

TESTIMONY TO THE COMMITTEE ON
SCIENCE AND TECHNOLOGY
SPACE AND AERONAUTICS SUBCOMMITTEE

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Chairwoman Giffords and committee members, I am pleased to have the opportunity to present my views on the U.S. human spaceflight program.

The proposed NASA FY 2011 budget represents a significant departure from the current program and raises some important issues worthy of debate prior to setting a course that will define human spaceflight for many decades.

Continuation of the International Space Station and Mars as the ultimate human exploration destination appear to be areas of consensus. While Mars is not explicitly identified, subsequent Administration statements suggest this conclusion.

Areas with significant differences in implementation approach are

- 1) the method of transporting humans to Earth orbit and specifically to the International Space Station,**
- 2) the need for a detailed plan for human exploration beyond Earth orbit,**
- 3) the development of a heavy lift capability to support missions beyond Earth orbit,**

4) the development of a capsule to support astronauts traveling to and beyond Earth orbit and

5) the definition of a technology program focused on specific mission needs.

Approaches being discussed to provide transportation to Earth orbit are Soyuz, Space Shuttle, Ares I or a derivative based on Ares I/V concepts and commercial.

Soyuz has been and will continue to be a valuable space transportation system. I do not believe Soyuz is a long term solution. The U.S. needs an indigenous system.

Space Shuttle has been the U.S. workhorse for three decades. It has remarkable crew and cargo capabilities. I do not believe Shuttle is the long term solution.

Private and in some cases government investments have created commercial enterprises focused on space tourism and cargo transportation to the Space Station. These companies should be encouraged, supported and applauded for their accomplishments. NASA's proposed budget, if implemented, will result in the U.S. being totally dependent upon commercial crew space transportation for an indigenous capability to Earth orbit. I believe we are a long way from

having a commercial industry capable of satisfying human space transportation needs. In my view, this is a risk too high and not a responsible course. The commercial crew option should not be approved.

The U.S. needs a transportation capability to Earth orbit that can be used for several decades. A system that can be the basis for a heavy lift capability would be advantageous. Considerable resources have been expended and significant progress has been made in the development of Ares I. I believe the most logical path forward is to commit to a transportation system based upon the Ares I investment. Consideration should be given to the ability to evolve the system to a heavy lift capability. NASA should be asked to undertake a study to define the required system.

My interpretation of the FY 2011 budget is that the proposed human exploration program is a technology endeavor without an exploration plan. A technology program without focus and identified mission uses can result in wasteful, nonproductive, “hobby-shop” activities. A detailed exploration plan with destinations, dates and implementation plans is needed. Options were effectively identified in the Augustine Committee report. A factor requiring consideration is that a lunar lander and facilities for extended stay on the moon are

expensive making the lunar option a function of funding availability. I am troubled by this observation since I believe human exploration must have “boots-on-the-ground.” An asteroid landing may be less challenging and expensive than a lunar landing. Again, NASA should be instructed to develop options and recommend a specific exploration plan.

Human exploration beyond Earth orbit will require a new heavy lift launch vehicle. I do not believe we need a technology program as a prerequisite. Available budget will determine the heavy lift implementation plan. NASA should be directed to develop an integrated space transportation plan that will result in the timely development of a heavy lift launch vehicle.

Human spaceflight requires a capsule for crew support. Given my strong opinion that commercial crew should not be the selected option, the logical starting point in selecting a capsule concept is Orion. Significant investment has been made in Orion and it should be the basis of a capsule to support Space Station operations and initiate exploration beyond Earth orbit. A study, by NASA, to define the crew support capsule is required. Constellation should not be cancelled. The NASA study will most likely identify required

Constellation modifications. Deferral of the lunar option may be required depending upon available budget.

The technology program identified in the proposed budget lacks definition and focus. However, a technology program largely directed toward resolving critical issues associated with implementing plan A and specifically a human Mars mission is required. NASA, with appropriate outside support, should define the required technology program.

I have cited the need for NASA studies for most of the areas of discussion. A plan A is needed which is absent from the proposed FY 2011 budget. The availability of a plan A will facilitate informed decisions relative to funding and affordability of a human spaceflight program that will be in place for decades. I would start by applying the 6B\$ commercial crew funding, the funding for precursor robotic missions, a portion of the technology funding and the 2.5B\$ allocation for Constellation termination to plan A.

I was asked to comment on the most significant impacts of the changes contained in the proposed FY 2011 budget. Changes as significant as those proposed cannot be implemented without

collateral impact. An example is the increased cost identified by the Air Force in their programs.

I believe the most significant impact will be the deterioration in the capabilities of the aerospace work force. We currently have a government, university and industry work force that is a national treasure. Many of the best and brightest are attracted by the excitement and challenge of space exploration. Decades of experience and investment have been instrumental in building this extraordinary work force. Without a challenging and meaningful space program, this national capability will atrophy. Assigning responsibility to the commercial sector for Earth orbit crew transportation will have a major adverse impact on the NASA work force.

