



February 26, 2016

The Honorable John Culberson
2372 Rayburn House Office Building
Washington, DC 20515

The Honorable Richard Shelby
304 Russell Senate Office Building
Washington, DC 20510

The Honorable Michael Honda
1713 Longworth House Office Building
Washington, DC 20515

The Honorable Barbara Mikulski
503 Hart Senate Office Building
Washington, DC 20510

The Coalition for Aerospace and Science (CAS) is an alliance of prominent American academic, industrial, and scientific organizations. We deeply appreciate the Congress' strong support for investments in the National Aeronautics and Space Administration (NASA) in Fiscal Year (FY) 2016. This robust investment provides much needed fuel for the engine of America's economy – our innovation ecosystem. **As you allocate funding for FY 2017, we urge you to build on the strong foundation established in the *Consolidated Appropriations Act of 2016* by providing real growth through at least a 5 percent increase for NASA to a topline of \$20.3 billion in FY 2017.**

Our recommendation echoes that of over 300 organizations from all fifty states representing American industry, higher education, science, and engineering, and a group of senior corporate leaders who recently endorsed the statement *Innovation: An American Imperative* (see attached). This statement urges Congress to enact policies and make investments that ensure the United States remains the global innovation leader.

As a mission-driven agency with a long-term R&D portfolio that comprises more than 60% of its budget, NASA thrives on stable and robust investments. One need only look to the last twenty years to see what happens when this is not the case. Between 1995 and 2015, NASA's purchasing power decreased by 11.6 percent overall, with some parts of the Agency experiencing even further declines. As such, we are strongly concerned with the Administration's FY 2017 request, especially with regards to the proposed sources of funding that do not currently exist. We ask the Congress to ensure that NASA receives the funding it needs to maintain its strong forward progress as it embarks on exciting new human exploration and science missions.

Every member of CAS has unique concerns and requests. However, the entire coalition is united in our support and advocacy for the Agency's critical research, missions, and programs. As NASA-wide stakeholders, we respectfully request that within the aforementioned topline request, Congress take note of the following specific opportunities for progress:

HUMAN EXPLORATION AND SPACE OPERATIONS

We are deeply troubled by the Administration's continued efforts to underfund the **Orion Multi-Purpose Crew Vehicle** and **Space Launch System (SLS)** programs, as evidenced by the President's FY 2017 Budget Request. If enacted, the request would disrupt and delay highly complex, long-term programs and would have a detrimental impact on the timely development of SLS and Orion. It is important to ensure that the significant progress already made on the development of the SLS and Orion spacecraft continues. Consequently, we request \$2 billion for SLS – the same as in FY 2016. Additionally, we recommend \$210 million for the SLS Exploration Upper Stage, \$1.35 billion for Orion, and \$460 million for Exploration Ground Systems. These levels of funding will enable completion of these systems on a schedule to enable the first crewed Orion mission in 2021. Moreover, meeting these modest schedule commitments is essential to enable the type of international partnerships for human exploration that have made the ISS such a success.

In regard to other parts of the **Human Exploration and Operations Directorate**, CAS supports the President's FY 2017 request for the International Space Station (ISS), its transportation systems, and a new deep space habitat. NASA should continue to be supported in its endeavors to ensure our near Earth, deep space, and space relay networks are demand-responsive and equipped for future critical missions.

SCIENCE

The Coalition requests that Congress fund NASA's **Science Mission Directorate** at \$5.9 billion, a 5 percent increase above FY 2016. Correspondingly, we request Congress provide \$1.71 billion for NASA's **Planetary Science Division**. The Coalition applauds Congress' ambitious plans for exploring Europa, an exciting prospect for exploration in our search for life elsewhere in our solar system and a top Planetary Science Decadal Survey priority. This amount would ensure mission development continues apace toward the target launch date in the early 2020's as directed in the FY 2016 *Consolidated Appropriations Act* report, as well as enabling the necessary development of Plutonium-238 – the fuel required for exploration to the outer reaches of our solar system. Beyond the Europa mission, this increase would ensure progress on the full suite of decadal priorities, keeping scientifically-productive ongoing missions on Mars and elsewhere and future Discovery and New Frontiers missions on track.

