

Gulf Coast Reporters' League

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A bi-monthly update of aerospace activities in the Gulf Coast I-10 region

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Farnborough International Airshow photo by Phil Weymouth

Aerial view of the Farnborough International Airshow held in July near London, England.

Farnborough: cementing bonds

The announcement from the Farnborough International Air Show last month was on the first day of the business session, and it was big.

Aerojet Rocketdyne said the assembly and testing of its AR1 advanced liquid rocket engine will be done at NASA's Stennis Space Center, Miss., adding about 70 jobs to its workforce of 130 already at SSC (*page 7*).

But announcements like that are not the norm. Indeed, what does not get publicity are the relationships that are developed and nurtured at the air show, which are key to the whole process. Those are investments of time and effort that might not have any payoff for many years to come.

By David Tortorano

Mobile, Ala., can certainly attest to that. It took a decade before its relationship with Airbus finally resulted in the city becoming the site of an A320 assembly line.

Delegations from Alabama, Florida, Louisiana and Mississippi attended the July 11-17 show, many of them were from the Gulf Coast I-10 aerospace region. They'll tell you the show is one of the few opportunities where they can get access to a lot of companies and top officials at one location.

"If we traveled all over the world it would cost an enormous amount," said Melissa Medley, executive director of the four-state Aerospace Alliance.

There were 1,500 exhibitors from 52 countries. Across five days of the trade

show - day one closed early due to heavy rain - the show recorded over 73,000 trade visits with about 25 percent of the visitors being either chief executive officer or director-level. There also was a significant increase in attendance of people responsible for procurement. On day one more than half of the visitors were from overseas, many with pre-arranged meetings.

Delegation visits have also increased, according to the FIA, with 98 military delegations attending from 66 countries and 29 commercial and civil delegations attending from 22 countries.

One of the highlights of the show, both in Farnborough and in alternating years in Paris, is the pre-show reception put on by the Aerospace Alliance. It was held the day before the show on the River Thames.

"It also kind of serves to unofficially kick off the larger event," said Medley.

The group, which represents Alabama, Florida, Louisiana and Mississippi, was formed when Mobile was in the running to build tankers for the Air Force. That project went to Boeing and Washington state, but the alliance remained to promote the region.

For the past seven years the Aerospace Alliance has held receptions that averaged 300 guests, including corporate and government officials. This year NASA officials also attended.

The two-hour reception is a way to connect and renew acquaintances, and to generate additional meetings. And the meeting is become well-known.

"When I called folks, they knew who we were, they knew what we were, they knew about the event and wanted to be part of it," Medley said.

"It creates and awareness," and puts the four states in the forefront even before the show begins.

For Roger Wehner, executive director of the Mobile Airport Authority, said having a list of successes makes it easier to appeal to others.

In addition to having an Airbus plant churning out A320 series jetliners - the first one was delivered in April 2016 -

Mobile has attracted more than a dozen suppliers.

Many of the newcomers to Mobile were announced last year during the June 15-21 Paris Air Show. On the first day it was Hutchinson Aerospace, and the next day MAAS Aviation said it would build a second paint operation in Mobile. Messier-Bugatti-Dowty said the next day that it would open an operation at the Mobile Aeroplex.

"We have a portfolio of successes. They have served us well as we communicated with prospective new ones," said Wehner. "It's kind of like a calling card."

Others from the Gulf Coast region are also in the race to land more aerospace operations. Rick Byars, head of economic development for Gulf Power, said Northwest Florida had 11 representatives.

"Northwest Florida is clearly being talked about more and more," he said, then added, "We're very close to finalizing a couple of deals."

Florida's Great Northwest coordinated the appointment-setting process, said Byars, noting there were more than two dozen meetings with companies. Of those, "we've had ongoing meetings" with 14 or 15 of them.

Shannon Ogletree, executive director of the Santa Rosa County Economic Development Office, said it was probably the most productive overseas trade mission. His county, home to Naval Air Station Whiting Field, is the immediate neighbor of aerospace powerhouse Eglin Air Force Base.

He said part of the reason this show seemed particularly productive was because of the number of people who wanted to hear "the pitch." He said there were up to 30 meetings, and "that's quite a bit over four days."

Wehner, Byars, Ogletree and Medley all said they thought the show was one of the best and most productive.

