

NASA ADVISORY COUNCIL  
National Aeronautics and Space Administration  
Washington, DC 20546  
Dr. Steven W. Squyres, Chairman

December 10, 2012

Mr. Charles F. Bolden, Jr.  
Administrator  
National Aeronautics and Space Administration  
Washington, DC 20546

Dear Administrator Bolden:

The NASA Advisory Council held a very productive public meeting at NASA Marshall Space Flight Center in Huntsville, Alabama, November 28-30, 2012.

As a result of its deliberations, the Council approved five recommendations and three findings. They are enclosed for your consideration. If you have any questions or wish to discuss further, please contact me.

Sincerely,

A handwritten signature in black ink, appearing to be 'S. Squyres', with a long horizontal line extending to the right.

Steven W. Squyres  
Chairman

Enclosures

## NASA Advisory Council Recommendation

### Outreach 2012-03-01 (HEOC-01)

**Name of Committee:** Human Exploration and Operations Committee

**Chair of Committee:** Mr. Richard Kohrs

**Date of Council Public Deliberation:** November 28, 2012

**Short Title of Recommendation:** Outreach

**Recommendation:** NASA should leverage its contractors in developing its overall outreach strategy. Specifically, NASA should develop an integrated outreach plan that includes actions that the Agency and its contractors can perform. NASA should also include a requirement in solicitations for offerors to submit their outreach plans as part of their proposal. An offeror's outreach plan, including flow down of the outreach requirements to subcontractors, would be evaluated and factored into the overall proposal rating. This activity should be coordinated with the Education and Public Outreach Office.

**Major Reasons for Proposing the Recommendation:** NASA has a multifaceted outreach program. It could be significantly enhanced by leveraging this program with a network of NASA's contractors and their numerous sub-contractors.

**Consequences of No Action on the Proposed Recommendation:** Many Americans are under the mistaken impression that the human spaceflight program has been cancelled. We risk losing support for NASA's programs if our stakeholders are not aware of the programs.

## NASA Advisory Council Recommendation

### Autonomy Research in Aviation

2012-03-02 (AC-01)

**Name of Committee:** Aeronautics Committee

**Chair of Committee:** Ms. Marion Blakey

**Date of Council Public Deliberation:** November 29, 2012

**Short Title of Recommendation:** Autonomy Research in Aviation

**Recommendation:** The Council recommends that the NASA Aeronautics Research Mission Directorate (ARMD) provide strategic Agency and national leadership, in coordination with the private sector and other government agencies, for current and future research activities in intelligent and autonomous aviation technologies. Areas of research would include safe, effective allocation of functions between humans and automation and target development of core technologies in machine intelligence and autonomous systems that address crosscutting technical challenges. The testing and certification of these non-deterministic software systems that are focused on enabling autonomous operations in complex, uncertain environments is a special area of concern and interest. NASA's efforts should generate the knowledge and concepts necessary to inform operations, safety and certification standards and procedures for non-deterministic systems.

**Major Reasons for Proposing the Recommendation:** Future aviation vehicles and systems (both manned and unmanned) will be more highly automated, and will require the implementation of software systems of varying degrees of complexity coupled with advanced hardware and communications capabilities. Thus, there is a need for research and development that will lead to an overall aviation system that can be operated safely with vehicle and systems of varying levels of autonomy.

Autonomy has the potential to reduce costs, increase performance, productivity, safety, and efficiency and enable new operational models for aviation. The safe integration of complex software intensive intelligent systems into the current airspace system is a long-term issue that the Council feels NASA is uniquely positioned to take a leadership role in achieving.

**Consequences of No Action on the Proposed Recommendation:** Autonomous systems can introduce uncertainties if they are not thoroughly assessed and evaluated under a wide variety of normal and abnormal operating conditions. Without strategic investments in key areas of intelligent and autonomous aviation technologies, the needed capabilities to achieve operational, safety, and certification standards and procedures for such systems will not keep pace with this rapidly evolving technology area.

## NASA Advisory Council Recommendation

### Aeronautics Flight Research Capability

2012-03-03 (AC-02)

**Name of Committee:** Aeronautics Committee

**Chair of Committee:** Ms. Marion Blakey

**Date of Council Public Deliberation:** November 29, 2012

**Short Title of Recommendation:** Aeronautics Flight Research Capability

**Recommendation:** Over the past few years, a number of external and internal assessments of NASA's Aeronautics research programs have been undertaken. More recently, at the request of NASA, the National Research Council (NRC) undertook a study of how best to integrate flight research in ARMD's current research activities. The NASA Advisory Council strongly endorses the critical role of flight research as underscored by the NRC and believes that NASA should sustain and enhance that capability. The NASA Advisory Council believes that there is significant value in proving technology performance in a relevant environment via flight testing.