For the **Earth Science Division**, the Coalition requests \$2.02 billion, an increase of \$96 million or 5 percent above the FY 2016 enacted amount. This amount ensures the development of two high-priority missions – Pre-Aerosol, Clouds, and Ocean Ecosystem (PACE) and Surface Water and Ocean Topography (SWOT). Through its instrumentation suite, PACE will help monitor oil spills and the detection of harmful algal blooms. These blooms have a significant negative impact on ocean ecology, human health, and fisheries that support the economies of the Gulf and lower Atlantic states. Meanwhile, SWOT represents an ambitious mission designed to conduct the first-ever global survey of Earth's surface water. Data from the satellite has promising uses for flood and drought management at local, regional, and national levels; improved risk assessments by the insurance industry; harnessing energy; and optimizing both military and commercial marine operations. Our request also supports the launch of Landsat 9 as early as 2021 and Landsat 10 in approximately 2029, as well as funding to increase the capabilities and uses of multi-spacecraft constellations of very small scientific satellites.

The Coalition strongly urges the Congress to ensure that the funding stream used for the development of the **James Webb Space Telescope** remain within the Astrophysics Division. A transfer of funding outside of the Division, or even the Directorate, would jeopardize future decadal priorities and represent a threat to America's status as a global leader in astronomical innovation and discovery.

To maintain progress on the top astronomy and astrophysics decadal survey priorities—including a 2024 launch for WFIRST—and to continue operating the current suite of scientifically-productive missions, CAS requests \$767 million for the **Astrophysics Division**, a 5 percent increase above FY 2016, and \$37 million for SMD-wide STEM education activities. Within Astrophysics, the Coalition requests \$100 million for WFIRST, \$75 million for Research and Analysis, and \$62 million for missions that have undergone the 2016 Senior Review and been deemed to have enough scientific value to merit continued operations. Furthermore, CAS requests that Congress direct NASA to conduct a feasibility study of an analogous New Horizons mission class within Astrophysics, referred to informally as *Astrophysics Probes*, in time for consideration by the next decadal survey committee. It is anticipated that this class of mission could achieve more frequent launches to satisfy the needs of the astronomy community with the potential for being less technically demanding and costly than large multi-billion flagship missions.

As technology continues to play a growing role in our daily lives, it is crucial that we advance our understanding of the Sun and the space environment. In 1859, a large Coronal Mass Ejection – known as the Carrington Event - sent charged particles to Earth from the Sun, causing widespread failure of the telegraph system. Should a similar event happen today, the economic impact to the United States alone is estimated to reach as much as \$2.6 trillion. This is not to mention the perpetual threat that solar activity poses to our civil and defense space-based assets and to future human deep space exploration. Research through NASA's **Heliophysics Division**, guided by the Solar and Space Physics Decadal Survey, seeks to understand this critical Sun-Earth relationship. As such, the Coalition requests \$700 million for the

Division, an increase of \$50.2 million or 7.7 percent. This amount would ensure an increased tempo in nimble, cost-effective *Explorer* missions as well as implementation of the NASA-NSF *DRIVE* initiative and the cross-agency *Space Weather Action Plan*.

TECHNOLOGY

The Space Technology Mission Directorate represents an important component of NASA-wide innovation, technology development, and the primary vehicle for bringing new technologies to market. One such promising innovation is the Laser Communications Relay Demonstration program, scheduled for a test in 2020 and is expected to break new ground in optical communication technology. This is NASA's next premier optical communication demonstration that has the potential to revolutionize the way we send and receive data, video and other information. The Coalition remains concerned that the recent unfunded transfer of the RESTORE-L program threatens to impact the Directorate's exciting technology development programs, including grants to engineers and researchers at many of our universities and small businesses. As such, CAS requests \$831.7 million for the Directorate to cover the transfer of RESTORE-L, while ensuring the Directorate remains a strong technological backbone for the Agency. Within that amount, CAS requests that Congress provide a \$5 million increase to the Directorate's Technology and Innovation Division for NASA's successful Technology Transfer Program, which has seen a 76 percent reduction in its budget over the last ten years.

AERONAUTICS

For NASA's Aeronautics Research Mission Directorate, we request \$790 million for FY 2017, an increase of \$156 million over FY 2016. This allocation will ensure a comprehensive research effort that cements America's status as a global aeronautics leader. A major component of this funding is a return to full-scale demonstrator aircraft testing of a wide range of concepts—from blended wing bodies to low supersonic boom travel. Additionally, we are supportive of the Agency's efforts to dramatically increase the capacity of the nation's airspace to support Unmanned Aerospace Systems, passenger growth, and advanced hypersonic research collaboration with the Department of Defense.

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We look forward to working with you as you formulate FY 2017 appropriations. Thank you once again for your leadership on NASA budget and policy matters.