Meanwhile, competitors Boeing and Airbus spent the week adding to their backlogs, combining for more than \$60 billion in orders and commit-



There were 110 aircraft that participated in flying and static displays during Farnborough trade week.

Aircraft making debuts were the Lockheed Martin F-35, pictured above, the Boeing 737 Max, Bombardier C Series, Embraer E190-E2, Embraer KC 390, Embraer Legacy 500, Antonov AN-178, HondaJet, Diamond Dart-450 and Gulfstream G500.

- Photo by Phil Weymouth

ments at list prices.

Airbus said it left the show with deals for 279 planes with a list value of \$35 billion. Boeing said it secured orders and commitments for 182 aircraft at a list value of \$26.8 billion, according to the *Wall Street Journal*. Of those orders, Airbus had 197 new firm orders worth \$25 billion and Boeing 19 new firm orders listed at \$3 billion.

There is a growing order gap in the single-aisle market. The A321neo and the 737 Max 9 are direct competitors. AirAsia ordered 100 A321s, but the 737 Max 9 received none.

Last year at the Paris show Airbus walked away with \$57 billion worth of business for a total of 421 aircraft, including 103 firm orders for the A320 series of jetliners.

At the 2014 Farnborough show, Airbus landed nearly twice as many orders and commitments. Airbus said its orders and commitments at Farnborough for 496 planes valued at \$75 billion. Boeing secured business worth \$40.2 billion for 201 planes.

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Unmanned

Drones growing SSC science repertoire

In the 1960s South Mississippi began working in the new field of space exploration and later oceanography, now unmanned systems has been added to its impressive science portfolio...

Stennis Space Center, Miss.

A federal facility best-known for testing huge space rocket engines has added to its repertoire over the years. The most recent capability is in a field growing in leaps and bounds: unmanned systems.

And a recent Federal Aviation Administration (FAA) decision to expand the restricted air space over NASA's Stennis Space Center (SSC) promises to make it a key activity.

"The expansion will add to our ability to support the emerging unmanned systems industry, and it positions Stennis as an ideal destination for companies looking to create jobs," said Gov. Phil Bryant, who also said the expansion will enhance SSC's rocket testing mission and lead to more innovation.

Since it was established in the 1960s to test Apollo rocket engines for lunar missions, SSC has expanded beyond its propulsion role to host numerous government agencies and private companies involved in aerospace, oceanography and other fields. So it's not surprising the center again is on the leading edge of the development of unmanned civilian and military systems.

Today at SSC activities with an unmanned systems spin include the recently established National Oceans and Applications Research Center, Innovative Imaging and Research, and the Alliance for System Safety of UAS through Research Excellence. In addition, the Navy, the largest tenant at Stennis Space Center, is expanding its

By Lisa Monti



Submitted photo

Department of Marine Resources guide Mike Pursley flies the I2R C-Hawk.

development and use of unmanned systems in support of naval operations.

Here's a closer look at each:

The National Oceans and Applications Research Center is a private, not-for-profit enterprise chartered by the State of Mississippi in 2014 to shine a spotlight on new technologies and unmanned vehicles to monitor the environment from space to the seafloor. The goal is to apply the knowledge and equipment to restoring the state's coastal natural resources and enhance the Mississippi Coast's economy.

NOARC works with a network of partners including private companies, state and federal agencies, Mississippi research universities and non-government organizations to eventually apply the innovations to other areas in the Gulf Coast region. One ongoing project is mapping Mississippi's oyster resources using new technologies in

support of the Governor's Oyster Restoration and Resiliency Council to restore the industry.

NOARC will work in the future with the state Port at Gulfport to show how useful unmanned surface maritime vehicles can be for monitoring the port's environment, examine access to the port and analyze safety hazards.

David Brannon, NOARC general manager, said the port project is a proving ground that will help restore and improve at all coastal ports.

"The new technology will emphasize unmanned maritime systems and new sonar instrumentation to map in great detail harbor and channel approaches and any obstacles present that could affect new construction in the port," Brannon said.

Innovative Imaging and Research is a woman-owned research and development business that became the first

in South Mississippi to get the OK from the FAA to fly unmanned aerial vehicles under 200 feet for commercial purposes. The FAA limit is 400 feet.

I2R flies UAVs into out-of-the-way spaces and in areas considered unsafe for people to get into so its cameras can capture detailed features. The ultra-high resolution images are used for precision mapping and other uses.

