focus our research in areas that are appropriate to NASA's unique capabilities." NASA would be well-served by reversing this principle: "We will mold NASA's unique capabilities to

In Remembrance

Dr. Robert H. Korkegi (1925-2008)

Dr. Robert Korkegi, distinguished aerospace engineer and former director of the ASEB, passed away on June 11, 2008. Dr. Korkegi had a long record of service to the international aerospace research community. He held the position of director of NATO's Advisory Group for Aerospace Research and Development (AGARD) in Paris, director of the Hypersonic Research Laboratory of the U.S. Air Force's Aerospace Research Laboratories, and technical director and charter member of the von Karman Institute for Fluid Dynamics in Belgium. Dr. Korkegi was a visiting professor of engineering and applied science at the George Washington University and most recently a visiting professor of Aerospace Engineering at the University of Maryland. Dr. Korkegi

directed the Aeronautics and Space Engineering Board from 1985-1990. He will be greatly missed by the ASEB and the aerospace community.



New Report Summarizes Civil Space Policy Workshop

In November 2007, the ASEB and Space Studies Board hosted a workshop to encourage national discussion about future directions of the U.S. civil space program. Approximately 60 participants from government, industry, and academia contributed expertise that spanned the fields of human spaceflight, space science, commercial space, science and technology policy, economics, international relations, and the media. They debated questions regarding the status, content, roles, national and international context, and sustainability of the civil space program, and those discussions were summarized in a new report, *United States Civil Space Policy: Summary of a Workshop*.

The workshop focused on program robustness, international context, and public interest and support, particularly regarding the sustainability of the civil space program. The goal was not to develop definitive answers to any of these questions but to air perspectives that would serve to inform subsequent broader discussion of such questions by policy makers and the public.

Many participants suggested that the administration's 2004 Vision for Space Exploration had not progressed as originally outlined nor as many had expected, due in large part to the failure of the administration and the Congress to seek the required resources. A prominent concern among participants was that although the Vision was to be "pay as you go," shortfalls in the NASA budget had led the agency to reallocate resources toward pursuit of the Vision and away from other activities such as space and Earth science. Speakers argued that continued operational costs of the International Space Station (ISS), delayed phase-out of the space shuttle, costs of near-term development of the next-generation space transportation system, and unbudgeted operational costs will all make the Vision increasingly unaffordable and unsustainable.

Subsequent discussion turned to leadership challenges, the relevance and value of the space program, and balance among activities within the program. Speakers cited both internal and external factors that can affect resource requirements. External influences include competition from China and India, the emergence of climate and energy as major global issues, and likely continued federal budget deficits. Interna-

tional collaboration and competition were prominent topics at the workshop.

There were considerable differences in opinion about a rationale for the civil space program, ranging from historically offered reasons (science, national security, commercial activities, a sense of human destiny and exploration, and national prestige and geopolitics) to a focus on the geopolitical contributions of the space program as perhaps one of the most compelling current-day rationales. But there was less than full agreement as to whether geopolitics meant cooperation or competition as a motivation for space activities.

Balancing the pursuit of science, human space exploration, aeronautics, and other dimensions of space activities was a concern among participants. Speakers emphasized that Earth observations necessarily assume even greater importance given evidence of possibly significant changes in climate. Additional workshop discussion included optimistic comments about future capabilities and infrastructure to support the civil space program if national priorities can be well articulated and sufficient resources made available.

The workshop concluded with the consolidation of discussion topics into three broad categories: communicating about space exploration; international competition, cooperation, and leadership; and ensuring robustness through new approaches and attitudes.

The report *United States Civil Space Policy: Summary of a Workshop* can be purchased, or downloaded as a PDF document for free, from http://www.nap.edu/catalog.php?record_id=12202.

Where's the executive summary?

Looking for a more extended summary of one of our reports? On the report's page on the National Academies Press website (such as http://www.nap.edu/catalog.php?record_id=12202), scroll down a little bit to a section called "Free Resources." There, in a box titled "Download Free," you will see a link called "PDF Summary." Click the link to download the full executive summary in PDF format.

Where's the report?

