THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Volume 1, Issue 1

December 2007

Aeronautics and Space Engineering Board News

Welcome to the inaugural issue of the ASEB News! This quarterly newsletter will update you on ASEB events and activities, as well as policy items of interest to the aerospace community. This first edition also commemorates the ASEB's 40th anniversary (1967-2007)—see related stories on pp. 10-12.

Inside this issue:

Wake Turbulence Report To Be Released in January

In response to the 2005 NASA Authorization Act (P.L. 109-155), NASA asked the ASEB to assemble a committee to conduct an independent analysis of what should be the appropriate elements of a national approach to overcoming wake turbulence challenges. The committee, chaired by ASEB member Tony Broderick, was charged with identifying and prioritizing the most important challenges in wake turbulence, and assessing current federal and nonfederal research. The committee will release its report, Wake Turbulence, An Obstacle to Increased Air Traffic Capacity, in early January 2008.

The committee has focused on identifying both technical and organizational challenges to overcoming wake turbulence. The report will include metrics and milestones for each challenge, as well as a program plan that prioritizes different tasks during different time periods.

Upon its release in early January, the prepublication report may be downloaded for free from the National Academies website. Please visit http://www.national-academies.org/aseb/ for access to the report. Hard copies may be requested by contacting Sarah Capote (scapote@nas.edu; 202-334-3827). The final report is expected to be published by the National Academies Press in March 2008.

ASEB To Host a Workshop on NextGen R&D

The ASEB is hosting a public workshop to assess the research and development plan for the Next Generation Air Transportation System, or NextGen. The plan is being prepared by the Federal Aviation Administration's interagency Joint Planning and Development Office (JPDO). The purpose of the workshop is to highlight R&D areas that merit particular focus, including those that appear to be of high value and/or high risk with regard to accomplishing NextGen goals.

The 2-day workshop will feature invited presentations on the JPDO R&D plan and related topics and discussions among the workshop participants. A summary (without findings or recommendations) will be prepared and made available to the public after the workshop.

The workshop will be held in March 2008 at the Beckman Center in Irvine, CA (the exact date TBD). Members of the public are welcome to attend, though advance registration is required. To register or to obtain more information about the workshop, please contact Sandra Wilson at (202) 334-2335 or swilson@nas.edu.

From the Chair: Necessary but Not Sufficient

Raymond S. Colladay

The embattled NASA Aeronautics Program has weathered a storm in recent years of eroding budgets, reprogrammings du jour, management changes that have seen Associate Administrators (AA's) come and go like playing musical chairs, and a general lack of broad and deep support from the community of stakeholders. This lack of support does not apply to the Congress, however. The Congress has frequently addressed the importance of a strong NASA aeronautics program in authorization language, and it has restored cuts through appropriations that it deemed unacceptable in response to budgets that were submitted by the Administration. Without stronger support from the other stakeholders outside of NASA, however, it is difficult for the agency to maintain a priority for aeronautics when so many challenges exist for its principal priority—space.

Hand wringing over just that perceived conflict in priorities has led many to argue that the aeronautics program should be moved to another agency. That would be an attempt to fix a problem by treating a symptom. Almost all NASA Administrators over the years have supported and defended the aeronautics program as far as they can with OMB and Congress, but there have been limits that frustrate their attempts to be stronger advocates. It is a fallacy to blame the recent hard times of the aeronautics program on conflicting space and aeronautics priorities. Space and aeronautics have different constituencies. Although the final budget may be a zero sum process at the agency level, it generally does not come down to those trades unless aeronautics is being considered for a major budget increase, something that has not been the case for some time.

Why is it so hard to gain traction in a program rich in heritage and legacy—one that is approaching its centennial milestone in just eight years—particularly when there is so much opportunity for progress and so much need? There are at least several reasons worth mentioning and they have to do not with legacy, but with a "what have you done for me lately" mindset prevalent in program justification. Legacy may contribute to the culture of an organization, but it is of little value when trying to generate support for programs.

Over the years, it became increasingly difficult to justify NASA's aeronautics investment on the basis of benefit-to-cost assessments. The reason is not a lack of benefit. The problem was a disproportionately large cost-to-benefit ratio resulting from the shift to full cost accounting, where the large financial burden of institutional costs for the research centers was carried in the aeronautics budget. This frustrated any attempt to put a value on program accomplishments. This imbalance was corrected in the FY2008 budget submission by the agency-wide adjustment in the full cost accounting system that more realistically accounts for elements of cost at the research centers that are more appropriately applied at the agency level.

"The steps taken over the last several years to restructure the NASA aeronautics program were *necessary*. If the program is to have *sufficient* resources to realize the advances possible in research and technology development that will keep the U.S. a leader in aviation, then the budget reductions of the last decade need to begin to be reversed."

