The Air Force’s Evolved Expendable Launch Vehicle (EELV) program is the Department of Defense’s primary pathway for launching new assets into space. At just over 20 years of age, the program has been remarkably reliable, meeting USAF’s need for assured access to space. For over a decade, however, EELV has essentially functioned as a monopoly, and launch costs have become a problem. The reorganization of major launch service contractors and the arrival of new commercial service providers in the market-place have given EELV growing pains.

The program has now reached the cusp of a sustainable, competitive launch services enterprise. But several key questions remain before the Space and Missile Systems Center (SMC), manager of the EELV program, can declare success. Foremost among these is the operational reliability of SpaceX, whose ability to safely and regularly launch National Security Space (NSS) mission payloads is critical to providing competitive, affordable, assured access to space.

On the Brink
of Competition

The Air Force is as close as it has ever been to a legitimately competitive launch services program.

The concept validation phase of EELV was completed in 1996. The stated goal of the program at that time was to build a launch capability that "satisfies both government and commercial payload requirements and reduces the cost of space launch by at least 25 percent," according to an Air Force fact sheet. In 1998, Boeing and Lockheed Martin won development agreements and had been awarded initial launch services contracts worth a total of $3 billion. In August 2002, Lockheed’s Atlas V rocket carried out the first EELV launch by placing a commercial Eutelsat payload into orbit. Three months later, Boeing provided the second program launch—with another Eutelsat payload—on its Delta IV rocket.

For a while, the Air Force had a viable competition between two tested providers of launch services. But it became clear this arrangement wouldn’t last long when Boeing and Lockheed Martin won development agreements and had been awarded initial launch services contracts worth a total of $3 billion. In August 2002, Lockheed’s Atlas V rocket carried out the first EELV launch by placing a commercial Eutelsat payload into orbit. Three months later, Boeing provided the second program launch—with another Eutelsat payload—on its Delta IV rocket.

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These Atlas boosters, then in production at Lockheed Martin, supported the 2002 maiden flight of Atlas V. Lockheed and Boeing later consolidated their launch services as United Launch Alliance.

An upstart rocket company called Space Exploration Technologies Corp.—SpaceX—filed a federal lawsuit that October seeking to block the merger. SpaceX’s founder, Elon R. Musk, claimed that the joint venture would give ULA a monopoly on the business for government launch contracts. SpaceX also claimed ULA’s alleged violation would be consistent with a history of noncompetitive practices in the launch services market, including DOD’s payment to Boeing and Lockheed of extra-contractual subsidies, or assured access payments, that gave them an unfair advantage in technology development.

Despite Musk’s concerns, the Federal Trade Commission approved the merger, formalized in December 2006. SpaceX was defeated in court, but refused to give up on its goal of matching, and if possible surpassing, the space launch heavyweights by offering reliable NSS launch services at more competitive prices.

In September 2008, the company successfully launched its small Falcon 1 rocket and was planning more demonstrations with a heavier, EELV-class Falcon 9. The Air Force agreed to license a launch complex at Cape Canaveral AFS, Fla. for Falcon 9 development work.

BUILDING TOWARD COMPETITION

Some in Congress began to see the EELV program as too expensive. A 2011 report by the Government Accountability Office found that the government’s block buy approach to bundling launch services was locking in higher prices than necessary, and the 2012 National Defense Authorization Act included a requirement that the program demonstrate its response to the GAO’s findings.

In light of the promising developments from SpaceX, SMC also wanted the program to refresh its original goals of producing lower costs through competition. In October
2011, the Air Force announced implementation of a new strategy for the EELV program that partnered the service with NASA and the National Reconnaissance Office (NRO) to prioritize missions that could offer a “new entrant on-ramp opportunity.”

This strategy could put SpaceX’s aspirations to work. It would take nearly three more years before the Falcon 9 completed its three successful demonstration launches that the Air Force required to become eligible for a new EELV business. USAF had meanwhile announced its intentions to bid seven future launch contracts competitively. Before this could become a reality, SpaceX—on the brink of certification to bid for NSL launches—challenged EELV’s December 2013 launch contract in federal court, arguing once again the agreement blocked competition. Musk claimed that SpaceX was producing launches at one-fourth the cost of the $400 million average launch awarded to ULA in the contract, and the American people were losing money.

