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GULF COAST AEROSPACE CORRIDOR

2019-2020

Key updates

- *Mobile getting second aircraft assembly line*
- *Pensacola's MRO campus growing*
- *New aviation training opportunities launched*
- *NASA planning huge technology park*
- *F-22s gone, more F-35s for the Gulf Coast*
- *Aviation base values nearly \$23 billion*
- *DoD contracts 2000-2017 top \$95.5 billion*
- *Latest airport enplanement figures*

About us

The *Gulf Coast Reporters' League* was established in 2011 by four journalists to provide research on aerospace activities along the Gulf Coast Interstate 10 region. First published in June 2011 as an annual, it shifted to biennial publication after the fifth edition. The 2019-2020 edition provides updated information from this ongoing research. The region's aerospace activities are tracked daily through Gulf Coast Aerospace Corridor's news feed (www.gcacnews.blogspot.com), weekly through a column (www.gcacperspectives.blogspot.com) and bimonthly via a newsletter found at our website www.gulfcoastaerospacecorridor.com.

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Cover photos, top left, Airbus jetliner at Mobile Aeroplex (Airbus photo); top center, student uses virtual reality tools at National Flight Academy, (NFA photo); top right, F-35 Joint Strike Fighter refueled (U.S. Air Force photo), bottom left, night-time view of Space Launch System (NASA illustration)

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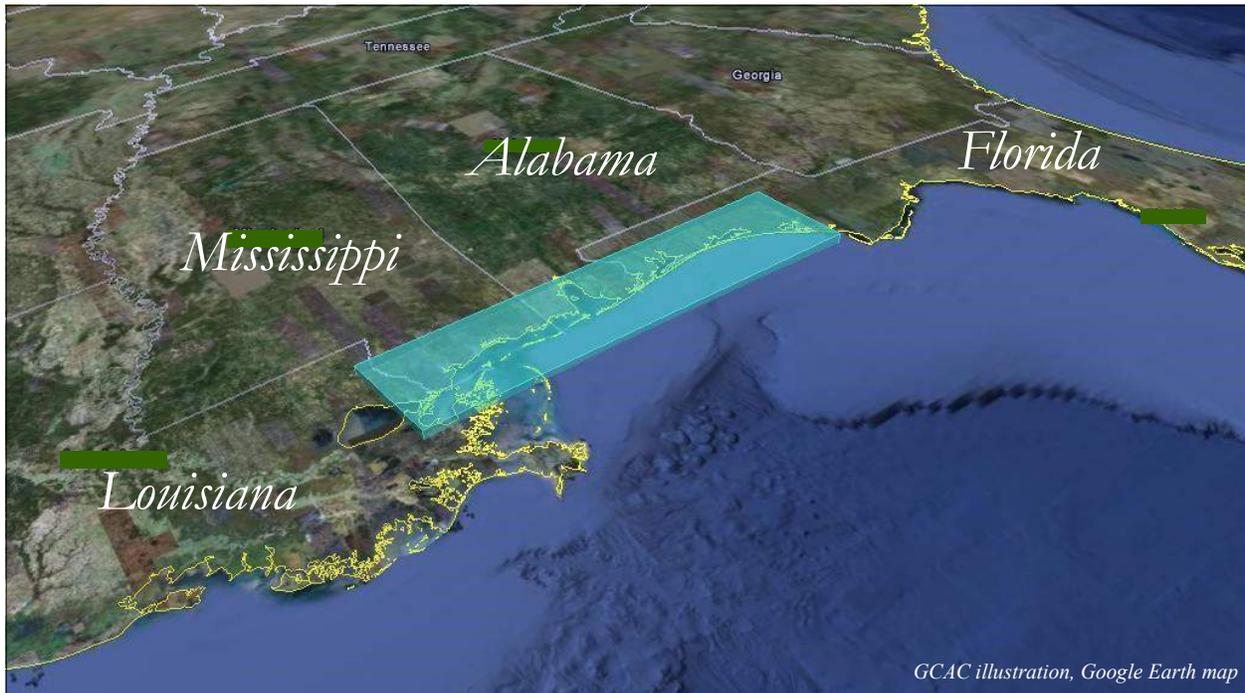


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Footprint, training expanding

The purpose of this research and the resulting book is to provide a framework to understand aerospace and aviation activities in the region between Southeast Louisiana and Northwest Florida. And what do we mean by framework?

It's one thing to know jetliners are built in Mobile, Ala. Another to realize final assembly work on another type of aircraft is done 35 miles away in Moss Point, Miss. It's a matter of context - know what is going on in your back yard and the neighbor's back yard.

This year's edition provides additional context by looking at aerospace and aviation activities in all four states of which this region is a part. It makes it all the more clear the unique role of the Interstate 10 region, the only area where the economic interests of all four of those states come together.

U.S. aerospace & defense industry	
Sales (2017)	\$865 billion
U.S. jobs (2017)	2.4 billion
Direct jobs (2017)	843,000
<i>Source: Aerospace Industries Association, 2018 Facts & Figures, U.S. Aerospace & Defense Industry</i>	

In the two years since the last Gulf Coast Aerospace Corridor book was published in 2017, announcements and expansions have increased the aerospace and aviation footprint along the Gulf Coast Interstate 10 corridor.

Mobile began work on a second passenger jet assembly line, this one for the A220. ST Engineering Aerospace is quadrupling the size of its maintenance, repair and overhaul campus in Pensacola, Fla.

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Aerospace activities at a glance

- Rocket and jet engine testing
- Rocket engine, satellite assembly
- Piston engine assembly
- Unmanned aerial system plant
- Areas approved for unmanned flights
- Jetliner final assembly lines
- Maintenance, repair and overhaul hangars
- Military pilot, maintainer training
- Military electronics/cyber training
- Aviation specialties training
- National Guard aerial combat center
- National Guard helicopter repair depot
- Restricted land and water ranges
- Aerial weapons RDT&E
- Applied geospatial technologies
- Human-machine cognition research
- Advanced manufacturing research
- 43-acre manufacturing plant
- Aerospace/technology parks
- Technology transfer offices
- Business incubators

To the west at Stennis Space Center (SSC), Miss., NASA is well underway in developing a 1,000-acre technology park designed to attract aerospace tenants who do not want to go through the tight security procedures required to set up an operation inside SSC itself.

One of the most notable parts of the past two years has been the doubling down on efforts to provide education and training for those interested in the aerospace and aviation field. Airbus launched two training programs - one for high school students, another for non-students with no aerospace experience who want to work for the company.

Work is continuing on Flight Works Alabama in Mobile, a hands-on aerospace education center that is also involved in education along with nine academic partners.

And the National Flight Academy in Pensacola, which has focused for six years on piqu-

ing the interest of students in aerospace, is now involved in workforce training.

Education leaders across the region as well as in the broader states are putting in place the tools necessary to meet the growing need for aerospace and aviation workers. It has, indeed, been a busy two years.

Economic development leaders have good reason to target aerospace. It's an economic jewel, a multibillion-dollar, research intense, innovative enterprise that produces technologically advanced aircraft, space and defense systems. It involves civilian and military activities and uses talent ranging from those who design aircraft and those who assemble them to those who fly and maintain them. Workers are highly skilled and the pay is better than average.

"The Gulf Coast aerospace corridor has all the right conditions for future growth," said Richard Aboulafia of the Teal Group. "A pro-business environment, strong political support for the industry, and great working conditions all mean good things for the future."

Neal Wade, chairman of the four-state Aerospace Alliance, takes an even broader view and sees the same thing happening throughout Alabama, Florida, Louisiana and Mississippi.

"The Gulf Coast region continues to enjoy excellent growth in aerospace projects and jobs as commercial and defense opportunities expand worldwide," he said. "As one of the largest aerospace corridors in the world, the Aerospace Alliance states are fully committed to enhancing their role in supporting such growth."

All four states have significant aerospace and defense activities, and combined they rank as the fourth largest aerospace region in the country, according to the Aerospace Alliance.

Florida is the No. 2 state in the nation for aerospace, aviation and space establishments, with more than 2,000 companies employing 82,000-plus workers.

Florida's best-known aerospace and aviation activity is the Space Coast, home to Kennedy

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Space Center, Cape Canaveral and Patrick Air Force Base. Since the earliest days of the space race this is the location where Americans ventured into space. It's also where private space companies have set up operations to leverage idled NASA facilities.

In addition to being a gateway to space, it's the air traffic hub for the western hemisphere, a center for flight training and home to aircraft and component manufacturing.

The state is No. 1 in the nation for maintenance, repair and overhaul facilities with more than 600 statewide. For aerospace manufacturing, it ranks 15th in the nation in its attractiveness, according to PwC, highest of the four states in the region.