The NASA Advisory Council feels that the current balance between fundamental and integrated systems level research within the Aeronautics Research Mission Directorate (ARMD) is appropriate for the given funding level. The Council also agrees with ARMD's plans for where and how to employ flight testing within the given budget, and expects this work to continue to advance aviation and aerospace. However, the Council believes there is an opportunity for NASA to make even more substantial contributions by supporting more robust flight research, which will result in a much better balance among all critical elements of conducting world class research: analytical methods, ground testing, and flight testing.

The NASA Advisory Council therefore recommends that NASA expand the use of flight test as an integral part of its overall research portfolio. However, the Council believes that additional resources outside of those currently allocated will be necessary to effectively implement additional flight research activities and it would be advantageous for ARMD to collaborate as much as practical with industry and other government agencies.

In recognition of Neil Armstrong's dedication and contributions to both the NRC study and flight research, including as an X-15 test pilot, the NASA Advisory Council believes that expanding the depth of flight research at NASA could be appropriately dedicated to his legacy.

**Major Reasons for Proposing the Recommendation:** While the Council recognizes the contributions of current ARMD activities that utilize flight assets (such as the EDA activity executed by the Airspace Systems Program in concert with the Federal Aviation Administration), the Council feels that increased flight test research is critical to the health of the aeronautics

enterprise. The Council recognizes that many factors have impacted the ability of NASA to sustain a robust flight research program. However, the resources and a strategic planning process through which NASA is able to establish priorities for utilizing flight research in balance with other technical capabilities will assure the long-term health and contributions of the NASA Aeronautics Research Program.

**Consequences of No Action on the Proposed Recommendation:** The competition for program resources not only at NASA but at other federal agencies has put the Nation's world-class flight research capability at risk. With continued budgetary pressures, the under-utilization of flight testing will further erode NASA's flight research capability.

**NASA Advisory Council Recommendation**

**Planetary Protection Procedural Requirements Document  
for Human Extraterrestrial Missions  
2012-03-04 (SC-01)**

**Name of Committee:** Science Committee

**Chair of Committee:** Dr. Wesley Huntress

**Date of Council Public Deliberation:** November 29, 2012

**Short Title of Recommendation:** Planetary Protection Procedural Requirements Document for Human Extraterrestrial Missions

**Recommendation:** The NASA Advisory Council recommends that NASA develop the appropriate implementing document to specify planetary protection procedural requirements for human extraterrestrial missions at a level corresponding to the current COSPAR (Committee on Space Research) planetary protection policy, and update it as new knowledge becomes available.

**Major Reasons for Proposing the Recommendation:** NASA Policy Directive 8020.7G on “Biological Contamination Control for Outbound and Inbound Planetary Spacecraft” requires the development of detailed documents delineating the standards and procedures implementing compliance with planetary protection standards and procedures for human spaceflight missions. Currently, however, no such documents exist for human missions.

**Consequences of No Action on the Proposed Recommendation:** NASA will be out of compliance with its own policy requirements as it plans the prominent flagship missions of human exploration and with international agreements to which the U.S. is a party.

## NASA Advisory Council Recommendation

### Workforce Skill Mix 2012-03-05 (CSC-01)

**Name of Committee:** Commercial Space Committee

**Chair of Committee:** Ms. Patti Grace Smith

**Date of Council Public Deliberation:** November 29, 2012

**Short Title of Recommendation:** Workforce Skill Mix

**Original Recommendation:** As a follow-up to Council Recommendation 2012-02-02 (CSC-01), the Council recommends that NASA revisit its near-term human capital planning to include specific new hires with significant outside business experience to enhance implementation of the Agency's vision of space commercialization.

**Major Reasons for Recommendation:** The Council appreciates NASA's response to Recommendation 2012-02-02 (attached for reference), and applauds the tools available to equip the existing workforce for the transition to space commercialization through business education and other development programs. The workforce currently managing and supporting the Commercial Crew Program's integrated capabilities phase, the conclusion of the Commercial Orbital Transportation Services program, and the International Space Station (ISS) Commercial Resupply Services contracts possesses a wealth of applicable technical experience in human space development and operations and has demonstrated adeptness at implementing non-traditional acquisition strategies and government/industry partnerships. However, the Council is concerned that there still exists a skill gap that applies more broadly to the Agency-wide vision of pursuing many space commercialization opportunities, which will then enable applying NASA's limited resources to government-managed deep space human exploration.

