COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

A Review of NASA's Space Launch System

Tuesday, July 12, 2011
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

Hearing Purpose

The original intent of the hearing was to examine NASA's selection of a heavy-lift launch system ("Space Launch System") that will be used to launch future crew and cargo flights beyond low Earth orbit. Members would have had an opportunity to ask questions regarding cost, schedule, capabilities, and justification for the selected design. However, on July 7, a senior NASA official publicly stated that a final decision on SLS won't be announced until "late this summer." In light of NASA's continuing delays (the NASA Authorization Act of 2010 required a decision and report by mid-January 2011), the hearing will instead provide an opportunity for NASA to explain why it has failed to reach a decision, what analyses still need to be completed, and when the Space Launch System decisions will be forthcoming.

Witness

The Honorable Charles F. Bolden Jr., Administrator, National Aeronautics and Space Administration

Background

The Bush Administration and the NASA Authorization Acts of 2005 and 2008

In the aftermath of the Space Shuttle *Columbia* accident the Bush Administration proposed a new vision for space exploration, following the retirement of the Space Shuttle, which would extend human capabilities beyond low Earth orbit for the first time since 1972. In the NASA Authorization Act of 2005 Congress directed NASA to "*establish a program to develop a sustained human presence on the Moon, including a robust precursor program, to promote exploration, science, commerce, and United States preeminence in space, and as a stepping-stone to future exploration of Mars and other destinations."* [P.L. 109-155]

Subsequently, NASA created the Constellation program (consisting of the Ares 1 rocket and Orion crew capsule, the Ares 5 heavy lift launcher, and the Altair lunar lander) that was designed to accommodate this stepping-stone approach, and was Congressionally-authorized by the NASA Authorization Act of 2008 "*to ensure that activities in its lunar exploration program shall be designed and implemented in a manner that gives strong consideration to how those activities might also help meet the requirements of future activities beyond the Moon*" and a range of future destinations "*to expand human and robotic presence into the solar system, including the exploration and utilization of the Moon, near Earth asteroids, Lagrangian points, and eventually Mars and its moons.*" [P.L. 110-422]

The Obama Administration

In NASA's FY2010 budget proposal the Obama Administration maintained the Congressionally-authorized policy of returning Americans to the Moon and noted that, "*Funds freed from the Shuttle's retirement will enable the Agency to support development of systems to deliver people and cargo to the International Space Station and the Moon,"* and, *"The Agency will create a new chapter of this legacy as it works to return Americans to the Moon by 2020 as part of a robust human and robotic space exploration program."* Yet in spite of these assertions the Administration eliminated funding for continued development of the Altair lunar lander and the Ares 5 heavy-lift launch vehicle, and cut more than $3 billion from NASA's five year Exploration Systems budget, relative to the FY 2009 budget request.

At the time of the FY2010 budget proposal the Administration established an independent review committee chaired by retired Lockheed Martin executive Norman Augustine. *The Review of Human Spaceflight Plans Committee* delivered its final report in October 2009 with the overarching conclusion that "*Meaningful exploration beyond low-Earth orbit is not viable under the FY 2010 budget guideline*" but that "*Meaningful human exploration is possible under a less-constrained budget, increasing annual expenditures by approximately $3 billion in real purchasing power above the FY 2010 guidance*."

Despite the Augustine Committee's finding that the FY2010 budget profile was insufficient for meaningful human space exploration, the next year the administration *reduced* the FY2011 Exploration Systems budget to $4.3 billion, which was $1.8 billion *below* the FY2010 runout plan. Hence, it appeared that "*Funds freed from the Shuttle's retirement…"* would not be provided by the Administration to *"enable the Agency to support development of systems to deliver people and cargo to the International Space Station and the Moon."*

In NASA's FY2011 budget request the Administration proposed canceling the Constellation program, claiming it was "*trying to recreate the glories of the past with the technologies of the past."* Then at a speech at the Kennedy Space Center on April 15th 2010, the President said that with respect to the Moon, "*the simple fact is, we have been there before. There is a lot more of space to explore*…." He announced that the U.S. would send humans to an asteroid by 2025, followed by a human mission to orbit Mars by the mid 2030s.