Each of our reports is also available in its entirety in PDF format from the NAP website. Each report highlighted in this newsletter has its corresponding NAP website listed (such as http://www.nap.edu/catalog.php?record_id=12202). On the report's page, click on the button that says "Sign in to download free PDFs" and follow the instructions to download the full report.

You can browse or search the NAP website at <http://www.nap.edu> for other ASEB titles.

Interim Report Reviews NASA's Exploration Technology Development Program

One of the programs within NASA's Exploration Systems Mission Directorate (ESMD), the Exploration and Technology Development Program (ETDP), develops new technologies for future human exploration missions, while reducing mission risk and cost. ASEB was asked by ESMD to form a committee to perform an independent assessment of ETDP that will include findings and recommendations related to the relevance of ETDP research to the objectives of the Vision for Space Exploration, to any gaps in the ETDP research portfolio, and to the quality of ETDP research. An interim report of the committee was delivered to NASA in March, 2008.

The ETDP interim report can be purchased, or downloaded as a PDF document for free, from http://www.nap.edu/catalog.php?record_id=12189.

The main result of the Interim Report was an assessment of the 22 projects which comprise the Exploration Technology Development Pro-

gram. Each project was flag-rated on the basis of the quality of the research, effectiveness in transitioning the research into the exploration program and the degree of alignment of the project with the Vision for Space Exploration. The majority of the projects received at least one yellow flag, meaning that risks to meeting the project objectives in the required timescale were observed and that remedial action was needed. The root cause in most cases was laid to constraints imposed by a limited budget relative to the exploration goals, the timescale laid out for meeting the requirements of the Vision for Space Exploration, and the desire to fully employ the NASA workforce at all of its centers. In spite of these constraints, the committee was impressed with the intensity of the effort, the dedication and enthusiasm of the NASA personnel to play a part in contributing to the VSE, the degree to which inter-NASA-center cooperation has developed, and the fact that all 10 NASA centers are engaged in the program.

The committee cited the following specific issues that cut across individual project lines; they will receive further analysis by the committee, and re-

lated findings and recommendations will be provided in the committee's final report.

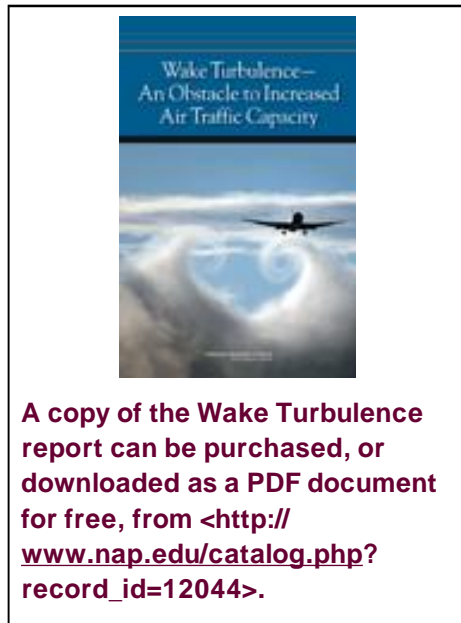
1. Some of the ETDP projects are carried out primarily within NASA centers. As a result, NASA is not taking advantage of expertise available in the university and industrial sectors that could support more rapid and higher-quality early research and development.
2. The committee noted a general tendency toward an incremental approach to ETDP developments, with the bulk of ETDP funding going to incremental advances on existing technologies. The committee questions whether this approach can allow NASA to successfully undertake and accomplish the innovative research goals of the VSE.
3. Many of the technology development projects tended to focus on supporting near-term aspects of the VSE. Some were linked exclusively to Orion and Ares 1, and others to the lunar surface access module and lunar surface operations. The committee did not find evidence that the extensibility of technologies to the exploration of Mars is a routine consideration.
4. NASA is now funding much less research at low Technology Readiness Levels (TRLs) in-house and in the university community than in the past. The committee was not clear as to how, in the absence of low-TRL research, the technologies required over the next 10-30 years will be developed and made available for future programs, or how the future expertise required by both NASA and the contractor community will be generated.
5. In a number of areas, mission-critical tests -- i.e., a system/subsystem model or prototype demonstration in an operational environment -- are not included in the program, due to a lack of time (scheduling) and/or funding to carry out necessary flight tests or to develop needed test facilities. Specific examples were identified. Not including these tests limits the TRL to which the technologies can be advanced and may increase mission risk. Although near term budgetary pressures are clear, the need for adequate testing is a recurrent theme in program failure reports and should be addressed.