The Council believes that achieving the expressed Agency vision, which will include new non-NASA markets for human space flight as well as many other new space commercialization initiatives, requires a workforce with significant outside experience in building entrepreneurial businesses, establishing new markets, competing for market share, and managing complex programs in a profit-motivated environment. This is needed at the Agency level as well as across the Centers where there is a need to create and successfully implement new commercial partnership opportunities. The Council finds from its recent Agency-wide fact finding that this is a gap today, and experience has shown that addressing it most effectively requires bringing in outside experience and business expertise to build into the existing workforce. This is the preferred and most direct option, and can be carried out in parallel with retraining the existing workforce. Practical, first-hand experience in a true commercial industry environment is needed, and will augment existing workforce skills and experience as NASA continues its transformation.

The Council recommends that NASA put in place specific hiring plans to bring more commercial industry business experience into the Agency as it seeks to continue moving forward with its transformation.

In addition to maximizing new commercial partnerships and opportunities, this new and enhanced Agency skill set would also benefit the technical execution of the commercial space programs. It would bring a private-sector perspective to solving the challenges that will eventually be faced as the Agency and its partners balance safety, costs, and schedule in a commercial services rather than a government-managed environment.

**Consequences of No Action on the Recommendation to Reconsider:** The Agency will continue to lack the types and depth of skills required to fully realize the space commercialization vision.

## **NASA Advisory Council Finding**

### **Aeronautics Test Facilities**

**Name of Committee:** Aeronautics Committee

**Chair of Committee:** Ms. Marion Blakey

**Date of Council Public Deliberation:** November 29, 2012

**Short Title of Finding:** Aeronautics Test Facilities

**Finding:** The Council endorses the management strategy engaged in by the Aeronautics Research Mission Directorate (ARMD) for the aeronautics test facilities. The corporate management of the facilities by the Aeronautics Test Program (ATP) has resulted in a strategic, long-term commitment by NASA to retain and invest in test capabilities that are considered important to the Agency and the Nation. The balanced business approach utilizing outside aeronautics test facility needs taken by the ATP within ARMD has resulted in economies of scale and the ability to fund the development and employment of highly specialized technical resources that provide NASA and the U.S. aerospace community a vital infrastructure within critical budget constraints. The approach ARMD ATP took to addressing the challenge of maintaining and enhancing critical infrastructure is a best in class approach that should be studied by any organization attempting to improve benefits to their customer community.

## NASA Advisory Council Finding

### Acceptance of Commercial Approaches at NASA Centers

**Name of Committee:** Commercial Space Committee

**Chair of Committee:** Ms. Patti Grace Smith

**Date of Council Public Deliberation:** November 29, 2012

**Short Title of Finding:** Acceptance of Commercial Approaches at NASA Centers

**Finding:** The Council finds that there is an increasing acceptance of commercial approaches across NASA.

With the retirement of the Space Shuttle and termination of the Constellation program, current Agency policy includes “commercialization” of low Earth orbit transportation. Initially, this transition was not widely accepted by many current or former NASA employees. Some former astronauts and contractors were particularly vocal in Congressional testimony and other public venues in resisting the change away from NASA’s traditional method of developing, funding, and managing major programs. However, there is evidence that this is changing. Metrics for the progress include the messaging NASA delivers in press releases, public statements and testimony, and validation from NASA’s partners. The increasing acceptance appears to be due in part to the widening realization that the change is necessary.

Furthermore, after visiting four NASA Centers and talking with all ten Center Directors (or their deputies), the Council finds that commercialization initiatives are in place at every NASA Center. These initiatives appear in various stages, depending on local factors such as facilities, Center geographical location, Center Director interest and communication, outside interests, and funding constraints. Most Centers are actively pursuing new opportunities for commercial partnerships, and are interested in removing impediments to quick and efficient implementation. Employees appear to accept that commercialization of low Earth orbit transportation is just one piece of a broader NASA strategy that includes challenging current in-house work to enable beyond-Earth exploration.

## NASA Advisory Council Finding

### Multi-Center Collaborations

**Name of Committee:** Information Technology Infrastructure

**Chair of Committee:** Dr. Larry Smarr

**Date of Council Public Deliberation:** November 29, 2012

**Short Title of Finding:** Multi-Center Collaborations

**Finding:** The Council is encouraged by the multi-center collaborations involved in engineering activities to upgrade Marshall Space Flight Center's Huntsville Operations Support Center (HOSC) and Payload Operations and Integration Center (POIC). Not only with the traditional human spaceflight centers such as Johnson Space Center and Kennedy Space Center, but also engineering expertise and tools from Goddard Space Flight Center, Ames Research Center, Jet Propulsion Laboratory, etc., are being incorporated into this activity.