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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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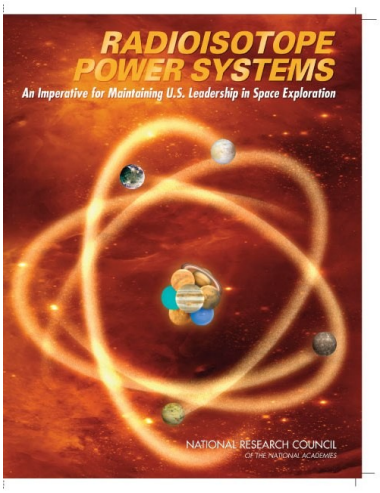
New Report Examines NASA's Development and Use of Radioisotope Power Systems

Spacecraft require electrical energy. This energy must be available in the outer reaches of the solar system where sunlight is very faint. It must be available through lunar nights that last for 14 days, through long periods of dark and cold at the higher latitudes on Mars, and in high-radiation fields such as those around Jupiter. Radioisotope power systems (RPSs) are the only available power source that can operate unconstrained in these environments for the long periods of time needed to accomplish many missions, and plutonium-238 (^{238}Pu) is the only practical isotope for fueling them.

Unfortunately, ^{238}Pu does not occur in nature, and no ^{238}Pu has been produced in the United States since the late 1980s. Since then, the U.S. space program has had to rely on the inventory of ^{238}Pu that existed at that time, supplemented by the purchase of ^{238}Pu from Russia. However, Russian facilities that produced ^{238}Pu were also shut down many years ago. The DOE will soon take delivery of its last shipment of ^{238}Pu from Russia, and the day of reckoning has arrived. The total amount of ^{238}Pu available for NASA is fixed, and essentially all of it is already dedicated to support several pending missions. If the status quo persists, the United States will not be able to provide RPSs for any subsequent missions. Because of the long time required to reestablish a domestic ^{238}Pu production capability, immediate action is required. In particular, the report recommends that the fiscal year 2010 federal budget should fund the Department of Energy to reestablish production of ^{238}Pu.

Advanced RPSs are required to support future space missions while making the most out of whatever ^{238}Pu is available. Accordingly, the RPS program is developing an Advanced Stirling Radioisotope Generator (ASRG). Demonstrating the reliability of ASRGs for a long-life mission is critical, but has yet to be achieved. Accordingly, NASA and the Department of Energy should complete the development of a flight-ready ASRG with all deliberate speed, with the goal of demonstrating that ASRGs are a viable option for the Outer Planets Flagship 1 mission. The Department of Energy and NASA need to establish formal guidance and processes for flight certification of RPSs in general and ASRGs in particular to facilitate the acceptance of ASRGs as a viable option for deep-space missions.



A copy of the Radioisotope Power Systems report can be purchased, or downloaded as a PDF document for free, from <http://www.nap.edu/catalog.php?record_id=12653>.

From the Chair: General Issues on NASA and Its FY2010 Budget Request

Raymond S. Colladay

[The following is the written testimony of Dr. Colladay from a hearing of the Subcommittee on Space and Aeronautics of the House Committee on Science and Technology, June 18, 2009.]

Civil, commercial, and national security space and aviation affects every part of our lives. It inspires, it facilitates a one-world community, it encourages training and education in science and engineering, it protects our future, and addresses the profound questions of our place in the universe—how did we get here and are we alone? NASA has demonstrated its ability to accomplish great things. It has a vision for the future for which there is general consensus in broad terms even as the finer details are debated. There are two fundamental questions that are pertinent to the subject of this hearing in dealing with NASA and its primary role of providing U.S. leadership in space and aeronautics: are the programs and the goals of the agency the right ones for the nation to be pursuing?—which is to say is the path and the destination right? And are there sufficient resources to effectively implement the program and the vision being pursued? I would like to address both of these questions in my remarks this morning.

There are a number of issues in the human space flight program that need to be untangled like what to do with the ISS beyond 2016; is the Constellation program headed in the right direction and does it have the commitment and support of this administration; is the timing for Shuttle retirement right; and are the replacement vehicles—Ares and Orion—the best approach to move beyond low-Earth orbit? The recently appointed Augustine Human Space Flight Review Committee will address these issues and present options charting a clear way forward.

