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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.

Inside This Issue

ASEB Leadership

In January, Dr. Alan Epstein succeeded General Lester Lyles as chair of the ASEB. Alan is is the vice president of technology and environment at Pratt & Whitney, where he is responsible for setting the direction for and coordinating technology across the company as it applies to product performance and environmental impact. He leads Pratt & Whitney's efforts to identify and evaluate new methods to improve engine performance and fuel efficiency for all new Pratt & Whitney products. He also provides strategic leadership in the investment, development, and incorporation of technologies that reduce the environmental impact of Pratt & Whitney's world-wide products and services. Before joining Pratt & Whitney, Dr. Epstein was the R.C. Maclaurin Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology (MIT) where he holds an appointment as professor emeritus. He was also the director of the MIT Gas Turbine Laboratory. His research while at MIT was concerned with gas turbines, power and energy, aerospace propulsion, and micro-mechanical and electrical systems (MEMS). Dr. Epstein is a member of the National Academy of Engineering and a fellow of AIAA and ASME. He received his B.S., M.S., and Ph.D. degrees from MIT in aeronautics and astronautics

In June, ASEB vice chair Patti Grace Smith passed away as a result of pancreatic cancer. Before retiring from government service in 2008 to found Patti Grace Smith Consulting, L.L.C., she served as the FAA's first Associate Administrator for Commercial Space Transportation, where she was responsible for licensing, regulating, and promoting the U.S. commercial space transportation industry. Ms. Smith joined the Department of Transportation in 1994 after having worked for the Federal Communications Commission, the U.S. Department of Transportation, the Defense Communications Agency, and the Senate Commerce Committee. She had served as the board's vice chair since 2014, and she was also a member of the ASEB's Aeronautics Research and Technology Roundtable. Her insights were a tremendous asset to the board, and she will be greatly missed.

ASEB member Elizabeth "Betsy" Cantwell is the board's new vice chair. She is also the co-chair for the ASEB/SSB Committee on Biological and Physical Sciences in Space (CBPSS). She is the Vice President for Research Development in the Office of Knowledge Enterprise Development as well as a Professor of Practice in the School of Matter, Transport, and Energy at Arizona State University. As such, she is responsible for leading the creation, management and capture of large-scale, externally-funded programs and projects that advance the University's research enterprise. Betsy came to ASU from the Lawrence Livermore National Laboratory (LLNL), where she was director for economic development. She earned her Ph.D. in mechanical engineering at the University of California, Berkeley and an MBA from the University of Pennsylvania's Wharton School of Business.

ASEB Board Members

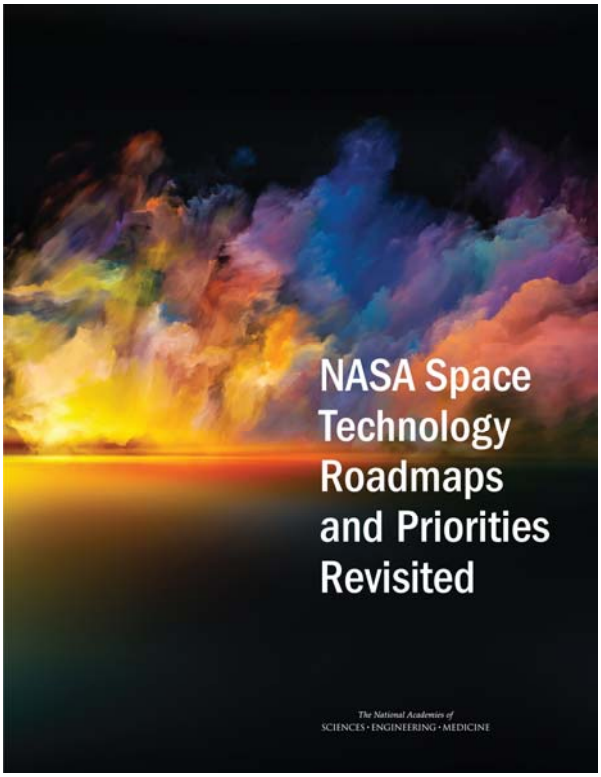
In 2017 the ASEB is celebrating 50 years of advising the nation in aeronautics and space engineering. The board will meet May 1, 2017 and then will meet with the Space Studies Board on May 2, 2017 for a symposium on America's Future in Civil Space.

