U.S. Needs Near-term Results in Human Space Exploration

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Next January will see the eighth anniversary of President George W. Bush's announcement of the Vision for Space Exploration (VSE), which set the nation on a renewed course to send Americans to explore beyond Earth orbit.

Eight years — that's about how long it took from John Kennedy's lunar landing challenge in 1961 to the accomplishment of that goal in 1969. Yet, eight years after the 2004 VSE announcement by another, we are hardly closer to venturing beyond low Earth orbit (LEO) with humans than we were when these goals were first announced.

The reasons for the lack of quicker progress are many, as are those who share the blame. But identifying either those reasons or their culprits isn't what is most important.

What *is* important, in our estimation, is to avoid the missteps of the recent past and to accelerate progress in order to capture public and political imaginations. More specifically, we believe it is necessary to find a way for human exploration beyond LEO to begin *in this very decade.*

Unfortunately, the just-announced Space Launch System (SLS)'s first crew flight date goal is 2021, still fully 10 years from now. And that's the best case.

We hope the noble goals and intended timetable set by lawmakers and NASA for SLS can be met, but we believe that 2021 for the first crewed flight is simply too distant to ensure exploration sustainability — so distant, in fact, that it ultimately may lead us away from the exploration actually intended.

Since accelerating SLS itself is not fiscally feasible, one is led to ask: What can be done?

We believe the solution boils down to one word: *pragmatism.*

Pragmatism means exchanging more perfect solutions for more practical ones by using existing systems, modified to the least extent practical, to accelerate the pace of exploration.

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We therefore urge an approach that obtains near-term results — i.e., human exploration beyond LEO — as quickly and as pragmatically as possible. In an era when budgets are shrinking, as are both public and political attention spans, we believe this course is a must for human space exploration in the United States.

Specifically, what does this course imply? It means two things:

- Establishing a commercial crew capability to LEO and the international space station as rapidly as possible, in order to expeditiously free up resources within the human spaceflight budget for exploration, rather than expensive Soyuz seats.
- Using the savings accrued by adopting commercial crew to jump-start human exploration beyond LEO before SLS is ready. This can be accomplished by developing orbital refueling for and then human-rating one or more existing rockets to carry out simple exploration missions — such as lunar/near-Earth object flybys and orbiters — using the Multi-Purpose Crew Vehicle or other crewed spacecraft that can be ready by mid-decade.

Studies we and others have been involved in over the past 18 months have shown that this kind of pragmatic approach is feasible.

We believe that as soon as actual human visits to nearby worlds begin, the public excitement, scientific results and other benefits of this exploration will strengthen the desire for more of it, sustaining both SLS itself and NASA's exploration objectives set in the 2020s and beyond.

There is no need for us to begin political games. Nor is there a need for new mandates, visions or elections. We must instead find ways to provide nearer-term exploration.

So let's accelerate and invigorate human space exploration with human missions launched before this decade is out. In doing so, the exploration community can achieve the sustainability that has eluded us so far, and show a nation and the world just how creative and productive Americans of this generation can be in human space exploration.

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Mission First, then Heavy Lift

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Any rational follower of aerospace activities can't help but be baffled at current discussions between NASA and members of Congress centered on design and subsequent funding of a heavy-lift launch vehicle — an inversion of accepted, normal practice and unlikely to lead anywhere. As a "make work" program, the initiative is borderline irresponsible. There is no defined mission for a heavy-lift launch vehicle as yet, much less an approved, funded mission. Therefore, even if a heavy-lift program were to be started, it would be an easy target for cancellation during budget negotiations since there is no mission for it. The idea that "We will build it and they will come" is risky at best, especially when billions of dollars are involved.

Normal practice is to begin with a proposed mission. Every member of the congressional space committees knows this. President Barack Obama should have known this when, in his April 2010 speech to aerospace workers in Florida, he called for development of an advanced heavy-lift rocket.

A mission concept can come from anywhere — from the president, from agency heads or their staffs, and even from a low-echelon engineer/visionary who metaphorically flutters his butterfly wings with an idea, eventually to become a storm half a world away.

With the identification, description and approval of a mission, the next step is to provide funding for requirements definition, preliminary designs and planning. This is the point at which the proposed launch system emerges, whether existing or a new design, and where the first credible projections of incremental and total cost are revealed. If the mission requires a heavy lifter, competition, not congressional direction, will determine how the rocket will be built.

In a new, ambitious mission that could call for heavy-lift capability, serious consideration should be given to avoiding what has historically characterized manned space ventures as "been there, done that." The term describes lunar exploration, Skylab, the space shuttle and looming ahead, because its replication is unlikely, the international space station (ISS). In the latter case there is opportunity to do something that has legs far into the future.

Although the life of the ISS is variously projected 10 and 20 years into the future, the truth is that the system has turned vulnerable. The original system was an active symbiosis between shuttle and spacecraft. Half of that duality has been retired, leaving the station in the awkward situation of dependency on Russian launch vehicles for personnel and supplies transfer. The recent loss of a resupply flight clearly illustrates the fragility of the remaining system.

U.S. space planners need to move sensibly and soberly to ensure that ISS and manned operations in Earth orbit do not again end up a "been there, done that" phenomenon. The end of ISS could mean another 20- or 30-year hiatus before manned operations are resumed in a long-term orbital outpost.

Coincidentally, the only sensible mission on the horizon that can both justify development of a heavy lifter and set the stage for more ambitious explorative missions is to extend and grow manned presence in near space in a seamless transition to an already tested, more flexible and more economical system than ISS.

NASA pointed the way in the post-Apollo years when the Skylab orbital workshop was launched in 1973. Even though damaged in flight, the station was host to three different pairs of astronauts for 28 days, 59 days, and 84 days successively. Though there was a strong contingent within NASA hoping to continue with the program, the agency elected instead to undertake development of the space shuttle with a companion Spacelab shrunken to fit inside the cargo bay. Spacelab was built and seven dedicated missions (two were German) were flown between 1983 and 1993. The total time in orbit: 59 days. In contrast, Skylab was manned for 171 days. Eventually, Spacelab morphed into the modules on the U.S. section of the ISS. The current U.S. space presence is not much different from Skylab, which was designed for three astronauts. Even now, it would not be much of a stretch to "unshrink" Spacelab to the original Skylab concept.

By now it should be evident that it is going to be slow going if the United States is unable to field more than two or three astronauts, one mission at a time. This can be changed.

Skylab pointed the way to the possibility of turnkey space stations that can serve various requirements, including scientific research, industrial research, manufacturing and processing, military missions, and even safe, robust tourist destinations.

In concept, turnkey stations would consist of a robotically serviced standard bus that provides electrical, station-keeping and other services with interface capability to a variety of applications modules. The approach would enable the United States to offer launch and orbital services to nations around the world that otherwise would never have any hope of launching 100-ton payloads for their own research purposes. The system, were it to be put into place, would have the following main benefits:

- A seamless transition from the expiring ISS into more modern, flexible systems.
- A huge new business base, populating low Earth orbit with multiple, productive workstations.
- Uniform, safe global control over large objects going into space as well as large-mass re-entry safety.
- Availability of heavy lift, which will open the gates to a variety of ambitious missions — a lunar base, Mars exploration, an asteroid landing, deep-space exploration, a space power prototype, perhaps even the first interstellar probe.

In this ambitious but readily achievable manned space scenario, a new mantra would become obvious for future space undertakings: Because we can.

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