

Going Nowhere

Why President Obama Must Give NASA a Destination

Saint Augustine famously wrote in his *Confessions* that, as a young man, he had prayed, “Lord make me chaste, but not yet.” Some sixteen centuries later, another Augustine—Norm Augustine, the head of a committee deciding NASA’s future—may have taken inspiration from his namesake when he announced that he wants the United States to have a bold manned space exploration program, but not yet.

Augustine, the former CEO of Lockheed Martin, was selected by

President Obama in early 2009 to head a committee revisiting the plans for NASA developed in the wake of the 2003 *Columbia* accident. Those plans involved the retirement of the space shuttle by 2010 and its replacement with a new architecture for sending astronauts to orbit, the Moon, and ultimately Mars. Dubbed Constellation, this new architecture would include new rockets and spacecraft, both of which NASA spent several years and billions of dollars designing.

In its final report, published in October 2009, the Augustine committee called for cancelling the Constellation program's drive to return to the Moon by 2020. Augustine and his colleagues further noted that while "Mars is the ultimate destination for human exploration of the inner solar system," a so-called "flexible path" plan—one that *might* enable NASA to send humans to a range of "inner solar system locations" and *perhaps* eventually on to Mars in some distant future—would be more feasible for budgetary and technical reasons.

Working from the Augustine committee report, the Obama administration in February 2010 proposed a new space policy comprising three key decisions. First, the Constellation program would be cancelled. Second, NASA would subsidize the development of private space-launch systems for delivering astronauts to the International Space Station. And third, the agency would take up the Augustine committee's "flexible path" option, abandoning the concept of setting a specific mission goal for its human spaceflight program in favor of an approach that would fund technology research for the purported purpose of better enabling some unstated mission that might be selected later.

The response to the Obama plan has so far been mixed. By and large, the space policy community is wary, and although many of the hopeful startups involved in the private space industry are excited by the prospect of competing for NASA projects, even they are not unified in support of the

Obama approach. For instance, Burt Rutan, the respected engineer whose SpaceShipOne won the Ansari X-Prize in 2004, has suggested that the Obama proposal amounts to "a surrender of our preeminence in human spaceflight." While Rutan has criticized the existing Constellation plan, he wrote in an open letter in February that he does "not think that NASA should 'give up' on manned spaceflight," and that the startup space companies won't be "taking Americans to Mars or to the moons of Saturn within my lifetime."

The Obama administration's plan is not yet set in stone. Almost no members of Congress, who control the purse strings, have come out in support of the plan, while several members have voiced strong opposition, including Democratic Senator Bill Nelson from Florida—a politically important state with a large NASA constituency. Apparently surprised by the congressional opposition, President Obama scheduled a "space summit" for April 15, 2010 in Florida. Presumably, he will use the occasion to either defend and elaborate upon his proposal, or to backtrack away from it.

President Obama should do the latter. The February 2 proposal is fundamentally flawed, as a review of its three key decisions makes clear. The first decision, to cancel the Constellation program, is very harmful to America's long-term interests in space—unless something better were to be proposed in its place.

The second decision, to support new launch companies, is a good idea, and

long overdue, but not terribly important for the overall future of the space program, since NASA has been buying launches from private space firms for the past half century.

But the third decision, to adopt a “flexible path” plan, is a horrible mistake that would guarantee that the U.S. human spaceflight program accomplishes nothing for the foreseeable future.

As I have argued before in the pages of this journal, NASA has over its history employed two distinct modes of operation which, for shorthand, we can call the “Apollo Mode” and the “Shuttle Mode.” The Apollo Mode, which prevailed in the human spaceflight program during the period from 1961 to 1973, involved first choosing a mission goal, then developing a plan to achieve that goal, and then designing and developing the hardware and technologies needed to implement the plan. The hardware set is then built, after which the mission is flown.

The Shuttle Mode, which has prevailed within the U.S. manned spaceflight effort since 1974, during the period when the space shuttle was being developed and flown, is almost the reverse: The technologies and hardware elements are selected first, based on the wishes of various technical communities. These projects are then justified by arguments that they *might* conceivably prove useful some distant day when grand spaceflight projects are finally initiated.

The historical record makes clear the ways that the Apollo Mode is

superior to the Shuttle Mode. During the Apollo era, dozens of groundbreaking new technologies were developed and were flown in missions of historic importance, including the manned lunar landings. The shuttle-era record is far less impressive; it resulted in no new technologies of importance and reached no new destinations—despite the fact that the agency’s budget for the past twenty years has been approximately the same, in inflation-adjusted dollars, as that which it enjoyed during the Apollo period. In the Apollo Mode, NASA’s efforts are focused and directed; in the Shuttle Mode, the space agency’s efforts are random and entropic, shuffling along without a purpose, always buffeted by political winds.