In the context of revisiting the National Academies effort that led to the 2009 report, *America's Future in Space: Aligning the Civil Space Program with National Needs*, the boards have organized this symposium to address the evolution of the 2009 report's recommendations in the context of current topics and issues in civil space policy. The agenda is being coordinated by a small organizing committee drawn from both boards and the one-day participatory workshop will focus on three moderated panel and audience discussions on **Space in Support of National and International Challenges**, **Future of Exploration and Discover,** and **Public-Private Partnerships in Pursuit of National Space Priorities**. The symposium will also include a set of "lightning" talks in key challenges and opportunities in technology development and space science.

The goal is to conduct the one-day meeting as a dynamic discussion-focused event with the leaders of our civil space efforts in the room. We will be emphasizing discussion among the panelists and the attendees, in an intimate meeting venue and with the goal of thoroughly discussing and looking forward to the challenges and opportunities that lie ahead for this important national effort.

The event will be webcast and the recording will be available on our website. To register or view the recording after the event visit www.nationalacademies.org/deps/aseb.

Committee on NASA Space Technology Roadmaps



The Committee on NASA Space Technology Roadmaps released its report, *NASA Space Technology Roadmaps and Priorities Revisited,* in August 2016. It is available at www.nap.edu.

Historically, the United States has been a world leader in aerospace endeavors in both the government and commercial sectors. A key factor in aerospace leadership is continuous development of advanced technology, which is critical to U.S. ambitions in space, including a human mission to Mars. To continue to achieve progress, NASA is currently executing a series of aeronautics and space technology programs using a roadmapping process to identify technology needs and improve the management of its technology development portfolio.

NASA created a set of 14 draft technology roadmaps in 2010 to guide the development of space technologies. In 2015, NASA issued a revised set of roadmaps. A significant new aspect of the update has been the effort to assess the relevance of the technologies by listing the enabling and enhancing technologies for specific design reference missions (DRMs) from the Human Exploration and Operations Mission Directorate and the Science Mission Directorate. NASA Space Technology Roadmaps and Priorities Revisited prioritizes new technologies in the 2015 roadmaps and recommends a methodology for conducting independent reviews of future updates to NASA's space technology roadmaps, which are expected to occur every 4 years.

Committee on NASA Technology Roadmaps Members

Todd J. Mosher, co-chair
Syncroness

Liselotte J. Schioler, co-chair
National Institute of Aerospace

Arden L. Bement, Jr.
Purdue University

John C. Brock
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James L. Burch
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Honeybee Robotics, Ltd.

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The Johns Hopkins University Applied Physics Laboratory

Torrey Radcliffe
The Aerospace Corporation

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Florida Institute for Human and Machine Cognition

Julie A. Shah
MIT

Alan M. Title
Lockheed Martin Advanced Technology Center

ASEB Calendar

May 1
ASEB Spring Meeting, Keck Center, Washington, DC

May 10-11
Aviation Safety Assurance Committee Meeting, Keck Center, Washington, DC

June 20-22
Committee on a Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA, Jonsson Center, Woods Hole, MA

July 17-18
Aviation Safety Assurance Committee Meeting, Keck Center, Washington, DC

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

Space Technology Industry-Government-University Roundtable (STIGUR)

The Space Technology-Industry-Government-University Roundtable was established to engage senior representatives from industry, universities, NASA, and other government agencies in discussions of critical issues related to NASA's space technology research agenda that are of shared interest. The Roundtable held its fifth meeting on July 21, 2016, in Washington, D.C. This meeting was the final Roundtable meeting under the terms of the initial agreement between the National Academies and the Space Technology Mission Directorate. The Roundtable was led by Chair Ray Johnson, formerly the chief technology officer of Lockheed Martin, and by roundtable member Stephen Jurczyk, NASA's associate administrator for space technology.

A new agreement is now in place and the ASEB is in the process of recruiting members to reestablish the Roundtable. The reformulated Roundtable will include some veterans of the initial effort to provide continuity as well some new members to provide a fresh perspective. The next meeting of the Space Technology Roundtable will likely take place in September 2017 in Washington, D.C.

CBPSS Members

Elizabeth Cantwell, Co-chair
Arizona State University

Robert J. Ferl, Co-chair
University of Florida

Kenneth M. Baldwin
University of California, Irvine

Mina J. Bissell
Lawrence Berkeley National Laboratory

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The University of Texas at Austin

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Wayne L. Nicholson
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MIT

Peter W. Voorhees
Northwestern University

Erika Wagner
Blue Origin, LLC

Hai Wang
Pennsylvania State University

David A. Weitz
Harvard University

Space Studies Board/ASEB Standing Committee on Biological and Physical Sciences in Space (CBPSS)