Member Organizations Include:

Aerospace Industries Association
American Astronautical Society
American Astronomical Society
American Geophysical Union
Association of American Universities
American Society of Agronomy
Consortium for Ocean Leadership
Crop Science Society of America
The Planetary Society
New Mexico State University

Northrop Grumman Corporation
Raytheon Company
Soil Science Society of America
SPIE – the international society for optics and photonics
Woods Hole Oceanographic Institute
University Corporation for Atmospheric Research
University of Arizona
University of Colorado – Boulder
University of New Hampshire
University of Washington

INNOVATION: AN AMERICAN IMPERATIVE

A call to action by American industry, higher education, science, and engineering leaders urging Congress to enact policies and make investments that ensure the United States remains the global innovation leader.

Our nation knows what it takes to innovate: a sustained commitment to scientific research, a world-class workforce, and an economic climate that rewards entrepreneurship and innovation. As the most dynamic and prosperous nation in the world, the United States has long benefitted from policies and investments that have promoted innovation and in turn driven productivity and economic growth, bolstered American trade, ensured our health and national security, and safeguarded the American dream. Our leadership is now at risk because of years of under-prioritizing federal scientific research investments and policies that promote innovation.

Now is not the time to rest on past success. As noted by the American Academy of Arts and Sciences in its 2014 Report *Restoring the Foundation: The Vital Role of Research in Preserving the American Dream*, "There is a deficit between what America is investing and what it should be investing to remain competitive, not only in research but in innovation and job creation." Competitor nations are challenging our leadership by copying our playbook for success. At the same time our nation's support for scientific research and innovation is stagnating. If these trends continue, other countries will soon surpass the United States as the global innovation leader.

We must heed the warnings in the *Restoring the Foundation* report and other salient reports of the past decade and act decisively. In particular, Congress must:

Renew the federal commitment to scientific discovery

by ending sequestration's deep cuts to discretionary spending caps and providing steady and sustained real growth in funding of at least four percent for basic scientific research at: the National Science Foundation, the National Institutes of Health, the Department of Energy's Office of Science, the Department of Defense, NASA, the National Institute of Standards and Technology, USDA, and NOAA;

Make permanent a strengthened federal R&D tax credit

as a part of comprehensive tax reform to encourage more private-sector innovation investment here in America instead of in competitor countries;

Improve student achievement in science, technology, engineering, mathematics (STEM)

through increased funding of proven programs and incentives for science and math teacher recruitment and professional development;

Reform U.S. visa policy

to welcome and keep highly educated international professionals, particularly those holding STEM degrees from U.S. universities;

Take steps to streamline or eliminate costly and inefficient regulations

and practices governing federally funded research to help unburden researchers to focus more time on conducting research and training the next generation of scientists, engineers, health care professionals, and business leaders;

Reaffirm merit-based peer review

as the primary mechanism major federal agencies should employ in making competitive scientific research grants to ensure the most effective use of taxpayer dollars; and

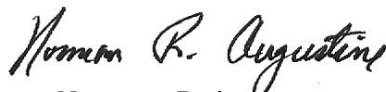
Stimulate further improvements in advanced manufacturing

through support for programs aimed at accelerating manufacturing innovation and new federal-industry-academic partnerships.

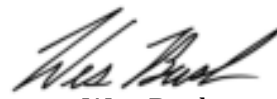
We, the signatories, urge support for these actions to keep the United States the global innovation leader. We stand ready to do our part.



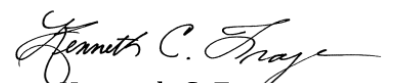
Samuel R. Allen
Chairman & CEO
John Deere



