

TESTIMONY
TO THE
COMMITTEE ON SCIENCE AND TECHNOLOGY
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Chairman Gordon, Mr. Hall and Committee members, I am pleased to have the opportunity to present my views on the proposed U. S. human spaceflight program.

My judgment is that implementation of the proposed human spaceflight program will be devastating to NASA, human spaceflight and the U. S. space program. For five decades the U. S. robotic and human spaceflight programs have had remarkable successes that have filled our books of knowledge, explored new worlds, enhanced our international reputation and given pride and inspiration to our fellow Americans. We have also had disappointing failures.

We have developed a mission success methodology that maximizes the probability of success, a methodology that has evolved over the life of the space program and continues to improve with the experience gained with the execution of each new project. A hallmark of the methodology is the recognition that spaceflight is a "one-strike-and-you-are-out" business. Thousands of individuals can do everything perfectly and one human error can result in a mission catastrophe. While minimizing human errors is certainly an objective, human errors cannot be totally eliminated. The challenge is to prevent a human error from causing a mission failure. Experience has shown this is

accomplished by test-as-you-fly and flying-as-you-test in combination with independent review and analysis, appropriate technical and management debate and experienced leadership. For five decades we have invested billions of dollars and the expertise of our best and brightest in NASA and industry to evolve our current mission success methodology. NASA has the continuity of human spaceflight expertise that is unique in our country and competitive with the best that exists globally. Our space industry is second to none in the ability to implement complex projects. It is the marriage of NASA's continuity of expertise with the implementation capability of industry that results in our proven mission success methodology which maximizes the probability of success. Space Shuttle and International Space Station are products of this methodology. The Air Force and the Aerospace Corporation in combination with their industrial partners use this methodology to produce the highly successful EELV. NASA's Jet Propulsion Laboratory uses this methodology in implementing the challenging planetary exploration program.

A fundamental flaw in the proposed human spaceflight program is a commercial crew initiative which abandons the proven methodology I have described. NASA's role is reduced to defining safety requirements and general oversight. An argument for pursuing this new human spaceflight approach is that the proven methodology is too expensive.

This same rationale caused the Air Force and NASA to try similar approaches in the 1990's. The Air force implemented a program called "Acquisition Reform." System responsibility for national security space programs was ceded to industry. Air Force and NRO project managers were told to step back, not to interfere and to let industry have total responsibility. Additionally, the Air Force and NRO essentially eliminated their systems 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 the approach 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\$. SIBRS 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 were 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 an 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.

I cannot conceive that the U. S. will abandon a methodology developed over decades with enormous human and financial investment for a concept that when tried in the 1990's resulted in massive failure. Why would we put NASA human spaceflight at such risk by employing an unproven commercial crew concept?

Commercial crew is a risk too high, not a responsible course and should not be approved.

Continuation of the International Space Station is an area of apparent consensus. A launch vehicle and crew capsule for transportation to and from the Space Station are required. I believe the most appropriate option is Ares 1 and Orion. NASA should be directed to develop a plan for transporting humans to and from Earth orbit. The Ares 1 and Orion elements of Constellation should not be cancelled. The results of the NASA plan development may suggest changes to Constellation.

A disappointing truth is the proposed NASA FY 2011 budget, in my opinion, is not adequate to support a credible, implementable Space Station Program and a credible, implementable beyond-Earth-orbit exploration program.

A credible Space Station program, without commercial crew, needs to be defined. An exploration program with a heavy lift launch capability, an exploration capsule, a focused technology program and an exploration concept with destinations and dates also needs to be determined. Cost estimates, with substantive independent systems engineering and independent cost assessment, need to be developed. Timely completion of these proposed actions is necessary to allow

resolution of current human spaceflight uncertainties. Only then can credible decisions be made as to the future of human spaceflight.

In summary, do not approve commercial crew, continue the Ares 1 and Orion programs and do the necessary in depth analysis and study that was absent from the proposed FY 2011 budget to define the human exploration program worthy of a great nation. Only then can the value of the program be judged against credible plans and budget. Above all else, do not approve a human spaceflight program without adequate resources to assure success. We have traveled that road too many times with the same unsuccessful result.