New Report Looks at Challenges in Wake Turbulence

As highlighted in the last issue of this newsletter, in late 2006, NASA asked the ASEB to assemble a committee to conduct an independent analysis to determine the appropriate elements of a national approach to overcoming wake turbulence challenges. The committee, chaired by ASEB member Tony Broderick, released its report, *Wake Turbulence: An Obstacle to Increased Air Traffic Capacity*, in January 2008.

Without major changes, the current air transportation system will be unable to accommodate the expected increase in demand by 2025. One proposal to address this problem is to use the Global Positioning System to enable aircraft to fly more closely spaced. This approach, however, might be limited by the wake turbulence problem, which can be a safety hazard when smaller aircraft follow relatively larger aircraft too closely. This report provides a description of the problem, an assessment of the organizational challenges to addressing wake turbulence, an analysis of the technical challenges in wake turbulence, and a proposal for a wake turbulence program plan. A series of recommendations for addressing wake turbulence challenges are also given. The report in-

cludes metrics and milestones for each challenge, as well as a program plan that prioritizes different tasks during different time periods.



A copy of the Wake Turbulence report can be purchased, or downloaded as a PDF document for free, from http://www.nap.edu/catalog.php?record_id=12044.

Two New Reports Review Research Proposals for Ohio

Committee for the Review of Proposals to the 2008 Engineering Research and Commercialization Program of the Ohio Third Frontier Program. This short report offers recommendations to the State of Ohio on which programs best satisfy the requirements of the Engineering Research Commercialization Program (ERCP). The purpose of the ERCP is to create jobs and business opportunities within Ohio through the development and commercialization of innovative technologies and new products that will have long-term economic impacts for Ohio. The committee held two meetings, the first in Washington, DC in April, and the second in Columbus, OH in May. Of the 32 proposals reviewed by the committee, five were recommended for funding. On June 26, the Third Frontier Commission, which oversees these sorts of grant programs for Ohio, decided to fully fund all five of these proposals.

Committee to Review Proposals to the 2008 Ohio Research Scholars Program of the State of Ohio.

This short report offers recommendations to the State of Ohio on which programs best satisfy the requirements of the Ohio Research Scholars Program (ORSP). The purpose of ORSP is to strengthen and increase the number of research clusters led by Ohio's academic institutions to support regional economic priorities. The committee held two meetings, the first in Washington, DC in April, and the second in Columbus, OH in May. Of the 26 proposals reviewed, the committee determined that five fully satisfied the program's requirements and two mostly satisfied the requirements. On May 20, the Third Frontier Commission voted to partly fund almost all of the proposals recommended by the committee.

<http://national-academies.org/aseb>

Committee News

Committee to Review NASA's Exploration Technology Development Program. The committee delivered an interim report to NASA in March, 2008 (see p. 6 of the newsletter for more information). The committee then held its third meeting, organized primarily as a summary meeting and to initiate the preparation of the final report, on April 21-22, 2008 in Woods Hole, MA. The final report, which will contain findings and recommendations on the entire ETDP activity, is currently in review and a prepublication version will be delivered to NASA on or about August 1, 2008.

Committee on Assessing the Research and Development Plan for the Next Generation Air Transportation System. On April 1-2, 2008, a workshop was held at the National Academies' Beckman Center to gather reactions to the research and development aspects of the Joint Planning and Development Office (JPDO) baseline Integrated Work Plan (IWP), which is designed to increase the efficiency of airport and air space use in the United States. The workshop was not a consensus activity and no consensus findings or recommendations were made. Rapporteur Deborah Boehm-Davis has prepared a summary of the main points in the workshop's discussions that captured the themes. The summary was in the final stage of NRC review in early July and, pending successful review, the summary is expected to be released in August 2008.

