

Options from the Review of U.S. Human Space Flight Plans Committee
Senate Commerce, Science and Transportation Committee
Science and Space Subcommittee
September 16, 2009

Chair: Senator Bill Nelson (D-FL)
Ranking Member: Senator David Vitter (R-LA)

Witness

Mr. Norman Augustine, Chair of the Committee to Review U.S. Human Space Flight Plans ([prepared statement](#))

Background

In May 2009, NASA established a Committee to Review U.S. Human Space Flight Plans at the [direction](#) of the White House Office of Science and Technology Policy (OSTP). The committee was chaired by Mr. Norman Augustine, former CEO of Lockheed Martin and a well respected advisor to the nation on science and technology issues. The 10-person committee had 90 days in which to assess the U.S. human space flight program that was developed following President George W. Bush's 2004 Vision for Space Exploration [speech](#), called the Constellation Program, and provide options for the future. The Augustine committee was directed not to make recommendations, but only to provide options. It released a [summary](#) of its report on September 8, 2009; a one-page **SpacePolicyOnline.com** summary is available [here](#). The full Augustine committee report is expected to be released by the end of September. This hearing was an opportunity for Mr. Augustine to report his committee's findings to the Senate subcommittee that authorizes NASA's program activities. The chairman and the ranking member of the full Senate Commerce, Science, and Transportation Committee, Senator John D. Rockefeller IV (D-WV) and Senator Kay Bailey Hutchison (R-TX) each prepared [opening statements](#) for the hearing. Senator Hutchison participated in the hearing; Senator Rockefeller did not attend. A [webcast](#) of the hearing is available on the committee's website.

Nuggets

"The human space flight program in America is at a tipping point right now probably more so than anytime since President Kennedy took the leadership to say that we should have such a program."

Mr. Augustine

"I believe the President is a visionary and I believe that the President is going to make a bold stroke not unlike President Kennedy. He set this nation on a course that was extraordinary and it is my belief that President Obama will do that."

Senator Bill Nelson

Hearing Highlights

As with the hearing before the House Science and Technology Committee the previous day (read a [SpacePolicyOnline.com summary](#) of the House hearing), the main themes of this

hearing were the future of the Constellation Program, the mismatch between NASA's budget and what it has been asked to do, the role of the commercial sector in human space flight, and whether the space shuttle program should be extended beyond its six remaining flights. The very strong support for the existing Constellation Program that was in evidence at the House hearing was not as pronounced at the Senate hearing. It was clear that Senators Nelson and Hutchison remain strongly committed to the International Space Station (ISS) and concerned about retaining the skilled workforce associated with the space shuttle. Senator Vitter seemed concerned that exploration goals could be further delayed if money is diverted into continuing the space shuttle in order to close the 7-year "gap" between when the shuttle is scheduled to be terminated and when a new U.S. human space flight system is available.

President John F. Kennedy's 1961 decision to send astronauts to the Moon before the end of that decade was invoked both by Senator Nelson and Mr. Augustine. Mr. Augustine began his testimony underscoring a sense of urgency: "The human space flight program in America is at a tipping point right now probably more so than anytime since President Kennedy took the leadership to say that we should have such a program." As the hearing concluded, Senator Nelson offered an optimistic assessment of what decision President Obama will make based on the Augustine committee's report:

I think the President really has a major decision here. There's nothing like a President making a bold decision to focus the nation on where we ought to be going technologically.... I believe the President is a visionary and I believe that the President is going to make a bold stroke not unlike President Kennedy. He set this nation on a course that was extraordinary and it is my belief that President Obama will do that.

During the hearing, Mr. Augustine did not detail the five options his committee developed, but they are:

- (1) the existing Constellation Program under the current budget profile (the "Program of Record");
- (2) extending the ISS to 2020 and beginning a lunar exploration program under the current budget profile;
- (3) the Constellation Program with an augmented budget of an additional \$3 billion per year through 2014 and a 2.4% inflationary increase thereafter;
- (4) "Moon First" where efforts are focused on establishing bases on the Moon, which requires the augmented budget; and
- (5) "Flexible Path," an evolutionary program that also requires the augmented budget where humans gradually travel further into the solar system without landing on the Moon or Mars (thereby avoiding their "gravity wells" for which expensive launch vehicles are required), but instead orbit the Moon and Mars, land on Mars' moons or an asteroid, or visit [Lagrange points](#).

The Augustine committee did not make any recommendations among the five options, but concluded the first two are "not viable." The committee also considered a "Mars First" option where efforts would focus on sending people to Mars in the near future, but concluded it would not be safe at this time. While "Mars is the ultimate destination for human space flight, it is not the best first destination," according to the committee's report.

At the hearing, Mr. Augustine appeared intent on hewing closely to his committee's mandate to avoid recommendations. Consequently, his answers may sometimes seem contradictory.

Future of the Constellation Program

Mr. Augustine explained that his committee reached the conclusion, “a disappointing one, frankly,” that the Constellation Program of Record (Option 1) is not executable because of the “mismatch between goals and funds.” He listed the outcomes if the current program is continued with its existing budget:

- six shuttle missions would have to be launched in the next 12 months, which raises safety questions;
- there would be no funds to enhance NASA’s technology program to provide the basis for a successful exploration program in the future;
- there would be insufficient funds to make use of the International Space Station in the next 5 years that it will be in orbit;
- the ISS would have to be deorbited in a little over 5 years from now;
- Ares I development would be completed two years after ISS has been “splashed into the Pacific Ocean” even though one of the purposes of Ares I is to support the ISS; and
- a heavy lift launch capability “which is the thing that this nation really needs to get on into space” would be delayed until the mid to late 2020s, and when it was ready “there would be no upper stage to put on it nor any lunar surface systems to use it. So we are looking at the mid ‘30s in this case before we would be able to do any real exploration....That’s basically the path that we’re on.”