The **Committee on Biological and Physical Sciences in Space (CBPSS)** worked with NASA to select the topic of "Exploration Systems Interface with Biological and Physical Behaviors" as the focus of a 1-day symposium held on Mar. 29, 2017, as part of the committee's scheduled March 28-30, 2017 meeting during the SSB's annual Space Science Week event. The symposium brought together academic, government and industry researchers and developers to discuss the specific interactions of biological and physical processes with the exploration technology systems, and how that interaction is altered by the space environment. The presentations and discussions focused on the most important challenges that these alterations posed to the development of safe, effective and reliable spacecraft systems, as well as the research that was needed to address these challenges. The areas covered ranged from microgravity fluid physics and combustion to cryogenic management and in-space manufacturing. During the non-symposium portion of the meeting, the committee also heard a presentation on the evolution of Center for the Advancement of Science in Space (CASIS) work to expand the ISS user base, and a status update on NASA's Space Life and Physical Sciences Research and Applications program. The committee also met in plenary with the other standing committees of the Space Studies Board on March 28.

On Mar. 22, 2017 committee co-chair Dr. Rob Ferl gave invited testimony at the House Subcommittee on Space hearing on "The International Space Station after 2024: Options and Impact".

ASEB Staff Members

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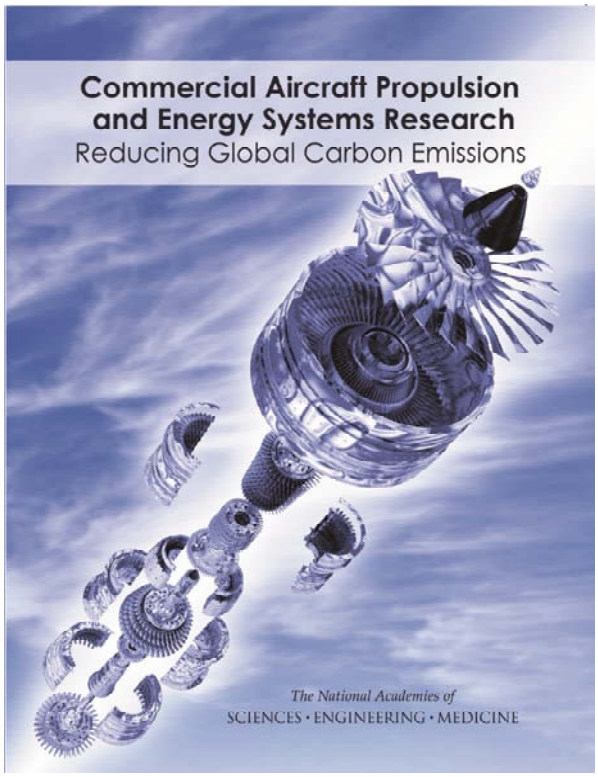
Anesia Wilks*
Senior Project Assistant

*Staff of other NRC Boards who are shared with ASEB

Committee on Propulsion and Energy Systems to Reduce Commercial Aviation Carbon Emissions (Low Carbon Aviation Committee)



The Committee on Propulsion and Energy Systems to Reduce Commercial Aviation Carbon Emissions released its report, *commercial Aircraft Propulsion and energy Systems Research,* in May 2016. It is available at www.nap.edu.

The primary human activities that release carbon dioxide (CO2) into the atmosphere are the combustion of fossil fuels (coal, natural gas, and oil) to generate electricity, the provision of energy for transportation, and as a consequence of some industrial processes. Although aviation CO2 emissions only make up approximately 2.0 to 2.5 percent of total global annual CO2 emissions, research to reduce CO2 emissions is urgent because (1) such reductions may be legislated even as commercial air travel grows, (2) because it takes new technology a long time to propagate into and through the aviation fleet, and (3) because of the ongoing impact of global CO2 emissions.

Commercial Aircraft Propulsion and Energy Systems Research develops a national research agenda for reducing CO2 emissions from commercial aviation. This report focuses on propulsion and energy technologies for reducing carbon emissions from large, commercial aircraft— single-aisle and twin-aisle aircraft that carry 100 or more passengers—because such aircraft account for more than 90 percent of global emissions from commercial aircraft. Moreover, while smaller aircraft also emit CO2, they make only a minor contribution to global emissions, and many technologies that reduce CO2 emissions for large aircraft also apply to smaller aircraft.

As commercial aviation continues to grow in terms of revenue-passenger miles and cargo ton miles, CO2 emissions are expected to increase. To reduce the contribution of aviation to climate change, it is essential to improve the effectiveness of ongoing efforts to reduce emissions and initiate research into new approaches.