Chaired by organizing committee chair Dr. John Lauber, Senior Vice President and Chief Product Safety Officer (retired), Airbus, S.A.S., the workshop was composed of experts from the JPDO, session moderators, members of the workshop organizing committee, and invited guests from government,

industry, and academia who were familiar with air traffic management. About 50 participants were present.

The presentations were based on information contained in version 0.2 of the IWP and focused on the description of the Concepts of Operation, the Operational Improvements to be gained by the technologies contained in each working group area, and the enablers needed to allow these capabilities to be implemented. Each of the presentations was followed by a discussion, from which emerged a number of themes and a number of specific research questions to be considered for incorporation into the next version of the IWP.

Committee to Assess NASA's National Aviation Operations Monitoring System (NAOMS) Project.

This ad-hoc committee was formed in May and held its first meeting on June 9-10 at the National Academies' Keck Center in Washington, D.C. The NAOMS project was a survey-driven approach to gathering data concerning flight safety. Data was gathered from 2001 to 2004 by surveying commercial and general aviation pilots. The committee is charged with assessing the survey's methodology, analyzing the generated data, and is to provide recommendations on the best way to utilize the project in the greater field of aviation safety. In addition to being briefed by NASA, the committee heard from the Federal Aviation Administration, National Transportation Safety Board, the Air Line Pilots Association, and Battelle Memorial Institute. The committee's next meeting will be at the Keck Center on October 13-14. The committee's final report is due in June 2009.

ASEB Calendar—Summer and Fall 2008

July 23-24, 2008	Aeronautics and Space Engineering Board Meeting. Washington, DC.
Early September 2008	Radioisotope Power Systems Committee first meeting. Location TBD.
September 2008	Rationale and Goals for the U.S. Civil Space Program Committee first meeting. Location TBD.
October 13-14, 2008	NAOMS Committee second meeting. Washington, DC.
Late October 2008	Radioisotope Power Systems Committee second meeting. Location TBD.
November 18-20, 2008	ASEB-SSB Workshop: Models for International Cooperation and Coordination in Space Activities. Irvine, CA.

For updates to the ASEB calendar, please see <http://www.national-academies.org/aseb>

Upcoming Studies

The ASEB is starting four new projects. If you would like further information or have recommendations for potential committee members for these activities, please contact us at aseb@nas.edu.

Radioisotope Power Systems. The ASEB is cooperating with the Space Studies Board in forming a new study committee to investigate radioisotope thermoelectric generators (RTGs) and comparable radioisotope power systems (RPSs) for use by NASA.

This study was prompted by the FY2008 omnibus appropriations bill for NASA which states that “a critical factor that will affect what future robotic missions is the source of power for probes that cannot rely on solar energy because they are traveling too far from the Sun (where solar energy density is inadequate), or too close to it (where solar arrays would be imperiled by the Sun’s proximity). RPSs are required for these spacecraft. The Appropriations Committees are aware of concerns by NASA and the Department of Energy that a supply of fuel would not be available. However, NASA has curtailed a major part of its technology development for advanced RPS devices. In order to permit effective planning for future missions, NASA should contract with the National Research Council to prepare a report on these issues.”

The NRC’s 2006 report, *Priorities in Space Science Enabled by Nuclear Power and Propulsion* recommended the development and application of RPSs to “enable varied and rich space science activities.” Since that time, NASA has envisioned greater use of ²³⁸Pu-based RPSs for the future

to accomplish both robotic and emerging human-related applications as part of the President’s Vision for Space Exploration. Three current NRC decadal surveys on space science comprise a starting point from which to look farther into the future and to consider where and under what circumstances advanced space nuclear systems might enable important scientific advances in the future.

In particular, this study will assess (1) the technical readiness and programmatic balance of

NASA’s RPS technology portfolio as it relates to NASA’s near- and long-term mission plans, (2) the ability of federal agencies to meet RPS goals and objectives, (3) facility requirements, and (4) strategies for potentially reestablishing domestic production of ²³⁸Pu as an alternative to continued procurement from Russia.

