

Back to the Moon, To Stay?

NASA's Plans for a Lunar Base

Go back to, say, the 1960s, and look at the visions people in that era had for the twenty-first century. The future would bring flying cars, plentiful electrical power provided by nuclear fusion, home robots doing household chores—and people living and working on the Moon. Well, the twenty-first century is here; flying cars never took off, fusion power is still

a distant dream, and the most sophisticated household robots are no more than bumbling vacuum cleaners. But a base on the Moon is now one small step closer to reality.

The emphasis should be on “one small step,” because NASA officials offered few details about their lunar base plans in their December 4, 2006 announcement at the Johnson Space

Center in Houston. What space agency officials did reveal is that NASA intends to gradually build up a base after 2020 through a series of human missions of increasing duration, so that by 2024 the facility will be ready for permanent occupation by rotating crews, in a manner similar to the way the International Space Station is manned today.

NASA has also picked out a notional location for the lunar base: the rim of the Shackleton crater near the Moon's south pole. A base on that location would benefit from near-continuous sunlight, eliminating the need to bring a nuclear reactor or other power source to generate electricity during the two-week lunar night. That location would also avoid the extreme temperature swing between day and night on the lunar surface. And it would be near areas of permanent shadow within the crater that may have deposits of frozen water that could help supply the station. "We finally have a place that is very interesting from an operational and engineering perspective because of continual sunlight [and] because of the ability to maybe get after materials on the Moon," said Scott Horowitz, NASA's associate administrator for exploration.

The announcement attracted a surprising amount of media attention, given that a lunar base of some kind had been assumed to be a part of the Vision for Space Exploration, NASA's overarching human spaceflight program, since its announcement three years ago. In his January 2004 speech outlining the Vision, President Bush

spoke about "extended human missions" on the Moon "with the goal of living and working there for increasingly extended periods." Most observers assumed all along that the agency would do more than just land on the Moon for some short, flashy "flags-and-footprints" missions like those of the Apollo era.

Nonetheless, NASA officials said the decision to develop a lunar base came only after a long series of discussions with various stakeholders, including scientists, engineers, and representatives of over a dozen other countries. That lengthy outreach process, said NASA deputy administrator Shana Dale, led to the conclusion that a lunar base was key for preparing for future human missions to Mars and other destinations in the solar system. "It also enables global partnerships, allows for maturation of *in situ* resource utilization, and results in a path that is much quicker in terms of future exploration" elsewhere in the solar system, Dale said.

Horowitz, a former astronaut, made the decision to develop a lunar base sound like a slam dunk. "It is one of the few where I have seen the science community and the engineering community actually agree on anything."

Conspicuously absent from the NASA announcement was any mention of how much the lunar base might cost. NASA administrator Michael Griffin later told a reporter that he didn't know how much it would cost to establish a base, but he expected it to be less expensive than developing the spacecraft and

rockets needed to send humans to the Moon, a cost NASA estimated in late 2005 to be just over \$100 billion.

Instead of discussing the cost, agency spokesmen tried to focus on the reasons why humans should return to the Moon, and why, once there, we should set up a base. In consultation with more than 1,000 experts from around the world, NASA has come up with a massive list of proposals for what humans could do on the Moon, along with explanations of how those activities would benefit people on Earth. This list—grandly called a “Global Exploration Strategy”—includes 180 objectives divided into 23 categories, ranging from astronomy and geology to technology development and commercialization. These categories are further grouped into six broad themes: human civilization, scientific knowledge, exploration preparation, global partnerships, economic expansion, and public engagement.

The problem for NASA, however, is that its themes are as shallow as they are broad, offering something for almost everybody but very little of substance. “Scientific knowledge,” for example, is an obvious justification for a lunar base, and there’s little doubt that humans could do outstanding research on the lunar surface. Yet are taxpayers willing to pay many billions of dollars to support the development of a human lunar outpost when robotic missions can do much (although certainly not all) of the same science for a fraction of the cost? And some of the other rationales for human lunar exploration run

the risk of promising too much. NASA suggests that, by going back to the Moon, the United States can improve international relations. A noble goal, to be certain, but one neither backed up by past experience (has the International Space Station really done anything to improve international relations, as it was supposed to?) nor a strong justification in and of itself for a return to the Moon.

Editorial writers picked up on this weakness in the days following the announcement. NASA’s six broad themes for why we should return to the Moon are all “laudable goals,” the *Los Angeles Times* opined, but they could all “be managed without a manned moon station and a twelve-figure price tag.” The *New York Times* agreed: “The wide sweep of these rationales is reminiscent of the extravagant promises for the space station, which was sold to Congress as a steppingstone to the planets, a scientific and economic bonanza, and a stimulus for students but is still limping along, half finished and far over budget, with greatly diminished expectations for what it can accomplish.”

Other critics noted the inadvertently mixed messages NASA was offering about the Moon and Mars. Just two days after rolling out its lunar base plans, the space agency held a news conference where scientists released new evidence that liquid water may still exist under the surface of Mars, occasionally spurting out the sides of craters and flowing downhill for a brief time. Discoveries like that, which raise

the possibility that rudimentary life exists on Mars, have led some to question whether NASA's exploration focus should be on the Red Planet rather than the Moon. "There's water on Mars, so we're going to live on the Moon. Does that strike anybody as weird?" asked *New York Times* science writer Dennis Overbye. "On the one hand there is the Red Planet, home of mythical canals and yearning. . . . On the other hand there is the Moon, by all accounts a dead cinder." The *Hartford Courant*, in an editorial contrasting lunar and Mars exploration, concluded that the recent discovery means that the "exploration of Mars deserves higher priority."

NASA's priorities will surely be scrutinized by the new Congress under Democratic control. It is unlikely that the overall Vision for Space Exploration, which has enjoyed broad bipartisan support, will be threatened by the Democratic leadership in Congress—but the new Democratic chairmen of key committees will likely cast a more skeptical eye upon some of NASA's plans, forcing the agency to defend the Vision in greater detail.

Moreover, the agency's long and unfortunate history of cost overruns on major projects has led some legislators to worry that NASA will not be able to pay for the Vision without stripping money from space science, earth science, and aeronautics programs. That problem will likely be exacerbated if, as expected, the new Democratic leadership chooses to pass no budget bill for the 2007 fiscal year, but instead fund the federal government through

a "continuing resolution" that would freeze budgets at their 2006 levels with only minor changes. Such a move would leave NASA, which expected a modest budget increase in 2007, several hundred million dollars short, making it difficult to keep its key exploration programs on schedule without raiding other parts of its budget.

A far bigger challenge, however, awaits NASA in 2009, with not only a new Congress but also a new president and, most likely, a new NASA administrator. Presidential candidates are only now starting to make their intentions known, and their stances on NASA and the Vision for Space Exploration fall near the bottom of the list of policy positions they will stake out during the campaign. That provides an additional degree of uncertainty regarding when or if the lunar base—or even the overall exploration program—will become reality.

The best way for NASA to cope with that uncertainty is to develop a stronger, more cohesive case for justifying and explaining the agency's long-term plans. It's all well and good to come up with long lists of reasons for building a Moon base, but at some point the agency and its advocates on Capitol Hill and elsewhere must zero in on the few best and clearest rationales for sending humans to the Moon, Mars, and beyond. Otherwise, a future Congress or president will surely find something else to do with NASA's budget.

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