SPACE NEWS Business Report

# NASA's Moon Plans Shift into High Gear

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WASHINGTON – NASA is set to begin rolling out the results of a landmark space exploration architecture study that calls for building an Apollo-like astronaut capsule and conducting up to six lunar sorties per year using rocket hardware derived from the space shuttle.

Sixty days in the making, the Exploration Systems Architecture Study will go a long way toward defining the approach and the hardware NASA will use to return astronauts to the Moon by 2020, and eventually go on to Mars.

That hardware includes the so-called Crew Exploration Vehicle (CEV) and the rockets that will be needed to loft both the CEV and huge amounts of cargo that will be needed to establish a sustainable astronaut presence on the lunar surface.

Long before being named NASA administrator this spring, Mike Griffin was on the record saying that he thought the United States ought to take maximum advantage of existing space shuttle hardware and infrastructure in building the new launchers.

In public speeches, congressional testimony and interviews since being sworn in, Griffin has made clear that he still believes shuttle-derived launchers are the way to go, not just for the really big Moon-bound cargo payloads but also for the CEV, whose destinations are to include lunar orbit and the international space station.

And nothing discovered in the course of the Exploration Systems Architecture Study seems to have dampened that belief.

“We have studied this as carefully and ecumenically as we know how to do,” Griffin told Space News in a June 27 interview at NASA Headquarters here. “For the purposes of launching the CEV, while we could probably make anything work, clearly the safest, most cost-effective, highest-reliability path that we see is shuttle-derived.”

Chicago-based Boeing and Bethesda, Md.-based Lockheed Martin have been pushing variants of their respective Delta 4 and Atlas 5 rockets as the solution to all of NASA’s exploration needs. Both rockets were developed under the U.S. Air Force Evolved Expendable Launch Vehicle (EELV) program for launching military satellites and would require upgrades to handle the 25-ton CEV and major redesigns to meet NASA’s heavy-lift cargo needs. To return to the Moon in a meaningful way, NASA says it needs a vehicle capable of placing 100 metric tons of cargo into Earth orbit, far beyond the capability of the Delta 4 or Atlas 5.

Griffin said that all things considered, shuttle-derived hardware looks like the best

choice for the heavy-lift cargo missions and for the CEV.

“[T]here would be a bunch of changes that would have to be put into the EELV to human rate it, and I don’t know that that’s the most fiscally sound path for NASA to go down. And frankly, I don’t know that the EELV community would welcome us getting into their production lines in order to make those kinds of modifications,” Griffin said. “So all that would have to be thought through very carefully. Right now the path we think is the most favorable is the shuttle-derived, in part because that gives us the best work force transition issues.”

Griffin said using shuttle-derived launchers would help NASA retain the work force it needs to keep flying the space shuttle safely until the last orbiter in the fleet is retired at the end of the decade.

**Architecture Takes Shape**

Griffin said in the interview that NASA likely would be ready to go public with its exploration plans around mid-July after coordinating with other parts of the U.S. government and with industry. Initial coordination briefings were set to begin the week of July 4.

“In the past we’ve often been accused of bringing in the solution with no other options and I am trying hard to get away from that,” Griffin said. “There are numerous stakeholders and I want to play fair with all of them. I’m not going to go out with an uncoordinated NASA position.”

Nevertheless, NASA gave a small group of outside experts an update on the Exploration Systems Architecture Study the week of June 27 and, according to a Washington-based source who had been briefed in turn, laid out a lunar exploration architecture that includes as many as six flights a year to the Moon.

According to this source, key elements of the lunar exploration architecture are coming into focus. For example:

> The CEV would be a reusable capsule capable of carrying four passengers to the Moon.
>
> NASA would use a three-person version of the CEV capsule to ferry astronauts to and from the international space station three times a year.
>
> An unmanned version of the CEV would be used as a cargo carrier, conducting three space station resupply missions a year.
>
> Both the CEV launcher and the heavy-lifter would be shuttle-derived and cost about $3 billion a year once in service.
>
> The CEV would launch atop a single solid-rocket booster whose design is virtually the same as those that help lift the space shuttle off the launch pad.