Alabama is best known for north Alabama's Huntsville, home of the Army's Redstone Arsenal and NASA's Marshall Space Flight Center, and continues to attract operations.

According to the U.S. Department of Labor's Bureau of Labor Statistics from May 2018, Alabama had the third highest employment for aerospace engineers in the nation, and the highest concentration of jobs (local quotient).

Huntsville had the nation's highest employment

level of aerospace engineers, and a local quotient of 33.11 - 33 times the national level.

Alabama, which is 19th in the PwC Aerospace Manufacturing Attractiveness rankings, has more than 400 companies engaged in the aerospace and defense sectors.

Mississippi, perhaps best-known for its NASA rocket engine test site in South Mississippi, has become a key player in the growing field of unmanned aerial vehicles.

Aurora Flight Sciences, Northrop Grumman Unmanned Systems and Stark Aerospace all build unmanned aerial systems in Mississippi. It's also home to the Raspet Flight Research Laboratory at Mississippi State University in Starkville, chosen by the Federal Aviation Administration to head a team of 16 universities as a center of excellence for UAS research. In 2016, the Department of Homeland Security picked MSU as a base of operation for drone research, much of the work will be in South Mississippi.

Additionally, Pioneer Aerospace has made parachute systems in the state of Mississippi since the 1930s, and Eaton Aerospace makes commercial aircraft components. GE Aviation

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makes jet engine components at two locations in the state.

Louisiana's aerospace footprint may be best known for NASA's Michoud Assembly Facility in East New Orleans, but to the west there's the 82,300 square-foot Kopter Group assembly facility at Lafayette Regional Airport, which moved in after the departure of Bell. It will begin assembling SHO9 helicopters in 2021.

Northrop Grumman operates major maintenance, repair and overhaul facilities at Chennault International Airport in Lake Charles, and Aviation Exteriors provides aircraft painting in New Iberia.

Northwest Louisiana is home of Barksdale Air Force Base and the 2nd Bomb Wing, the oldest in the Air Force, and its massive B-52H Stratofortress bombers.

With all that activity in the four states, the Interstate 10 region between Southeast Louisiana and Northwest Florida is the only location where the aerospace interests of all four intersect. It's a roughly 350-mile stretch along the northern Gulf of Mexico and something of a showcase where growth in one area of the corridor can benefit all four.

The I-10 region has a long history of involvement in aviation. It's where the Navy established its first, and for a long time only, air station, and where NASA created major facilities in the earliest days of the space race. It's home to two NASA operations involved in building and testing the next generation of NASA spacecrafts, and where the new breed of private space companies builds and tests space hardware.

It has significant military aviation activities, including pilot training and aerial weapons development. It's where research is conducted not only in aerospace but in related fields like high-performance materials, artificial intelligence/robotics, geospatial applications and more.

Many of the region's aerospace activities put it in select "clubs." With an Airbus assembly line, it joins a group of sites where large passen-

ger jets are assembled, and having two NASA facilities puts it in the small spaceflight group. It's also one of the few region that trains pilots to fly the fifth-generation F-35.

If there's a key message from this year's research, it's the same as our last publication: The region must continue to focus on attracting aerospace while the interest is there. But to do that, it needs to continue to develop its aerospace worker pipeline as a priority. In addition, having the training facilities is one thing, getting potential workers interested in the field is an entirely different matter and particularly difficult to address.

It's also a matter of creating a culture of learning where young people can get excited about a career in aerospace and aviation. As aerospace officials nationwide have made clear, there are a lot of exciting career options for young people, especially in industries where new products are churned out on a regular basis. Ensuring they know that aerospace is just as creative - perhaps more so - is the challenge.

Over the past few years there have been encouraging developments with the creation of learning centers designed to pique the interest of young people: Infinity Science Center in Miss., Flight Works Alabama in Mobile, and the National Flight Academy in Pensacola are getting noticed by the younger generation.

Here are the most recent findings and observations of this ongoing Gulf Coast Reporters' League study. The list includes new findings along with those from the League's past studies:

General

- The I-10 region is involved in a range of aerospace and aviation-related activities, including aircraft manufacturing, space flight, propulsion systems, military aviation, unmanned aerial vehicles, robotics, aerial weapons, high-performance materials, advanced manufacturing and RDT&E.
- Aerospace is a target industry for Alabama,

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Florida, Mississippi and Louisiana. Multiple local economic development groups have also targeted aerospace, and state and local leaders have joined in a mix of regional alliances to pursue the aerospace industry.

- The United States is a low-cost leader among developed nations when it comes to manufacturing. That bodes well for the region and each of the four states as it seeks more foreign investments and promotes its manufacturing capabilities.
- The Aerospace Alliance was formed in 2009 to promote aerospace activities in the four states, and continues its work, including hosting pre-show events in Farnborough, England, and Paris, France.
- Despite the high level of aerospace activity in the I-10 region, there is no “go-to” organization that focuses on the specific aerospace interests of the I-10 region.

Airbus

- Airbus is currently building an assembly line for the A220, the former Bombardier CSeries and now the newest member of the Airbus family of aircraft. In 2018 Airbus acquired a majority stake in the partnership.
- The Airbus campus at the Mobile Aeroplex has increased in size from 116 to 198 acres, and is growing from 10 buildings to 17.
- The Airbus A320 final assembly plant, which delivered its first jetliner in April 2016, is on track to produce five jetliners per month in 2019.
- Airbus delivered its 100th plane built in Mobile in December 2018.
- The Airbus plant has continued to attract suppliers to the Mobile Aeroplex since it was first announced. Some will want to be close to the plant, others further away to keep from competing for workers.
- Additional aerospace activities directly or indirectly caused by the Airbus plant will take years to develop. Potential newcomers will keep an eye on progress of the plant

before making what could be an expensive investment in the region.

- Airbus in Mobile attracts international interest in the region.

Military

- Hurricane Michael in October 2018 heavily damaged Tyndall Air Force Base, Fla., and likely changed its mission. It is losing its F-22 pilot training mission and is being considered for three F-35 squadrons.
- Naval Air Station Whiting Field, near Milton, Fla., accepted a new outlying field in Santa Rosa County, replacing another field in Escambia County that will now be developed by the county.
- Naval Air Station Whiting Field began receiving in 2019 the first new helicopter simulators in 40 years.
- Military activities bring billions into the region through payroll, contracting and other activities. Between 2000 and 2017, 5,153 contractors in 19 I-10 counties/parishes were awarded 111,732 DoD contracts valued at more than \$95.5 billion.
- The military’s huge complex in this region is a vast schoolhouse that trains tens of thousands of students each year who earn wings, hone combat skills or learn technical fields, including avionics and aircraft maintenance.
- Military aviation activities in the region include pilot and flight officer training, weapons development, search and rescue, unmanned aerial systems, logistics and a variety of combat missions.
- The U.S. Coast Guard has port activities and air operations throughout the region, including the Aviation Training Center in Mobile, Ala., where all Coast Guard aviators learn to fly a particular aircraft type.
- The region has 10 bases with aviation-related missions, and between them more than three dozen aircraft types, ranging from high-tech \$145 million fighters all the way down to relatively low-cost, ubiquitous,

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- orange and white Navy trainers and drones.
- Aviation-focused military bases in the Gulf Coast aerospace corridor had a replacement value in 2017 of more than \$21.9 billion. If outlying fields and other aviation annexes are included, it goes up another \$1 billion.
- The Marine Corps declared the F-35 operational, and the Air Force declared its variant combat ready. Eglin Air Force Base, Fla., is home of the F-35 integrated training center and two reprogramming labs.
- A second F-35 reprogramming lab, this one for Australia, Canada, and the United Kingdom, is transitioning from Fort Worth, Texas, to Florida's Eglin Air Force Base.
- former UTC Aerospace Systems became Collins Aerospace Systems.
- While still UTC Aerospace Systems, Collins Aerospace's expanded facility in Foley, Ala., delivered its first fully integrated "neo" engine and nacelle. Safran opened a nacelles operation in Mobile.
- Blue Air Training, which provides training for military close air support personnel, opened a facility at the Pensacola airport.
- L3 Crestview Aerospace was sold in May 2018 to New York investment firm American Industrial Partners as part of a \$540 million cash deal. The investment firm will acquire two components of L3 Technologies – Vertex Aerospace, which includes L3 Crestview Aerospace, and TCS.

