

◀Military Space Quarterly▶

SpaceX Gears Up for Launches at Vandenberg Air Force Base

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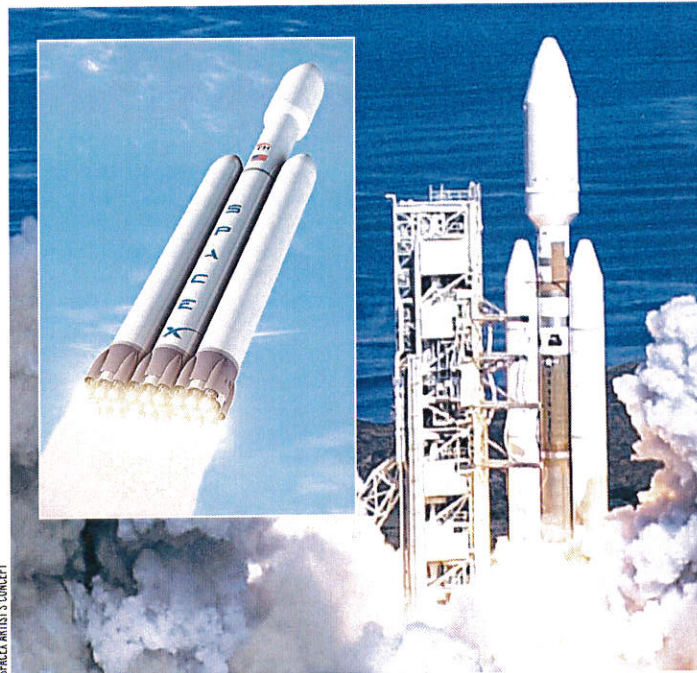
As Space Exploration Technologies Corp. (SpaceX) ramps up for regular cargo runs to the international space station from Florida, a new launch site to put satellites into polar orbits from California is on track to debut next year.

The company, which in October completed the first of 12 planned space station resupply flights under a \$1.6 billion NASA contract, is refurbishing Space Launch Complex-4 (SLC-4) East at Vandenberg Air Force Base, located 150 miles northwest of Los Angeles.

"It will be online early next year," SpaceX's commercial crew project manager, Garrett Reisman, said at the International Symposium for Personal and Commercial Spaceflight in New Mexico last month.

The launch complex, originally built for Atlas rockets, was modified in the 1970s for the military's Titan boosters. It was last used for a Titan 4 launch in October 2005. SpaceX plans to use the pad to launch Falcon 9 and Falcon Heavy rockets.

The company reportedly has spent up to \$30 million to remove mobile service and umbilical towers at SLC-4 East and build a 2,800-square-meter integration and processing hangar. An existing concrete pad and flame



SpaceX's Falcon Heavy rocket (inset image) will launch from a rebuilt launch complex at Vandenberg Air Force Base, Calif., last used to launch a Titan 4 rocket in October 2005.

trench will be reused.

Two Falcon flights are on the manifest for launch from Vandenberg in 2013. First, an upgraded Falcon 9 rocket will carry a Canadian Space Agency communications and research satellite called Cascade Smallsat and Ionospheric Polar Explorer, or Cassiope. Before the end of the year, SpaceX is aiming to debut its heavy-lift Falcon, a potential game-changer for the U.S. launch industry.

Intelsat, the world's largest

communications satellite operator, last year signed up for the first commercial launch of a Falcon Heavy, which is designed to carry twice as much as the United Launch Alliance (ULA) Delta 4 Heavy, currently the biggest rocket in the U.S. fleet.

With a payload capacity of 53 metric tons to low Earth orbit, Falcon Heavy's commercial price ranges from \$83 million to \$128 million — about one-third the cost of Delta 4 or Atlas 5 launch.

Falcon Heavy will fly from SpaceX's launch site at Cape Canaveral Air Force Station as well as from Vandenberg.

"[I] am hopeful we will do the first Heavy flight from Vandenberg towards the end of next year, and from the Cape in 2014," Elon Musk, SpaceX founder, chief executive and chief technical officer, wrote in an email to *SpaceNews*.

Falcon Heavy also could play a role in NASA's planned deep-space exploration initiatives. The agency is developing its own heavy-lift Space Launch System (SLS) and Orion capsule for human missions to asteroids, the Moon and eventually Mars.

"It is up to NASA as to whether they would consider Falcon Heavy/Dragon for deep space missions. We would not propose to do this instead of SLS/Orion, but rather in addition to," Musk said.

SpaceX has its eye on another customer — the U.S. military, which currently is in a near-exclusive and expensive relationship with ULA.