Another even more important factor, and the one that lies at the heart of the necessary versus sufficient question, is quality. Because NASA is not the customer for its aeronautics program, except for selected space applications, the typical measures of quality and relevance are not as apparent as would be the case if NASA were the principal user of its own research. Other measures are needed, be they market or peer-review driven. I believe that in the absence of reasonable metrics to assess quality and relevance, the Administration kept reducing the aeronautics budget until it got attention. Industry could not provide those metrics because it

(Continued on page 3)

From the Chair

(Continued from page 2)

does not speak with one voice, nor could Congress. Given the recent trends, NASA did what it had to do to stop the downward spiral and put the program on a defensible foundation.

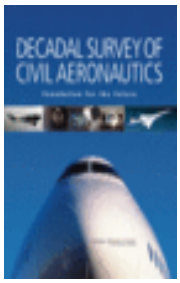
The recently restructured aeronautics program was a necessary step. The first order question that any NASA Administrator or AA must answer is whether the best use is being made of the money for research and technology development (R&T) that is available—is the research, the output of the program, worthwhile and of high quality? Without being able to answer that in a credible, unambiguous, and supportable manner, the second question is never asked: what is the right amount to invest in the NASA aeronautics program? I am not necessarily suggesting that quality suffered in the program before its restructuring, just that the program tended to be focused on selective areas of interest that were not as broadly applicable and therefore as defensible. By taking the program back to fundamentals and structuring the research based on knowledge and understanding of basic principles that improve our ability to design more optimum systems, rather than just more advanced point designs, the first question has been answered.

Not only has the program been reestablished on a new and more defensible progression of results, but stakeholders have had to reset their expectations and the way they work with NASA. All the research partners must change habits. NASA must put a priority on stability of partnerships built on mutual professional respect. Industry must see the value of a strong NASA-industry-academia research team led by NASA working on their relevant needs and priorities. Universities must promote interest in aeronautics R&T to attract students who will graduate and enter the future workforce. NASA should do even more to promote this culture of cooperation among the research partners. Even though the available resources right now do not leave much, if anything, for contract R&T with industry, companies should see the value of the program in developing its future workforce, if nothing else.

Now for the sufficiency question, which can and should be asked—by OMB, the Congress, and all the stakeholders—how much should we be spending on NASA aeronautics? What is sufficient to achieve the R&T advances necessary to maintain U.S. leadership? There are major technical advances that are within reach given sufficient resources—advances that include increasing capacity of our air transportation system while improving safety and reliability, increasing efficiency, and reducing energy consumption and environmental impact. These and other promising, high-payoff areas for aeronautical R&T were identified in the *Decadal Survey of Civil Aeronautics* report issued by a committee of the ASEB in 2006. NASA has the means, the recognized role and responsibility as reiterated in the recently released National Aeronautical R&D Policy, and the public interest in its charter to step up to these research challenges. Our air transportation system is vitally important to our national economy, mobility, national security, and the general safety of the traveling public. The current system is stretched to its capacity limit as anyone who travels by air these days can attest. The FAA and its partners from other government agencies and departments have developed a comprehensive plan for the Next Generation Air Transportation System (NextGen), coordinated and facilitated by a Joint Planning and Development Office co-chaired by FAA and NASA. NASA could do more in support of NextGen if it had additional resources, which, if available, could be used to augment out-of-house contract R&T and achieve a more balanced effort among the government, academia, and industry partners.

In a productive, high-quality research program, there will be technology emerging at key milestones that has promise, but is not yet mature enough to transition to industry. Taking research to the next step or a higher Technology Readiness Level (TRL), though still far from hardware application, can be an expensive proposition. So is research to explore complex systems interactions evaluated in realistic environments. In the past we had discrete programs that were line items in the budget, called "Systems Technology" where breakthroughs that emerged from the "R&T

(Continued on page 4)



The ASEB report *Decadal Survey of Civil Aeronautics: Foundation for the Future* can be read online, downloaded for free in PDF format, or purchased in hard copy at: http://www.nap.edu/catalog.php?record_id=11664. The ASEB can also provide you with a free electronic copy of the report on CD-ROM—contact us at aseb@nas.edu for a CD.

ASEB Staff

Marcia Smith
Director

Alan Angleman
Senior Program Officer

John Wendt
Senior Program Officer

Maureen Mellody
Program Officer

Kerrie Smith
Program Officer

Heather Lozowski
Financial Associate

Sarah Capote
Program Associate

Sandra Wilson
Program Assistant

Director's Corner

Marcia S. Smith

Welcome to the inaugural issue of ASEB's quarterly newsletter. The articles contained herein offer a window into the current issues that ASEB and its study committees are addressing. It also presents an opportunity to commemorate the 40th anniversary of the Board and the important role it has played in aeronautics and space engineering policy over the past four decades.