The UAV flights help the I2R team, led by Mary Pagnutti, its president, and Dr. Bob Ryan, chief technical officer, to develop technology for more scientifically quantitative images and video. They formed the company in 2007 after supplying instrument calibration services to NASA's satellite and aircraft remote sensing program.

"We are only just beginning to see the potential of what we can accomplish by imaging from UAVs. Our imaging technology is giving scientists detailed information over areas that may be unsafe or difficult to travel through so they can better understand important ecosystems and related restoration efforts, in a cost effective manner," Pagnutti said.

I2R officials say the HDR video captured from a UAV could be used for monitoring environmental sites such as strip mines. NASA recently awarded I2R a contract to further develop HDR high speed video technology that NASA will use to record rocket propulsion tests.

I2R develops and customizes cameras for high-tech industries, government agencies and universities that need high quality imagery for scientific and engineering applications. I2R also calibrates cameras at its SSC site and develops customized image processing algorithms and custom instruments.

"We have unique capabilities that enable us to generate calibrated images that improve scientists' abilities to detect real change on the ground independent of when the data was collected – time of day and time of year, and the amount of haze – or particulates in the sky," Pagnutti said.

The Alliance for System Safety of UAS through Research Excellence, led by Mississippi State University, is an international network of 22 research universities and 110-plus partners in industry and government. The alliance is the FAA's Center of Excellence for Unmanned Aircraft Systems.

ASSURE's goal is to apply members' research to help the FAA make rules and set procedures to ensure the safety of unmanned aircraft systems flying in the nation's skies. Researchers are looking into noise standards for drones, collision avoidance and training pilots. Their findings will aid in integrating drones into the nation's airport systems without interfering with manned aircraft.

"The ASSURE program truly is leading the way in FAA research to safely integrate UAS into the national airspace," said Executive Director Marty Rogers, a native of Fulton, Miss., and a U.S. Air Force veteran.

Rogers said that the program has more than 60 proposed research projects under review and in consideration with the FAA. The program is currently limited to funding directly tied to ASSURE research and matching funding from partners, totaling between \$10 million and \$20 million per year, but MSU has been approached to help provide needed UAS professional services and research to other sponsors, and is currently exploring mechanisms to support these requests.

"There really is still quite a small contingent of people and organizations that are considered experts in this field, and the ASSURE program is fortunate to have outstanding representatives of the technology as its core team ... really the best of the best," Rogers said.

Naval oceanographers rely on unmanned systems to gather information for the fleet. Officials with the Naval Oceanography organization at SSC see even more use and development of the unmanned aerial, surface and undersea systems in the future. The systems are

vital to collecting information from the environment to enable military commanders to make decisions in the physical battlespace in, on and above the world's oceans.

"Naval Oceanography has more than two decades of experience operating unmanned systems," said Dr. Bill Burnett, deputy commander and technical director for the Commander, Naval Meteorology and Oceanography Command. "Our strategy is to advance our own unmanned capabilities, while sharing our expertise and experience to accelerate and enhance the capabilities of other unmanned system stakeholders in government, industry, universities, academia and our international partners."

The Naval Meteorology and Oceanography Command, with headquarters at SSC, is a worldwide organization providing environmental information to help Naval and joint forces operate more safely and effectively and make better decisions faster than the adversary. The headquarters directs and oversees the collection, processing and exploitation of accurate, relevant and timely oceanographic, meteorological, hydrographic, and precise time and astrometric information.

In addition to the command's headquarters, five subordinate commands are at SSC: the Naval Oceanographic Office, Naval Oceanography Operations Command, Fleet Survey Team, Naval Oceanography Mine Warfare Center and Naval Oceanography Anti-Submarine Warfare Center.

Stennis also is home to the Naval Research Laboratory, the NOAA National Data Buoy Center and the University of Southern Mississippi Marine Science program. All have broad expertise in unmanned system tactics, techniques and procedures.

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Research/applied technologies

DI: Putting innovation on the fast track

Innovation has always been important in warfare, and in a world where technology changes rapidly, the military looks to think tanks to ensure war fighters have the best tools and quickly...

Fort Walton Beach, Fla.

For an organization that didn't even open its doors until 2014, what's happened since then is a strong indication of the value of its work.

The Doolittle Institute, a think tank that launched in Fort Walton Beach with \$1.5 million in funding from the Air Force Research Lab Munitions Directorate, is on a growth curve.