Corporate

- Major U.S. aerospace and defense companies have operations in the Gulf Coast region, including many with multiple sites. Foreign aerospace and defense companies and non-aerospace companies also have a sizeable footprint in the region.
- There are multiple technology transfer offices and incubators in the region. Two major hot spots for technology transfer are Stennis Space Center, Miss., and Eglin Air Force Base, Fla.
- Aerospace activities in the region are in growth sectors, including commercial jets, unmanned aerial systems, advanced materials, and geospatial technologies. In addition to unmanned aerial systems, three federal operations are involved in some aspect of unmanned underwater vehicles.
- Subsystem work for the F-35 is being done at the Northrop Grumman Unmanned Systems Center in Moss Point, Miss. The expansion, a new operational area, was opened June 2018
- Selex Galileo's operation at Stennis International Airport in Kiln was purchased by Tyonek Services Group.
- United Technologies purchased Rockwell Collins and split into three companies. The

Unmanned/robotics

- Fuselage work on the Global Hawk and final assembly of the Fire Scout unmanned aerial systems is done in Moss Point, Miss., by Northrop Grumman.
- Northrop Grumman began flight tests for MQ-8C Fire Scout unmanned helicopters produced in Moss Point in September 2018.
- Unmanned systems are flown in military/federal air space at Eglin Air Force Base, Fla., Camp Shelby, Miss., and Stennis Space Center, Miss., and other locations. The restricted air space at SSC was recently expanded.
- The Institute for Human and Machine Cognition in Pensacola, Fla., is a premiere research center in robotics and human/machine interaction.

R&D/innovation

- R&D activities in the region involve federal, state and corporate players. Eglin Air Force Base, Fla., spends more in R&D each year than many prestigious universities.
- Eglin Air Force Base, Fla., now has a second reprogramming lab, this one for foreign partners in the F-35 program.

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- Commercial space company SpaceX is currently doing R&D on its next generation rocket engine at Stennis Space Center, Miss. Called Raptor, it eventually will power a space launch for a trip to Mars.
- Stennis Space Center, Miss., is where Aerojet Rocketdyne is developing its AR1 engine that is designed to replace the Russian-built RD-180.
- SSC and Michoud each plays a role in federal and commercial space ventures. Each has under-utilized equipment.
- The GE Aviation plant in Auburn, Ala., is the site where the company is mass producing 3D printed parts for its LEAP engine.
- rounding acres into an advanced manufacturing park. The National Center for Advanced Manufacturing is at Michoud.
- Multiple sites in Northwest Florida, many aerospace-focused, have been certified as ready for development by Gulf Power's First Sites program.
- In August 2018, some \$5 million worth of improvements were finished at Stennis International Airport in Hancock County, Miss. The 8,500-foot grooved and lighted runway is considered essential to attracting new companies to the airport.
- Continental Motors in August 2018 began work on a 275,000-square-foot engine and parts manufacturing facility at the Mobile Aeroplex. The facility consolidates operations scattered among a dozen buildings.

Airports/aviation parks

- A new ST Engineering maintenance, repair and overhaul hangar had its grand opening in 2018 at Pensacola International Airport. Three additional hangars are being built.
- NASA is looking for a non-federal private partner to lead development of a 1,100-acre technology corridor called Enterprise Park, just outside the gates.
- PSA Airlines, a subsidiary of American Airlines, opened a new maintenance facility at Pensacola International Airport.
- Aerospace and aviation-focused technology parks have been established or are developing across the region.
- Many of the non-commercial and commercial airports in the region have land and buildings available for new tenants.
- The proximity of Mobile Aeroplex in Mobile, Ala., and the Jackson County Aviation Technology Park in Moss Point, Miss., forms a hub of aircraft manufacturing in the central portion of the corridor.
- The proximity of Stennis Space Center, Miss., and Michoud Assembly Facility, New Orleans, forms a hub of spacecraft manufacturing and testing in the west portion of the I-10 corridor.
- At Michoud, NASA hopes to turn 300 sur-

Space

- At Stennis Space Center, Miss., work is finished on the B-2 test stand that will be used to test the Space Launch System.
- The New Orleans-built Orion Multipurpose Crew Vehicle was finished and shipped to Kennedy Space Center, Fla.
- Infinity Science Center in Mississippi has a Saturn V first stage for temporary display.
- In early June 2018 at SSC, Aerojet Rocketdyne completed assembly of the first AR-22 rocket engines, a variant of the RS-25, for the Boeing Phantom Express
- Commercial space company Relativity Space in March 2018 entered into a 20-year agreement to use exclusively SSC's E-4 test complex. It's all part of NASA's effort to find commercial companies to use underutilized assets, like test and launch facilities.
- Stratolaunch in November 2017 signed an agreement to use the E1 test stand at SSC. In late 2018, it successfully tested a component of its hydrogen-fueled PGA rocket engine with the pre-burner hot-fire test.
- Stennis Space Center in April 2019 wrapped up four-plus years of testing the RS-25 rock-

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et engine, formerly used in the Space Shuttle, that will be used in the Space Launch System (SLS).

Education/workers

- Airbus has launched two training programs, one for high school students, and one for non-students.
- The National Flight Academy is now involved in workforce training.
- ST Engineering has a scholarship program for students interested in aerospace.
- There are 16 universities, several with “very high” research activity, with interests in the Interstate 10 region.
- Mississippi Gulf Coast Community College is among the nation’s top associate degree producers in science, technology, engineering and math.
- The National Security Agency and Department of Homeland Security designated the University of West Florida’s Center for Cybersecurity a national center of academic excellence in cyber defense education.
- States and local areas have workforce programs to train blue and white collar workers for the aerospace and related industries. Many of the programs are company specific. Alabama, Louisiana, Mississippi and Florida are right-to-work states.
- High schools in the region have programs targeting aerospace, advanced materials and geospatial career fields.
- Hancock County, Miss., is considering establishing an aerospace academy.
- Florida A&M University-Florida State University College of Engineering and researchers and engineers from Eglin Air Force Base have begun a new partnership to train graduate and undergraduate students in areas critical to the Air Force.

The authors hope this study will provide the public, development officials and politicians with a better understanding of the capabilities of this

region in a range of science, technology, engineering and math fields. The Gulf Coast Reporters’ League believes the general public lacks an appreciation of the capabilities available in the region. Understanding what’s here, what’s needed and working together has benefits.

Airbus has been a wakeup call, certainly for Northwest Florida. During the 2013 Gulf Power Economic Symposium, the vision of a region on the cusp of change was a compelling message.

Stan Connally, former president and CEO of Gulf Power, said a transformation was already underway in Mobile, thanks to Airbus.

“That town is reinventing itself,” Connally said. “We have a real opportunity right here ... to be a partner in that redefinition,” he said.

Every Aerospace Alliance Summit since the first in 2011 has brought up the issue of education and training. The alliance’s Neal Wade said in his opening remarks of the 2018 summit that surveys all point to education as a top critical need of the aerospace industry.

John Watret, chancellor of Embry-Riddle Aeronautical University, said at the most recent summit that the first time they focused on education and training they had 11 people, “and each year the small rooms end up filling up.”

Ron Garriga, Embry-Riddle associate executive director of U.S. Campus Operations, said the industry will need 790,000 pilots, 754,000 technicians and 890,000 new cabin crew over the next 20 years to maintain the world’s fleet.

“Ladies and gentlemen,” Garriga said, “if that doesn’t concern you, where have you been? ... We have got to get our pipeline together.”

Responding to the needs of the current pipeline and understanding how those needs will change in the future will be critical for the Gulf Coast region to be a leader.

David Tortorano

Publisher, Gulf Coast Aerospace Corridor

Co-founder/Editor

Gulf Coast Reporters’ League



I: Assembly, maintenance

'Great things are done by a series of small things brought together.'

- Vincent Van Gough, 1853-1890

Airbus photo

An area now on the fast track

A second passenger jet assembly line in Mobile and a growing MRO campus in Pensacola make this area the region's job hotspot

It's stunning how quickly South Alabama has become a center for jetliner manufacturing. First there was the Airbus A320 series, making its first delivery in 2016. Now an A220 assembly line is being built right next door. When it starts producing jetliners, it will make Mobile the fourth largest passenger jet manufacturing center in the world.

That's impressive in itself, but zoom out from Mobile to the immediate neighborhood and an intriguing bigger picture emerges.

Go 35 miles to the west of Mobile to Moss Point, Miss., and you'll find a second aircraft production line. Northrop Grumman has been churning out finished Fire Scout unmanned helicopters since 2006. Then shift gears and go 60 miles to the east of Mobile to Pensacola, Fla. There you'll find ST Engineering Aerospace, which already operates a maintenance, repair, and overhaul (MRO) in Mobile, creating a major four-hangar MRO campus at Pensacola International Airport in a state that's No. 1 in MROs with 600 statewide.

That 135-mile stretch of Interstate 10 with aircraft manufacturing and aircraft maintenance, repair and overhaul, puts this part of the region on the fast track. In the next few years it will need some 2,000 aerospace workers.

