

**NASA Advisory Council**  
National Aeronautics and Space Administration  
Washington, DC 20546

*General Lester L. Lyles (USAF, Ret.), Chair*

April 9, 2018

Mr. Robert M. Lightfoot, Jr.  
Acting Administrator  
National Aeronautics and Space Administration  
Washington, DC 20546

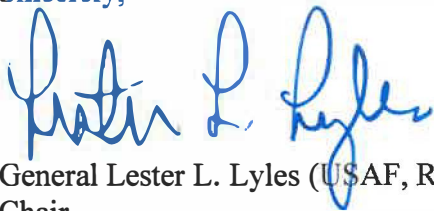
Dear Acting  Administrator Lightfoot:

The NASA Advisory Council held its first public meeting of 2018 at NASA Headquarters, Washington, DC, on March 28-29, 2018.

As a result of our deliberations, and in accordance with our “two-tier” approach for transmitting recommendations and findings to the NASA leadership, the Council approved one Council recommendation and two Council findings for your consideration (enclosed). The Council also approved one Committee recommendation and six Committee findings for consideration by the NASA Associate Administrators. Copies of the latter also are enclosed for your information and awareness. If you have any questions or wish to discuss this further, please do not hesitate to contact me.

This was our final Council meeting with you prior to your planned Federal retirement at the end of this month. On behalf of the Council, I would like to take this opportunity to convey our sincere appreciation and admiration for your exceptional leadership over the past 15 months as NASA Acting Administrator, and for your tremendous NASA career spanning over three decades. It has been an honor and privilege for us to serve with you. Congratulations on your retirement, and our best wishes for continued success in your future pursuits.

Sincerely,



General Lester L. Lyles (USAF, Ret.)  
Chair

Enclosures

## NASA Advisory Council Recommendation

### Organizational Options to Promote Technology Investment and University Grants and Fellowships 2018-01-01 (TIEC-01)

<b>Name of Committee:</b>	Technology, Innovation and Engineering Committee
<b>Chair of Committee:</b>	Dr. William Ballhaus
<b>Date of Council Public Deliberation:</b>	March 29, 2018
<b>Short Title of Recommendation:</b>	Organizational Options to Promote Technology Investment and University Grants and Fellowships

#### **Recommendation:**

The Council recommends that the NASA Administrator task the Acting Associate Administrator to develop and present to the Council mechanisms and/or a hybrid organizational option that promotes appropriate levels of investment in early and mid-stage technology development and University grants and fellowships. This includes defining metrics to assess effectiveness.

#### **Major Reasons for the Recommendation:**

- NASA needs cutting edge technologies to undertake its missions.
  - NASA “grand” missions are technology-enabled.
  - James Webb Space Telescope (JWST), Mars Science Laboratory (MSL), International Space Station (ISS) - type of work NASA should be doing.
  - Demonstrates NASA/U.S. technical leadership.
  - Current missions are based on technologies developed through investments made over several decades.
- In the timeframe FY 2005 - FY2009, technology budgets (basic research -\$500M; applied research -\$900M) were drastically reduced.
  - NASA technology shelf depleted over the last decade due to a lack of investment. NASA has begun to correct this over the last three years (e.g., Space Technology Program (STP)).
  - A number of Administrators in the past have organizationally fenced off the budget for “seed corn” and crosscutting investments that includes research and technology and system-level demonstrations to preserve options for the future.
- To reverse this decline, NASA established the Office of Chief Technologist (OCT) in 2010, and the Space Technology Mission Directorate (STMD) in 2013, and rebuilt the crosscutting technology program as well as made focused investments in technology development in the Human Exploration and Operations Mission Directorate (HEOMD) and Science Mission Directorate (SMD).

- STMD university engagement:
  - During the mid-2000s, NASA's university engineering research programs were decimated.
  - STMD reengaged the academic community in engineering research and technology development and has rekindled interest in NASA among students, especially at the graduate level.
  - If appropriate mechanisms are not put in place, NASA interactions with universities will be adversely affected as in the past.

**Consequences of No Action on This Recommendation:**

Narrows technology options for future programs and adversely affects human capital development for NASA and its contractors.

## NASA Advisory Council Finding

### Technology Investment

<b>Name of Committee:</b>	Technology, Innovation and Engineering Committee
<b>Chair of Committee:</b>	Dr. William Ballhaus
<b>Date of Council Public Deliberation:</b>	March 29, 2018
<b>Short Title of Finding:</b>	Technology Investment

**Finding:** The Council finds that NASA’s major missions have been enabled by technology investment over a number of years. Previous experience with housing “seed corn” and crosscutting technologies in development mission directorates produced unfortunate results:

- Drastic reductions in those technology budgets.
- Alienation of university connections – the major source of human capital for NASA and its contractors.