NASA Institute for Advanced Concepts. The ASEB has submitted a proposal to NASA on the subject of the NASA Institute for Advanced Concepts (NIAC). NIAC was established in 1998 with a mandate to fund grants for concept development of revolutionary aeronautical and space systems; it was terminated by NASA in 2007. The ASEB’s proposal grew out of report language accompanying the Commerce, Justice, Science, and Related Agencies Appropriations Bill, 2008, by the U.S. House of Representatives which directed the NASA administrator to enter into an arrangement with the National Research Council to evaluate NIAC’s effectiveness in meeting its mission, including a review of the grants made by the Institute, their results, and the likelihood that they will contribute to the Institute’s stated goals; evaluate the method by which grantees are selected and recommend changes, if needed; make recommendations on whether NIAC or a successor entity should be funded by the Federal government and, if so, what changes, if any, should be made to NIAC’s original mission, goals, operations, or other matters; and make recommendations as to how the Federal Government in general and NASA in particular should solicit and infuse advanced concepts into its future systems.

The ASEB will begin four new studies in 2008:

1. **Radioisotope Power Systems**
2. **NASA Institute for Advanced Concepts (NIAC)**
3. **Rationale and Goals for the U.S. Civil Space Program**
4. **Near Earth Objects: Survey and Hazard Mitigation Strategies**

The study plans to address (1) the extent to which the NIAC-sponsored advanced concept studies are innovative and technically competent; (2) the effectiveness of the NIAC in infusing advanced concepts into NASA’s strategic vision, future mission plans, and technology development programs; (3) the relevance of these studies to the aerospace sector at large; (4) NIAC’s success in leveraging potential partnerships or cost-sharing arrangements; and (5)

(Continued on page 10)

Interested in working with the ASEB?

Graduate students can apply to work with the ASEB as a Fellow through the National Academies’ **Christine Mirzayan Science & Technology Policy Graduate Fellowship Program**. The Fellowship is a ten-week program designed to introduce graduate students to science and technology policy, the National Academies, and the ASEB. For more information on the Fellowship program, visit <http://www.national-academies.org/policyfellows>.

Upcoming Studies

(Continued from page 9)

the potential approaches NASA could pursue to generate advanced concepts, either internally or from external sources of innovation.

Rationale and Goals for the U.S. Civil Space Program. Whoever wins the White House in November is likely to take a fresh look at U.S. civil space policy, and the civil space program could be facing a time of transition. The National Research Council (NRC) has decided that it is timely to conduct its own review and assessment of the rationale and goals for the U.S. civil space program. The study is being funded internally, with no sponsorship from the federal government, industry, or other groups. General Lester Lyles (USAF, ret.) has been appointed to chair the study, and Raymond Colladay, chair of the ASEB, and Lennard Fisk, immediate past chair of the Space Studies Board (Univ. of Michigan), have been appointed as co-vice chairs. The NRC is currently assembling the rest of the committee slate. The first committee meeting is expected in the third quarter of 2008. The report is scheduled to be released in the summer of 2009.

Hill News: Pending Legislation

Congress is busy with a number of authorization and appropriations bills related to aeronautics and space engineering. Here is a quick summary of where things stand:

H.R. 6063: National Aeronautics and Space Administration Authorization Act of 2008

Status: Passed in the House of Representatives on 6/18/08; referred to the Senate on 6/20/08.

ASEB Summary: This bill authorizes \$20.2 billion to fund NASA's activities for FY2009. The bill requires NASA, to the maximum extent possible, to align the fundamental aeronautics research program to address high-priority technology challenges of the National Academies' *Decadal Survey of Civil Aeronautics*. The bill also prescribes aeronautics research programs in the environment, sonic boom, aviation safety, climate change, certification, and aviation

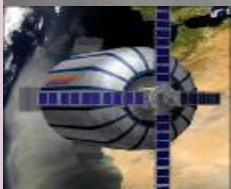
Near-Earth Objects: Survey and Hazard Mitigation Strategies. In April, the SSB and ASEB received approval for a congressionally-mandated study on the potential hazard of near-Earth objects (NEOs) to Earth and its inhabitants. NEOs are asteroids, comets, and large meteoroids whose orbits bring them close to Earth's orbit. The SSB and ASEB will form an ad hoc committee to undertake a two-phase study to review the NASA reports, "2006 Near-Earth Object Survey and Detection Study" and "Near-Earth Object Survey and Deflection Analysis of Alternatives: Report to Congress" as well as other relevant literature and to provide recommendations addressing two major tasks: to determine the best approach to completing the NEO census required by Congress to identify potentially hazardous NEO's larger than 140 meters in diameter by the year 2020; and to determine 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.