It is an honor for me to serve as ASEB Director, assuming the reins from respected colleagues with whom I interacted over many years in my previous job as a policy analyst for the U.S. Congress at the Congressional Research Service. George Levin (1997-2007) and JoAnn Clayton Townsend (1990-1997) led the Board during eventful years in the aeronautics and space engineering communities, as well as within the National Research Council itself. JoAnn has written a column for this newsletter sharing the highlights of her years first as a staff member of the Board, and later as Director. Former ASEB chair Bill Hoover has contributed a column covering the years that he and George worked together to reshape the Board to adjust to the dynamic changes at NASA—the Board's main sponsor.

Today, the Board is involved in a diverse array of studies covering the spectrum of aeronautics and space engineering issues. Three studies were underway during 2007 and are close to completion: a study assessing NASA's aeronautics research program, which, inter alia, provides an opportunity for ASEB to look at the extent to which NASA is following the recommendations of our 2006 *Decadal Survey of Civil Aeronautics*; a study assessing the nation's wake turbulence research program; and a study evaluating radiation shielding issues associated with returning humans to the Moon. These are discussed elsewhere in the newsletter.

In November 2007, the ASEB and the Space Studies Board held a workshop to discuss challenges facing the U.S. civil space program. The workshop report will serve as input to a new study, Critical Issues in U.S. Space Policy, that is due to be released in April 2009 (see below).

Ongoing studies or other activities where the major work will occur in 2008 are a study that is assessing the Exploration Technology Development Program in NASA's Exploration Systems Mission Directorate; a workshop to review the Next Generation Air Transportation System ("NextGen") R&D plan issued by the Joint Planning and Development Office; a study that will assess the survey methodology for NASA's National Aviation Operational Monitoring Service (NAOMS), which has been in the headlines in recent months; another set of proposal reviews for the State of Ohio's engineering research and com-

(Continued on page 5)

From the Chair

(Continued from page 3)

Base" and systems programs like the X-airplane series, would be budgeted with firm start and end dates and progress milestones that could be monitored by all the stakeholders and responsible managers. With the current fundamental program, similar to the former "R&T Base" in place, the budget guidelines should be increased to accommodate more systems R&T and/or higher TRL research. Specifically, the answer to how much is enough depends on progress, results, and the need to mature promising technologies to the point where they can be effectively transitioned or explored in a systems environment.

The steps taken over the last several years to restructure the NASA aeronautics program were necessary. If the program is to have sufficient resources to realize the advances possible in R&T that will keep the U.S. a leader in aviation, then the budget reductions of the last decade need to begin to be reversed. If that happens, celebration of the centennial anniversary of NACA/NASA in 2015 will highlight a NASA aeronautics program worthy of its proud legacy.

Raymond S. Colladay
Chair, ASEB
rcspace@wispertel.net

Director's Corner

(Continued from page 4)

mercialization program; a study reviewing scientific mission concepts for the 2020-2035 time period that could take advantage of the new launch vehicle and spacecraft capabilities NASA is creating through the Constellation program, jointly with the SSB; and a "blue ribbon panel" that will address critical issues in U.S. civil space policy, also jointly with the SSB.

"Though advocates of the science and aeronautics programs often blame the human spaceflight program for their reduced funding, in fact, the human spaceflight aspects of the Vision are stretched just as thin."

The "Critical Issues" study is of particular note for two reasons. First is the breadth of the study, covering everything in the civil space realm, including commercial space activities. (National security space issues are not a focus of the study, but may be addressed to the extent that they impact or interact with the civil space program.) Second, it is being funded internally by the National Academies so that the institution can make its own statement about what should be the future of the U.S. civil space program. The report is due in April 2009.

The need for such a study four years after President Bush announced his Vision for Space Exploration may be surprising to some – after all, isn't the United States already set on its course in space for the long term future? The Vision directed NASA to focus its resources on returning humans to the Moon by 2020, and someday sending them to Mars. When he announced the Vision, the President directed NASA to find the funding from within its existing activities, except for a promised addition of $1 billion spread over the first 5 years (FY2005-2009). The Administration has actually requested that increase only once, however, in FY2005, the first year. Congress approved it, but subsequent Administration budget requests have not reflected even that insufficient promise.

One source of funding for the Vision is expected to be savings from termination of the space shuttle in 2010, and U.S. use of the International Space Station (ISS) in 2016, both dates earlier than planned. However, in the short term, funding requirements to return the space shuttle to flight status after the Columbia tragedy, and increased costs for the ISS because the shuttle will not be available to supply it after 2010, have further stressed NASA's budget.

Consequently, every NASA program has been negatively affected by funding shortfalls. Though advocates of the science and aeronautics programs often blame the human spaceflight program for their reduced funding, in fact, the human spaceflight aspects of the Vision are stretched just as thin.