The Space Technology Mission Directorate (STMD) was established to reverse these outcomes and has produced a robust technology portfolio with university and industry partnerships.

## NASA Advisory Council Finding

### Office of Education Continued Progress and Strategic Alignment

<b>Name of Committee:</b>	Ad Hoc Task Force on STEM Education
<b>Chair of Committee:</b>	Dr. Aimee Kennedy
<b>Date of Council Public Deliberation:</b>	March 28, 2018
<b>Short Title of Finding:</b>	Office of Education Continued Progress and Strategic Alignment

#### **Finding:**

- The Office of Education continues to demonstrate progress toward implementing the recommendations of the Education and Outreach Business Services Assessment (BSA). The actions taken by the Office of Education to improve the strategic alignment, implementation, and evaluation of their STEM engagement activities have happened swiftly and are impressive.
- The Office of Education has undertaken a comprehensive approach to researching and developing an evaluation program. The Office has also realigned the Space Grant and Internship programs to be more closely aligned with the mission and vision of NASA. Another step the Office has taken is to use the unique situation of the two educators on the International Space Station (ISS) to name this year the “Year of Education on Station.” Finally, the Office realigned the informal institution solicitation to be more focused and streamlined.
- In summary, specific examples of the impressive progress include:
  - Significant progress toward evaluation of NASA STEM education investments
  - Realigned signature programs (i.e., Space Grant and Internship)
  - Amplifying NASA profile with “Year of Education on Station”
  - TEAM II solicitation optimized

**NASA Advisory Council – Committee Recommendation**  
**Human Exploration and Operations Committee Recommendation**  
**to NASA Associate Administrator**  
**for Human Exploration and Operations Mission Directorate**  
**Metrics for International Space Station (ISS) Transition**  
**and Fleet Leader Approach for Critical Exploration Systems**

<b>Name of Committee:</b>	Human Exploration and Operations Committee
<b>Chair of Committee:</b>	Mr. Kenneth Bowersox
<b>Date of Council Public Deliberation:</b>	March 28, 2018
<b>Short Title of Recommendation:</b>	Metrics for ISS Transition and Fleet Leader Approach

**Recommendation:** The NASA Human Exploration and Operations Mission Directorate (HEOMD) should formulate a set of metrics to guide ISS transition. Suggested metrics include the minimum amount of run time for fleet leader exploration systems in the areas of life support, propulsion and avionics.

**Major Reasons for the Recommendation:** NASA has set forth a very clear set of principles to guide its ISS transition plan for 2024 and beyond. In addition to these principles, it would be very helpful for HEOMD to formulate metrics to guide the transition. Some suggested metrics would be the cost of alternative platforms, cost of conducting exploration systems development without access to low Earth orbit, the minimum annual amount of orbital time required for crew preparation and training, and the amount of running time needed on exploration systems in low Earth orbit before those systems could be certified for a trip to Mars. In particular it would be helpful to consider specific run time requirements for the critical systems that must be tested prior to a Mars transit such as life support, propulsion and avionics. It may even be appropriate to consider a fleet leader continuous test program for critical systems, where there is always a test platform that has more run time than the critical systems to be used aboard a reusable Mars transport vehicle.

**Consequences of No Action on the Recommendation:** NASA will lose opportunities to clearly communicate the status of ISS transition criteria.

**NASA Advisory Council – Committee Finding**

**Aeronautics Committee Finding  
to NASA Associate Administrator for  
Aeronautics Research Mission Directorate**

**FY 2019 Aeronautics Research Mission Directorate (ARMD)  
Budget and Strategy**

<b>Name of Committee:</b>	Aeronautics Committee
<b>Chair of Committee:</b>	Mr. John Borghese
<b>Date of Council Public Deliberation:</b>	March 28, 2018
<b>Short Title of Finding:</b>	FY 2019 ARMD Budget and Strategy

**Finding:** The Aeronautics Committee agreed that the NASA Aeronautics Research Mission Directorate (ARMD) overall portfolio and strategy are aligned to support the future of aviation by being the enabler for new vehicles and airspace. In particular, the Committee endorses research in the areas of autonomy and electric vehicles. The Committee also believes that ARMD research should be directed in areas that are not being addressed by commercial industry and other government agencies such as the certification of autonomous systems and the airspace management and other certification methodologies needed for these new classes of vehicles.