Chapter highlights

- Airbus will now build A220 jetliners in addition to A320s in Mobile, Ala.
- Pensacola on track to become major maintenance, repair, overhaul center
- Larger Northrop Grumman Moss Point, Miss., plant now flight testing drones
- Mississippi, Louisiana key centers for NASA's Space Launch System
- Eglin develops, tests and/or manages more than 90 weapon systems

Airbus, which is expanding its A320 assembly line as well as building an A220 assembly line, will need 600 to 700 workers. Pensacola, which opened the first ST Engineering hangar last year for 400 workers, will need an additional 1,300 workers for the three additional hangars and related operations.

If anything, that number is likely to increase with the strong possibility of more suppliers opting to set up shop in Mobile, Pensacola, or the surrounding area.

While the entire region is growing its aerospace footprint, this central portion of the corridor is on a roll. It's an enviable position to be in, but with that growth spurt comes the very real issue of finding enough workers in Mobile and Pensacola. (*see Chapter IV*).

Having both aircraft manufacturing and the closely-related maintenance, repair and overhaul is plus for a region.

The following pages describe in two stories the aircraft assembly and aircraft maintenance segments found in the Mobile-Pensacola area.

Photo page 12: Dramatic photo of one of the A320 series jetliners built in Mobile, Ala.

AIRCRAFT ASSEMBLY IN MOBILE/MOSS POINT

Mobile, Ala., and Moss Point, Miss., are home to Airbus and Northrop Grumman, two leading aerospace and defense companies that are assembling two very different categories of aircraft within a 35-mile radius. One category is for civilian use, the other for the military. And both are in market segments that are growing.

New kid on the block

It wasn't that long ago that Mobile's aerospace fame was thanks to the MRO complex operated by what was then-called VT Mobile Aerospace Engineering, and the aircraft piston-engine manufacturer Continental Motors.

Now Mobile's most famous aerospace company is Airbus, which along with Boeing dominates the passenger jet industry. It made Mobile a player in a select club of cities with jetliner assembly lines.

The \$600 million Airbus A320 final assembly line at the Mobile Aeroplex is one of four centers worldwide that produces the popular A320 series. In Mobile, it can produce the A319, A320 and A321.

Work on the first Mobile-built Airbus passenger jet began in 2015, and it came off the assembly line in 2016. The A321 had its maiden flight of more than three hours on March 21, 2016. It was delivered to JetBlue in April 2016.

Major sections of the plane, from wings to tail to fuselage and more, are shipped to the Port of Mobile from Airbus facilities and suppliers in Europe. There are currently four to five aircraft ship sets arriving each month from St. Nazaire, France. The transport ship is named the Mobile Express, according to Kristi Tucker, an Airbus spokeswoman.

Engine podding work for the planes built in Mobile is done across the bay in Foley, Ala., by Collins Aerospace Systems, the new name for



First A321 on assembly line in 2016.

GCAC photo

UTC Aerospace Systems. The name changed when United Technologies split into three companies, including Collins Aerospace, after purchasing Rockwell Collins.

As of the end of May 2019, Airbus has delivered 123 of its A320 series aircraft from its Mobile facility to eight customers: ALC (leasing company), Allegiant, American, Delta, Frontier, Hawaiian, JetBlue, and Spirit.

Airbus, however, is trying to address the backlog of orders by increasing the monthly output for its plants. In Mobile it's expanding the original plant and expects to be delivering five aircraft a month by the end of 2019, said Tucker.

Building passenger jets is significant in itself, but it's the type of plane that's key to why Mobile is doing so well.

Richard Aboulafia, vice president and aerospace analyst with The Teal Group, said during the Aerospace Alliance Summit in November 2016 that it's significant that the plane being built in Mobile is "the biggest single aerospace program in the world in terms of dollars, both historically and moving forward, and volume is extremely important in this business."

Top Airbus officials see that, too.

"The addition of the A320 family assembly line allows the Gulf Coast region and Alabama to establish a new aerospace center of compe-

Chapter I: Assembly, maintenance

tency which will create jobs and strengthen the aerospace industry in the U.S.,” said Allan McArtor, chairman of Airbus Americas, who called it the “most significant, game-changing event in U.S. aerospace in decades.”

Second assembly line

Then in October 2017 came an announcement that would alter Mobile’s trajectory. Airbus SE agreed to acquire a majority stake in Canada’s Bombardier Inc.’s CSeries jetliner program, and said it would add another final assembly line for that plane at its manufacturing site in Mobile.

Under the agreement, Airbus provides procurement, sales and marketing, and customer support expertise to the CSeries Aircraft Limited Partnership (CSALP), the entity that manufactures and sells the plane. Headquarters, primary assembly line and related functions would remain in Québec. CSALP has since been renamed the Airbus Canada Limited Partnership.

In July 2018, Airbus, Bombardier and Investissement Quebec closed on the deal, and the CSeries was renamed the A220. There are two models, the A220-100 and A220-300, designed for the 100 to 150 seat market, a category that previously had no Airbus aircraft.

JetBlue became the first customer for the A220, signing a Memorandum of Understanding for 60 firm orders for the A220-300 model, powered by Pratt & Whitney GTF engines.

A ceremonial groundbreaking was held in January 2019 for the A220 final assembly line at the Mobile Aeroplex at Brookley right next to the A320 assembly line. Bombardier’s investment is close to \$300 million.

Airbus posted the first notices for job candidates in January 2019, and the first workers reported in late March 2019, while construction was still in its early phase. There will be 600 workers at the plant by mid-2020.

The plant will begin producing A220 aircraft in Mobile in the third quarter of 2019 with the first delivery in 2020. The assembly line will eventually produce four A220 passenger jets every

month. The only other plant in the world producing the single-aisle, twin-engine A220 passenger jets is in Mirabel, Quebec, Canada.

But the A320 and A220 may not be the only aircraft assembled in Mobile. There is another tanker battle on the horizon, and Mobile could eventually benefit.

New tanker battle looms

In an opening salvo of a future aerial tanker battle, Airbus teamed up with Lockheed Martin to develop tankers to meet the U.S. military’s growing demand. The December 2018 memorandum of agreement between the two aerospace giants comes eight years after Airbus lost an Air Force tanker battle to rival Boeing.

Mobile knows all about that battle. Airbus teamed with Northrop Grumman and put in a bid to build the tankers in Mobile. They won, but Boeing protested, a new contest was scheduled and Northrop dropped out. Airbus went it alone but Boeing won with its smaller plane.

Now Airbus will work with Lockheed and go after the next possible aircraft and refueling service orders. The U.S. Air Force, which wants to ultimately replace its entire fleet of over 400 tankers, is examining ways to meet growing demand for aerial refueling with possible fee-for-service arrangements, purchases of hundreds of additional aircraft, and the future development of a stealthy tanker.

Airbus and Lockheed agreed to jointly explore all those opportunities. Airbus has had success selling its A330-based Multi Role Tanker Transport (MRTT), which has been selected by 12 countries. The aircraft is already refueling or capable of refueling most major U.S. combat airplanes, including the F-35.

There have been press reports that Mobile could be a possible site to build the tankers, but the company is saying nothing at this point.

Pascagoula’s Fire Scout plant

Some 35 miles to the southwest of Mobile Aeroplex another major aerospace and defense

Chapter I: Assembly, maintenance



MQ-8C on assembly line in Moss Point.

Northrop Grumman photo

company, Northrop Grumman, works on two cutting-edge unmanned aircraft systems. The 101,000-square-foot Northrop Grumman Unmanned Systems Center in Moss Point, Miss., does final assembly work on the Fire Scout unmanned helicopter and central fuselage work on all variants of the Global Hawk fixed-wing unmanned aerial system.

The first Fire Scout, using a Schweizer airframe, rolled out of the Moss Point plant in December 2006 and went to Naval Air Station Patuxent River, Md., for testing. By early 2017, 33 MQ-8Bs models and 19 of the larger MQ-8C Fire Scouts, which use the Bell 407 airframe, had come out of the Moss Point plant. There have also been 23 ground control segments for Fire Scouts produced in Moss Point.

Northrop Grumman in the fall of 2018 began flight tests for MQ-8C Fire Scouts produced in Moss Point at the Trent Lott International Airport.

“Building on Northrop Grumman's recent announcement of new production capabilities in Moss Point and a 40 percent increase in employment at the site, the ability to now conduct MQ-8C Fire Scout flight tests where the production occurs will bring new efficiencies and effectiveness to our local operations and improve our ability to serve the U.S. Navy,” said Melissa Packwood, Northrop Grumman Fire Scout program director.

Moss Point also handles the central fuselage work for all variants of Global Hawk, including the Navy's Triton. Although the Mississippi plant was not involved in early versions of the Global Hawk, it's been involved in all variants built after the plant opened. As of early 2017, Moss Point has done central fuselage work on 45 of the high-flying aircraft, according to company officials.