Congress seemed to agree. Senate Armed Services Committee Chairman Sen. John McCain (R-Ariz.) asked DOD’s inspector general to investigate why EELV had recently cut the number of competitive launch contracts from 14 to seven. After months of discussions, SpaceX and the Air Force reached an agreement in January 2015. Musk’s company dropped its lawsuit and the service established a clear and efficient time line for certification of the Falcon 9 for NSL competition. The Air Force granted that certification four months later, and SpaceX was finally cleared to compete for EELV launch contracts. In September 2015, SMC released a request for proposal for an EELV Phase 1A round of GPS III launch contracts, to be awarded under the new competitive acquisition strategy for National Security Space, “but there’s still detailed work from a design verification standpoint.”

Today, SpaceX remains in an EELV limbo of sorts. It has won two competitive contracts, but has not yet successfully launched a payload connected to the program. This doesn’t worry Leon, who told Air Force Magazine that SpaceX is on a typical path of assessment leading up to readiness for secure launch. “We have agreement on what it takes... to qualify the vehicle for National Security Space,” she said, “but there’s still detailed work from a design verification standpoint.”

While the Falcon 9 upgrade configuration is certified by SMC, the rocket will still have to undergo “a recurring flight worthiness process to ensure [that] the flight hardware for a specific mission meets our technical requirements,” Leon said.

The contract, throwing it to SpaceX by default. Brett Tofey, ULA’s vice president for engineering, said the company withdrew because it wanted to avoid a “cost shootout” with SpaceX. He resigned following that comment, and McCain called for another investigation.

SpaceX could still claim victory for having won its first EELV contract—and having done so at a much lower cost. But the way forward would not be without difficulty of its own making. The company lost Falcon 9 rockets to explosions once after launch in June 2015 and again during prelaunch checks in September 2016.

Since these accidents, SpaceX has offered an upgraded configuration of its Falcon 9 rocket, and it says it has addressed the anomalies that led to the failures. The Falcon 9 upgrade has been certified by SMC for launch, and this March, SpaceX won the contract for the third GPS III launch—this time with ULA in the competition. SMC launch enterprise director Claire Leon made it clear, in a phone call with reporters, that SpaceX won out on price.

**IDENTIFYING A NICHE**

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**Photo:** Matthew Jurgens/USAF; SpaceX

And we’re back: The first stage from a SpaceX Falcon 9 rocket lands at LZ-1 in May after launching an NRO satellite.

**Photo:** Matthew Jurgens/USAF; SpaceX

**This July 2016 time exposure shows a Falcon 9 taking off (left) from Kennedy Space Center with supplies for the International Space Station, as its expended first stage lands (right) at Landing Zone-1 (LZ-1), a former Cape Canaveral Air Force Station launch complex.**

Despite having lost two competitive contracts in a row to SpaceX, ULA CEO Salvatore T. “”Every”” Bruno is optimistic about winning future launch contracts.

“The way those first two GPS competitions were structured,” Bruno told Air Force Magazine, “the bidders meet a minimum standard, and then once they meet that standard, the only differentiator is the price.” That’s why SpaceX has a two-zero record in the Air Force’s first truly competitive launch program, said Bruno.

“We do not expect to underbid SpaceX’s price for any of these types of missions,” he said. GPS III satellite launches are examples of “missions for which there is a higher risk tolerance on the part of the government”—the contract decisions can focus more singlemindedly on price. “It’s those low risk tolerance missions,” like the Space Based Infrared System early missile warning and Advanced Extremely High Frequency military communication satellite launches, “where we are the most competitive,” Bruno insisted.