Until the disposition of the ISS is decided, there is a big hole in mission planning with uncertain out-year budget implications. The issue is not just are we going to keep the station beyond 2016, which seems likely given how much we have spent finally getting it assembled and ready for full occupancy, but more importantly, what are we going to use it for? This is a remarkable facility and a significant accomplishment in engineering design and on-orbit assembly. It is a modern-day example of cooperative program management on an international scale; not a simple feat. As we transition from the assembly phase to utilization, we should take full advantage of its utility for research to expand our knowledge of how to live and work in space. Having said that, however, the vision and destination for human space flight should be outward, beyond low Earth orbit. The ISS is a way-point in that journey outward and I believe it will prove to be indispensable in learning to take the next steps.

The NASA science program continues to amaze the world with its spectacular achievements. The science community has led the way in providing consensus views on planning and roadmaps for the future through its Decadal Surveys. We borrowed the technique on the Aeronautics and Space Engineering Board for the Decadal Survey of Civil Aeronautics in 2006. Others will address the state of space science and I will limit my remarks to a shared concern about cost growth in ongoing programs and projects that put other projects at risk and crowd out new-start opportunities.

There are a number of reasons for cost growth on projects—from poor initial cost estimates to overconfidence in what can be done with constrained budgets to years of inadequate attention paid to advanced space technology development. I would like to specifically address the last point. Because of budget pressures, NASA has turned away from putting a priority on advanced technology development, even though the Space Act of 1958 and every subsequent amendment calls for NASA to be a leader in R&D. Today the advanced technology base is so deficient it is costing us in lost opportunities to do bold things with more capable systems and is costing us valuable resources in overruns some of which could be avoided with a more robust technology base.

Aeronautics is underfunded, but a broad-based, innovative advanced space technology development program that is organizationally independent of ongoing hardware development programs is nonexistent. The

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downward trend started soon after aeronautics and space technology, once logically managed together, were split apart. A decision soon followed to focus technology specifically on major development program needs by moving the resources to mission areas it intended to serve. Predictably, once all technology development was placed with the major development efforts it became near-term oriented as a risk reduction effort backstopping hardware development. The Aeronautics and Space Engineering Board sponsored study on the Exploration Technology Development Program for Constellation done last year expressed concern on just that point of the need for more emphasis on longer-term research. With budget and schedule pressures as demanding as ever, the situation has not improved. Clearly, there is a need for focused, risk-reduction technology that is defined by explicit mission requirements and funded by the mission office, but it does not fill the need for the agency on a broader level to pursue long-term technology "push" well out in front of requirements and broad in scope supporting civil (not just NASA) and commercial space. An agency that has inspired us with bold missions and spectacular accomplishments needs to be investing in technology that continually seeks to transform state-of-the-art capabilities and enable future missions that some day we may want to do, if we only knew how.

In DARPA, when I was Director, we sought to be disruptive with technology that challenges or disrupts conventional thinking and it is still doing that today. By setting up a healthy tension in an organization between technology push focused on long-term research and technology pull from programs, someone is always asking not only "what for?", but also "what if?" and "why not?" An advanced research and technology development mission of NASA would be exploring advanced launch systems in pursuit of low cost access to space; compact nuclear power systems; plasma- and other electric-propulsion concepts; energy storage technology; highly energetic propellants; affordable space-based solar power systems; multi-spectral sensors; advanced space-based communications; closed-loop life-support systems; radiation shielding concepts; highly intelligent and mobile robotics—the list could go on with a host of other areas of research not being addressed in today's constrained environment. And you will not see requirements for such systems, because we do not write a requirement for something no one knows how to do.

NASA should revitalize advanced space technology development as a priority mission area of the agency. It should engage the best science and engineering talent in the country wherever it resides in universities, industry, NASA centers or other government labs focused on world-class research and innovation and not driven by the need to maintain ten healthy centers. It should support not only future NASA missions, but other government agencies and commercial space. The "customers" for its technology products would be industry, NASA itself, other government agencies like NOAA, and military space where dual-use technology is applicable. Having this broad mandate would make it similar in the breadth of customers served to the NASA role in aeronautics with its heritage in NACA going back almost a century.

"An agency that has inspired us with bold missions and spectacular accomplishments needs to be investing in technology that continually seeks to transform state-of-the-art capabilities and enable future missions that some day we may want to do, if we only knew how."