Unmanned aerial systems is a high-growth segment of the aerospace industry. Drones of every size and shape

are becoming ubiquitous, and orders for Fire Scout and Global Hawk are going to come in for years into the future.

Northrop Grumman executives have said that the Moss Point plant could participate in the building of other unmanned systems. It has room in the plant, and also has first crack at additional acres at the park.

In May 2017, Northrop Grumman announced that it would do some subassembly work for the F-35 at the Moss Point plant.

Nearby aircraft assembly

There are other areas just outside the region covered in this book that are also involved in aircraft assembly.

Bell has announced that, if it is selected to build the U.S. Navy's Advanced Helicopter Trainer, it will assemble the aircraft in Ozark, Ala., where it currently does some of the assembly work for the Fire Scout helicopter.

The company would build the Bell 407GX_i, and final assembly would take place in Ozark, according to Bell's parent company Textron. Ozarks is near Fort Rucker, where the Army trains its aviators, and north of Milton, Fla., and Naval Air Station Whiting Field, which would eventually base the helicopters.

The Navy wants about 130 aircraft for the program. Bell's workforce at the Ozark site could grow by 25 percent to a total of 100 work-

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ers if the company wins the competition, according to the Alabama Department of Commerce.

If selected, the Bell 407GX_i would replace the Navy's TH-57 Sea Ranger training helicopters, which Bell first introduced in the 1970s. A decision from the Navy is expected later this year. Bell is competing against Airbus Helicopters and Leonardo Helicopters.

In Lafayette, La., two hours west of New Orleans along Interstate 10, Swiss company Kopter Group plans to assemble new SHO-9 helicopters at Lafayette Regional Airport. It will create 120 new direct jobs with an average annual salary of more than \$55,000, plus benefits.

Activities at the 14.7-acre site will include production, customization, assembly and customer service. Suppliers include Kaman (composite parts), Garmin (avionics), Parker Aerospace (hydraulic pumps), Collins Aerospace (external lighting) and Honeywell (turboshaft engine).

The helicopters ultimately will be assembled in Lafayette with U.S.-sourced components representing at least 50 percent of the aircraft value.

In addition, the company will make a \$4.2 million capital investment to modify and equip a state-of-the-art, 84,700-square-foot helicopter assembly building at the airport, the former Bell Helicopter facility.

Bell Helicopters in October 2018 shut down its operation at the airport when the state terminated its contract with Bell due to underperformance. LED provided \$26 million in funding to the manufacturer in 2013 to establish an assembly base in the state. The facility was initially supposed to be the final assembly line for the Bell 505 Jet Ranger X but later transitioned to the 525 cabin subassembly facility.

Part of the agreement was that Bell would create 115 new direct jobs. Bell renegotiated the contract in 2017 to bring that number down to 95. But that figure was not met so the contract was terminated.

Kopter Group hopes to do better, but no doubt the state will step in if it doesn't deliver.

- David Tortorano

Airbus photo



Delivery center going from five to eight aircraft positions.

Airbus campus grows

First there was Hangar 9, where Airbus workers have produced a steady stream of A320 series jetliners since 2015.

Now comes Hangar 7, the new final assembly line for the newest Airbus - the A220. It will be about the same size as Hangar 9, which is 836 feet long and 209,917 square feet.

But the hangar is just one of the changes transforming the Airbus campus. The footprint has gone from 116 acres to 198, and is getting seven more buildings for a total of 17.

By the time the A220 line is in operation, the Airbus campus will be producing nine jetliners per month - five A320s and four A220s.

Production of the A220 aircraft will begin in Q3 of 2019 with a target of producing four aircraft a month by the middle of next decade. The facility is currently producing five A320 series aircraft each month.

Kristi Tucker, a spokeswoman for Airbus in Mobile, said the current delivery center is being expanded to accommodate three more aircraft positions. The new buildings are a transshipment hangar, where major components are gathered after shipment and checked before entering the final assembly hangar; two flightline/final phase hangars (four bays); another logistics center; another gauging canopy; and two paint shops.

Airbus has eight final assembly lines worldwide that produce the full range of single-aisle and wide-body jetliners. Five are for the A320 series.

Toulouse, France, has five assembly lines, two for the A320 and one each for the A330, A350 XWB and A380. Hamburg, Germany, has one final assembly line with four production lines for the A320.

Tianjin, China, has one final assembly line for the A320, and Mobile has one final assembly line for the A320 and is building an assembly line for the A220.

- Gulf Coast Reporters League

AIRCRAFT MAINTENANCE IN MOBILE/PENSACOLA

Of all the claims Florida can make about its aerospace footprint, one not well known may be its standing when it comes to maintenance, repair and overhaul (MRO) facilities.

“We’re the No. 1 state for MROs, we have over 600 establishments statewide,” said Tim Vanderhoof, senior vice president of business development for Enterprise Florida, the state’s economic development organization.

Pensacola is adding to that luster.



MRO hangar in Pensacola airport.

GCAC photo

Lucrative field

During the June 2018 Southeast Aerospace and Defense Conference in Mobile, Ala., one of the topics discussed was the move of Original Equipment Manufacturers (OEM) into the aftermarket, which represents a challenge to maintenance, repair and overhaul facilities.

The MRO industry is expected to continue to grow until 2028, with the value set to rise globally to \$114 billion. OEMs see the aftermarket as a revenue source, so are pushing in-service support contracts, speakers said.

Larger MROs are able to go head-to-head with the OEMs because of their labor pools and capabilities. ST Engineering Aerospace and HAECO do as much airframe maintenance work as the other top 10 global MRO providers combined, according to *Aviation Today*.

Brian Prentice, a partner of Oliver Wyman, said at the conference that airline customers will determine the outcome. Airlines want a safe, reliable and nimble service provider for their aircraft, and the aftermarket developed to be responsive to airlines.

One of the larger MRO companies that is unlikely to be impacted by the growing interest of the OEMs is ST Engineering Aerospace.

The big dog

When a new ST Engineering - then called VT

MAE - MRO hangar had its grand opening at a hangar on the north side of Pensacola International Airport in June 2018, the ceremonial ribbon-cutting attracted then-Gov. Rick Scott.

Workers already had their first project, a UPS aircraft that was in new hangar for routine maintenance.

The MRO will eventually have more than 400 workers. But what the crowd did not know was that the opening of the \$46 million, 173,500-square-foot hangar was only the beginning.

Less than a year later work was under way to begin building three more hangars, two of them larger than the first hangar, all operated by ST Engineering Aerospace.

The project is valued at \$335 million.

The proposed campus will increase Pensacola’s MRO footprint four-fold. It will create more jobs than the aircraft maintenance positions that were lost in the 1990s when the Naval Aviation Depot at Naval Air Station Pensacola was closed.

“I consider this to be an incredibly important project. As an individual who is a lifelong resident of Pensacola, this is truly a transformational moment for this area,” said Dan Flynn, director of Pensacola International Airport.

“It’s a great visionary project,” said Scott Luth, CEO of FloridaWest Economic Development.

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“We are excited to be a part of that team to bring this opportunity to Pensacola and Northwest Florida.”

All of this comes at a time when the MRO field is growing. According to *Aviation Week's* MRO-Network, the global MRO industry expects to grow from total gross revenues of \$75.6 billion in 2017 to \$109.2 billion in 2027.¹

The first nibble

Seven years ago Pensacola officials and ST Engineering first started talking about opening an MRO at the airport. The company, which has had an MRO operations in Mobile since 1991, looked at South Mississippi, South Alabama and Northwest Florida for an expansion site before opting for a 19-acre site in Pensacola.²

Triumph Gulf Coast in July 2018 gave preliminary approval to two grants to expand the region's aerospace and aviation infrastructure. The board voted unanimously to support \$56 million for the ST Engineering airport project, and another \$8.5 million for substantial expansion of Whiting Aviation Park in Santa Rosa County.

Triumph Chairman Don Gaetz said the investments “will directly create over 3,100 high-paying jobs” and grow Northwest Florida as a leader in aerospace.

In October 2018, ST Engineering and the city of Pensacola signed a memorandum of understanding (MOU) for additional maintenance, repair and overhaul hangars at Pensacola International Airport, adjacent to a 173,500 square-foot hangar that opened in the summer.

ST Engineering will invest \$35 million in the \$210 million project. The MOU was signed Oct. 27 in Singapore. Under the agreement, ST Engineering and the City of Pensacola will develop the MRO complex over four years after the formalization of definitive agreements.

The 655,000 square-foot design-to-build complex will consist of three state-of-the-art wide-body aircraft hangars and an administration building. Since opening in June 2018, the current facility has already redelivered 25 aircraft.

In February 2019, Triumph Gulf Coast agreed to provide another \$10 million for Pensacola's MRO expansion project.