In addition to soaring costs for ULA's rockets, the military pays the company, which is jointly owned by Boeing and Lockheed Martin, more than \$1 billion a year under a separate contract for engineering, maintenance, processing and other support.

ULA says the contract has been key to becoming more efficient and cutting costs.

"We have been delivering effi-

ciencies on this capabilities contract consistently since ULA formed. We've actually seen about 5 percent improvement, year over year — greater than a 30 percent total cumulative savings — and we expect to continue to see savings in the future," Tony Taliancich, director of ULA's Customer Program Office, told *SpaceNews* during an informal briefing with reporters at Cape Canaveral last month.

The Air Force is in the midst of deciding how it wants to proceed with future launch services purchases.

"The government has laid out an acquisition strategy that says in the next block they would transition to an all-up launch service price," Taliancich said. "The timing still has to be worked out."

For now, ULA is standing behind its near-perfect six-year track record of 65 missions. But that wall may not last for long. With four flights of Falcon under its belt and a long line of customers in the wings, SpaceX has no intention of backing off its challenge to ULA's monopoly.

"The real question is why isn't a competition being held? SpaceX isn't demanding that it be given anything, we just want the Air Force to hold a competition," Musk said.

"If Falcon 9 is good enough for dozens of commercial satellite operators and NASA, including science missions like JASON 3 and future human transport missions, then why not the Air Force?"

U.S. Air Force Plans Annual Piggyback Flights Starting in 2014

DEBRA WERNER, SAN FRANCISCO

The U.S. Air Force is preparing to establish a new service for secondary payloads. Starting in 2014, the service plans to conduct annual flights of an adapter designed to mount six secondary payloads on Evolved Expendable Launch Vehicles (EELVs), the rockets the U.S. government relies on to send large satellites into orbit.

Some Air Force and industry officials have pushed for this type of service since the first EELV Secondary Payload Adapter (ESPA) ring was launched in 2007 aboard the United Launch Alliance (ULA) Atlas 5 rocket that carried the first Space Test Program mission into orbit. The Air Force has many Evolved Expendable Launch Vehicle (EELV) missions scheduled during the next five years "with anticipated excess weight margin," former U.S. Air Force Secretary Michael Wynne wrote in a Feb. 13, 2008 memo. "We should leverage this excess capacity by maximizing our use of ESPA."

Since Wynne issued that memo, only one ESPA ring has flown. In 2009, NASA used

the excess lift capacity on an Atlas 5 rocket carrying its Lunar Reconnaissance Orbiter to launch the Lunar Crater Observation and Sensing Satellite (LCROSS). To look for water ice buried in lunar craters, engineers from the NASA Ames Research Center and Northrop Grumman Corp. fitted an ESPA ring with sensors, antennas, propulsion, communications and navigation systems to gather information as the Centaur upper stage and then the LCROSS spacecraft crashed into the lunar surface.

Although Wynne called on the Air Force to conduct routine ESPA flights in 2012, the Air Force now plans to initiate ESPA service in early 2014. "The EELV ESPA program currently consists of development of an ESPA ring and implementation of an ESPA standard service with the expectation of one ESPA launch per year beginning in 2014," Air Force Space Command spokeswoman Jennifer Green-Lanchoney said Nov. 8 in a written response to questions. "Future ESPA standard service flights will be manifested based on availability of sufficient excess capacity and mission configuration requirements."

Government and industry officials offer several explanations for the slow adoption of ESPA rings. Some of the customers who pay launch vehicle providers to send their billion-dollar satellites into orbit are reluctant to share the ride with small satellites for fear those missions could cause delays in the primary satellite's integration and launch. At the same time, some small satellite developers have so little funding they are looking for a free ride into orbit and cannot afford to pay even a small fraction of a large rocket's launch cost.

Nevertheless, interest in ESPA missions is growing as new entrants shake up the launch vehicle industry. "There has been an uptick in ESPA activity in the last three to six months," said Joe Maly, ESPA product manager for MOOG CSA Engineering of Mountain View, Calif., the firm that developed ESPA rings while working under contract for the Air Force Research Laboratory in the 1990s. Maly attributed some of that activity to the competitive launch market. Both the Falcon 9 rocket built by Space Exploration Technologies Corp. of Hawthorne, Calif.,

and the Antares rocket built by Dulles, Va.-based Orbital Science Corp., the two vehicles selected by NASA to ferry cargo to the international space station, are designed to be compatible with ESPA rings.

In addition, companies are developing more capable ESPA variants. Initially, ESPA rings were simple devices designed to mount six payloads weighing 180 kilograms each between the primary payload and the upper stage of an Atlas 5 or Delta 4 rocket. "Now, customers want their own avionics, solar arrays and ability to maneuver in orbit," Maly said.