That brings me to the aeronautics program where there is good news and bad. Aviation has a major impact on U.S. economic competitiveness and our leadership position in the world. No one questions that it is vitally important particularly in the U.S. in moving people and goods throughout the country and the world. The good news regarding the NASA aeronautics program is the restructured program in fundamental research is stable and providing excellent results. I am particularly pleased with the new emphasis in systems research in this year's request. The Environmentally Responsible Aviation (ERA) program builds on the progress in the base research program and begins to address the complex system interactions accompanying the integration of technology to achieve lower fuel consumption, lower emis-

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From the Chair: General Issues on NASA and Its FY2010 Budget Request

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sions, lower noise, improved safety, and greater air-traffic system capacity. These attributes, all desirable in isolation, tend to work against each other when integrated into a system. The newly formed category of Integrated Systems Research, of which the ERA program is the first in the category, enables NASA, in cooperation with industry and universities, to explore the system advances that will make aviation more energy independent and environmentally friendly. More resources in the out-years would be helpful. The Recovery Act funding that the Congress was able to add to the NASA aeronautics budget this year was very helpful in jump starting this important area of research and it is also being put to good use in facilitating the transition of NextGen focused technologies to the FAA.

This year's budget request is very encouraging and a positive step. However, NASA's investment in aeronautics is a fraction of what it was just a short time ago, and that is the bad news. Ten years ago the aeronautics budget was over 3 times what it is today in equivalent full-cost accounting terms and today's dollars. Then, it was 10 percent of the total NASA budget. The Congress has consistently recognized inadequate funding for aeronautics by augmenting past administration requests, but unless that level is reflected in the runout budget request by the administration, the research efforts at the higher level cannot be sustained, year-to-year. More resources would be helpful in areas of system-level testbeds and taking technology to higher readiness levels for the advances in the Airspace Systems and Aviation Safety programs in support of NextGen. Also, it would enable NASA to shift the balance of R&D to be a better blend of in-house and out-of-house research with universities and industry—something the NRC Decadal Survey on Civil Aeronautics also recommended.

Taking aeronautics and space technology together, an investment of at least ten percent of the total agency's budget for advanced aerospace technology development focused on forward-looking innovation is not unreasonable, in my view, for a government agency that has a mandate to help maintain U.S. leadership in aerospace science, engineering, research, and advanced technology development. One does not need to go too far back to a time when it exceeded that level.

Coming full circle to my opening comment about having the right program content and the right amount of resources to implement it, I have touched on where I think some of the holes are in program content and underfunded technology and of course the Augustine Committee will untangle the big issues in human space flight. I must be perfectly clear that the areas I mentioned needing more funding cannot and should not be solved by transferring money from other parts of NASA. Every time I look at the current scope of the NASA program and consider what budget level it takes to do it right, I come up with a level of around $22-23 Billion for the agency. This figure is not based on a rigorous, detailed assessment, but a well-informed opinion. It would seem that at this level, NASA's space and aeronautics mission should compete favorably for discretionary resources against other priority national needs, particularly given how it supports many of those needs of broad national interest. Much less than that level of funding means something has to give—some combination of mission scope, program content, schedule, or institutional infrastructure. This subcommittee has taken aggressive steps in the past to recognize the need for increased funding for NASA. I hope the testimony given at this hearing is helpful in your deliberations on the FY 2010 budget.

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Director's Corner

Richard Rowberg

My tenure as Acting Director of the ASEB and SSB is now in its eighth month. It has been a busy and interesting time. The ASEB has been very active over this period, holding a total of 13 study committee meetings and releasing five reports. In addition, we organized and held a meeting of experts for NASA's Aeronautics Research Mission Directorate (ARMD), that was very well received, and held a meeting of the ASEB in May that included a joint meeting with the SSB. One of the highlights for the Board this summer was the selection of one of its members, Charlie Bolden, as the new NASA Administrator. Of course, Charlie had to resign his position on the Board and we will certainly miss his contributions.

Projects released included a report reviewing NASA's Institute of Advanced Concepts (NIAC), another in our series for the State of Ohio reviewing its technology development programs, a report on radioisotope power systems, a report looking at America's future in space, and an interim report on near-earth object mitigation strategies. The last three were done jointly with the SSB. These reports are described in more detail in other sections of this newsletter.