Perhaps the only area in which the achievements of the current NASA compare with those of the agency’s Apollo period is robotic exploration—the rovers exploring Mars and the various probes sent around the solar system. But this is the exception that proves the rule: these projects have been successful precisely because they continue to use an Apollo-style approach in which missions are selected first, designs are then drawn up, and technology is developed to realize those designs. If, instead of adopting a mission-driven approach, the Jet Propulsion Laboratory (which produced the Mars rovers) instead chose to spend its funds developing random technologies and then designed its missions around the purpose of employing those toys to justify their existence, its productivity would fall to nil as well.

Which brings us to the open-ended Obama proposal to take a “flexible path” to space. It is squarely in the Shuttle Mode.

Consider the following: At the same time that the Obama administration announced its new policy, NASA gave notice that the three key supposedly “game-changing” inventions it would seek to develop as part of the effort would be the Variable Specific Impulse Magnetoplasma Rocket (VaSIMR) propulsion drive, orbital space depots, and heavy-lift technology.

But the VaSIMR thruster, while energetically advocated by its inventor as supposedly necessary for sending humans to Mars, offers no clear mission benefits over existing ion-drive electric propulsion systems—and both remain useless as tools for supporting human exploration missions without the prior development of huge multi-megawatt space nuclear reactors to power them, which is not part of the program. Furthermore, even if such huge space nuclear-power systems were created, the claim that VaSIMR (or any other electric thruster) would then enable transit to Mars with much shorter flight times than existing chemical propulsion systems, or even *equal* flight times to those available from existing rockets, simply has no basis in technical reality. So stalling a Mars program while waiting for such magic-based capabilities to materialize is a prescription for having the human spaceflight program continue to mark time without accomplishment.

The potential utility of orbital propellant depots—basically gas stations

in space—as a way to enable manned missions to the Moon, near-Earth asteroids, or Mars has never been established. To the contrary, none of NASA’s recent designs for Moon or Mars missions has involved refueling spacecraft from orbital propellant stations. To insist that future mission architects adopt such a strategy is to force them to swallow a suboptimal system design based on an arbitrary decision to favor one technology.

Finally, it is simply not the case that we need new technologies to create heavy-lift launch systems. We flew our first heavy-lifter, the Saturn V, in 1967. What is needed to give us a functioning heavy-lift booster now is a decision to build it—which will never come unless there is first a mission to employ it.

Thus, without the guidance supplied by a driving mission, under the new Obama space policy, another ten years and more than a hundred billion dollars will be spent by NASA’s human spaceflight program without achieving anything significant. We may take part in another twenty flights to low-Earth orbit, but there is no new world there to explore. Together with the Russians, we have already flown there some three hundred times over the past half-century. Spending a king’s ransom to raise that total to three hundred twenty hardly seems worthwhile. Under the Obama proposal, we may develop some new technologies, but without a mission plan to guide their selection, they won’t be the right technologies, they won’t be realized as actual flight

systems, they won't fit together, and they won't take us anywhere.

Some fiscal hawks might think that giving NASA a mission with a real destination will be too costly. But it must be remembered that NASA's average annual budget from 1961 to 1973, during the years when the agency flew all the Mercury, Gemini, Apollo, and Skylab missions, as well as scores of lunar and interplanetary probes, was about \$19.7 billion (converted to today's dollars). That figure is very close to NASA's current budget, and is in fact almost identical to the average NASA budget that President Obama has proposed for the next five fiscal years—except, of course, the space agency won't be putting a man on the Moon. In essence, by cutting Constellation while increasing NASA's budget, the president is giving the agency more money while asking it to accomplish nothing.

The American people want and deserve a human spaceflight program that really is going somewhere—and not just anywhere, but to a destination really worth going to. That destination is Mars. For the past four decades since the end of the Apollo era, Mars has been the challenge staring the American space program in the face. A world with varied resources and a past history that includes oceans of liquid water, Mars is the Rosetta Stone that will tell us whether the development of life from chemistry is a general phenomenon in the universe, and whether life as we know it on Earth is the pattern for all life everywhere, or alternatively that we are simply

one esoteric example of a far vaster and more interesting tapestry of possibilities. Moreover, Mars is the closest world that truly has the resources needed for human settlement. For our generation and those that will follow, Mars is the New World. We should not shun its challenge.

But regardless of what destination we choose, what is essential is that there *be* a destination, which defines a mission plan, which defines a hardware set, which then defines what technologies should be developed and what hardware elements will be procured. If matters are approached this way, there are many methods of procurement of flight systems that can be used, including conventional and entrepreneurial approaches, but they need to be employed coherently to achieve a defined objective.

If this is not done, then ten years from now, after spending another \$100 billion on human spaceflight, we will be no closer to sending astronauts to the Moon or Mars than we are today. To put it another way, President Kennedy famously said that humans would go to the Moon and return safely to Earth “before this decade is out”—but President Obama has proposed in essence that “this decade our plan is to accomplish nothing in space.”

The Obama administration claims that its proposed space policy enables a “flexible path.” In reality, it is a prescription for yet another wasteful random walk. Four decades of stagnation in space is enough. If any progress is to be made, a course must be

set. Leadership is required. President Obama should reject the timid proposal his administration floated in February, which would mark the end of the American human spaceflight program, and should instead take the side of audacity and hope—by committing NASA to reach for Mars in our time.

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