weather. The bill requires a stepping-stone approach to human space exploration, including exploration-related technology development unrelated to a specific flight project. It also requires NASA to develop a risk mitigation plan for human space exploration. The bill also gives directives about utilizing the International Space Station (ISS) and the Space Shuttle, including a specific requirement to deliver the Alpha Magnetic Spectrometer to the ISS.

S. 3270: National Aeronautics and Space Administration Authorization Act of 2008

Status: Approved by the Senate Committee on Commerce, Science, and Transportation on 6/24/08. The bill was formally introduced on 7/16/08 and placed on the legislative calendar.

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Hill News: Pending Legislation

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ASEB summary: The bill authorizes \$20.55 billion to fund NASA's activities for FY2009. In comparison to H.R. 6063, S.3270 authorizes an additional \$200 million for ISS research and an additional \$150 million for the development of a commercial crew vehicle. Like the House bill, it includes a provision to align NASA's aeronautics research with the high-priority challenges described in the ASEB's *Decadal Survey of Aeronautics*. The bill prescribes specific aeronautics research and development in the areas of environmentally friendly aeronautics technologies, supersonic flight and the impact of sonic booms, and climate change. The bill authorizes funds to accelerate the operational capability of human spacecraft and includes provisions to ensure uninterrupted human access to space. Like the House bill, the bill also gives directives about utilizing the International Space Station (ISS) and the Space Shuttle, including a specific requirement to deliver the Alpha Magnetic Spectrometer to the ISS.

S. 3182: Departments of Commerce and Justice, Science, and Related Agencies Appropriations Bill of 2009

Status: Approved by the Senate Committee on Appropriations on 6/23/08; awaiting vote by the full Senate.

ASEB summary: The bill recommends \$17.8 billion for NASA, an increase of 2.8 percent. The bill recommends \$500.0 million for aeronautics, a decrease of 2.3 percent. The bill recommends \$3,530.5 million for exploration systems, an increase of 12.3 percent. This money is to fund the new crew launch vehicle, the crew exploration vehicle, the heavy lift component, and the lunar precursor robotic program. The bill recommends \$5,774.7 million for space operations, an increase of 4.5 percent. This money is to fund the Shuttle, ISS, and supporting operations. The bill does not prescribe Shuttle payloads, missions, or retirement constraints.

H.R. ____: Departments of Commerce and Justice, Science, and Related Agencies Appropriations Bill of 2009

Status: Approved by the House Appropriations Committee on 6/25/08.

ASEB summary: Specific details are not yet available.

Public Law 110-253, signed into law on 6/30/08, extends the FAA's authorization for an additional three months, through the end of the fiscal year. The FAA has been operating under such extensions while Congress debates four-year reauthorization measures (H.R. 2881 and S. 1300, below).

H.R. 2881: FAA Reauthorization Act of 2007

Status: Passed by the House on 9/20/07; awaiting consideration by the Senate.

ASEB summary: The bill reauthorizes appropriations for FY2008-FY2011 for: (1) airport planning and development and noise compatibility planning programs; (2) air navigation facilities and equipment; (3) FAA operations; and (4) FAA research, engineering, and development. The bill lays out requirements for NextGen implementation, aviation safety, integration of unmanned aircraft systems into the national airspace, and other programs. The bill prescribes a number of specific research and development initiatives (including aviation and climate change, runway surfaces, certification, and space weather), and it requires the FAA to fund studies by the National Academies in energy and environment research programs, the impact of space weather on aviation, and aviation safety research programs.

S. 1300: Aviation Investment and Modernization Act of 2007

Status: Passed by the Senate Commerce, Science, and Transportation Committee on 8/3/07.