Report briefings were provided to administration officials, NASA officials and staff, and congressional staff, as appropriate. 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 by the Senate. In all cases, the report was very well received. The radioisotope power systems report was briefed to NASA staff, and both congressional authorizing committees, all of whom praised the study. The day it was released, DOE—in an independent move—announced it was restarting production of Pu-238 an action that was recommended by the study, although action by the House and Senate Subcommittees on Energy and Water Development Appropriations would leave the future of production in doubt.

In addition to these releases, studies in progress include an assessment of NASA's aviation safety related programs (being performed with the Transportation Research Board) and an assessment of NASA's National Aviation Operations Monitoring Service (NAOMS). The latter is currently in the final stages of review and should be released by the end of September. Finally, we are involved with SSB in a decadal survey of biological and physical science in space. Details of all these studies, as well as all recent releases, can be found on the ASEB and SSB websites.

As for the outlook, the Board has scheduled a meeting for mid-October at the National Academies' Keck Center. We intend to focus on advanced technology development at NASA, a topic that was cited as critical in the America's Future in Space report. In addition, there are several mandated studies on various aviation safety issues included in the legislation passed by the House to authorize appropriations for the FAA for FY2010 to FY2012 (H.R. 915). One of these calls for the FAA to request the NRC to carry out a review of the FAA's safety-related research programs which will likely involve both ASEB and TRB if the authorization legislation in is enacted. The Senate has not yet acted on this legislation. We have identified some good candidates for the position of Director of the ASEB and SSB and are in the final interview stages. We hope to have an announced decision by the end of October.

Finally, it is important to note the excellent work done by ASEB staff on the many items noted above. Maureen Mellody, who led the experts meeting project and is working on the decadal survey, Alan Angleman who directed the radioisotope study, Brian Dewhurst who played a key role on the America's Future in Space study (and who recently took a position at NASA), Paul Jackson who is working on the near earth objects study and directed that NAOMS study, and John Wendt who directed the NIAC study, and Andrea Rebholz who provides administrative leadership for ASEB and support for these projects are to be recognized for their outstanding performance. They certainly have made my job more manageable and enjoyable.

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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 National Academies Press 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.

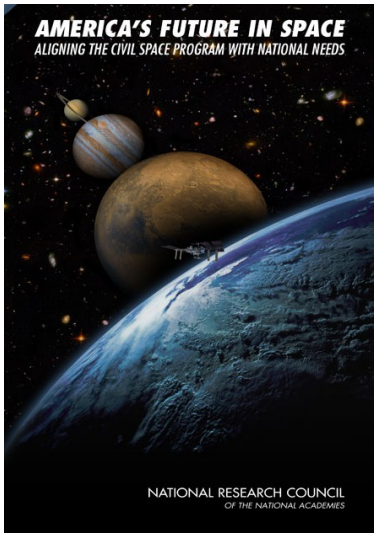
New Report Provides Advice on the Rationale and Goals of the U.S. Civil Space Program

The Committee on the Rationale and Goals of the U.S. Civil Space Program released its final report, *America's Future in Space: Aligning the Civil Space Program with National Needs*, on July 7, 2009. The study was commissioned and funded by the National Academies to advise the nation on key goals and critical issues in 21st century U.S. civil space policy.

The report provides a long-term, strategic perspective that frames a vision for future civil space activities. With its focus on top-level issues and objectives, the report presents six broad goals to inform civil space program choices and resources planning; four foundational elements that are crucial for executing robust, realistic, sustainable, and affordable U.S. space activities; and seven recommendations addressing current issues that prevent the U.S. civil space program from capitalizing on opportunities to serve the larger national interest through its specific missions.

The report notes that today we live in a globalized world of nations with intertwined economies, trade commitments, and international security agreements. Commercial space-related ventures now figure significantly in global economic competitiveness. Observations from space offer unique capabilities for global environmental monitoring, and space activities have had transformational effects on scientific research and on research and development enterprises with long-term advances and applications beyond the space sector. Thus, the report explains, a preeminent U.S. civil space program with strengths and capabilities aligned for tackling widely acknowledged national challenges—environmental, economic, and strategic—will continue to make major contributions to the nation's welfare.

The report *America's Future in Space: Aligning the Civil Space Program with National Needs* can be purchased, or downloaded as a PDF document for free, from <http://www.nap.edu/catalog.php?record_id=12701>.



