

Written Testimony of
Neil A. Armstrong
Before the
Committee of Commerce, Science and Transportation
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Mr. Chairman, and Members of this Committee, I want to express my sincere appreciation for being invited to present my views on NASA's new plan for human space flight. As I have come to accept that my opportunities to once again see our beautiful planet Earth from afar are limited, I can speak my mind without fear of jeopardizing my crew status.

New non-classified national program concepts are, typically, accompanied by substantial review and debate in a number of venues. That process is occasionally frustrating, but it assures that all the major issues (performance, cost, funding, safety, schedule etc.) will be examined in some detail prior to a public proposal.

After the tragic loss of Columbia and its crew, and the completion of the accident investigation, Admiral Gehman, the Chairman of the Columbia Accident Investigation Board, noted that NASA needed a long term, strategic, guiding vision. President Bush, after reflection, proposed such a vision: finish the International Space Station, return to the moon, establish a permanent presence there, and venture onward toward Mars. After completion of the very detailed Exploration Systems Architecture Study (ESAS), that vision became a Program known as Constellation. A high level panel of human space flight veterans and a highly experienced independent review team vetted the ESAS conclusions. ESAS results were briefed to senior Administration officials including OSTP, OMB, USAF Air Staff and DDR&E. Of course, this Committee as well as other congressional committees and subcommittees were briefed.

As this committee well knows, that vision was analyzed, debated, and improved upon within the Congress for nearly two years. You then concluded, nearly unanimously, that it was the appropriate policy for our country. Three years later, after a change in Congressional control, the policy was once again approved, although it was still not adequately funded.

With regard to President Obama's 2010 plan, I have yet to find a person in NASA, the Defense Department, the Air Force, the National Academies, industry, or academia that had any knowledge of the plan prior to its announcement. Rumors abound that neither the NASA Administrator nor the President's Science and Technology Advisor were knowledgeable about the plan. Lack of review normally guarantees that there will be overlooked requirements and unwelcome consequences. How could such a chain of events happen? A plan that was invisible to so many was likely contrived by a very small group in secret who persuaded the President that this was a unique opportunity to put his stamp on a new and innovative program. I believe the President was poorly advised.

America has invested substantially for more than half a century to acquire a position of leadership in space. But for any organization, a public utility, an airline, a university, or an NFL team, to maintain a leadership position requires steadfast determination and a continuing investment in the future. That investment must be made wisely.

I believe that, so far, our national investment in space exploration, and our sharing of the knowledge gained with the rest of the world, has been made wisely and has served us very well. America is respected for the contributions it has made in learning to sail upon this new ocean. If the leadership we have acquired through our investment is allowed simply to fade away, other nations will surely step in where we have faltered. I do not believe that this would be in our best interests.

I am very concerned that the new plan, as I understand it, will prohibit us from having human access to low Earth orbit on our own rockets and spacecraft until the private aerospace industry is able to qualify their hardware under development as rated for human occupancy. I support the encouragement of the newcomers toward their goal of lower cost access to space. But having cut my teeth in rockets more than 50 years ago, I am not confident. The most experienced rocket engineers with whom I have spoken believe that will require many years and substantial investment to reach the necessary level of safety and reliability. Business analysts believe that at least two qualified competitors would be required to have any chance of reducing ticket prices. They further believe that a commercial market large enough to support even one competitor is unlikely.

If these experts are correct, the United States will be limited to buying passage to the International Space Station from Russia, and will be prohibited from

traveling to other destinations in LEO, such as the Hubble Space telescope, or any of the frequently mentioned destinations out on the space frontier.

As I examine the plan as stated during the announcement and subsequent explanations, I find a number of assertions which, at best, demand careful analysis, and at worst, do not deserve any analysis.

The Augustine Commission found that “NASA essentially has the resources either to build a major new system or to operate one, but not to do both”. In that context, the principal choices would be develop the Constellation Program or to continue to operate the Shuttle and the ISS.

The Shuttle, a stellar low Earth orbit machine, is scheduled for termination this year. It has a great deal of versatility and can do many things well, although the current protocol limits its operation to the ISS orbital inclination. While the Shuttle is four decade old technology, it has been operating well and could be expected to be able to continue to do so for some years if approved. Shuttle operation is, however, very costly. It could not be justified solely as a crew taxi, but would, and should, continue to carry cargo, and continue to perform the many other services it now provides.

The now to be cancelled Constellation program showed promise to fulfill lofty goals with a high level of safety and flexibility. Constellation would also be very costly. Critics claim it is ‘unexecutable’, primarily because it has been under funded.

The new 2010 plan goals are largely undefined in the near term but have been characterized as supporting ISS through 2020 and finding breakthrough technology to allow flying to a near Earth asteroid and to Mars at some time in the future.

