U.S. Space Leadership: Reverting to the Mean?

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The phrase 'reverting to the mean' is often used in the financial industry to address the nearly-inevitable likelihood that a fund or stock's spectacular success over the long term (think ponzi-scheme king Bernie Madoff) is simply unsustainable. Reverting to the mean is viewed with such certainty it is sometimes linked two other high-probability events, death and taxes. But just what causes something to revert to the mean? Often it's because of changed conditions like market competition, consumer preferences, or government intervention (which itself is capable of pulling a company's returns back to earth or conversely, back from Chapter 11). Gaming is another great example of reverting to the mean: think about how many people had to *lose money* so that guy shilling for the gambling house on the radio could say "I won a hunnert fifty-six thousand dollars and you can be a winner too."

For some time, U.S. space programs have been reverting towards the mean. Ok, while there really isn't a real mean for space programs, the general idea is relative to the U.S., others are catching up, and relative to these others, the United States is not nearly as dominant as it has been. This seems to be especially true regarding the United States as a *space launching nation*. Need proof? Let's see--China now has a serious commercial space program and a robust manned space flight effort as well. When they get their heavy lift Long March 5 on line in 2014, they'll be capable of launching a wide variety of very heavy payloads including up to 55000 pounds to a low earth orbit, as well as to geosynchronous orbit and beyond. Russia? They possess the know-how behind the amazing RD-180 engines and some exceedingly mature space launch systems. Besides the space shuttle, the Russian Soyuz and Proton systems provide rides to the International Space Station. Arianespace? That French-led endeavor, along with its nine other European partners, are probably pretty happy with the Ariane 5's 32 consecutive successful launches. How about some other space launching nations that few seldom think of like India, Japan, and Iran? So far, indigenous South and North Korean space programs have only been suborbital...so far.

Reverting to the mean for U.S. *human space flight* isn't too bothersome--unless you're NASA--as the value of manned space flight is basically a spectacular stunt, kind of like a grizzly bear dunking a basketball. First you say "Wow!" Then you say "Weird." Next, it's "Are you going to eat the rest of that hot dog?" Finally you say "Why is that bear dunking a basketball anyway?" From a military perspective however, a loss of U.S. *space launch leadership* is more problematic: space launch is that necessary first enabler for all other operations in the space domain, such as the traditional unmanned space missions of providing ISR, communications,

weather, and GPS that not only enable the U.S. military but are also thoroughly intertwined with our economy.

Just as the United States has a national security requirement to be capable of performing military missions in the air, on the ground, and on and under the sea, we similarly have a need to be able to get to space and to operate our space systems. If we lose the ability to get to space, we put our capacity to operate in the space domain at serious risk. Because of the decision made to get military payloads off the space shuttle following the 1986 Challenger disaster and because we were then in the Cold War, a number of already developed space launch systems came quickly into great prominence.

The Atlas and Titan programs provided ICBM-based space launch vehicles and the Delta program, which started life as the Thor IRBM did the same. However, these recycled rockets, especially Titan in its heavy-lift configuration, were not particularly responsive nor were they cheap. As their fly-out approached, this afforded the military space community an opportunity to envision cheaper, better, and faster ways of getting to space, which became the Evolved Expendable Launch Vehicle program. But the assumptions associated with the EELV program-- that an "explosion" of commercial space activities would provide the military the ability to reduce its own launch costs by sharing expenses with other space launch users--has never come close to fulfillment. The lack of a robust U.S. commercial space launch industry for the size payloads the military and intelligence communities commonly fly has in fact resulted in massive EELV cost overruns and even more consolidation within the U.S. space launch service industry.

Now, the high cost of getting to space (as well as the high cost of satellites and associated space systems) is dragging U.S. space programs back towards the mean. With the DoD space systems, this is the culmination of excessive rework, of a requirements process that has trends towards exquisite solutions, the planned use of not-ready technologies, funding instability, and too often, a lack of government and contractor proficiency. Other nations seem to lack many of the cost-busting challenges the U.S. suffers from including their reduced labor rates and less entangled bureaucracies.

Is there anything that can save us from reverting to the mean? In the long term--50 years or more--maybe not. However, if things are to improve in the next five years, it is almost certain to be caused by market-based competition from U.S. launch systems like SpaceX's Falcon 9 or Orbital Sciences' Taurus 2 launch vehicles, or OSC's Peacekeeper ICBM-derived Minotaur 4 and 5 launch vehicles. These systems, using old-school rocketry like Falcon 9's RP-1 (kerosene that's been space-rated) and liquid oxygen burning engines and using similar proven concepts like recycling existing ICBM components a la the legacy Delta, Atlas, and Titan programs have an excellent chance to get our national space launch efforts back on a more affordable footing. While improvements in U.S. launch programs alone won't preserve our space leadership, they are an essential and compelling starting point to do just that.

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