On November 29-30, 2007, a joint SSB/ASEB workshop was held on the topic of the U.S. civil space program. The report of that workshop will not offer findings or recommendations, providing only a summary of what was discussed. The Critical Issues study that we are about to undertake will use the workshop summary as input. A prevalent theme of the 60 or so participants in that workshop was that the government's civil space program is headed for a train wreck. The gloomy mood was broken only by a few participants who expressed optimism about commercial space opportunities such as "personal spaceflight." Generally, however, the participants could not see how the civil space program could continue to garner public and congressional support, or make significant progress, with its goals and resources so completely mismatched.

We are in the early stages of forming the Critical Issues study committee. The Presidents of the NAS, NAE and IOM, who approved the funding for the study, want to ensure that the committee is composed of preeminent individuals with a broad perspective on national policy, not only members of the space community. This portends to be an especially significant study by the ASEB and SSB, and we will keep you posted in future editions of the newsletter.

Marcia Smith
Director, ASEB
msmith@nas.edu

More information about the November workshop on the U.S. civil space program can be found online at: http://www7.nationalacademies.org/ssb/SSBCivilSpaceWkshp.html

Committee News

The Committee to Assess NASA's Aeronautics Research Program. In the 2005 NASA Authorization Act, Congress directed NASA to request a study of the agency's fundamental aeronautics program. NASA expanded the scope of the study to include all of the NASA aeronautics research program. The study committee will make recommendations to improve the program's ability to (1) meet the high-priority technology challenges that are identified in the recent ASEB report, *Decadal Survey of Civil Aeronautics*; (2) address NASA's internal requirements for aeronautics research (e.g., to support robotic and human space exploration); and (3) satisfy non-civil aeronautics research requirements that NASA is addressing as part of agreements with other federal agencies and departments. The study will also identify critical improvements in workforce expertise and research facilities, if any, that NASA and the nation should make to achieve the goals of NASA's aeronautics research program. The report draft has been completed, and is now in the review phase. Public release of a prepublication version of report is expected in the first two months of 2008.

The Committee on Evaluation of 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 is currently in review and is expected to be released in January 2008.

The Committee to Review 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. The committee held its first meeting on October 10-11, 2007 in Washington, D.C., which included a series of presentations by NASA officials that provided the administrative and technical background to ETDP. Subgroups of the committee held site visits to obtain first hand briefings on the 12 ETDP program areas at the Jet Propulsion Laboratory in Pasadena, CA, in early November; at the Johnson Space Center in Houston, TX, also in November; and at the Glenn Research Center in Cleveland, OH, in mid-December. An Interim Report on the committee's findings and recommendations will be delivered to NASA on March 1, 2008 and a prepublication version of the final report on August 1, 2008.

Review of Proposals for the State of Ohio's Third Frontier Project. For the past 5 years, the ASEB has reviewed proposals for the State of Ohio's Third Frontier Project. The objectives of the Third Frontier Project are to expand the State's high-tech research capabilities, promote technology commercialization and innovation, create technology-based businesses, and create high paying jobs in Ohio. This initiative is designed to: build world-class research facilities; support early stage capital formation and the development of new products; and finance advanced manufacturing technologies to help existing industries become more productive. The Ohio Department of Development issues a request for proposals, and contracts with the NRC to perform the proposal evaluation process. ASEB establishes committees that examine the technical and commercial potential of the engineering and physical science proposals, while our sister board, the Board on Life Sciences (BLS), does the same for biomedical proposals. The NRC committees assess how well the proposals meet evaluation criteria and priorities, and identify those judged to

(Continued on page 7)

Committee News

(Continued from page 6)

have the greatest merit for the State of Ohio to consider for possible funding. Subsets of the NRC committees meet in Ohio with key personnel from the proposal teams to evaluate their capability to carry out their plans. The committees' reports rank-order the proposals and provide to the State of Ohio justification for their conclusions as well as suggestions on how the proposals could be improved. The ASEB expects to begin another round of proposal reviews in February 2008. In addition to the traditional research and commercialization program proposals, the State of Ohio is initiating a new Ohio Research Scholars Program (ORSP) in 2008, for which the ASEB and BLS will jointly review proposals. The goal of ORSP is to increase the number of clusters of research excellence, led by Ohio's academic institutions that support regional economic priorities.

The ASEB Welcomes New Board Members

The Aeronautics and Space Engineering Board is pleased to welcome five new members to the Board. The Board is made up of experts in aeronautics, space engineering, and complementary disciplines. Members serve staggered two-year terms. Additional biographical information is available on our website at: http://www.national-academies.org/aseb.