On July 6, 2011 during a Twitter® Town Hall webcast, President Obama expressed his vision for exploration this way, *"…let's ultimately get to Mars. A good pit stop is an asteroid. I haven't actually – we haven't identified the actual asteroid yet, in case people are wondering. But the point is, let's start stretching the boundaries so we're not doing the same thing over and over again. But rather, let's start thinking about what's the next horizon. What's the next frontier out there and you know, but in order to do that we're going to need some technological breakthroughs that we don't have yet."*

In lieu of *Constellation*, the Administration's FY2011 budget sought to fund development of "commercial crew" transportation services (three or four, according to NASA), and postpone construction of human exploration systems for a least five years, instead pursuing additional propulsion research and technology development. Despite repeated requests by both the House Committee on Science, Space, and Technology, and the Senate Committee on Commerce, Science, and Transportation throughout 2010, NASA failed to provide a credible plan justifying their

proposal. As a result, after extensive review and debate, Congress in its 2010 NASA Authorization Act reversed the Administration's approach and directed the agency to build upon the capabilities of the Shuttle and Constellation programs and immediately begin developing the SLS and MPCV.

The NASA Authorization Act of 2010 [P.L.111-267]

Last year Congress passed the NASA Authorization Act of 2010, which was signed by the President on October 11, 2010 [P.L.111-267]. The Act provided policy guidance and recommended funding levels for three years, and called for a National Academy *"review of the goals, core capabilities, and direction of human space flight, using the goals set forth in the National Aeronautics and Space Act of 1958, the NASA Authorization Act of 2005, and the NASA Authorization Act of 2008, the goals set forth in this Act, and goals set forth in any existing statement of space policy issued by the President.*" The review is to be completed by next year.

Congress again reaffirmed the policy of the NASA Authorization Act of 2005 (42 U.S.C. 16761(a)), *"that the United States shall maintain an uninterrupted capability for human space flight and operations in low-Earth orbit, and beyond, as an essential instrument of national security and of the capacity to ensure continued United States participation and leadership in the exploration and utilization of space."* [§201(b)]

Section 202 (a) stated that, *"The long term goal of the human space flight and exploration efforts of NASA shall* ***be to expand permanent human presence beyond low-Earth orbit*** *and to do so, where practical, in a manner involving international partners."* Section 301(a)(1) stated, *"The extension of the human presence from low-Earth orbit to other regions of space beyond low-Earth orbit will enable missions to the surface of the Moon and missions to deep space destinations such as near-Earth asteroids and Mars."*

Section 2(9) of the NASA Authorization Act of 2010 states, *"While commercial transportation systems have the promise to contribute valuable services, it is in the United States' national interest to maintain a government operated space transportation system for crew and cargo delivery to space."*

As a result, the Act provided **$10.8 billion** (through FY2013) to continue developing a Shuttle- and *Constellation*-derived launch system (newly designated the Space Launch System and Multi-Purpose Crew Vehicle) that would also assure a national capability to access the International Space Station for the U.S. and our international partners in case commercial proposals fail to materialize or Russian Soyuz vehicles are unavailable. The Act also directed NASA to proceed immediately with its development with the goal of making the system operational by 2016.

Congress envisioned that the Space Launch System (SLS) and Multi Purpose Crew Vehicle (MPCV) would get maximum benefit from the more than $10.3 billion that had been spent (up to that time) on the *Constellation* program. *Constellation* had achieved a number of developmental milestones including the successful flight tests of the Ares 1-X and the Orion launch abort systems, and a ground demonstration of the new five-segment solid rocket motor that was to power the Ares 1 and Ares 5 launchers. The SLS and MPCV were to continue to focus on developing the advanced human safety features of the Orion project, and be capable of evolving into a heavy lift launch system that could eventually carry 130 tons to orbit to enable human exploration beyond Earth orbit.