**NASA Advisory Council – Committee Finding**

**Aeronautics Committee Finding  
to NASA Associate Administrator for  
Aeronautics Research Mission Directorate**

**System-Wide Safety (SWS) Report**

<b>Name of Committee:</b>	Aeronautics Committee
<b>Chair of Committee:</b>	Mr. John Borghese
<b>Date of Council Public Deliberation:</b>	March 28, 2018
<b>Short Title of Finding:</b>	System-Wide Safety (SWS) Report

**Finding:** The Aeronautics Committee found that the System-Wide Safety (SWS) project has many facets and needs to identify which ones provide a real payoff and focus on specific areas. They understand that this project is in formulation and supports the NASA Aeronautics Research Mission Directorate (ARMD) intent to focus on topics where NASA can provide unique and important contributions to the safety of the National Airspace System (NAS) as traffic density increases and new entrants enter the airspace. The Committee also believes that SWS should address the cyber security element of NAS management and clearly define yearly objectives.



**NASA Advisory Council – Committee Finding**

**Aeronautics Committee Finding  
to NASA Associate Administrator for  
Aeronautics Research Mission Directorate**

**Advanced Materials and Structures Strategy**

<b>Name of Committee:</b>	Aeronautics Committee
<b>Chair of Committee:</b>	Mr. John Borghese
<b>Date of Council Public Deliberation:</b>	March 28, 2018
<b>Short Title of Finding:</b>	Advanced Materials and Structures Strategy

**Finding:** The Aeronautics Committee appreciated being a part of the initial planning of this project in order to provide feedback in its infancy. The initial planning has displayed insights into the interrelationship of core areas, including advanced manufacturing, computational materials and structures, multifunctional materials and adaptive structures, and the issues of qualification, certification and lifecycle sustainment. The Committee believes that this research is very important. There is significant multi-agency investment in the government's new manufacturing initiatives that NASA should evaluate and integrate with the national endeavor in this area and focus on specific needs of aviation where there are gaps in the research.

**NASA Advisory Council – Committee Finding**

**Aeronautics Committee Finding  
to NASA Associate Administrator for  
Aeronautics Research Mission Directorate**

**Electric Aircraft Technology**

<b>Name of Committee:</b>	Aeronautics Committee
<b>Chair of Committee:</b>	Mr. John Borghese
<b>Date of Council Public Deliberation:</b>	March 28, 2018
<b>Short Title of Finding:</b>	Electric Aircraft Technology

**Finding:** The Aeronautics Committee was impressed with the direction that the electric aircraft technology team is headed and how they have used the low carbon study results to guide that direction. The Committee also suggested that NASA's goal be to uncover the regulators primary focus areas, inspiring solutions for validation, verification and certification while working with industry to address these challenges. The Committee was very impressed with the hybrid electric system research activities and encourages the project to focus on modeling the efficiency of the various configurations.

## NASA Advisory Council – Committee Finding

### Science Committee Finding to NASA Associate Administrator for Science Mission Directorate

#### Joint Agency Satellite Division (JASD)

<b>Name of Committee:</b>	Science Committee
<b>Chair of Committee:</b>	Dr. Bradley Peterson
<b>Date of Council Public Deliberation:</b>	March 29, 2018
<b>Short Title of Finding:</b>	Joint Agency Satellite Division (JASD)

**Finding:** The Science Committee finds that the spacecraft launched through the Joint Agency Satellite Division (JASD) program already have delivered tremendously valuable data that serves multiple stakeholders and provides broad societal benefits, one of the major goals of NASA. Some of the initial instrumentation on GOES-S is potentially game changing, such as the Geostationary Lightning Mapper (GLM), allowing weather systems to be observed at excellent resolution. These capabilities allow us to move forward and incorporate advances into new model development, as only a minimal amount of interpolation is needed (e.g., ocean observations are being resolved at the needed time and space scales). The Science Committee appreciates NASA's strong partnership with the National Oceanic and Atmospheric Administration (NOAA) on this efforts. In this time of extreme weather, these capabilities allow the prediction of a host of weather events, as well as their consequences.

**NASA Advisory Council – Committee Finding**

**Science Committee Finding  
to NASA Associate Administrator  
for Science Mission Directorate**

**Workforce Diversity**

<b>Name of Committee:</b>	Science Committee
<b>Chair of Committee:</b>	Dr. Bradley Peterson
<b>Date of Council Public Deliberation:</b>	March 29, 2018
<b>Short Title of Finding:</b>	Workforce Diversity

**Finding:** The Science Committee finds that NASA is taking proactive steps to make the workforce more inclusive and equitable, and is undertaking efforts to better quantify problems in diversity and inclusion.