Amy L. Buhrig is director of technology for Boeing Commercial Airplanes. She is responsible for leading the definition of technology required to enable future products and services, while ensuring the company's investments are aligned with business unit strategy and industry economics. Ms. Buhrig is also the primary interface between Boeing Commercial Airplanes and Phantom Works, the company's research and development organization, to maximize the value derived from the company's R&D activities. Ms. Buhrig has also worked at the Phantom Works, most recently leading a team to define the strategy for the Structural Technologies, Prototyping, and Quality organization. The first 20 years of Ms. Buhrig's career were spent in Boeing Integrated Defense Systems. She performed studies to quantify the benefit of investing in novel design methods for the Boeing 777 and F-22 aircraft and assessed company strengths applicable to the commercial space market, and she was vice president of marketing and sales for Boeing's Sea Launch Company.

Pierre Chao is a Senior Fellow and Director of Defense-Industrial Initiatives at the Center for Strategic and International Studies (CSIS) where he directs a team focused on policy issues related to the defense industrial base, including defense industrial policy, acquisition reform, trans-Atlantic relations, export controls, and technology/innovation policy. Before joining CSIS in 2003, Mr. Chao was a managing director and senior aerospace/defense analyst at Credit Suisse First Boston (CSFB) from 1999-2003, where he was responsible for following the U.S. and global aerospace/defense industry. Prior to joining CSFB, Mr. Chao was the senior aerospace/defense analyst at Morgan Stanley Dean Witter from 1995-1999, and he served as an aerospace/defense industry analyst with several other firms. In 2000, Mr. Chao was appointed to the Presidential Commission on Offsets in International Trade. He has been a member of numerous Defense Science Board studies. He is also a guest lecturer at the National Defense University and the Defense Acquisition University. Mr. Chao earned dual Bachelor of Science degrees in Political Science and Management Science from MIT.

New to the Board in 2007:

Amy L. Buhrig, Boeing

Pierre Chao, CSIS

David Goldston, Princeton University

Richard Kohrs, Independent Consultant

Edmond Soliday, United Airlines, retired

David Goldston is a Visiting Lecturer in the Science, Technology and Environmental Policy Program at Princeton University's Woodrow Wilson School of Public and International Affairs. He also writes the monthly column "Party of One" on Congress and science policy for Nature, and he is serving on

(Continued on page 8)

The ASEB is hiring!

The Aeronautics and Space Engineering Board will be seeking to fill a new **Study Director** position. The position will be opening in early 2008. Visit http://www.national-academies.org/aseb to learn more about the position and to obtain application information.

Graduate students can also 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.

The ASEB Welcomes New Board Members

(Continued from page 7)

a number of panels preparing reports on science policy issues. Mr. Goldston was Chief of Staff of the U.S. House Committee on Science from 2001 through 2006. In that role, he oversaw a committee with jurisdiction over most of the federal civilian research and development budget, including programs run by NASA, the National Science Foundation, the Department of Energy, the Department of Commerce and the Environmental Protection Agency. Prior to becoming staff director, Mr. Goldston was legislative director for Congressman Sherwood Boehlert (R-NY). As legislative director, Mr. Goldston was Boehlert's top environmental aide and also oversaw the legislative and press operations of the office. From 1985 to 1994, he served on the Science Committee as the special assistant on the Subcommittee on Science, Research and Technology. In 1994 and 1995, Mr. Goldston was project director at the Council on Competitiveness, a private sector group with members from industry, labor and academia. Mr. Goldston was graduated magna cum laude with a B.A. in American history from Cornell University in 1978. He has completed the course work for a Ph.D. in American history at the University of Pennsylvania.

Richard Kohrs has over 50 years of experience in systems engineering and integration of NASA Apollo, Shuttle, Space Station, and Commercial Programs. He retired from NASA as Director of Space Station Freedom where he had overall responsibility for development and operation of the program. He was Deputy Director for the Space Shuttle program where he managed the daily engineering processing, and operations activities. Earlier he led the systems integration of the Shuttle Program, with responsibility for vehicle integration of Orbiter, Main Engines, External Tank, Solid Rocket Boosters, and the Ground System. After retirement from NASA he served as Vice President of International Activities for ANSER and Director of International Aerospace Cooperation for ANSER. From 1997 through 2005 he served as Chief Engineer of Kistler Aerospace with overall responsibility for technical integration of the seven major subcontractors and systems engineering and integration of the Kistler reusable launch vehicle. From February 2006 to April 2007 he served as Program Manager of SAGES (Shuttle/Apollo Generation Expert Services) for SAIC. This activity provides the NASA Constellation Program access to retired senior personnel from Mercury, Gemini, Apollo, and Shuttle Programs.

Edmond L. Soliday was employed by United Airlines for over 35 years as a pilot, human factors instructor, flight manager, and staff executive, serving the last 11 as vice president of safety, quality assurance and security. He has served on numerous aviation safety related advisory boards and commissions, and he has chaired the Commercial Aviation Safety Team, the Air Transport Association Safety Council, the Star Alliance Safety Committee, and the ATA Environmental Committee. Captain Soliday formerly served on the Executive Board of the Flight Safety Foundation. He currently serves on the Massachusetts Institute of Technology Global Airline Industry Program Advisory Group and is an Indiana State Representative serving on the Transportation, Commerce. Energy and Technology committees. Among his awards are the Bendix Trophy, the Vanguard Trophy, and the Laura Tabor Barbour International Air Safety Award. Capt. Soliday has previously served on four NRC study groups.