Last month Florida Gov. Rick Scott announced that DI would get \$100,000 of the \$1.8 million awarded through the Florida Defense Support Task Force Grant Program for seven defense projects across 13 counties.

"It's important to note the state of Florida has recognized the value of what we're doing, bringing in companies, connecting entrepreneurs, bringing in non-defense teams," said DI executive director Steve Butler.

Indeed, the grant is just part of the story about cutting-edge DI, which today has a growing operation in Tampa, collaboration agreements with universities and research organizations, and multimillion-dollar funding expected to double this year.

Conceived in 2012, the Doolittle Institute was incorporated in Florida as a non-profit. It opened its 6,000 square foot Fort Walton Beach facility on Sept. 8, 2014, and now has seven people working there.

Its charter is to create an innovative environment for bringing together the best minds of industry, academia, and

By David Tortorano

government to collaborate and find solutions to the toughest science and technology challenges faced by the Air Force Research Lab Munitions Directorate (AFRL/RW).

The concept behind DI has been around for a long time. It's a way for the military to try new concepts outside the normal acquisition process, which can be slow and filled with red tape. The goal is to get the best tools possible into the hands of the nation's war fighters as quickly as possible.

Butler said that on any given day at DI you'll find people from AFRL, the test wing, program offices, people from Hurlburt Field and others.

At the heart of DI's mission is technology transfer, and it works both ways. Technology developed by the military can find its way into the public sector and public sector work can find its way faster into the military.

There is proven value in removing creative teams from the bureaucratic arena and putting them in an environment with fewer rules and restrictions to do "innovative sprints," said Butler.

"That allows you to try things faster, allows ideas to be tested faster and fail faster," he said.

Innovation tradition

Doolittle Institute is the fourth military/business/educational collaborative organization funded by the Air Force. The first, founded in 2002, is the Wright Brothers Institute near Dayton, Ohio, funded by AFRL at Wright-Patterson Air Force Base.

Another one in Rome, N.Y., is the Griffiss Institute, created through a partnership with the AFRL's Information Directorate at Griffiss Air Force Base before that central New York base closed. Griffiss Institute continues as an AFRL partner with a focus on cyber technology.



A third organization, near Albuquerque, N.M., is the Phillips Technology Institute. It's partnered with AFRL's Directed Energy and Space Vehicles Directorate at Kirtland Air Force Base.

The Air Force learned long ago the value of civilian science and technology experts. World War II underscored the important role of science and technology in modern warfare, and showed that much of the needed expertise was outside the military.

One organization that owes its birth to that collaboration is RAND Corp., one of the world's original think tanks. In its early years RAND was most notable for thinking outside the box. Originally part of Douglas Aircraft, it was spun off and over time assembled a unique team of researchers committed to interdisciplinary cooperation.

Collaboration with entities "outside the fence," along with legislation that allowed academia and companies to

benefit from that research, helped keep the United States a world leader in military and civilian technology.

Doolittle Institute is a result of that long list of outside the box, outside the fence collaboration.

Getting noticed

DI's work with Eglin quickly got the attention of the U.S. Special Operations Command at McDill Air Force Base. It would eventually result in the establishment of a DI-managed office in Tampa's Ybor City neighborhood.

Called SOFWERX, it also brings a diverse group of people together to address the technological needs of America's special operations forces, said Butler. According to Butler, SOCOM acquisition chief James Guerts is a believer in "failing faster" and moving on to try something different for a more agile acquisition process.

"There's value in doing things quickly," said Butler, especially for SOCOM, which is willing to take chances to get things to war fighters quickly.

SOFWERX is administered by DI under a Partnership Intermediary Agreement. Congress created PIAs to facilitated communications between government agencies, the private sector, academia and general public.

The DI subsidiary opened in 2015 in an old brick building that makes it easier for the technology community to work with SOCOM in a neutral meeting space outside the more rigid confines of a military base. It has 10 employees, but Butler said it's likely to double its size in the future.

In Tampa there are facilities for meetings big and small, breakout rooms and, rapid prototyping equipment, including laser cutters, 3D printers and more, said Butler.

Ideas can come from the military, contractors or outsiders who walk in the front door. It puts them with folks plugged into the acquisition process.

At any given time the facility can have company officials, researchers, academics and others collaborating. A

project given a preliminary go-ahead may result in a prototype. That can lead to a more formal acquisition.