Norman R. Augustine
Co-Chair
Restoring the Foundation



Wes Bush
Chairman, President & CEO
Northrop Grumman



Kenneth C. Frazier
Chairman & CEO
Merck & Co., Inc



Marillyn A. Hewson
Chairman, President, & CEO
Lockheed Martin Corporation



Charles O. Holliday
Chairman
Royal Dutch Shell plc



Joseph Jimenez
CEO
Novartis



W. James McNerney, Jr.
Chairman of the Board & CEO
The Boeing Company



Satya Nadella
CEO
Microsoft



Jay Timmons
President & CEO
National Association of
Manufacturers

Academy of Radiology Research
 Acoustical Society of America
 Ad Hoc Group for Medical Research
 Adv. Technical Intelligence Assn.
 Aerospace Industries Association
 Agricultural & Applied Economics Association
 Aizoon Technology Consulting
 AMD
 American Academy of Arts & Sciences
 American Anthropological Association
 American Association for Dental Research
 American Association for the Advancement of Science
 American Association for the Study of Liver Diseases
 American Association of Colleges of Pharmacy
 American Association of Mycobacterial Diseases
 American Association of Petroleum Geologists
 American Association of Physical Anthropologists
 American Association of Physicists in Medicine
 American Association of Physics Teachers
 American Association of State Colleges and Universities
 American Astronomical Society
 American Chemical Society
 American Council on Education
 American Dairy Science Association
 American Dental Education Association
 American Educational Research Association
 American Geophysical Union
 American Geosciences Institute
 American Institute for Medical & Bio. Engineering
 American Institute of Aeronautics and Astronautics
 American Institute of Chemists
 American Institute of Physics
 American Mathematical Society
 American Meteorological Society
 American Physical Society
 American Physiological Society
 American Phytopathological Society
 American Political Science Association
 American Psychological Association
 American Society for Engineering Education
 American Society for Microbiology
 American Society for Nutrition
 American Society of Agronomy
 American Society of Animal Science
 American Society of Plant Biologists
 American Sociological Association
 American Veterinary Medical Association
 Anchorage Economic Development Corporation
 Applied Materials, Inc
 Archaeological Institute of America
 Arizona Nevada Academy of Science (ANAS)
 Arizona State University
 Arkansas Research Alliance
 ASME
 Association for Information Science and Technology
 Association for Psychological Science
 Association for Women in Mathematics
 Association for Women in Science
 Association of American Geographers
 Association of American Medical Colleges
 Association of American Universities
 Association of American Veterinary Medical Colleges
 Association of Independent Research Institutes
 Association of Public and Land-grant Universities
 Association of Research Libraries
 Association of University Technology Managers
 ASTRA, Alliance for Science & Technology Research in America
 Auburn University
 Battelle
 Bay Area Council
 Biophysical Society
 Biotechnology Industry Organization
 Boise State University
 Boston University
 Botanical Society of America
 Brown University
 Business-Higher Education Forum
 California Institute of Technology
 California Polytechnic State University
 Carnegie Mellon University
 Cary Institute of Ecosystem Studies
 Case Western Reserve University
 Center for Policy on Emerging Technologies
 Clemson University
 Coalition for Aerospace and Science
 Coalition for National Science Funding
 Coalition for National Security Research
 Colorado School of Mines
 Colorado State University
 Columbia University
 Computing Research Association
 Consortium for Ocean Leadership
 Consortium of Social Science Associations
 Cornell University
 Council of Graduate Schools
 Council of Scientific Society Presidents
 Council on Competitiveness
 Council on Governmental Relations
 Crop Science Society of America
 Delaware State University
 Duke University
 Earthquake Engineering Research Institute
 Ecological Society of America
 EDUCAUSE
 Emory University
 Energy Sciences Coalition
 Entomological Society of America
 EPICenter Memphis
 FASS
 Federation of American Societies for Experimental Biology
 Federation of Associations in Behavioral and Brain Sciences
 Florida State University
 Foundation for Science and Disability
 Genetics Society of America
 Geological Society of America
 George Mason University
 Georgia Institute of Technology
 Georgia Regents University
 Georgia Research Alliance
 Google
 Greater Boston Chamber of Commerce
 Greater Madison Chamber of Commerce
 Harvard University
 Hawaii Academy of Science
 Hepatitis B Foundation
 Hewlett-Packard Company
 Human Factors and Ergonomics Society
 IBM
 Idaho Academy of Science and Engineering
 IEEE-USA
 Indiana University
 Infineon Technologies Americas Corp.
 Information Technology Industry Council (ITI)
 Innovation Associates
 Institute of Food Technologists
 Intel Corporation
 International Economic Development Council
 International Society for Educational Planning
 International Technology and Engineering Educators Assn.
 Iowa State University
 IPC - Association Connecting Electronics Industries
 Jefferson Science Associates LLC
 Kansas State University
 Kent State University
 Kentucky Academy of Science
 Linguistic Society of America
 Louisiana State University
 Lowell Observatory