ASEB Calendar—Winter 2008

January 30-31, 2008	Aeronautics and Space Engineering Board Meeting. Irvine, CA.
February 5-6, 2008	Meeting of the Committee for the Review of NASA's Exploration Technology Development Program. Irvine, CA.
March, 2008 (TBD)	Workshop: Assessing the Research and Development Plan for the Next Generation Air Transportation System. Irvine, CA.

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

Hill News: Senate Holds Hearing on Issues Facing the Space Program after the Shuttle is Retired

Senate Committee on Commerce, Science, and Transportation:
Subcommittee on Space, Aeronautics, and Related Sciences
Issues Facing the U.S. Space Program after Retirement of the Space Shuttle
November 15, 2007

A hearing was held to address the retirement of the Space Shuttle, its remaining missions, NASA's plans to compensate should they not fulfill all mission requirements on schedule, and other issues facing NASA when the Space Shuttle is retired. NASA Administrator Michael Griffin, Associate Administrator William Gerstenmaier (Space Operations), and Associate Administrator Richard Gilbrech (Exploration Systems) testified at the hearing.

The witnesses made no formal opening statements, but responded to questions from Chairman Bill Nelson (D-FL) and Ranking Member Kay Bailey Hutchison (R-TX). The questions focused on three primary concerns: 1) whether NASA was too committed to retiring the Shuttle at a fixed date of 2010, rather than retiring the Shuttle only upon successful completion of the International Space Station (ISS); 2) the potential for Russia to control human access to space after 2010, when the Shuttle is retired; and 3) the gap between the retirement of the Shuttle and the beginning of the Constellation program, and the impact of that gap on NASA's workforce and corporate memory. The two Senators expressed concern that NASA was no longer planning to transport the Alpha Magnetic Spectrometer (AMS) to the ISS because there are too few Shuttle flights remaining in the schedule to accommodate it. They used that decision as an example that NASA will not properly outfit the ISS as a National Laboratory before the Shuttle's retirement.

Although NASA is exploring other options to launch crews and cargo to the ISS after the Shuttle program is terminated, using existing or new U.S. commercial launch vehicles, the Senators seemed skeptical that they will be available. That would leave the Russian Soyuz as the only means to take U.S. crews to and from the ISS. Senator Nelson noted that it is possible that the geopolitical situation may change and Russia might deny us access to their Soyuz vehicles. He also noted that paying Russia for Soyuz launch services after 2011 is contingent upon Congress passing another waiver for NASA to the Iran and Syria Nonproliferation Act, and Congress may not be willing to do that. Senator Hutchison stated that her attempt (along with Senators Mikulski and Shelby) to add $1 billion in emergency funding to NASA's FY2008 budget (money that NASA had hoped to use, inter alia, to speed Constellation's development and help shorten the gap), "does not appear to be successful."

The Senators were in agreement that the gap could force NASA to lay off as many as 5,000 employees at Cape Canaveral upon the discontinuation of the shuttle. Dr. Griffin stated that NASA is trying to protect its brainpower and that the earliest that the Shuttle could be replaced, and therefore new jobs created, would be 2013, three years after the shuttle is retired. The current NASA budget, without additional funding, puts the date at 2015—a gap of five years. Senator Nelson said that NASA should write a plan for its workforce, as the gap has a chance of widening. Dr. Griffin emphasized that this situation was not of his making, and he agreed that it was unwise to have a gap in the U.S. ability to launch humans into space, but that he did not have a solution to offer.

Sarah Capote, ASEB Program Associate, listened to and summarized this hearing.

THE 40th ANNIVERSARY OF THE ASEB

ASEB Directors 1967-2007

Marcia Smith
(2007-present)

George M. Levin
(1997-2007)

JoAnn C. Clayton Townsend
(1990-1997)

Robert H. Korkegi
(1985-1990)

Albert Evans
(1983-1985)

Robert Burger
(1979-1983)

LaRae Teel
(1971-1979)

Robert Burger
(1967-1971)

The ASEB in Retrospect (1990-1997)

JoAnn Clayton Townsend, former ASEB Director

Early in my tenure, the ASEB celebrated its 25th anniversary. As we approach its 40th, it seems clear that through its life the Board has revisited several important issues, and that it has been a continuous voice in advocating and defining a strong aerospace advanced technology base.

In aeronautics, there were studies to recommend future directions for advanced technology development; help shape a future air traffic management system; identify high speed research requirements; and develop better aviation weather services. We also offered guidance regarding ground test facilities for both NASA and the U.S. Air Force Arnold Engineering Development Center.