The initial grant from Triumph Gulf Coast of \$56 million called for a commitment to Pensacola that would create 1,325 jobs and keep them in the community for at least three years. The additional money upped the commitment to seven years. Before that vote, the Pensacola City Council and Escambia County Commission each approved committing an additional \$5 million a piece to the project, bringing the local governments' contribution to \$15 million each.

With Triumph's vote, the city was still on the hook for about \$24.8 million. Pensacola Mayor Grover Robinson was optimistic \$20 million of that would come from the Florida Department of Transportation. Indeed, FDOT came through in February, upping its commitment by \$20 million to a total of \$45 million.

In March the Pensacola City Council approved the new lease for ST Engineering and authorized the mayor to borrow up to \$20 million to float the cash until the city begins receiving grants approved for the project. The authorization allows the mayor to provide cash flow to pay contractors building the three new hangars and administration building.

If the city sticks to the schedule, construction of the first new hangar will begin this year.

The hangar can hold two 777s, four 757s with winglets or six A320s, according to Flynn.

The entire campus will be 112 acres, including the acreage with the first hangar. In addition to the first hangar, it will add two 191,000-square-foot and one 173,000-square-foot hangars, 100,000 square feet of warehouse and shop space, a 120,000-square-foot administrative office building and associated roadways, taxiways, as well as aprons.

The land and buildings will be leased to ST Engineering Aerospace, subject to a long-term real property lease. The entire MRO development will be city-owned assets of the airport, according to the applicants.

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Phase two of the MRO Aviation Campus will create at least 1,325 jobs at an average annual salary of \$44,461 plus benefits. When combined with the 400 new jobs associated with the first hangar, total aerospace sector jobs employed directly by ST Engineering Aerospace would be 1,725. That's more than the 1,000 workers at the 10-hangar, 900,000-square feet it has at the Mobile Aeroplex.

In addition to the direct ST Engineering Aerospace jobs, full time equivalent jobs directly related to the aviation and aerospace industry will be located at the airport. That includes about 77 administrative and engineering staff, 60 full time customer airline engineering jobs on site to oversee the repair and maintenance protocols associated with their aircraft, and an additional 16 vendor and auditor positions.

The project will also require some 25 non-aerospace jobs in security, maintenance and janitorial services. And, under discussion, is the opportunity for establishing about 63 North America executive and senior administrative jobs at the Pensacola MRO Campus.

The MRO in Pensacola is part of VT Systems of Alexandria, Va., a wholly-owned subsidiary of Singapore-based ST Engineering, which has been the world's top MRO operation for years.

The state-of-the-art facilities to be developed in the MRO Aviation campus will use "Smart MRO" technologies. The company's engineers, technicians, and mechanics will use next generation methods at the Pensacola campus, including laser scan technology and 3D (additive manufacturing) to fabricate parts; drones for remote aircraft inspection; composites for appropriate aircraft; and robotics. In 2017, ST Engineering acquired Pittsburgh-based Aethon.

Along with the use of cutting-edge techniques, the campus is also envisioned as a location for education and training. Plans are to establish within the MRO hangars a training center for secondary education providers to prepare students for careers in the commercial aviation maintenance. The plan is to enhance existing

workforce development programs at Washington High School (Aviation Maintenance Academy), George Stone Technical Center (Airframe and Power plant Technology) and Pensacola State College.

In addition, this proposed project will assist in transitioning veteran military personnel to commercial aviation and aerospace jobs. A near-term vision is the collaboration between ST Engineering Aerospace and local education providers will create an MRO Aviation Training Academy to develop the workforce needed for the available jobs and to maintain a pipeline of trained technicians for the future.

Upon completion of the campus, ST Engineering Aerospace will have invested about \$75 million of its own funds, according to the Triumph Gulf Coast document.

As with any project of this size, the expectation is that it will result in luring suppliers to the Pensacola area. The applicants pointed out that ST Engineering Aerospace will spend some \$35 million annually in the procurement of airplane and non-airplane components from about 1,200 vendors, and said the supply chain activity could lead to the relocation of suppliers to the region.

Such a large MRO complex would more than make up for the 2,500 maintenance, repair and overhaul jobs that were lost in the 1990s when the Naval Aviation Depot (NADEP) at Naval Air Station Pensacola was shut down as a result of the base closure and realignment process.

Though NADEP shut down, there continued to be hundreds of maintenance workers in the Pensacola metropolitan area.

The importance of the campus was underscored in April 2019 when Singapore Technologies Engineering (ST Engineering) secured around \$959 million in new contracts in the aerospace sector.

Among the new contracts is a 10-year service agreement with a long-time, North American operator to provide heavy maintenance checks for its fleet of Airbus A300s and Boeing 757s.

The contract will cover over 160 wide-body

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and narrow-body aircraft, to be serviced at its MRO facilities in San Antonio, Texas, and Pensacola, starting in 2020.

The Pensacola MRO campus is the second MRO operation for ST Engineering. It has had an MRO in Mobile, Ala., that employs over 1,000 workers since 1991. It's part of VT Systems of Alexandria, Va., a wholly-owned subsidiary of Singapore-based ST Engineering.

While the ST Engineering operation has grabbed the most attention, PSA Airlines, a subsidiary of American Airlines, plans to open a new maintenance facility at PNS.

It will create some 30-35 jobs and support PSA's efforts to grow its fleet by about 20 aircraft. PSA will be looking to hire team members, including mechanics, leads, inspectors and stores personnel. In a news release, PSA said Pensacola International Airport was an ideal location for the new facility because the area provides a sustainable workforce, strong local military presence and an abundance of technical schools. PSA currently has maintenance facilities in Dayton, Canton and Cincinnati, Ohio; Norfolk, Va.; Charlotte, N.C.; Greenville, S.C.; and Savannah, Ga.

Military MRO

The other aerospace project that received Triumph Gulf Coast funding was in Milton, Fla., some 30 miles from Pensacola. The vision for Santa Rosa County's Whiting Aviation Park is to create an aviation maintenance, repair and overhaul depot that could handle major and minor work for smaller military and civilian aircraft. To add to its appeal, the plan is to establish an education and training center as well.

The idea for the aviation park has been around since 2002, then on July 18, Triumph Gulf Coast, a non-profit established to distribute re-

covery funds that resulted from the 2010 BP oil spill, gave preliminary approval for a grant of \$8.5 million for Whiting Aviation Park.

"The Triumph Board has provided us with a game-changing opportunity by allowing us to put in infrastructure for Whiting Aviation Park," said Shannon Ogletree, director of Santa Rosa Economic Development.

He said construction could begin late this summer or early fall. Moffett/Nicholas is the engineering firm that will perform the design phase.

The funding will be used to improve 40 acres of industrial park land outside the fence but adjacent to Naval Air Station Whiting Field. The Triumph money will be used for infrastructure – electric, water, sewer, storm water retention and more. The improvements are intended to support helicopter maintenance, repair and overhaul operations in support of the Whiting Field military training missions.

Economic development officials hope the park will help Whiting's military training missions by providing the option of having work on aircraft done nearby instead of flying planes elsewhere.

The park is industrial zoned. Details of the agreement for use of the 6,000-foot runway are still being worked out. The runway has tower capabilities thanks to the military training mission at Whiting.

North of Florida in Andalusia, Ala., aircraft maintenance service provider Yulista Holding of Huntsville, Ala., opened a new fixed- and rotary-wing facility at the Southern Alabama Regional Airport. It includes two hangars, an office, and manufacturing and storage space, with services geared toward Lockheed C-130 and Boeing 737 aircraft.

- David Tortorano

For an overview of aerospace products built or tested in the region, see Chapter I, pages 14-22, *Gulf Coast Aerospace Corridor 2017-2018*. For weapons systems managed by Eglin Air Force Base, see pages 31-32.

¹ Oliver Wyman, Global Fleet and MRO Market Forecast Summary, page 3.

² Duwayne Escobedo, "One that didn't get away," Gulf Coast Aerospace Corridor Newsletter, October 2014, page 1.

Where in the world is BluesMobile?

The first Airbus plane built in Mobile gets around. Here's how to keep up

If you ever fly JetBlue, ask about the name of the airplane. JetBlue's approximately 250 commercial passenger aircraft are named most often with whimsical variations of "blue." There's the Chicken Cordon Blue, Blue Velvet, My Other Ride Is a JetBlue, and so on.

If your plane turns out to be called the BluesMobile, you're on the first Airbus plane ever built in Mobile, Ala.

It was a history-making day in Mobile when the Airbus A321 made its first flight March 21, 2016 from the Airbus Final Assembly Center at the Mobile Regional Aeroplex at Brookley.

More milestones occurred when the twin-engine, single-aisle plane was delivered to JetBlue and when it officially went into service.

Three years later, the BluesMobile is often found between John F. Kennedy International Airport in Queens, N.Y., and any of several international resort vacation hotspots. Keeping up with it is a simple matter of entering its registration number and JetBlue in your search engine of choice. That number is N965JT.