These are vastly different plans and choosing the proper path is vital to America’s continued space leadership.

Orion

Amendments to the 2010 plan were announced in the President’s April 15 speech at the Kennedy Space Center. He stated that the cancelled Orion Spacecraft would be given new life as an emergency return vehicle from the International Space Station. Such a craft would be necessary if an Orbiter or Soyuz was not available, if the ISS had a major emergency, or in case of a medical emergency.

In the first decade of ISS operation we have not needed such a spacecraft, and, hopefully, in the remaining ISS lifetime, we will not need one. However, there

certainly is merit in having emergency escape ability. The difficulties crop up when we examine the detail of the requirements necessary for such a vehicle.

Configuration studies of emergency return vehicles have been going on for decades, NASA had a selected vehicle for development, the X-38, a lifting body which had substantial promise, but was cancelled for budgetary reasons in 2002.

The complexities of such a craft, required because of the wide variety of emergency situations that could be encountered, indicated that a near ballistic shape such as Orion would be inferior to a configuration with higher aerodynamic performance.

Because the Orion Light, as described, would be capable of carrying humans on only a return to Earth trajectory and not from Earth to the ISS, its utility would not seem to compare well with the Soyuz and its 2-way trajectories that are currently used. The time and cost of this development including the autonomous or remotely controlled rendezvous and docking would appear to be significant. It appears that this would be a very expensive project with limited usefulness.

Heavy Lift

The second Florida announcement concerned studying heavy lift rockets with the objective of choosing a best design by 2015, then beginning construction and test. It was asserted: "That's at least two years earlier than previously planned....and that's conservative, given that the previous program was behind schedule and over budget." The assertion is disingenuous, in that it is comparing an unknown project in the future with a known project already underway for some years. The 'previous program' is assumed to be the Ares V which depends on the same 5.5 segment SRBs and J-2X engines of the recently cancelled Ares 1. The delay in the Ares 1 development was due to under funding as a result of Shuttle Return to Flight requirements, ISS requirements, 2004 hurricane damage, OMB reductions and FY2010 Budget reductions. The budget reductions for Constellation through 2020 totaled more than 20 billion dollars. Considering those realities, some members of the Augustine Committee concluded that the Ares program was being quite well managed and in reasonably good shape.

Knowledge in Heavy Lift rockets is currently substantial. A great deal of such study has been completed in recent years as a part of the normal NASA and military studies. As of the time I write this testimony, NASA's web site describes the Ares V as follows: "Under the goals of NASA's exploration mission, Ares V is a vital part of the cost-effective space transportation infrastructure being

developed by NASA's Constellation Program to carry human explorers back to the moon, and then onward to Mars and other destinations in the solar system. “

While Ares has been criticized for being late and over budget, the cause of that condition is largely understood. It seems appropriate that the reason for discarding all this work should be explained to this committee.

A heavy lift rocket derived from the Shuttle (SDHLV) has often been suggested as a useful vehicle and could be produced in far less time than that proposed in the 2010 plan, The technology and hardware, for this development is already largely available and would not require five years of study to implement.

Workforce

The plan's consequent expected loss of jobs in space communities has been widely reported. This committee knows far more about such matters than I and I will not comment on it. I am concerned, however, about work force issues. Shuttle termination and Constellation cancellation will result in widespread breakup of design, manufacturing, test and operating teams that will be expensive and time consuming to reassemble when they are once again needed.

With the job market so tight, individuals who are in programs expected to be cancelled or cut back are leaving to pick up one of the few available jobs. Some of the best and the brightest are already leaving because of the uncertain future. Maintenance of a quality workforce is vital to a successful spaceflight program and attention to this consequence of the new plan must be considered,

Safety

It was asserted that by buying taxi service to Low Earth Orbit rather than owning the taxis, “we can continue to ensure rigorous safety standards are met”. The logic of that statement is mystifying. Does it mean that safety standards will be achieved by regulation, or contract, or by government involvement? Does it mean that the safety considerations in the taxi design, construction and test will be assured by government oversight? The Augustine Committee report is quoted as follows: “Thus, the Committee views any commercial program of crew transport to ISS as involving a strong independent mission assurance role for NASA.” The cost of that government involvement will be substantial and that cost must be acknowledged in the total cost of the service.

The private company spacecraft, to my knowledge, have not been as rigorously analyzed for safety as have existing rockets, Ares and shuttle derivatives, but it must be noted that Ares 1 enjoys, by a significant margin, the highest safety rating of the configurations studied.

I have highlighted just a few of the many issues and questions engendered by the 2010 NASA plan. I do believe, if the National Space Plan is subject to the normal review process of this Congress, the aerospace industry, and the reliable experts we know in the military and aerospace community, America will be well served.

Most respectfully,

Neil Armstrong

Neil Armstrong
Commander, Apollo 11