Low Carbon Aviation Committee Members

Karen A. Thole., Co-chair *Pennsylvania State University*

Woodrow Whitlow, Co-chair *Cleveland State University*

Meyer J. Benzakein, *The Ohio State University*

R. Stephen Berry *University of Chicago Gordon Center for Integrative Studies Department of Chemistry and James Franck Institute*

Marty K. Bradley *Boeing Commercial Airplanes*

Steven J. Csonka *Commercial Aviation Alternative Fuels Initiative*

David J.H. Eames *Rolls-Royce North America*

Daniel K. Elwell *Elwell and Associates, LLC*

Alan H. Epstein *Pratt and Whitney*

Zia Haq *U.S. Department of Energy*

Karen Marais *Purdue University*

James F. Miller *Argonne National Laboratory*

John G. Nairus *AFRL/RQQ*

Stephen M. Ruffin *Georgia Institute of Technology*

Hratch G. Semerjian *National Institute of Standards and Technology*

Subhash C. Singhal *Pacific Northwest National Laboratory*

Aviation Safety Assurance Members

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The Ohio State University

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Bonnie Schwartz
Air Force Research Laboratory

Craig Wanke
The MITRE Corporation

Aviation Safety Assurance Committee

This study is focused on research that will contribute to the development of a safety assurance system. Such a system would continuously monitor the national airspace system to collect data on the status of aircraft, air traffic management systems, airports, weather, etc.; detect emergent safety risks over time scales from minutes to days; and recommend corrective action both in-flight and prior to flight of a particular aircraft.

The committee is led by Kenneth Hylander, who is Chairman of the Board of Governors of the Flight Safety Foundation. The committee held its first two meetings in Washington, D.C. on January 23-25 and May 15-17. At the latter meeting the committee investigated long-term safety assurance issues specific to air traffic management, human operators, data analytics, and new entrants (primarily UAVs and commercial space operations). The committee's final two meetings will take place on May 10-11 in Washington, D.C., and July 17-18 in Woods Hole, Mass. The committee's final report is scheduled for delivery in Jan 2018.

Committee on a Midterm Assessment of implementation of the Decadal Survey on Life and Physical Sciences Research at NASA

The committee held its first meeting on February 7-9, 2017 in Washington, D.C. The committee first met with Dr. Craig Kundrot, director of the NASA Division of Space Life and Physical Sciences Research and Applications (SLPSRA), who provided an overview of SLPSRA as well as its relationship to the decadal. Next, Dr. Francis Chiaramonte, Dr. David Tomko, Dr. Steve Davison, and Dr. Mark Lee briefed the committee on the research and accomplishments of the four SLPSRA research subdivisions including physical sciences, biological sciences program, human research, and fundamental physics. NASA Deputy Chief Scientist Dr. Gale Allen provided context for SLPSRA's role within NASA, including organizational connections and potential future roles. Dr. Julie Robinson, ISS Chief Scientist, briefed the committee on ISS research, past, present, and future. She highlighted groundbreaking discoveries, including the "Cool Flames" experiment. Finally, the Committee's open session ended on the second day with a briefing from Michael Roberts, Deputy Chief Scientist at the Center for the Advancement of Science in Space (CASIS), about the role of CASIS in microgravity research. The committee spent the remainder of its meeting in closed session reviewing materials, developing data requests, and conducting task and meeting planning—with a particular focus on plans for a Community Input Event during its next meeting. Following the February meeting, the committee continued to rapidly develop, organize and publicize this event. The committee's next meeting was held on April 18-20, 2017 in Washington, DC.

On March 22, 2017 committee co-chair Dr. Rob Ferl gave invited testimony at the House Subcommittee on Space hearing on "The International Space Station after 2024: Options and Impact".

Midterm Assessment Members

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Alan Hargens
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Dominique Langevin
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Syncroness, Inc.

Elaine Oran (NAE)
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Pennsylvania State University

James T'ien
Case Western Reserve University

Mark Weislogel
Portland State University

Gayle Woloschak
Northwestern University

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Aeronautics and Space Engineering Board

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The ASEB's sister board, the Space Studies Board (SSB), also publishes a newsletter; visit http://sites.nationalacademies.org/SSB/ssb_052298 to subscribe or to view past SSB newsletters. The ASEB's division, the Division on Engineering and Physical Sciences (DEPS), also publishes a newsletter; visit http://sites.nationalacademies.org/DEPS/DEPS_059299 to subscribe.

About the ASEB...

The 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. Among these issues are: research and development aspects of the Next Generation Air Transportation System (NextGen); NASA's aeronautics research program; national aeronautics R&D policy and its implementation; space policy and programs, with a focus on human spaceflight and space operations; commercial space activities; and other aerospace engineering topics.

Photo courtesy of Dwayne Day, ASEB Staff.