Eugene Covert, who earlier had chaired seminal ASEB studies on the space shuttle main engine, led the most comprehensive study on aeronautics since the very first published ASEB report, that chaired by H. Guyford Stever. The 1992 Covert report responded to NASA's request to assess the current status of U.S. aeronautics in a competitive environment and to identify technology advances necessary to meet future challenges. It included stellar panels on aerodynamics, avionics and control, general systems, information sciences and human factors, materials and structures, operational and environmental issues, and propulsion.

Regarding space, ASEB revisited advanced space technology needs and space shuttle and space station issues. Much of its advice fed directly into NASA program planning. ASEB prepared reports defining technology needs to support humans in space as well as technology for small spacecraft. It assessed space shuttle software development, quality control and testing for the space shuttle solid rocket motor, and technology and test programs needed for the next generation reusable launch vehicles. At the Defense Nuclear Agency's request, it reviewed the space nuclear reactor TOPAZ International Program and compared Russian TOPAZ technology with state-of-the-art US technology. Asked to assess earth-to-orbit transportation options, an ASEB committee chaired by Joseph Gavin found that the most binding constraint to lowering the cost of access to space while increasing reliability and resiliency was the way we do business, e.g., launch vehicle assembly, payload processing, and launch pad design and availability.

Orbital debris became a major concern, and George Gleghorn chaired a series of influential reports on orbital debris. Paul Shawcross staffed these reports which included study participants from other space-faring nations and contributed to international cooperation.

At the request of the House of Representatives' Science Committee, we established a space station standing committee led by Jack Kerrebrock. While scientific uses are often cited to sell the station, Dr. Kerrebrock's committee emphasized its importance as an engineering research center, similar to other NASA research centers but with two primary purposes: to study the effects of long-term space faring on human health and capabilities, and to develop technologies that will enable more efficient, safer human and robotic activities in space and that require research in orbit for their full development.

Working with the NRC's Commission on Engineering and Technical Systems, we recommended technical improvements and enhancements to the Global Positioning System. Together with the Space Studies Board we looked at reducing the costs of space science research missions. And working with the NRC National Materials Advisory Board we began a long term effort to help the Air Force Research Laboratory review and assess grant applications. I should also note that although the NRC eschews real-time advice, there can be little doubt that sponsors valued the direct give and take with experts on the Board and its committees.

(Continued on page 11)

THE 40th ANNIVERSARY OF THE ASEB

Perspectives of a Board Chair (1998-2005)

William W. Hoover, former ASEB Chair

For a decade, 1996-2006, I was either a member of the ASEB or its chair and witnessed many changes in the aeronautics and space engineering communities, particularly at NASA. By the time George Levin, then the relatively new director of the ASEB, asked me to serve as chair in 1998, we had concluded that "times they were a-changing." We knew that we needed to give a new sense of purpose to the Board members and a renewed sense of importance of the work of the ASEB to our traditional sponsor, NASA, as well as to attract a broader base of sponsors.

We both believed strongly that the ASEB was an asset that could and should make significant contributions in the national interest. Our vision was that anything concerning aeronautics or space engineering technology and related policy needs was fair game for consideration by the ASEB regardless of the government agency involved. We defined aeronautics in its broadest context of the air transportation system, which included air traffic management, safety, and security. We were mindful that our view required an enhanced spirit of cooperation and coordination by the ASEB with other Boards in the NRC, including the Space Studies Board (SSB), the Air Force Studies Board (AFSB), the Transportation Research Board (TRB), and others.

So what was the "why" and "how" of what we sought to accomplish? NASA aeronautics funding had been in decline for several years, and some in government believed that aeronautics was a mature technology that did not face the same challenges as in the past and therefore did not require the independent assessments that ASEB historically provided. Even though NASA had responsibility within the federal government for research in civil aeronautics, it was constrained by concerns about industrial policy within the government, in the transfer of technology, and unlike aeronautics research in the Department of Defense (DOD), it was not supported by a strong requirements process. Industry was beginning to question the relevance of NASA aeronautics.

The turnover of NASA Associate Administrators (AAs) responsible for aeronautics, and changes to NASA's organizational structure, were frequent. Each AA had to deal with shifting priorities and demands within NASA, which often did not give them the time and energy to think about how to use the ASEB or to seek its help.

The focus and priority within NASA was strongly tilted toward its space activities, but constant changes in organizational structure and personnel were just as prevalent there. Unlike the SSB, which had stable funding for studies related to NASA's space science program, requests for ASEB engineering studies were spotty at best as NASA was searching for mission and direction beyond the space shuttle and International Space Station programs.