In spite of the promise and utility of civil space activities, the report says the civil space program does not now always fully capitalize on opportunities to serve the larger national interest, due in part to a lack of conscious attention to the connection and alignment between them. Additional impediments include overly constrained resources, inadequate coordination across the federal government, missed opportunities to transition roles from government-led to private sector-provided services, obstacles to international cooperation, weakened institutional partnerships, and lack of emphasis on advanced technology development programs. These impediments provide the basis for the recommendations presented in this report.

Committee chair, Gen. Lester Lyles (USAF ret.), testified on the study conclusions at a hearing of the Space and Aeronautics Subcommittee of the House Committee on Science and Technology on July 16. The study was organized under auspices of the ASEB and the Space Studies Board; ASEB chair, Ray Colladay, and former SSB chair, Lennard Fisk, served as vice chairs.

New Report Reviews the NASA Institute for Advanced Concepts (NIAC)

The NASA Institute of Advanced Concepts (NIAC) was established in 1998 to provide an independent, open forum for the external analysis and definition of revolutionary space and aeronautics advanced concepts to complement the advanced concepts activities conducted within the NASA Enterprises. Funded at approximately $4 million per year, NIAC received a total of $36.2 million in NASA funding during the 9 years of its existence; it was terminated by NASA in 2007. In 2008, Congress directed the National Research Council to review the performance of NIAC. The Committee was asked to evaluate how well NIAC had developed revolutionary aeronautical and space concepts that could dramatically impact how NASA develops and conducts its mission. The committee's objectives were to evaluate NIAC's effectiveness in meeting its mission; evaluate the method by which grantees were selected; make recommendations on whether NIAC or a successor entity should be funded by the Federal government; 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.

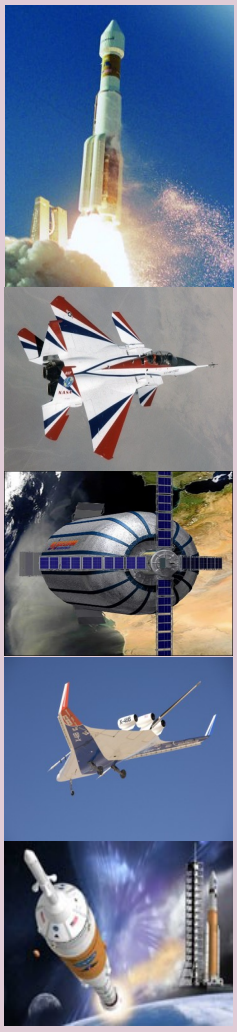
The Committee found that NIAC's approach to implementing its functions successfully met NASA-defined objectives, resulted in a cost-effective and timely execution of advanced concept studies, afforded an opportunity for external input of new ideas to the agency, and subsequently provided broad public exposure of NASA programs. Three NIAC efforts appear to have impacted NASA's long-term plans, and two of these efforts have either already been incorporated or are currently under consideration by the NRC Astronomy and Astrophysics Decadal Survey as future NASA missions. However, by design, the maturity of NIAC products was such that a substantial additional infusion of resources was needed before these advanced concepts could be deemed technically viable for implementation as part of a future NASA mission or flight program. This technology readiness immaturity created infusion difficulties for the NIAC program and innovators.

The NIAC report can be purchased, or downloaded as a PDF document for free, from <http://www.nap.edu/catalog.php?record_id=12702>.

The Committee recommended that NASA should reestablish a NIAC-like entity (referred to as NIAC2) to seek out visionary, far-reaching, advanced concepts with the potential of significant benefit to accomplishing NASA's charter and to begin the process of maturing these advanced concepts for infusion into NASA's missions. NIAC2 should expand its scope to include concepts that are scientifically and/or technically innovative and have the potential to provide major benefit to a future NASA mission in 10 years and beyond. A NIAC2 organization should be funded and administered separately from NASA development programs, mission directorates, and institutional constraints. Similarly, NIAC2 proposal opportunities should be managed and peer-reviewed outside the agency. However, NIAC2 proposal opportunities should be open to principal investigators or teams both internal and external to NASA. Because most NIAC2 projects will bear fruit only over the long term, a major review of NIAC2 grants should occur every 5 years, to ensure continuous infusion opportunities into NASA missions and planning.

