Outsourcing the ''final frontier''

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"*I believe it is obvious to most that, if a desired product lies within the state of the art, it can be provided with substantially greater efficiency by the commercial sector than by the government*."
- Michael D. Griffin, Former NASA Administrator

The proposed 2011 NASA Budget [1] takes human spaceflight in a bold new direction. Along with scuttling the Constellation Program [2], and investing in heavy-lift rocket systems, the proposal leans heavily on the private sector. The International Space Station received clemency through at least 2020, and with the Space Shuttle retiring in 2010, the US will need reliable means of orbital transportation. Thus, we either hitch rides on Russian Soyuz spacecraft, or invest in the US commercial sector. The choice is clear.

A picture of Mars taken from the Hubble Space Telescope. Will we ever set foot on the Red Planet?

On January 14, 2004, then President Bush announced his "Vision for Space Exploration [3]." This expansive policy set myriad benchmarks, including retiring the Space Shuttle and completing the International Space Station (ISS) by 2010, and developing it's successor, the Orion Spacecraft (part of the Constellation Program). The latter would take flight by 2014, and affect a return to the moon by 2020. The long-term plan was to establish a moon base, and use that as a springboard to exploring the universe, including Mars.

Yet, in many ways, the “Vision” was a step backwards. The craft itself was a throwback to the Apollo era—Bush described Orion as “the first spacecraft of its kind since the Apollo Command Module.” Michael D. Griffin, former NASA Administrator, lamented [4] that we’d spend the next 15 years “re-creating capabilities we once had, and discarded.” Many felt the focus should be on Mars, not the Moon. Buzz Aldrin, the second man on the moon, said [5] the best way to honor the Apollo astronauts “is to follow in our footsteps; to boldly go again on a new mission of exploration.”

But we could’ve been to Mars already save for crippling budget cuts in the early 70’s. In the wake of Apollo’s astounding success, the Space Task Group of 1969 [6] unequivocally supported a Mars mission—“We conclude that a manned Mars mission should be accepted as a long-range goal for the space program.” President Nixon’s response [7] conveyed a less-than-ringing endorsement—“We must build on the successes of the past, always reaching out for new achievements. But we must also recognize that many critical problems here on this planet make high priority demands on our attention and our resources.”

Nixon was presented with three choices, ranging from an $8-$10 billion option that would’ve included a Mars expedition, and both an Earth and Lunar Space Station, to a modest $4-$5.7 billion a year program that included an Earth-orbiting space station and the Space Shuttle. Nixon chose the cheaper option, and thus, we haven’t left Low Earth Orbit [8] in over 37 years. In this editor’s humble opinion, our reticence to explore beyond the exosphere [9], combined with a lack of clear policy goals (comparable to the “Space Race”) has killed public enthusiasm for space travel.

“Please tell me this isn’t a government operation”

The Space Shuttle program is a textbook case of government mismanagement. Proponents of the Shuttle claimed [10] it’d make space travel “routine and economical.” Instead, the Shuttle was developed [11] “only” 15% over the projected cost, and the per-mission cost was more than $140 million, a figure that when adjusted for inflation, was seven times greater than what NASA projected over a decade earlier. Nowadays, the average Shuttle launch costs [12] $450 million.

Space Shuttle Discovery launches at the start of STS-120.

How routine was it? NASA originally projected a weekly launch rate, a gross overestimate. That got downgraded to 24 per year. But then reality hit, and even in its heyday, the program hit a high launch rate [13] of nine per year (1985). In 2009, we launched [14] five. In 2008, it was only four, and in ’06 and ’07, a mere three!

The Shuttle has also exhibited an abysmal safety record. With 2.5 million parts, the Space Shuttle is one of the most complex machines ever devised. But as with every complex system, even its designers can’t anticipate every contingency (and with the Shuttle, literally millions of things can go wrong). Thus in the wake of the Columbia tragedy, the Columbia Accident Investigation Board (CAIB [15]) found “a NASA culture that had gradually begun to accept escalating risk, and a NASA safety program that was largely silent and ineffective.”

But it goes deeper. The Space Shuttle has fallen short on all fronts. As CAIB mentions, “NASA designed and developed a remarkably capable and resilient vehicle, consisting of an Orbiter with three Main Engines, two Solid Rocket Boosters, and an External Tank, but one that has *never met any of its original requirements for reliability, cost, ease of turnaround, maintainability, or, regrettably, safety.*” (emphasis mine). The Challenger disaster made the latter abundantly clear. Thus far, Shuttle disasters have claimed the lives of 14 astronauts. This works out to a fatality rate of approximately 2%. By contrast, the 2007 Motor Vehicle fatality rate

[16] per 100,000 licensed drivers was only .02% (i.e. statistically insignificant).

Constellation
The Constellation Program projected a return trip to the moon by 2020. But an independent panel [17] found it years behind schedule and over-budget. And the 2020 benchmark was hopeful, at best. The panel concluded that “there are insufficient funds to develop the lunar lander and lunar surface systems until well into the 2030s, if ever.” The last thing we need (especially in a recession) is another “Space Shuttle”—a bloated government program that doesn’t fulfill its original requirements. It’s time for a fresh approach.

On February 2, NASA Chief Charlie Bolden announced the winners [18] of the "Commercial Crew Development" (CCDev), a competition intended [19] to “develop and demonstrate human spaceflight capabilities” within the private sector. A total of $50 million dollars, appropriated from the American Recovery and Reinvestment Act (i.e. The Stimulus Act), was awarded to various companies for the purpose of facilitating transportation to and from the ISS. The alternative, as mentioned, is to hitch rides aboard foreign spacecraft for the 10-year gap between the retirement of the shuttle and the completion of the ISS.

A 3D model of SpaceDev’s Dream Chaser, a seven-person spacecraft. SpaceDev is a subsidiary of Sierra Nevada Corp.

Winners included Sierra Nevada Corp., Boeing, United Launch Alliance, Blue Origin, and Paragon Space Development Corp. The biggest share went to Sierra Nevada, which received $20 million towards development of the Dream Chaser [20], a seven-person orbital spacecraft. This is in addition to ongoing contracts with SpaceX and Orbital Sciences (worth a combined $3.5 billion) to build and launch unmanned cargo ships to the ISS.

Call your travel agent
Is there a market for space travel? Virgin Galactic [21] thinks so, and the company is banking on it. On December 7, 2009, VG unveiled [22] SpaceShipTwo (dubbed the

VSS Enterprise), the world's first commercial spaceship. Already, the company has 300 signatories on its waiting list at $200,000 a head—and this just for a relatively short suborbital flight. Supposedly, SpaceShipThree will be an orbital craft.

Burt Rutan (President of Scaled Composites, a partner company) claims [23] the Enterprise will be 100 times safer than government space travel. In contrast with Space Shuttles, which reenter at orbital speeds (25,000 km/h or 16,000 mph) and require heat shields (a factor which led to Columbia's destruction), the Enterprise uses a "feathered reentry system [24]" that results in low reentry speeds.

It's time for something new. The Apollo program was one of mankind's crowning achievements. But through shifting political winds (an inevitable factor in long-term government programs), Apollo gave way to the bloated, inefficient Space Shuttle program. And "re-creating" Apollo's capabilities would take decades. It's time to hand the reigns to the private sector.

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