Seattle-based Spaceflight Inc. is marketing space for secondary payloads on Falcon 9 flights. The payloads would fit on a Spaceflight Secondary Payload System (SSPS), a ring similar to ESPA that features avionics, power and telemetry systems to support five payloads weighing as much as 300 kilograms. In addition, Spaceflight and its sister company Andrews Space are working to develop Sherpa, an in-space tug and satellite

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Pentagon Orders Study of Commercial Satcom Opportunities, Barriers

WARREN FERSTER, WASHINGTON

Citing missed opportunities to utilize the commercial satellite telecom sector, the Pentagon's No. 2 official has asked an independent advisory panel to look into the matter and identify possible ways to fix the problem.

In a memo dated Sept. 3, U.S. Deputy Defense Secretary Ashton Carter directed the Defense Business Board to identify opportunities, obstacles and corrective actions related to leveraging private-sector satellite communications capabilities. The board advises the Pentagon on effective business practices as they apply to military activities.

According to the memo, the Pentagon is frequently approached by companies offering "highly desirable and time-sensitive commercial satellite communication capabilities" that often require an up-front funding commitment for a multiyear period. The Defense Department (DoD) has been unable to take advantage, either because of inflexible procurement procedures or a "culture that appears to resist dependence on commercial providers for satellite services," the memo says.

A copy of the memo was obtained by *SpaceNews*.

"Some obstacles, like congressional funding and other statutory



Ashton Carter

restrictions ... are beyond our control; however, there may be some changes in existing regulations

processes that could allow DoD to better leverage opportunities from the commercial satellite service providers," Carter wrote.

The study task force will examine opportunities including expedited methods of acquiring commercial satellite capabilities and services, the memo says. "Examples of space goods and services include but are not limited to: payloads hosted on commercial satellites, service-level agreements for commercially provided space-based capabilities," the memo says.

The roadblocks identified in the memo include legal, cultural, administrative and programmatic. Specific examples include restrictions against multiyear funding

commitments and the need by some vendors for an initial upfront commitment so they can obtain private-sector financing for their projects, the memo says.

The task force should identify ways to overcome these barriers to make commercial satellite capabilities more widely available to Pentagon users, the memo says. "The corrective actions should specify which actions can be accomplished within existing legal authorities, and which actions require a change to existing statutes, regulations or processes," Carter wrote.

The memo did not specify a due date for the study results. A spokesman for Carter could not immediately be reached for comment.

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platform that adds capability to SSPS to move secondary payloads from the place where a primary mission drops them off to their desired orbital slot.

Orbital also announced plans in October to develop an experimental platform designed around an ESPA ring under a five-year, \$32 million contract awarded by the Air Force Research Laboratory. The ESPA Augmented Geostationary Laboratory Experiment Platform will be designed to host six payloads in geosynchronous, geostationary or low Earth orbit, Orbital said in an Oct. 24 statement.

As ESPA interest picks up, launch vehicle providers are working to ease the concerns of their primary mission customers. "The ground rules are that whatever secondary missions we carry have no impact on the primary mission," said Tony Taliancich, customer program office director for Denver-based ULA. "You don't want to impact

schedule, interfere with technical activities or increase risk. Generally that's not too hard to accomplish."

ULA is expanding its secondary payload services. "We have developed a number of concepts to utilize some of the excess performance and volume on launch vehicles," Taliancich said.

On Sept. 13, an Atlas 5 rocket carrying a classified National Reconnaissance Office (NRO) payload also launched 11 cubesats. The miniature satellites were enclosed in the Centaur upper stage Aft Bulkhead Carrier, an external platform developed by NRO and ULA to accommodate secondary payloads with a maximum weight of 77 kilograms. ULA is offering space for secondary payloads of different shapes and sizes on a variety of internal and external platforms. The company can accommodate secondary payloads ranging from one-kilogram cubesats to 5,000-kilogram satellites that could be sent into orbit alongside another large spacecraft in a dual-launch configuration, he added.

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five years, including testing, the report said. "Any program restart must be integrated into the B-2 flight test and modernization schedule," the report said.

Delivery of the initial FAB-T terminals for presidential conferencing is expected to begin in 2015 and be completed four to five years later, the report said.

The VLF radios, meanwhile, will provide a "very high probability" of providing proper reception over the entire Northern Hemisphere from top military officials, according to the report. To reach far-flung

strategic bombers, the VLF signals will be relayed from command authorities via aircraft-based transmitters, the report said.

Richard Esposito, a Boeing spokesman, said via email Nov. 8 that all of the issues associated with the company's development of FAB-T have been addressed.