To improve the manner in which advanced concepts are infused into its future systems, the committee recommends that NASA consider reestablishing an aeronautics and space systems technology development enterprise. Its purpose would be to provide maturation opportunities and agency expertise for visionary, far-reaching concepts and technologies. To allow for successful, sustained implementation of NIAC2 infusion objectives, NIAC2 should report directly to the Office of the Administrator, be outside mission directorates, and be chartered to address NASA-wide mission and technology needs. Finally, identification of center technical champions and provision for technical participation of NASA field center personnel in NIAC2 efforts – participation that can be expected to increase as NIAC2 projects mature – is recommended.

Briefings of the final report were made to NASA, Congressional staffers, OMB and OSTP during the period 26-27 September.



Committee News

Committee to Assess NASA's National Aviation Operations Monitoring System (NAOMS) Project. This ad-hoc committee held its final meeting March 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. The committee's report is currently in review and is expected to be released in the middle of September 2009.

Committee for the Review of Near-Earth Object (NEO) Surveys and Hazard Mitigation Strategies. This ad hoc committee and its panels have undertaken a two-phase study to provide recommendations addressing two major tasks: determining the best approach to completing the NEO survey required by Congress to identify potentially hazardous NEO's 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 steering group will hold its final meeting September 1-2 at the National Academies' Beckman Center in Irvine, CA. Both panels have held all of their meetings. The committee's interim report was delivered to NASA and publicly released August 12. The interim report provides a brief overview of the committee's first task regarding the ongoing survey of NEOs, and concludes that the current survey will not accomplish its goals by 2020. The committee's final report, expected in early 2010, will provide a detailed evaluation of both of the committee's tasks.

Committee for the Review of NASA's Aviation Safety Related Programs. The purpose of this study is to advise NASA and Congress on the status of NASA's aviation safety-related research programs. The committee will assess a variety of factors about the research programs, including whether they have well-defined, prioritized, and appropriate objectives; whether the programs are properly coordinated with the safety research programs of other relevant agencies (such as FAA); whether the programs have allocated appropriate resources to each of their objectives; and the presence and suitability of mechanisms to transfer research results into operational technology and procedures. The committee was formed and had its first meeting in June at the National Academies' Keck Center in Washington, D.C. In addition to NASA, the committee received briefings from congressional staff and the FAA. The committee's second meeting will occur September 3-4 at the NASA Ames Conference Center in Mountain View, CA. The committee is planning to release its final report in the spring of 2010.

Decadal Survey on Biological and Physical Sciences in Space. This Congressionally-mandated study will establish priorities and provide recommendations for life and physical sciences research in microgravity and partial gravity for the 2010-2020 decade. The committee will develop criteria for the prioritization. A steering committee and seven subordinate panels have been formed. The steering committee has met twice in 2009, and will hold its third meeting on October 14-17, 2009. Six of the panels met jointly on August 19-21, 2009, and all panels are continuing to meet through the fall and winter months. A final report is expected to be released in the fall of 2010. This study is being conducted jointly with the Space Studies Board.

Hill News: Congressional Legislation for NASA and FAA Funding a Work-in-Progress

Lewis Groswald

Congress is still working on the Fiscal Year 2010 budget for the National Aeronautics and Space Administration (NASA). As it stands, the house passed H.R 2847, the Commerce, Justice, Science, and Related Agencies Appropriations Act. In the bill, the House recommended $18,203,300 for NASA, which is more than $482 million below the President's request, but still $420 million above the FY2009 budget. Provisions for funding in the bill include completing the International Space Station, advancing human spaceflight, advancing knowledge in the fundamental disciplines of aeronautics, and developing technologies for safer aircraft and higher capacity traffic air systems.

NASA's aeronautics directorate was provided $501 million for the "purchase, lease, charter, maintenance, and operation of mission and administrative aircraft." This, of course, is separate from human spaceflight operations, which is under the aegis of the Space Operations Mission Directorate (SOMD) and the Exploration Mission Directorate. The House provided SOMD with $6.097 billion in the bill, of which $3.157 billion is specifically for space shuttle operations, and $2.267 billion for space station operations. The Exploration directorate received $3.29 billion in funding, which covers research, development, operations, support, maintenance, spaceflight, and myriad other program activities.