While they don't discuss much of what happens at the think tanks, one project that has been publicized is TALOS, the Tactical Assault Light Operator Suit. Some of the work now involves developing the underlayer suit that will be comfortable - one version even has cooling fins. In this type of environment, they can tinker with it and make adjustments as they move forward until it works as intended.

What's to come

The Doolittle team will use the Florida grant to identify Small Business Innovation Research recipients who can help accelerate commercialization of new products and bring them to market, based on DoD technologies.

"The state's funding for this grant will bolsters DI's efforts, create economic development and demonstrate the State of Florida's commitment to Air Force research and technology programs," Butler said.

More is also in store. Sid Saunders, a consultant for DI, said long-range plans call for bringing a rapid prototyping capability to the Fort Walton Beach operation, like in Tampa.

More collaboration partners is also highly likely. Currently DI has collaboration contracts with multiple universities in the Southeast, including the University of Florida, University of Central Florida, Florida State University, University of South Florida, Auburn University, and Georgia Tech.

The collaborative agreements allow the military to fund work with those universities through DI.

One of the organizations working with DI has become particularly well-known: The Institute for Human and Machine Cognition in Pensacola.

Sixteen months ago the not-for-profit IHMC and DI signed an affiliation agreement to enable the them to work together to achieve common

goals, according to Ken Ford, president and CEO of IHMC.

"IHMC and DI have taken the opportunity to explore several areas of collaboration, including bringing the leadership of IHMC and AFRL/RW together to explore joint research interests and utilizing IHMC's Concept Mapping expertise to display tech transfer tools on the DI website," said Ford. "In fact, one of the most interesting joint projects involved the area of tech transfer."

How long will they work together?

"The expectation is that DI and IHMC will continue to collaborate on an ongoing basis," he said.

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Why name it Doolittle?

Col. Jimmy Doolittle flew into history at America's darkest hour when he led a bombing raid on the Japanese homeland in April 1942, four months after the attack on Pearl Harbor.



Even before the raid that would boost U.S. morale and earn the future general the Medal of Honor, Doolittle was accomplished. He'd earned a doctorate in aeronautics at the Massachusetts Institute of Technology and set multiple flying records. One big achievement was developing instrument flying used to this day. He was the first to test the now ubiquitous artificial horizon in an instrument panel.

"He was maybe the only person who could have made that raid happen," said Steve Butler, director of the Doolittle Institute in Fort Walton Beach. Doolittle hallmarks of speed, innovation and solutions provided the institute with words to live by as it works to lift the entire region by fusing military prowess, technological breakthroughs, business acumen and education.

Space

SSC key in quest for next gen engines

Spacecraft propulsion has been a key activity in the region for years, but the quest to replace Russian engines and create a new generation of U.S. powerplants is making SSC a key battlefield...

Stennis Space Center, Miss.

NASA's rocket engine test facility in South Mississippi has become a battleground in the contest to replace Russian-built engines used for government launches.

SpaceX and Aerojet Rocketdyne, two of the four companies competing to develop engines to replace the RD-180, both have chosen to use Stennis Space Center (SSC) to develop the crucial engines.

Aerojet Rocketdyne announced last month that it will use SSC to develop the AR1, a 500,000-pound thrust class engine. Five months before that announcement Aerojet Rocketdyne was awarded a \$115.3 million "other transaction agreement" for the development of the AR1 prototype for the Evolved Expendable Launch Vehicle (EELV) program.

For SSC, that was good news after good news. In January, also as part of the effort to replace the RD-180, the Air Force awarded a \$33.6 million contract to Space Exploration Technologies Corp. (SpaceX) to develop the Raptor methane rocket engine for the EELV. SpaceX has been using SSC to test the Raptor since 2014 after upgrading the E-2 test stand with methane capability.

At issue is the effort to find a replacement engine for the EELV, a program started in the 1990s to assure U.S. access to space for the Department of Defense and other federal

By David Tortorano



NASA photo

Russian-built RD-180 engines power the Atlas V launch vehicle.

agencies.

For the past decade United Launch Alliance, a joint Boeing and Lockheed Martin company, has had a lock on the launches. The Atlas V, which boosts most of the U.S. government's satellites, has a first stage powered by the Russian-made RD-180.

That engine, designed by NPO Energomash, is modified specifically for the U.S. Atlas launcher. But the engine was caught up in the disagreement between the United States and Russia in the wake of the 2014 Russian takeover of Crimea.