The heavy-lift vehicle initially would be sized to lift 100 metric tons into orbit for Moon missions but could evolve to loft 120 metric tons for Mars missions.

**A Joint Recommendation**

The U.S. Space Transportation Policy released by the White House in January requires NASA and the Pentagon to reach a joint recommendation on the nation's next heavy-lift launcher and leaves it to the president to decide. The policy also directs NASA to give preference to a solution based on EELV hardware to help the Air Force defray the costs of supporting the program.

Griffin said June 27 that he had yet to meet with U.S. Defense Secretary Donald Rumsfeld but did meet recently with Air Force Gen. Lance Lord, commander of Air Force Space Command, to discuss NASA's case for building shuttle-derived launchers. Griffin said Lord agreed that a shuttle-derived vehicle "was the obvious path" for NASA's exploration needs.

But that does not necessarily mean the Air Force won't be getting any NASA help in shouldering the EELV burden: Griffin said he told Lord that NASA would be willing to switch to the medium-lift variants of the EELVs to loft its science spacecraft "provided that there is not an undue financial penalty for NASA."

That might spell the end of Boeing's smaller but highly reliable Delta 2 rocket, which has served as NASA's primary workhorse for the past decade or more. That vehicle is no longer in the Air Force's plans.

Griffin called a switch to EELV "the most nascent of plans" noting that NASA still has about a dozen Delta 2 launches under contract.

Air Force Space Command spokeswoman Maj. Angie Blair said June 28 that Lord was on travel and not immediately available to comment on his meeting with Griffin. A Defense Department official, who asked not to be identified by name, confirmed that Griffin and Lord had reached a tentative agreement on Delta 2 and said that the Air Force is not likely to stand in the way of NASA developing shuttle-derived launchers.

"We want to help them do what works best for them," the Defense Department official said. "Ultimately it is their call, not ours."

**Single Stick and In-Line Heavy**

Griffin likes to point out in interviews and public talks that the space shuttle is essentially a heavy-lift launcher with a very heavy payload shroud — the shroud, of course, being the space shuttle orbiter itself. And NASA has for years been studying options for a heavy-lift vehicle based on the shuttle's main engines, external tank and solid rocket motors.

For launching the CEV, Griffin said he favors using a modified shuttle solid-rocket booster equipped with a new upper stage. Industry officials say options for powering the upper stage include a modified space shuttle main engine or the J-2 engine that was

used on both the second and third stages of the giant Saturn 5 rocket of Apollo fame.

There are two basic designs for a shuttle-derived heavy lifter. The so-called side-mounted vehicle, which closely resembles today's space shuttle launch configuration except that the orbiter would be replaced with a cargo carrier, could lift 75-90 metric tons. The so-called in-line heavy-lifter has the cargo carrier mounted above the core-stage tank. Utilizing four to five space shuttle main engines, two solid rocket boosters and a modified external tank, it would be about the size of a Saturn 5 and could loft up to 120 metric tons.

ATK Thiokol, the Magna, Utah-based company that builds the solid-rocket boosters, has been touting shuttle-derived solutions for NASA's exploration needs.

"It's safe, it's simple and it's soon," said former NASA astronaut Scott Horowitz, ATK Thiokol's director of exploration space transportation. "That has been the mantra since the astronaut office first looked at this problem after the Columbia accident."

Horowitz has been making the rounds in Washington in recent weeks briefing congressional staffers and news media on shuttle-derived launcher designs. In an interview with Space News, he estimated development costs for a human-rated CEV launch vehicle based on the shuttle solid rocket booster at $1 billion to $1.5 billion, a figure that does not include the CEV itself.

"Probably NASA could spend $200 [million] to $300 million a year and this thing could be sitting on the pad by 2010 and ready to put people on top," Horowitz said.

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