 Maine State Chamber of Commerce
 Massachusetts Institute of Technology
 Materials Research Society
 Mathematical Association of America
 Michigan State University
 Michigan Technological University
 Micron Technology, Inc
 MN-SBIR
 Montana State University
 National Alliance for Eye and Vision Research
 National Association of Colleges and Employers
 National Association of Geoscience Teachers
 National Association of Graduate-Professional Students
 National Association of Marine Laboratories
 National Center for Science Education
 National Center for Technological Literacy- Museum of Science
 National Coalition for Food and Agricultural Research
 National Council for Science and the Environment
 National Defense Industrial Association
 National Ground Water Association
 National Science Education Leadership Association
 National Science Teachers Association
 New Mexico State University
 New York University
 North Carolina Academy of Science
 North Dakota State University
 Northeastern University
 Northern Illinois University
 Ohio University
 Oklahoma Academy of Science
 Oklahoma State University
 ON Semiconductor
 ONAMI
 Oregon State University
 Pace University
 Parapsychological Association
 Penn State University
 Phiston Technologies, Inc.
 Population Association of America
 Portland State University
 Poultry Science Association
 Princeton University
 Qualcomm
 Rensselaer Polytechnic Institute
 Research!America
 Rice University
 Rochester Institute of Technology
 Rutgers, the State University of New Jersey
 SAGE
 Semiconductor Equipment & Materials International (SEMI)
 Semiconductor Industry Association
 Semiconductor Research Corporation
 Silicon Valley Leadership Group
 Small Business Technology Council
 Society for In Vitro Biology
 Society for Industrial and Applied Mathematics
 Society for Industrial and Organizational Psychology
 Society for Neuroscience
 Society of the Study of Evolution
 Society of Toxicology
 Soil Science Society of America
 South Dakota State University
 Southeastern Universities Research Association
 Southern Illinois University System
 SPIE, the international society for optics and photonics
 SRI International
 SSTI
 Stanford University
 State University of New York
 Stillwater Chamber of Commerce
 Stony Brook University
 Supporters of Agricultural Research Foundation
 SURA
 Syracuse University
 Task Force on American Innovation
 Technology Association of Georgia
 TechVision21
 Texas A&M University
 Texas Instruments Incorporated
 Texas Tech University
 The Coalition for the Life Sciences
 The College of William and Mary
 The Electrochemical Society
 The Industrial Research Institute
 The Johns Hopkins University
 The New England Council
 The Ohio State University
 The Optical Society
 The Procter & Gamble Company
 The Science Coalition
 The University of Alabama at Birmingham
 Tri-City Development Council – Tri-Cities, WA
 Tufts University
 UEDA
 UNAVCO
 United for Medical Research
 Universities Research Association
 University at Buffalo, State University of New York
 University City Science Center
 University Corporation for Atmospheric Research
 University of Alaska
 University of Alaska Fairbanks
 University of Arizona
 University of Arkansas
 University of California System
 University of California, Berkeley
 University of California, Davis
 University of California, Irvine
 University of California, Los Angeles
 University of California, Merced
 University of California, Riverside
 University of California, San Diego
 University of California, San Francisco
 University of California, Santa Barbara
 University of California, Santa Cruz
 University of Central Florida
 University of Cincinnati
 University of Colorado at Colorado Springs
 University of Colorado Boulder
 University of Colorado Denver
 University of Colorado, Anschutz Medical Campus
 University of Connecticut
 University of Delaware
 University of Florida
 University of Georgia
 University of Hawaii
 University of Illinois
 University of Illinois at Chicago
 University of Illinois at Urbana-Champaign
 University of Iowa
 University of Kansas
 University of Louisville
 University of Massachusetts Amherst
 University of Maryland
 University of Michigan
 University of Minnesota
 University of Mississippi
 University of Missouri System
 University of Nebraska
 University of Nevada, Reno
 University of New Hampshire
 University of New Mexico
 University of North Carolina at Chapel Hill
 University of North Carolina System
 University of North Carolina Wilmington (UNCW)
 University of Notre Dame
 University of Oklahoma
 University of Oregon
 University of Pennsylvania
 University of Pittsburgh
 University of Rochester
 University of South Dakota
 University of South Florida
 University of Southern California
 University of Tennessee
 University of Toledo
 University of Vermont
 University of Virginia
 University of Washington
 University of Wisconsin System
 University of Wisconsin-Madison
 University of Wisconsin-Milwaukee
 University of Wyoming
 Utah State University
 Van Fleet & Associates
 Vanderbilt University
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 Washington State University, Tri Cities
 Washington University in St. Louis
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 West Virginia University
 Western Massachusetts Economic Development Council
 Western Michigan University
 Woods Hole Oceanographic Institution
 Yale University