For example, on May 31, 2019, the BluesMobile left Barbados at 1:16 p.m. Atlantic Standard Time, and arrived at JFK at 6:41 p.m. Eastern Daylight Time, a little bit early according to www.flightaware.com. The 2,027-mile trip took five hours and five minutes. The average speed was 539 miles per hour at a top height of 36,000 feet.

That same night, it left JFK at 10:21 p.m. EDT for Puerto Rico. It was a bit late, as JFK was experiencing weather delays at the time. It landed on time in Puerto Rico at 2:41 a.m.

From May 25 to May 31, 2019, the BluesMobile flew 27 times, an average of 3.3 times daily. Most of the trips were either to or from JFK, but other destinations in addition to Barbados



First flight of the eventual BluesMobile.

GCRL photo

and Puerto Rico were the Dominican Republic; Denver; Cancun; Paradise, Nev.; Orlando; Boston; New Orleans; and Palm Beach, Fla.

Detailed flight information is available for free on the internet for as far back as three months. Subscribers to flightaware.com can get the entire flight history of the BluesMobile.

BluesMobile seats 190 passengers. According to www.airbus.com, the A321 generally seats 170 to 200 depending on configuration, and can fit as many as 220 in a more cozy layout. Seats are 18 inches wide.

The site www.flightera.net reports the BluesMobile made 114 flights in May 2019.

For more numbers, go to www.planemapper.com. Do some conversion math on the registration information and the following statistics come up in addition to the 190 passenger seats:

- Range: 3,480 miles;
- Weight empty: 47,500 kg;
- Weight at takeoff: 93,000 kg;
- Weight at landing: 77,700 kg;
- Length: 146 feet;
- Height: 38.58 feet;
- Wing span: 111.84 feet.

The A321 is the longest of the A320 family of jets. Airbus touts its roominess, overall comfort and fuel efficiency.

- Jane Nicholes

II: Space



The investment frontier

The \$345 billion space enterprise has government and commercial players, and this region has a foot in both worlds

Late this year or early next year in South Mississippi, four RS-25 engines and the core stage of NASA's Space Launch System (SLS) will roar to life in a thunderous spectacle during a static test, called a "Green Run," at the historic B-2 test stand.

With a combined 2.2 million pounds of thrust, the engine core test at Stennis Space Center (SSC) will be a display of raw power that will bring back memories of the Saturn V tests during the Apollo era.

"It will probably give the stand a little bit of a workout," SSC director Richard Gilbrech said during the Aerospace Alliance Summit in 2017 in New Orleans, adding with a smile, "My goal is not to become a launch site."

When this test happens, it will underscore the importance of the Interstate 10 region's space-related activities. All the RS-25 engines that will be used in the SLS program were tested at SSC, and the core stage was built at Michoud Assembly Facility (MAF), some 35 miles away in East New Orleans.

As impressive as the test will be, it is just one event in the dynamic 21st century space age, where government and commercial players in the United States and abroad are all vying for a piece of the \$345 billion global industry. And there's plenty of action, from launch services to

Chapter highlights

- *SSC creating a 1,100-acre park for commercial space operations*
 - *Gulf Coast is part of an exclusive club of areas with NASA centers*
 - *SSC tests rocket engines, MAF builds large space structures*
 - *Hancock County, Miss., seeking license for spaceport at Stennis airport*
 - *Eglin home to a powerful space observation radar*
-

satellite production, and from space tourism to building space habitats. NASA's ambitious SLS project to send astronauts into deep space is just one piece of the action.

For established space companies there's more money to be made, and for start-ups there are opportunities for niche activities that could be the start of something big. For economic development professionals, opportunities abound. At least one organization in the region is seeking a license to turn an airport into one of the nation's spaceports.

And, in what might eventually turn out to be one of the most important moves for the long-term health of the space industry in this region, NASA is moving forward with a plan to create "Enterprise Park," a huge technology/research park near SSC as a lure to businesses.

The space industry

According to the Federal Aviation Administration's *Annual Compendium of Commercial Space Transportation: 2018*, the size of the global space economy, which combines satellite services and

Photo page 23: Artist's illustration of NASA's Space Launch System in Block 1 cargo configuration.

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Green Run will be at the B-2 test stand. NASA/SSC photo

ground equipment, government space budgets, and global navigation satellite services (GNSS) equipment, is estimated to be \$345 billion.

At \$98 billion in revenues, or about 28 percent, satellite television represents the largest segment of activity. That's followed by services enabled by GNSS, which represent about \$85 billion in revenues, or 25 percent.

Government space budgets represent \$83 billion, or 24 percent. Other satellite services (fixed and mobile satellite services, broadband, and remote sensing) generated about \$30 billion in revenues, and ground equipment represents \$29 billion in revenues. Satellite manufacturing generated nearly \$14 billion.

There is continued, strong investment in start-up space ventures. Including acquisitions and debt financing, 2016 was the highest investment year for startup space. Average deal size increased by about 50 percent, while the number

of deals, investors, and firms reporting new funding all decreased by about 30 percent, said the FAA report. Well over 100 investors put \$2.8 billion into 43 start-up space ventures across 49 deals.

The Space Report 2018: The Authoritative Guide to Space Activity, released by the Space Foundation in July 2018, says the global space economy in 2017 totaled \$383.5 billion, up from the \$323 billion in 2015 cited in *The Space Report 2016*.

That report says seven countries/agencies spent more than \$1 billion on space, and the U.S. share of global government space spending was 57 percent. There was a seven percent increase in the number of orbital launch attempts worldwide. The U.S. share of global launch activities was 33 percent.

There was a 100 percent increase in the total number of spacecraft deployed and a 200 percent increase in the number of commercial spacecraft deployed. The U.S. share of global spacecraft deployed was 65 percent, it says.

Meanwhile, the *2018 State of the Satellite Industry Report* by the Satellite Industry Association, released in June 2018, said there was a record number of satellite launches in 2017. Earth observation satellites made up 49 percent of the total. Overall satellite industry revenue grew by three percent compared with the previous year led by satellite manufacturing revenues which increased by 10 percent over 2016.

Satellite services revenues remained the largest industry segment in 2017 and increased to \$128.7 billion, powered by consumer satellite television, satellite broadband and Earth observation services. Satellite manufacturing 2017 revenues increased by 10 percent over the previous year to \$15.5 billion with a record 345 satellites launched in 2017. Ground equipment 2017 revenues rose by nearly six percent over the previous year to reach \$119.8 billion.

New investment frontier

Morgan Stanley in November 2018, in an update of its *Investment Implications of the Final Fron-*

Chapter II: Space

tier, said that nearly a half century since humans left footprints on the Moon, “high levels of private funding, advances in technology and growing public-sector interest is renewing the call to look toward the stars.”

Morgan Stanley estimates that the global space industry could generate revenue of \$1.1 trillion or more in 2040.

“The investment implications for a more accessible, less expensive reach into outer space could be significant, with potential opportunities in fields such as satellite broadband, high-speed product delivery and perhaps even human space travel. While the most recent space exploration efforts have been driven by handful of private companies in recent years, discussions of a sixth branch of the U.S. military -- the ‘Space Force’ -- along with growing interest from Russia and China, means public-sector investment may also increase in the coming years,” the report says.

Earlier, Goldman Sachs, in *Profiles in Innovation* series in May 2017 highlighted the state of the industry and called space the “next investment frontier.”

“Rocket launches are being privatized, the most ambitious satellite constellation ever is being deployed, man is looking back at the Moon and Mars, and militaries are vying for the ultimate high ground,” the report said, adding, “technological advances and necessity are creating a wave of opportunity as business and governments invest in a new Space Economy.”

A report by Bank of America Merrill Lynch was even more optimistic about the future growth of the industry. It forecast the size of the space industry over the next three decades will reach at least \$2.7 trillion.

Southern space juggernaut

The space industry, whether for commercial or military purposes, operates at the cutting edge and requires a highly skilled, highly trained workforce to build, launch, and utilize space assets. It’s an aerospace field any region would love to have in its portfolio. The South and the I-10 re-



SLS core stage at MSFC’s Test Stand 4693. NASA photo

gion have a foot in the door, thanks to decisions made in Washington at the start of the space age.

The South’s space ties go back to the early ’60s, when President Kennedy issued a challenge to beat the Soviets and get a man on the moon before the end of the 1960s. Newly established NASA launched a program to establish manufacturing, test and launch facilities needed to get there, and the South won big.¹

It became the home to key NASA facilities because of the availability of large tracts of land and interconnected waterways needed to transport large space vehicles. Longer periods of fair weather flying, the same thing that attracted the military, also played a role. In addition, powerful, senior Southern politicians recognized the economic benefit the space program would bring.²

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Huntsville, Ala., Houston, Cape Canaveral, Fla., Bay St. Louis, Miss., and New Orleans formed the “Space Crescent” in the South. In “Way Station to Space,” Mack R. Herring cited a story in the July 20, 1964 issue of *U.S. News & World Report* that described the space program as a new industry in the South worth “billions.” Money for facilities was being spent at the rate of “one-million dollars every two hours.”