"The need to address interim solutions is driven by the timing of funding for production terminals," he said. "Boeing is working with the government to offer options for providing FAB-T terminals for the B-2 and B-52 bombers and the RC-135 aircraft as fast as the funding can be made available to support this need."

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meeting this past April, in which the U.S. government asked the MoD to develop such a capability, the MoD said in its email.

"There is a strong political pressure for MoD to take this program because of American demand for a military-to-military program," said Kazuto Suzuki, an expert on Japanese space policy and an associate professor at the Hokkaido University in Japan. "I believe that it is largely because of the information sharing issue with U.S. mil-

itary, which is understandable given the sensitivity of [space situational awareness] data."

Suzuki said the relatively modest investment in the radar modifications reflects the fact that space situational awareness is a lower priority than communications, intelligence, surveillance and reconnaissance capabilities. "The MoD has found that the best way of dealing this issue is to use existing FPS-5 for [space situational awareness], so that the investment is minimized to the cost of testing," he said.

Britain Readies 4th Skynet for Dec. Launch

PETER B. de SELDING, TOULOUSE, France

The fourth and likely the last of Britain's Skynet 5 military telecommunications satellites, Skynet 5D, is scheduled to arrive at Europe's Guiana Space Center spaceport in South America by mid-November to prepare for a Dec. 19 launch aboard an Ariane 5 ECA rocket.

Riding with the 4,900-kilogram satellite will be Mexico's Mexsat 3 telecommunications satellite, a small example of Skynet 5's status as a military satellite at home in the commercial world.

Nearly 10 years after the Skynet 5 contract was signed, it remains either an avatar of future military telecommunications programs or an anomaly — it depends who is asked.

This year, the French defense minister said France would not seek to sell its current Syracuse 3 military telecommunications satellites to the private sector as part of an outsourcing of military satellite communications services.

The U.S. Air Force similarly has struggled with multiple proposals to commercialize the less-strategic military satellite telecommunications systems, but up to now has been unable to find the formula.

Germany, Italy and Spain have moved partly in the direction of privatization.

None has gone as far as Britain and Astrium Services, which as of 2003 took ownership of Britain's old Skynet 4 satellites and committed to provide a protected communications service to British military authorities with satellites that Astrium would purchase, launch and own.

Originally foreseen as two satellites, the contract has evolved to comprise four Skynet 5 spacecraft and extended to 2022 with an estimated total value of up to 3.6 billion British pounds (\$5.75 billion).

Astrium Services has agreed to provide surge capacity to British forces and has built satellites that account for this while also giving the company additional capacity to sell to third parties approved by British authorities.

To date, Astrium Services has sold Skynet 5 X-band capacity to NATO and to the governments of the U.S., France, Germany, Portugal, Canada, Austria, the Netherlands, Slovenia, the Czech Republic and Germany.

In addition, Astrium Services, through its London Satellite Exchange affiliate, can purchase L-, C- or Ku-band capacity available on

the commercial market to complement the military UHF or X-band aboard Skynet 5.

As the years have passed since the contract was signed in 2003, Astrium has been able to use the British government's anchor customer status to upgrade Skynet-related ground equipment and services.

"We can do the capex," said Simon Kershaw, executive director of Astrium Services Government Communications, referring to the capital expenditure required to upgrade the Skynet system. "Then the customer comes in and buys a service on a usage basis, so there is a continual technology refresh going into the infrastructure. Under a conventional government buy, this would take forever to procure. But we understand that there will be a minimum volume that makes our investment worthwhile."

In a Nov. 6 press briefing here on Skynet 5 before Skynet 5D left Astrium Satellites' factory for the launch site, Kershaw said that different nations' tax laws may partly explain why the Skynet 5 example has not been followed by others. But he rejected arguments that the British defense establishment is unhappy with the program after 10 years.

"I don't think they would have extended it to 2022 if this was the case," he said. "Clearly governments have a need for sovereign control of these kinds of assets and we have been able to guarantee that with Skynet 5."

"Overwhelmingly, we have gotten support from the customer that this is a success. The senior [British] military will stand up and stand alongside us and express their support for it."

Astrium is now discussing with British authorities on what happens next for Skynet 5 and a possible follow-on system given the evolving military requirement and the troop withdrawals from Iraq and Afghanistan.

With Astrium's purchase of the X-band capacity being launched aboard Telesat Canada's Anik-G1 commercial telecommunications satellite over the Pacific in early 2013, the company will have a near-global X-band coverage stretching from 178 west to 135 degrees east in geostationary orbit.

What Astrium Services does not have is a Ka-band offering for military customers. Kershaw said Astrium understands that U.K., U.S. and other military forces are moving to Ka-band for broadband links. Sooner or later, he said, the company will address that demand.