He added that his committee offered viable options that could give us a “very exciting program,” but they require \$3 billion a year more. Without the additional funds, the U.S. human space program “substantially goes on hold.” Development of new launch vehicles could continue, and some technology development could be pursued, but there would be no significant human space flight work and the ISS “will come to an end 5 years from now,” he said.

Even though he and the committee did not choose among Options 3, 4 and 5, his comments at the hearing suggested that he considers the “Flexible Path” (Option 5) to be an exciting possibility.

Budget Constraints

Mr. Augustine stressed that the mismatch between NASA’s funding and its goals has existed for several decades and it is time to bring that to an end: “if we have to change the objectives to fit the means, then so be it.”

Senator Nelson asked how the committee assessed the value of human space flight. Mr. Augustine replied that the committee members did not have backgrounds in health care or other issues confronting the nation so could not make trade-offs between national priorities. However, he argued that the value of the space program cannot be justified in terms of scientific, technological or educational impacts. While those are real and important, he continued, the primary value is intangible – to prepare a path to put human beings into the solar system and demonstrate American leadership. Saying that Americans spend millions of dollars gambling on the Super Bowl, on videos and going to the movies, or on illegal drugs, he asserted “This nation can afford a strong human space flight program. It’s simply a question of priority.”

During a dialogue with Senator Vitter, Mr. Augustine said the gap between the shuttle and its replacement may be just the first of several gaps. He explained that because of funding

constraints, NASA does not have sufficient funds to operate its current systems and develop a new one: “there will be another problem that when we complete the Ares I there will be another gap – what are we going to do with the Ares I and the Orion once we get them, and when we complete the Ares V there will no ... lunar lander, nor a surface system to use it. So this may be just the first of three or four gaps.”

He also said there was a view that terminating the shuttle would free funds for the exploration program, but the amount of savings is tempered by the fact that NASA must pay the Russians for taking astronauts to and from the ISS, and that many of NASA’s fixed costs currently are bookkept with the shuttle program and those will have to be transferred somewhere – probably to the exploration program. His committee therefore estimated the savings from terminating the shuttle at about \$2.5 billion per year, less than what some are expecting.

Future of the Space Shuttle and “The Gap”

As part of a discussion with Senator Vitter, Mr. Augustine stressed the need to add funds for the shuttle program in FY2011 so the remaining flights could be conducted without “launch fever” – rushing to complete them because of an impending date certain for terminating the program.

In terms of whether the shuttle program should be continued beyond its six remaining flights, Mr. Augustine told Senator Hutchison that his committee concluded the only way to close the 7-year “gap” is to extend the shuttle. He added that the shuttle would need to be recertified, and spending the money on the space shuttle likely would delay the exploration program.

In a discussion with Senator Vitter, Mr. Augustine estimated the cost of extending the shuttle to eliminate the gap to be \$18 billion. As the dialogue continued, Mr. Augustine commented – stressing that he was trying to avoid making a recommendation – that the money might be better spent on accelerating the development of a U.S. heavy lift launch vehicle (such the Ares V) and building other aspects of the exploration program. “The cost of continuing to operate the shuttle is quite high,” he said. Later, however, he told Senator Nelson that one of the benefits of keeping the shuttle would be that the shuttle-derived launch vehicle options provided in his committee’s report would be more viable.

He told Senator Nelson more bluntly, though, that spending money to keep the shuttle going would have a “significant negative impact” on the exploration program. He explained that the gap was due to past decisions and that we are “to a considerable degree stuck with the gap.”

Role of Commercial Companies in Human Space Flight

Senator Hutchison said that she supports the Commercial Orbital Transportation Services (COTS) program, but asked “if we have that private capability, but not the Orion or the Ares ready to go and we still have the gap in our own NASA capabilities, do you think that exclusive reliance on the commercial development is justifiable in the face of the need to utilize the space station, or does that concern you?”

Mr. Augustine replied that his committee offered options that relied heavily on the commercial sector so that NASA would be free to tackle other, more challenging, goals. He said reliance on commercial providers certainly involves risk and his committee was conservative in its estimation of those companies’ capabilities, but there was no reason to expect they could not succeed given the support of NASA. Senator Hutchison asked again “could they provide that service if there is a gap” and would it be “reliable enough”? He replied:

I think the answer is yes, but fortunately we don't have to answer that at this moment. There are other alternatives available including French launch vehicles, continue to use the Russian launch vehicles, none of which are [sic] attractive to me as an American. Although I believe in international programs and I believe that if you're going to have international programs that are meaningful, we're going to have to get used to having other nations on the critical path. At the same time, there is no more critical path, I think, than being able to carry astronauts to low Earth orbit and that might be the one exception where I think we should have a capability. So my answer is that there is risk, non-trivial risk, but in our mind it is a risk worth taking.

Senator Nelson asked when a commercial capability to take crews to orbit could be a reality, and Mr. Augustine replied that it probably would not be within the next 6 years, though he said he would provide a more firm answer for the record. Senator Vitter later asked if the Augustine committee agreed with the 2008 report of NASA's Aerospace Safety Advisory Panel that it is unlikely a "commercial crew" capability would be ready in time to eliminate the gap, and Mr. Augustine replied that his committee had the same view.