The Senate incarnation of H.R. 2847 is still up for more debate. As of right now, the legislation has only been read to the Appropriations Committee. However, the Committee's recommendation provides NASA with $18.686 billion – $903 million more than in FY2009 (not including American Recovery and Reinvestment Act funding). All of the directorates receive greater funding levels in the Senate version than the House version: Aeronautics – $6 million; Space Operations – $64 million; Exploration – $647 million, providing the full budget request of $21.8 million for ISS microgravity research. Each is recommended for funding above FY2009 levels. In the Exploration section of the bill, the Committee provides the full budget request for the Ares I and Orion crew capsule, and explicitly states that the "Ares V cargo launch vehicle will be a critical national asset," providing $100 million in funding to facilitate "the earliest possible start of development."

The Aeronautics program was broken down into five categories for funding: Aviation Safety (the bill states that it is restoring $15 million to the safety program, for a total of $75 million); Airspace Systems; Fundamental Aeronautics; Aeronautics Test Program; and Integrated Systems Research. The Senate bill provides $15 million for NASA to establish a University Affiliated Research Center to collaborate with the Dryden Center to focus on Unmanned Aircraft Systems, remote sending research applications and education programs, with the purpose of transitioning NASA's research to operation usage. The legislation also provides $60 million for the Environmentally Responsible Aviation Project to research reducing fuel use, noise and emissions from aircraft.

The Federal Aviation Administration (FAA) is also in the process of authorization with H.R. 915, the FAA Reauthorization Act of 2009. The bill was passed in the House, and received by the Senate Committee on Commerce, Science and Transportation. Unlike the NASA Appropriations bill, the FAA legislation is only an authorization bill. Authorization bills, as opposed to appropriation bills, only provide a ceiling for budget levels. Funding is not provided to agencies without an appropriation bill, and an authorization bill is not required to make appropriations. The FAA legislation is intended to amend title 49 of the United States Code to authorize appropriations for the FAA for fiscal years 2010 through 2010, as well as improve aviation safety and capacity and provide stable funding for the national aviation system, among other purposes.

There are four sections within FAA operations that are delineated for budgeting. Airport Planning and Development and Noise Compatibility Planning and Programs will start at $4.1 billion in 2010, and rise to $4.2 billion in 2012. Air Navigation Facilities and Equipment will go from $3.2 billion in 2010 to $3.5 billion in 2010. FAA Operations will rise from $9.5 billion in 2010 to $10.3 billion in 2012. Finally, Research, Engineering and Development will start at $214 million in 2010 and rise to $244 million in 2012.

The total budget amounts suggested for the FAA in fiscal years 2010, 2011 and 2012 are $17.1 billion, 17.6 billion, and $18.3 billion, respectively.

Human Space Flight Review Winding Down

Lewis Groswald

The forthcoming Review of Human Space Flight Plans Committee, commissioned by President Obama, is wrapping up its work. Originally slated for release August 31st of this year, a summary report was transmitted to the Office of Science and Technology Policy and NASA on Tuesday, September 8th.

The United States' human spaceflight program is at a major crossroads right now, with the space shuttle retirement looming in 2010 or 2011, and the potential for the International Space Station to lose US support in 2016. Also at stake are the Ares I rocket for human crew, the Orion crew capsule, the Ares V heavy lift rocket, and the Altair lunar lander.

There are numerous recommendations the Committee could make, including continuing the development of the Constellation architecture laid out by former NASA Administrator Michael Griffin, scrapping the new rockets in favor of human-rating evolved expendable launch vehicles (EELVs), maintaining support of the ISS through 2020, and continuing space shuttle operations beyond the 2010-11 retirement date.

The Orion crew capsule recently and unanimously passed an internal design review. However, if the Ares I rocket was abandoned in favor of other hardware, the gap in human spaceflight would be furthered delayed by a matter of years in order to human rate the EELVs and make the necessary changes to accommodate the Orion capsule, or design a new system altogether. Then again, there is the option of slowing development of Constellation hardware to meet the constraints of the available budget, delaying a lunar landing beyond 2020. In the current fiscal year 2010 appropriations bill that contains NASA funding being debated upon in the Senate, the Senate Appropriations Committee has allocated $100 million for Ares V, calling it a "critical national asset." What happens to this funding before the bill reaches the Senate floor may well depend on what the Committee says.