NASA was directed to provide a report to Congress by January 9, 2011, describing the SLS and MPCV including *"…the assumptions, description, data, and analysis of the systems trades and resolution process, justification of trade decisions, the design factors which implement the essential system and vehicle capability requirements…the explanation and justification of any deviations from those requirements, the plan for utilization of existing contracts, civil service and contract workforce, supporting infrastructure utilization and modifications, and procurement strategy to expedite development activities through modification of existing contract vehicles, and the schedule of design and development milestones and related schedules leading to the accomplishment of operational goals established by this Act."* [Section 309]

In November 2010, NASA issued a series of small ($650,000) study contracts to 13 companies to provide industry inputs to the heavy lift studies. Initial responses were obtained in late February 2011 and final replies in late April 2011.

In January 2011, Administrator Bolden sent a letter to the Committee that said, *"Unfortunately, a 2016 first flight does not appear to be possible within projected FY 2011 and out year funding levels, although NASA is continuing to explore innovative procurement and development approaches to determine whether it can come closer to this goal."*

According to briefings by senior NASA officials in May 2011, the report is expected to include, 1) the basic framework for a "capability driven architecture" and concept of operations that provides the "strategic context for exploration of multiple destinations," 2) an analysis of the cost and benefits of proposed vehicle designs for the SLS and MPCV and alternatives, 3) analysis of the current Ares, Shuttle and Orion contracts for the applicability to the future development program, and 4) analysis of potential acquisitions approaches.

NASA has contracted with Booz Allen Hamilton to perform an independent cost assessment. The results were due in May 2011 for inclusion as part of the final report. In May 2011 senior NASA officials expressed confidence that the final report would be completed by June 20th, this was later changed to July 8th. NASA's report to Congress is now more than six months late. NASA is awaiting final approval from OMB.

Continuing delays have already resulted in the loss of thousands of highly skilled aerospace jobs, and threatens to do costly damage to the U.S. industrial base. On March 30, 2011 in testimony before the Space and Aeronautics Subcommittee hearing on *A Review of NASA's Exploration Program in Transition*, the Chairman of the Corporate Membership Committee of the American Institute of Aeronautics and Astronautics testified that, *"…the space industrial base is not FACING a crisis; we are IN a crisis. And we are losing a National Perishable Asset…our unique workforce."*

FY2011 Full Year Continuing Resolution

On April 15, 2011 a full year continuing resolution established spending levels for the balance of FY2011. As noted in the table below, for the Space Launch System, amounts provided are slightly above authorized levels. Subsequently, on June 15th NASA provided Congress with an operating plan based on the continuing resolution (FY11 CR column below) and gave notice that *"(A)dditional information on NASA's progress in selecting an architecture and acquisition strategy will be provided to Congress in the Updated Report on MPCV and SLS in summer 2011."* Agency officials are now suggesting that the information won't be available until late summer at the earliest.

NASA FY12 Budget Req - Space Launch System & Multi Purpose Crew Vehicle

($ = million)

	FY11		FY12			FY13	
	Auth	CR	Auth	Budg Req	CJS Appro*	Auth	Budg Req
Space Launch Sys	1.631	1.786	2.650	1.690	1.985	2.640	**
Multi Purpose Crew Veh	1.120	1.196	1.400	0.916	1.063	1.400	**
Total	**$2.751**	**$2.982**	**$4.050**	**$2.606**	**$3.048**	**$2.640**	**$2.591****

*As approved by the CJS Subcommittee on July 7.

** Budget provided no breakout.

Recent FY2012 Appropriation Activity

On July 7th the House Appropriations Subcommittee on Commerce, Justice, Science, and Related Agencies reported an FY2012 appropriations bill providing a total of $3.65 billion for Exploration Systems, that included the following provision: *"Provided, that not less than $1,063,000,000 shall be for the multipurpose crew vehicle to continue existing vehicle development activities to meet the requirements described in paragraph (a)(1) of section 303 of Public Law 111–267, and not less than $1,985,000,000 shall be for the heavy lift launch vehicle system which shall have a lift capability not less than 130 tons and which shall have an upper stage and other core elements developed simultaneously."*