The 2015 Defense Authorization Act requires transition from the RD-180 engines for National Security launches. In addition to Aerojet Rocketdyne and SpaceX, Blue Origin and Orbital ATK also are working on EELV engines.

The awards to SpaceX and Rocketdyne were "other transaction agreements," used instead of a standard

procurement contract to leverage ongoing investment by industry in rocket propulsion systems. In this type of agreement, the company and federal government share development costs.

Rocketdyne is contributing \$57.7 million at the time of award in February to develop the AR1, a booster stage engine intended for use on United Launch Alliance's Vulcan launch vehicle, the planned replacement for the Atlas V. The total potential government investment, including all options, is \$536 million. The total potential investment by Rocketdyne, including all options, is \$268 million.

For the Raptor engine, SpaceX is contributing \$67.3 million at the time of the January award to develop the prototype for the upper stage of the company's Falcon 9 and Falcon Heavy launch vehicles. The total potential government investment is \$61.4 million. The potential investment by



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Thinking about 2017

If you're a regular reader of this newsletter, you know the high level of aerospace activity in this region. And if you also subscribe to the daily aerospace news feed, you know there's a lot going on that just doesn't make it into the newsletter.

Our team has begun the process of looking at our publications schedule for 2017. We know we'll be publishing our biennial aerospace book in June 2017. We're also considering adding pages to this bimonthly, or perhaps turning it into a monthly.

This past year we also published a business quarterly to cover other topics. The reaction has been favorable, and at least one paper in the region reprints some of our stories. We'll be reassessing that as well.

If you have any thoughts on how we can improve, please drop me a line. We're always interested in your ideas.

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SpaceX is \$122.8 million.

In January, the same time SpaceX won a contract, a \$47 million contract went to Utah-based Orbital ATK for a new solid-fueled rocket motor for a large satellite launcher concept being designed by Orbital ATK. New strap-on solid rocket boosters made by Orbital for ULA's Vulcan rocket, and a Blue Origin-built upper stage engine for Orbital ATK's own proposed launcher also received funding.

ULA wants to fly its next-generation Vulcan rocket with engines made by Blue Origin burning liquefied natural gas, a fuel never before used on a large orbital-class launcher. ULA says the BE-4 will be ready sooner and will be easier to eventually recover and reuse. That engine got a separate Air Force cash infusion Feb. 29.

The engines

The AR1 engine burns a mixture of kerosene and liquid oxygen, the same propellants as the RD-180. Rocketdyne successfully achieved full-power during a preburner test series at SSC in early June. Aerojet plans to have the engine flight-qualified by 2019.

The methane-fueled Raptor engine has about three times the thrust of the company's existing Merlin powerplants. SpaceX has been testing components for the Raptor since it cut the ribbon on its E-2 test stand in April 2014. In addition to having its eyes on the EELV, SpaceX's is also creating new spaceships that will take colonists to Mars. Plans are to use the Raptor engine.

The Raptor is capable of generating nearly 300 tons of thrust, and can be used for both the upper and core stage of launch vehicles. A cluster of nine will be used on the core stage of the planned Mars Colonial Transporter. The Raptors use of methane as a fuel is crucial since methane can be synthesized on Mars.

The BE-4 will generate 550,000 pounds of thrust and consume a cryogenic combina-



NASA photo

Aerojet Rocketdyne tests the AR1 subscale preburner at SSC.

tion of liquefied natural gas and liquid oxygen. Two of the BE-4 engines would boost the Vulcan rockets first stage. The BE-4 should finish qualification testing in 2017.

Launch competition

In addition to the engine competition, there's also the competition for launch contracts. ULA had been the only company offering the service, but in May 2015 SpaceX's Falcon 9 was certified to handle military satellite launches. In October the Air Force called for bids, and ULA opted not to submit one.

California-based SpaceX did bid and was awarded an \$83 million contract in April to launch the second GPS-III satellite. Because of the new, lower-cost competition, Colorado-based ULA is revamping its lineup of rockets and trimming costs.

The Air Force on Aug. 3 sent draft request proposals to both launch providers it expects to bid on the third GPS-III satellite. Bids are due by Sept. 19 and the launch is scheduled for 2019.

Rocketdyne already assembles and tests the RS-68 and RS-25 engines at SSC, and the company's decision to add the AR1 to its lineup - along with SpaceX's decision to develop the Raptor at SSC, underscores the value of NASA's engine test center.

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