

**Congress of the United States**  
**Washington, DC 20515**

February 27, 2014

The Honorable Charles F. Bolden, Jr.  
Administrator  
National Aeronautics and Space Administration  
300 E Street S.W.  
Washington, DC 20546

Dear Administrator Bolden,

Since President Obama canceled NASA's Constellation program, the agency has been hamstrung in its efforts to develop an inspirational human spaceflight mission that will maintain America's space leadership. NASA needs a well-formulated, long-term series of missions to utilize the Orion crew capsule, the Space Launch System, and other systems that will enable American astronauts to travel beyond low-Earth orbit. We agree that the International Space Station is the centerpiece of America's human spaceflight program in the near-term and landing an astronaut on Mars is the best long-term goal. But there is too much uncertainty about what should be done as the intermediate milestones in this journey.

In a hearing before the Science Committee last year, Dr. Steven Squyres, Chairman of the NASA Advisory Council, testified succinctly on this point: "It is not hyperbole to say that sending humans to Mars and returning them safely to Earth will be the most technically difficult task in human history. When attempting something so difficult, there is great value in setting intermediate milestones against which progress can be measured and demonstrated."

We believe it is time for NASA to begin to develop a clear, well-planned technical implementation plan for the future of human spaceflight over the next few months. Both House and Senate drafts of the National Aeronautics and Space Administration Authorization Act of 2013 (H.R. 2687 as well as S.1317) contain similar directives for NASA to develop such a roadmap. The fact that both of these bills call for a plan for astronauts to venture deeper into the solar system clearly demonstrates a need for NASA to provide more clarity beyond test flights for the Orion crew capsule and Space Launch System.

Last year, the Administration championed an Asteroid Retrieval Mission as a next step. However, the mission was not vetted by NASA's own advisory committees or the stakeholder community before it was presented formally to Congress. Upon review, a majority of experts said that such a mission did not demonstrate sufficient technical applicability to an eventual Mars landing.

As NASA develops a roadmap of stepping stone missions, the agency should work with the stakeholder community to develop exploration and science objectives. This should include

analysis of a series of mission options to inform policy-makers in the White House and Congress. This analysis should not be construed as a reflection of the President's budget request, but it should be NASA's best objective engineering technical analysis and program cost estimates so that Congress can better understand and evaluate options for NASA's missions before authorizing funds for NASA's programs.

At a minimum, NASA should be mindful of the following considerations and questions:

- Like Mercury and Gemini programs led to NASA's Apollo programs, what are the major manned and unmanned missions and technology demonstrations that might serve as interim steps prior to an eventual landing on Mars? In answering this question, the following subset of questions should be analyzed:
  - How will the International Space Station be used as a human research, technology and hardware demonstration testbed?
  - How will this sustainable, stepping stone approach incorporate what could be tested and demonstrated in cis-lunar orbits, the Moon's surface, in proximity of asteroids, and various Mars missions to flyby, orbit, and land?
  - What are the major technology elements to be developed and when could they be demonstrated before proceeding to a Mars landing?
  - How might the international and commercial industry contribute expertise, systems, and funding toward these missions?
  - What are the science and exploration objectives for the various mission options?
- During the Space Shuttle program, NASA developed a comprehensive probabilistic risk assessment (PRA) methodology that should be applied to inform the safety and risk factors for various Orion and SLS missions. This PRA methodology should inform NASA's analysis of various mission plans.
- Unique Earth-Mars planetary alignments that reduce mission complexity and transit time for crewed flyby missions occur roughly every 15 years. The next alignment is in the years 2018 and 2021. What systems must be developed to successfully mount a Mars Flyby mission by 2021 to take advantage of this unique planetary alignment?
- Budget availability is a major driver for the schedule to develop such systems and carry out such missions. NASA's analyses should be independent from the Administration's budget projections and instead based on when NASA believes such systems could be developed. If the cost for a mission is more than the President's budget request, what are the additional costs?

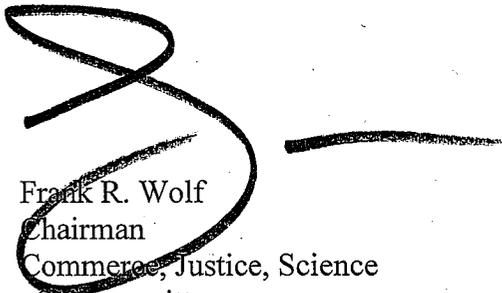
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Some of the initial analyses for this roadmap can and should be conducted fairly quickly, while others may take longer. We expect this to be an ongoing, in-depth dialogue between NASA and its Congressional oversight committees not only to justify NASA's FY 2015 budget request to the Congress for current systems under development, but also to provide more long-term stability of purpose to NASA's mission. We look forward to working together with you on this.

Sincerely,



Frank R. Wolf  
Chairman  
Commerce, Justice, Science  
Subcommittee  
Committee on Appropriations



Lamar Smith  
Chairman  
Science, Space, and Technology Committee