The Committee will offer the White House multiple options for future exploration architectures. For instance, whether or not the US should remain in low Earth orbit, continue on a path to the Moon, go straight to Mars, or explore other targets like Lagrange gravity points or asteroids. Numerous calls have been made by presenters to the Committee to give commercial space providers a greater role in exploration.

One finding that the Committee has already made well-known is that the human spaceflight program has not been given the money promised to it under President Bush's Vision for Space Exploration (now the United States Space Exploration Policy). At current funding levels of approximately $100 billion for human spaceflight in the 2010 to 2020 decade, the current program is, according to the panel, "not executable." In the Vision for Space Exploration, human lunar landings were to commence in 2020, but in reality may not happen until 2030, if ever. Meeting the original Moon goal might require an additional $50 billion.

For more information, visit the HSF Committee website at http://www.nasa.gov/offices/hsf/home/index.html. The summary of the committee's report is available through the Office of Science and Technology Policy at http://ostp.gov/galleries/press_release_files/Augustineforweb.pdf .

Upcoming Studies

The ASEB is starting one new project this quarter. If you would like further information or have recommendations for potential committee members for this activity, please contact us at aseb@nas.edu.

Committee to Review Proposals to Ohio's Third Frontier Program's 2010 Wright Projects (WP) Competition. Continuing the previous work of the National Academies for the State of Ohio, a committee will be established to review applications to the Wright Projects (WP) competition of the Ohio Third Frontier (OTF) Program for Fiscal Year 2010 to identify proposals that best meet the scientific, technical, and commercialization criteria of the award program. The WP competition focuses on capital improvement and research and development at universities (which have teamed up with businesses) for near-term commercialization of new products. Proposals to the WP competition will be quite similar to those submitted to the 2009 ERCP competition, which were reviewed recently by an ASEB committee.

Recently Completed Activities

Meeting of Experts on NASA's System-Level Research to Mitigate the Environmental Impact of Aviation. The Aeronautics and Space Engineering Board hosted a meeting of experts on behalf of NASA's Aeronautics Research Mission Directorate on May 14-15, 2009. The meeting of experts focused on NASA's plans for system-level research to mitigate the environmental impact of aviation. The purpose of this meeting was to bring together a broad cross-section of 20-25 experts in government, industry, and academia to provide comments and observations on the environmental impact mitigation plans that NASA has developed. A meeting of experts is designed to be an open exchange of information and ideas and does not have a consensus report or any formal recommendations as outcomes. Participants at this meeting included NASA employees; representatives of the NASA Advisory Council's Aeronautics Committee; invited subject-matter experts in industry, academia, and other branches of government; and members of the public.

Report of the Committee for the Review of Proposals to the 2009 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 February, and the second in Columbus, OH in March. Of the 32 proposals reviewed by the committee, five were recommended for funding. On April 28, the Third Frontier Commission, which oversees these sorts of grant programs for Ohio, decided to fully fund the top four proposals recommended by the committee (which resulted in not enough funding to fund the fifth).

ASEB Calendar—Fall 2009

September 1-3, 2009	Review of Near-Earth Object Surveys and Hazard Mitigation Strategies committee meeting, Irvine, CA.
September 3-4, 2009	Review of NASA's Aviation Safety Related Programs committee meeting. Moffett Field, CA.
September 8-9, 2009	Decadal Survey on Biological and Physical Sciences in Space: Fundamental Physical Sciences panel meeting, Washington, DC.
October 13-14, 2009	Aeronautics and Space Engineering Board meeting, Washington, DC.
October 26-28, 2009	Decadal Survey on Biological and Physical Sciences in Space: Animal and Human Biology panel meeting, Washington, DC.
October 28-30, 2009	Decadal Survey on Biological and Physical Sciences in Space: Integrative and Translational Research for the Human System panel meeting, Washington, DC.
November 9-10, 2009	Decadal Survey on Biological and Physical Sciences in Space: Fundamental Physical Sciences panel meeting, Irvine, CA.
November 11-13, 2009	Decadal Survey on Biological and Physical Sciences in Space: Translation to Space Exploration Systems panel meeting, Washington, DC.
November 19-20, 2009	Decadal Survey on Biological and Physical Sciences in Space: Human Behavior and Mental Health panel meeting, Irvine, CA.

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

THE NATIONAL ACADEMIES
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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 Millennium Program through the Ohio Department of Development (ODOD), and identifies experts to assist the Government Accountability Office (GAO) 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.