ASEB summary: The bill reauthorizes appropriations for FY2008-FY2011 for: (1) FAA operations; (2) FAA air navigation facilities and equipment; (3) civil aviation research and development (R&D); (4) airport planning and development and noise compatibility planning programs; (5) certain other aviation programs; and (6) administrative expenses for certain airport programs. The bill prescribes specific research and development initiatives, including noise and emissions, jet fuel, runway surfaces, aviation safety, unmanned aircraft, and advanced materials.

Hill News: House Holds Hearing on NASA's Aeronautics Research and Development Program

**U.S. House of Representatives Committee on Science and Technology:
Subcommittee on Space and Aeronautics**

NASA's Aeronautics R&D Programs: Status and Issues

May 1, 2008

The House Committee on Science and Technology's Subcommittee on Space and Aeronautics held a hearing to review NASA's current Aeronautics Program. The purpose of the hearing was to examine the relevance of NASA's aeronautics research and development effort, with particular focus on safety and the environment. Testifying at the hearing were Jaiwon Shin, NASA Associate Administrator for Aeronautics; Carl Meade, Co-Chair of the National Academies' Committee for the Assessment of NASA's Aeronautics Program; NAE and ASEB member Preston Henne, Senior Vice President at Gulfstream Aerospace Corporation; and NAE member Ilan Kroo, Professor of Aeronautics and Astronautics at Stanford University.

Chairman Udall expressed his concerns about the difficulty NASA faces in meeting the technical challenges in aeronautics, stating that "the decline in NASA's aeronautics funding is making it increasingly difficult to maintain an aeronautics research program that will be capable of stepping up to the challenges the nation's aviation sector will be facing in the coming decades." He also recognized the usefulness of the National Academies' *Decadal Survey of Civil Aeronautics* in forming a relevant aeronautics research and development agenda. Ranking Member Feeney

emphasized the importance of research and technology to support NextGen and to develop more efficient, safer, and environmentally friendly aircraft. He

also cautioned against too strong a reliance on foreign suppliers for these technologies.

In his opening statement, Dr. Shin emphasized the importance of supporting NextGen and growth in the air transportation system to meet increased air travel demand. Mr. Meade, representing the ASEB's Aeronautics Assessment Committee, summarized the committee's findings, and said that while the committee found that NASA supported a great deal of worthwhile research, NASA needs a methodical approach to prioritize its potential research opportunities. Mr. Meade stated that "the content of the Decadal Survey of Civil Aeronautics appears to not have been a significant factor in the selection of the research portfolio being pursued by many of [NASA's] research projects." Mr. Henne cautioned that the foreign competition was increasing in the aerospace industry, and federal investment in aeronautics is vital for the United States to remain competitive with other nations. Dr. Kroo praised NASA's achievements in and

commitment to fundamental aeronautics research, particularly given its limiting budget constraints. He suggested that NASA focus on the next step—technology transfer and system-level integration of the most promising technologies.

Questions to the witnesses focused on aviation safety, the environmental impact of air-

craft, foreign competition, and access to research and test facilities.

Mr. Meade's full written testimony can be found online at <http://science.house.gov/publications/Testimony.aspx?TID=12940>, or you can contact the ASEB at aseb@nas.edu for a copy.

About Us...

The Aeronautics and Space Engineering Board (ASEB) was established in 1967 "to focus talents and energies of the engineering community on significant aerospace policies and programs." In undertaking its responsibility, the ASEB oversees ad hoc committees that recommend priorities and procedures for achieving aerospace engineering objectives and offers a way to bring engineering and other related expertise to bear on aerospace issues of national importance.

The majority of ASEB studies originate with the National Aeronautics and Space Administration (NASA), particularly the Aeronautics Research Mission Directorate and the Exploration Systems Mission Directorate. Some of these studies are requested by Congress in related legislation. ASEB also conducts proposal reviews for the State of Ohio's Third Frontier Project through the Ohio Department of Development, and it identifies experts to assist the Government Accountability Office in conducting its studies. The ASEB also has performed technical and policy studies for the Nuclear Regulatory Commission, the Defense Nuclear Agency, the Federal Aviation Administration, the National Science Foundation, the Defense Threat Reduction Agency, Air Force Space Command, the Air Force Office of Scientific Research, the National Oceanic and Atmospheric Administration, and others.

THE NATIONAL ACADEMIES

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