If the ASEB was to remain viable we needed to become proactive, stimulate new thinking, and demon-

(Continued on page 12)

JoAnn Clayton Townsend

(Continued from page 10)

While I was director, ASEB produced 27 reports. The late Duane McRuer and, later, Jack Kerrebrock, chaired the Board for most of this time. Their wisdom, energies and creativity contributed greatly to our successes and to the pleasure the volunteers and staff experienced. I feel fortunate to have been a part of this enterprise and to have worked with a truly wonderful staff and some of the nation's finest scientists, engineers, and aerospace policy persons.

JoAnn Clayton Townsend
Part time ASEB Staff, 1982-1985
ASEB Staff, 1985-1990
ASEB Director, 1990-1997

ASEB Chairs 1967-2007

Raymond S. Colladay (2005-present)

William W. Hoover (1998-2005)

John D. Warner (1996-1998)

Jack L. Kerrebrock (1994-1996)

Duane McRuer (1990-1994)

Albertus D. Welliver (1988-1990)

James Kramer (1986-1988)

Joseph F. Shea (1984-1986)

A. Richard Seebass (1981-1984)

Bob Rummel (1978-1981)

Art Bryson (1976-1978)

George Solomon (1974-1976)

Willis Hawkins (1971-1974)

Ray Bisplinghoff (1969-1971)

Guy Stever (1967-1969)

THE 40th ANNIVERSARY OF THE ASEB

ASEB's First 40 Years: 1967-2007

Perspectives of a Board Chairman, William Hoover

(Continued from page 11)

strate our relevance to NASA and other agencies. Our technology credentials had to remain paramount, but our ability to address broader national issues needed to come to the forefront. We conducted many Board meetings as mini workshops with panels of outside experts from academia, industry, senior government officials and Board members. We convinced the National Academy of Engineering (NAE) to host a series of five Aerospace Roundtable dinners that were attended by university presidents, CEOs from industry, and senior government officials. These dinners were discussion forums for a broad range of aerospace issues.

From these new endeavors came ideas and guidance for new studies and avenues to pursue. Importantly, many of these efforts were directed at bringing an awareness of national needs and changing priorities. We brought our ideas to NASA, FAA, DOD, the Department of Transportation, the Department of Homeland Security, the Defense Advanced Research Projects Agency, the National Transportation Safety Board, the Government Accountability Office, the Commerce Department, the FBI, the White House (OMB, OSTP, the Council on Economics and the Council on Domestic Policy), and the Governor of Ohio. We also met with Congress.

The SSB, AFSB, and the TRB were kind enough to let me attend many of their Board meetings. These meetings helped to provide further ideas and fostered cooperation and coordination. Through the efforts of George Levin and the other Board directors, we were successful in participating in several joint studies.

Of all the studies we did during those years, some were of particular interest.

- *Securing the Future of U.S. Air Transportation – A System in Peril* had a significant impact on how the government organized to address bringing a new air traffic management system into fruition.

- *Issues and Opportunities Regarding the U.S. Space Program* closely preceded and underscored President Bush's announcement of the new Vision for Space Exploration. A report of the joint SSB/ASEB workshop summarized the discussion among over 90 leading experts in space policy, science and engineering technology, including two Nobel Prize winners.

- A *Decadal Survey of Civil Aeronautics* was an effort to parallel the stature of Decadal Surveys performed by the SSB and the Board on Physics and Astronomy to create a de facto requirements process for civil aeronautics research, and to provide a flexible model and methodology suitable for determining future research needs. Congress subsequently requested the ASEB to assess the extent to which NASA is following the recommendations of the Decadal Survey (the Committee to Assess NASA's Aeronautics Research Program, described on p. 6).

- *System Integration for Project Constellation* was important in that it demonstrated the capability of the ASEB to bring together 17 former CEOs and Senior Vice Presidents from aerospace industries and former heads of government agencies, with over 900 years of management experience, on very short notice, in an intense 4-day meeting, to produce a report that had significant value to NASA.

All in all during my tenure, I believe we were successful in making a meaningful use of the ASEB, made valuable contributions to our sponsors and had some impact on fostering national interests. I cannot thank George Levin, as Director of the ASEB, enough for his untiring efforts to innovate and work diligently toward our goals and manage the business of the ASEB in a highly professional way. We were also blessed by having extremely competent and dedicated study directors and support staff. It was my pleasure to turn the chairmanship over to the very capable hands of Ray Colladay, a long time participant and supporter of the ASEB.

William W. Hoover
ASEB Chair: 1998-2005
ASEB Member: 1996-1998, 2005-2006

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
Advisers to the Nation on Science, Engineering, and Medicine

Aeronautics and Space Engineering Board

The National Academies
Keck Center
500 Fifth St. NW
Washington, DC 20001

202-334-2858 (phone)
202-334-2482 (fax)
http://www.national-academies.org/aseb
aseb@nas.edu

The Aeronautics and Space Engineering Board News is published quarterly. If you would like to receive an electronic or print copy, please let us know at aseb@nas.edu or 202-334-2858.