The loss of capability that has been built over decades will happen very quickly. This is not a resource that can be turned on and off. I suspect the uncertainty created by the proposed NASA budget is causing people to evaluate their futures. Good people always have a choice. Rebuilding lost capabilities will take decades.

When the “dust settles” I believe the U.S. must have a human spaceflight program worthy of a great nation as suggested by the title

of the Augustine Committee report. In my view, the human spaceflight program contained in the proposed FY 2011 budget fails this goal. I believe a program can be developed that will put us on a responsible course to Mars with exciting and challenging intermediate destinations. A program that will utilize the capabilities of the total aerospace work force, a program of which the current generation can be proud and by which future generations can be inspired. A program that I believe will require some budget augmentation. A program that is worthy of a great nation.

ATTACHMENT

COMMERCIAL CREW

I believe the commercial crew option is a risk too high, not a responsible course and it should not be approved.

The U.S. space industry is second to none and has been instrumental in the extraordinary accomplishments of the U.S. space program. My concerns about the commercial crew option are not caused by reservations about the industry capabilities. My concerns are that the space industry alone is not adequate to successfully implement an endeavor as challenging as human spaceflight.

Continuity of the nation's human spaceflight expertise resides within NASA, not an industrial enterprise. NASA has been continuously leading our human spaceflight program for almost five decades. Several companies have been partners with NASA, but not on a continuous basis. I can make the same case for JPL relative to planetary exploration and the Air Force and NRO for national security space.

In my opinion, there is no logic that supports having an industrial enterprise totally responsible for crew transportation to Earth orbit with NASA defining safety requirements and general oversight.

We actually tried a similar approach in the 1990's. The Air Force implemented a program called "Acquisition Reform." System responsibility for national security space programs was ceded to industry under a contracting approach called Total System Performance Responsibility (TSPR.) Air Force and NRO project managers were told to step back, to not interfere and to let industry have total responsibility. Additionally, the Air Force and NRO essentially eliminated their system engineering capabilities since the responsibility would reside with industry.

The results were devastating and the adverse impact is still with us today. Good project managers and project management personnel left and an exceptional systems engineering capability was eliminated. Projects were a disaster and TSPR was judged by all to be a total failure.

Problems were not isolated to one project or to one company, the impact was systemic. As examples, FIA managed by Boeing was cancelled after the expenditure of about 10B\$. SBIRS High, managed by Lockheed-Martin, has been referred to as “a case study in how not to execute a space program.” NPOESS, managed by Northrop-Grumman, is a story that is still evolving. On average, programs implemented using this approach resulted in half the intended program for twice the cost and six years late.

NASA implemented a similar approach called “Faster-Better-Cheaper.” Mars '98 is the most significant example of this approach. Mars '98 was a total failure with the loss of the orbiter, lander and two probes. The orbiter managed by Lockheed-Martin, under contract to JPL, failed because of confusion between metric and English units. This confusion resulted in errors large enough during Mars orbit insertion to cause the spacecraft to enter the atmosphere and be destroyed. These same errors were prevalent during midcourse corrections implemented on the trip from Earth to Mars without a cause being determined. Had the JPL institutional navigation capability been applied to understand these midcourse errors, I believe they most likely would have found the cause and implemented corrections to prevent the failure. They were excluded from the management of Mars '98 because of the “give the contractor the responsibility” concept. This is an example of how NASA’s continuity of expertise could have been applied to an important and challenging project.

An Aerospace Corporation study documented 11.2 B\$ of total mission failures during the 1990’s.

NASA is supporting new industrial enterprises to provide cargo transport to the Space Station. This commercial cargo approach has

the potential to develop new commercial space enterprises. While this is a reasonable concept, performance has yet to be demonstrated. The proposal that this cargo capability, which has yet to be proven, can be extrapolated to include commercial crew is not credible.

An argument is made that NASA will specify human safety requirements for use by potential commercial crew companies. This is necessary but far from sufficient to assure mission success. Today, space projects do not fail because of the items that would be contained in the safety requirements document. I doubt the requirements would say “don’t confuse metric and English units,” or “don’t write down a wrong number to be used in the guidance equations,” which resulted in a Titan IV failure, or “don’t let the foam hit the Shuttle wing leading edge.” Because humans are involved, errors will happen.

Success results when problems are successfully managed. I believe successful management occurs when the continuity of expertise of NASA or the Air Force or the NRO is combined with the implementation capability of industry. The application of this combined capability with the resulting checks and balances and constructive technical debate is the foundation of our extraordinary success.

There is much discussion as to whether commercial crew is cheaper or, in the end, will cost more. Similar debates are occurring relative to schedule. These cost and schedule issues deserve resolution; however, I believe the most important issue is “Will the commercial crew concept be successful?” I do not believe the probability of success is sufficiently high to justify commercial crew as a responsible option. It is an option, that if not successful, will result in the U.S. having no space transportation for two decades or longer.