So instead of trying to beat SpaceX at their own game of extremely low-cost launch, “I intend to bring better value, more reliability, more schedule certainty, and higher performance. That’s worth more than the higher price I’m going to offer,” said Bruno.
SMC’s most recent draft request for proposal (RFP) for launch services, released in May, includes three of the lower-cost GPS III missions. The other three missions will require a heavy configuration, versions of which ULA already has certified for both its Delta IV and Atlas V rockets. SpaceX is developing a heavy configuration for its Falcon 9 system, but certification is still in the early stages, Leon said. It is possible SpaceX’s heavy could compete for the first batch of launches, she said, “but they have a fair amount of work to do.”

A draft RFP for a second block of six launches is expected by the end of the year, and “within that there are some high-end missions that would likely put a real premium on reliability and schedule certainty,” Bruno said. He thinks ULA will compete much better for those launches. While stressing that “every mission is unique, and we have a unique set of evaluation criteria for every RFP,” Leon agreed that for some of the more technically demanding missions, “if ULA has demonstrated that capability before, then that gives us more assurance.”

Despite ULA’s focus on high-end missions, Bruno said it has also taken measures to cut costs in the last few years. The consortium has reduced the cost of its Atlas rocket by one-third, he said, and has eliminated a third of its executives. It has consolidated supply chains and plans to shut down three of its five launchpads. ULA is working on a second round of layoffs. The first round, last year, cut 350 positions, and the current round is “along that size or larger,” Bruno said.

THE FUTURE IS RECYCLED

Despite the focus on cost in the media and Congress, Leon insists that price always comes second for the EELV mission. “Mission assurance and high reliability is of even more importance,” she said. But this is the kind of caution that has earned the EELV program consistent criticism from lawmakers, the GAO, and others. The Air Force maintains that the program is chasing innovation within the framework of the responsibility that comes with launching what Leon called “some of the nation’s most precious assets and most capable satellites.”

The cost equation changes dramatically if a billion-dollar payload is destroyed or fails to reach a functional orbit. The question now testing EELV’s appetite for risk is whether the program will use recycled booster rockets.

In late March, SpaceX succeeded in relaunching a recovered Falcon 9 booster, an advance that promises enormous cost savings if its reliability can be consistently demonstrated. The cost to refurbish SpaceX’s recycled Falcon 9 booster was “substantially less than half the build” cost of a new rocket, said Gwynne Shotwell, company president and CEO, at the 33rd Space Symposium in Colorado Springs, Colo., in April. Shotwell said the company ultimately wants to “refly a rocket within 24 hours.”

THE AIR FORCE IS INTRIGUED

“I would be comfortable with flying with a reused booster,” said Gen. John W. “Jay” Raymond, chief of Air Force Space Command, at a press briefing at the Space Symposium. “They’ve proven they can do it. We’d make sure that we can do it safely, but I’m pretty [sure] we’ll get comfortable with doing that.”

When asked if recycled rockets could be used for launches as soon as EELV Phase 1A, Raymond was unwilling to commit to a timetable, but said, “I’m open to it.” SMC’s Leon expressed similar optimism with a bit more caution. “We don’t have a schedule for it yet” at EELV, she said. She thinks the Air Force is more likely to use recycled boosters first in “experimental-class programs” that can take advantage of rapid acquisition authorities. “You’re not going to see it in phase 1A as far as I can tell,” Leon said.

Congress is also interested in recycled rockets. At the House Armed Services strategic forces subcommittee markup hearing on June 22, Rep. Trent Franks (R-Ariz.) put forward an amendment that “the US government should fly reusable rockets when it’s safe and makes sense to do so.” The amendment was approved by voice vote and will be included in the House version of the 2018 National Defense Authorization Act.

As for EELV, “what we’re trying to do is in future competitions not necessarily preclude the ability to use a relaunched vehicle,” Leon said. While she thinks “it’s a good thing” that Raymond has stated his openness to the possibility, “it’s not the highest priority right now.”

The top priority remains assured access to space for the US military. Reusing boosters, lower-cost launch, and competition are all techniques that are useful insofar as they help SMC achieve the goal of an ever faster and more reliable capability to get new assets on orbit for US military missions in a world that makes greater use of space-enabled combat with every passing year.