Because of those decisions long ago, space is one of the key aerospace segments in the Gulf Coast region. It’s home to NASA’s SSC in Southwest Mississippi (*page 40*), and MAF in Southeast Louisiana (*page 42*). It’s also home to the military’s phased array radar system at Eglin Air Force Base, Fla., which has been keeping its eyes on space 40-plus years (*page 43*).

That the South benefited when NASA dominated the space program is clear. What is less certain is how the South will do in an age when private players and commercial activities are playing an ever-increasing role in space.

Commercial space

If there is one company that illustrates just how important commercial space activities have become, it’s Space Exploration Technologies, better known as SpaceX. The launch in February 2018 of the Falcon Heavy, the most powerful commercial rocket in the world, was particularly startling. The 23-story rocket built with three of the company’s proven Falcon 9 rockets, powered by 27 Merlin engines with a combined 5 million pounds of thrust went skyward from Cape Canaveral on an unusual mission.

Two of the three boosters made vertical landings back at Kennedy Space Center, while the third booster scheduled to land on a drone ship hit the ocean about 100 yards from the ship.

It lifted an unusual cargo into orbit. It was a Tesla Roadster with a dummy in the driver’s seat. The end goal is that the car would drift in space in an orbit around the sun.

The Aerospace Industries Association (AIA) in 2017 said space and space-derived markets are



SpaceX Falcon Heavy uses 3 Falcon 9s. *SpaceX photo*

emerging for everything from internet communications, remote sensing, satellite servicing, transportation to space and manufacturing in space.

“Today, commercial space activity is no longer subordinate to the dedicated government programs that once dominated space news coverage,” said David Melcher, AIA president and CEO, in remarks at the Space Symposium in Colorado in April 2017.

“It now represents three-quarters of global space economic activity. Indeed, space has been growing in its commercial importance ever since NASA launched the first private sector telecommunications satellite known as Early Bird over 50 years ago. And now, global commercial space and space enabled services account for many times the activity of NASA, the U.S. Air Force and international government efforts,” he said.

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Technicians work on Orion module for EM-2. *NASA photo*

Commercial interests have, of course, been involved in the federal space program from day one. NASA needed the companies to develop systems, and in many cases those companies established operations close to NASA centers to be near the customer. That's one reason NASA centers are economic engines.

But in the new age, NASA is just one customer. Space flight companies are cropping up in multiple places nationwide. Still, the South has some of the most unique capabilities in the world that can be a lure for the new breed. SSC, for instance, is the most capable of NASA's sites where rocket engines are tested, the last place in the country where NASA can test full-scale engines or whole rocket stages 24/7. SSC is marketing itself as a test site with expensive, assets already in place.

Gilbrecht said Stennis Space Center was created to provide NASA with a location to test powerful rocket engines. The requirement was a sparsely populated area with rail, roads and water access, close enough to population centers from which to draw a workforce. SSC is a 140,000 acre site with a 15-mile circle around the center.

"Imagine trying to recreate that in today's litigious world," he said at the New Orleans summit.

Florida's Space Coast and Huntsville, Ala., both important NASA centers, both have had success attracting commercial operations. Flori-

da has a long track record with its launch facilities, and Huntsville has years of expertise in propulsion systems work.

The industry, whether a huge aerospace company that's worked in the field for years or one of the startups backed by the deep pockets of billionaires, still needs the same things NASA has built up over 60 years. For some companies it makes sense to tap into what's already available through NASA.

Leveraging NASA assets

It was big news when a NASA facility at Kennedy Space Center that faced an uncertain future with the end of the Space Shuttle program got a new lease on life when Boeing decided to use it to build the company's CST-100. Space Florida, an aerospace economic development agency, took over the Space Shuttle Main Engine Processing Facility and Processing Control Center and is leasing it to Boeing to build its Crew Space Transportation spacecraft.

A writer in a *Time* magazine story a few years back likened the Boeing lease to an aristocrat selling off parts of the family estate. But Florida officials saw it as a chance to attract the commercial space flight industry.

In January 2019, Los Angeles-based Relativity Space, which aims to build rockets using 3D printers, announced a contract with the Air Force to build and operate a launch facility at Cape Canaveral Air Force Station, Fla. The five-year "multi-user" agreement means Relativity can begin operating out of Launch Complex 16 (LC-16), the historic location built in the 1950s and site of hundreds of American space launches. The agreement includes an option to extend for an exclusive 20-year term.

Frank DiBello of Space Florida, has been praised for the impact he has had on diversifying Florida's space activities from a NASA launch site to a major player in commercial space.

"The mandate that we have is to take aerospace, aviation and space and make sure that Florida has the infrastructure to succeed in those

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marketplaces, whether that's roads and bridges, or launch pads or manufacturing facilities," he said during the 2017 Aerospace Alliance Summit in New Orleans.

"We hope to grow the space launch capabilities in Florida where today the cape is the busiest space port in the world with about 30 launches, to a level where we're somewhere between 100 and 200 launches, and that's a year. And that's not inconceivable."

In the Gulf Coast I-10 Corridor region, both SSC and MAF have excess capacity that can be offered to private companies. And with space flight costs so high, that could provide a savings hard to pass up. In addition to idle facilities, SSC and MAF both have thousands of acres available for development.

Patrick Scheuermann, former director of Stennis Space Center, once pointed out that there are a lot of companies with great ideas that are in the laboratory or subscale version. Success with those smaller versions will force them to make an investment in their own back yard or search for a location to test the larger scale.

"Rather than them duplicating infrastructure somewhere or putting their capital dollars somewhere, they're basically using resources that the taxpayers already paid for once," Scheuermann said in 2011 when still at SSC.

SSC in March 2012 started looking for a company interested in partnering with NASA or leasing the E-4 site originally designed to test propulsion systems for a now-defunct program. E-4 has concrete-walled test cells and hard stand, a high-bay work area with a bridge crane and adjacent work area, control room space and personnel offices, and road and barge canal access.

It took six years, but in March 2018, Los Angeles-based commercial space company Relativity Space, which is building rockets using 3D printing, entered into a 20-year agreement to use exclusively the E-4 test complex to help it develop and test fire its rocket engine, Aeon 1. The contract gives Relativity access to four testing chambers at SSC.



Test of launch abort system in Maryland.

NASA photo

In addition, Stratolaunch in November 2017 signed an agreement to use the E-1 test stand at SSC. In November 2018 it successfully tested a component of its hydrogen-fueled PGA rocket engine with the pre-burner hot-fire test. The name PGA is from the initials of the company's founder Paul G. Allen, who died in 2018. The Microsoft co-founder launched the company with aerospace engineer and entrepreneur Burt Rutan in 2011 with the aim of providing flexible, low-cost access to space.

The Gulf Coast even has ties with SpaceX, the California-based company founded by Elon Musk. SpaceX is using SSC to develop its next generation Raptor engines.

Park and spaceport

Having under-utilized assets is one thing. Making it easier for companies to opt to locate in this region is an entirely different thing.

The Gulf Coast is in the exclusive club of locations with NASA centers. SSC is where NASA has tested large rocket engines since the 1960s, and MAF is where huge aerostructures have been built just as long. Both facilities have roles in NASA's current deep-space program, the Space Launch System. But both are involved in commercial space ventures, a field that was supercharged during the Obama administration with the push to have private companies take over low-orbit resupply missions.

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Having a stake in both the federal and commercial sides of the space enterprise bodes well for the region. While NASA's programs rely on funding provided by Congress, the commercial field is more open-ended and can venture into activities that are not on NASA's agenda. Both SSC and MAF are actively courting commercial ventures to take advantage of under-utilized NASA facilities.

"Considering the advancements in commercial efforts in space travel and space-related services, NASA Stennis Space Center has the capacity to support those efforts - like the rocket engine test stands and engine component test facilities," said Robbie Ingram, executive director of the Mississippi Enterprise for Technology, the incubator and technology transfer office at SSC.

"Mechanisms exist to allow commercial space enterprises access to that same infrastructure so these type facilities do not have to be replicated," he said.

While NASA continues its bid to find commercial companies to use under-utilized assets, economic development officials here are hoping to get even more involved as growth shifts to commercial ventures.

Plans are in the works to create a 1,100-acre "Enterprise Park" outside SSC to attract more commercial space operations.

During the Aerospace Alliance Summit in New Orleans Dr. Richard Gilbrech, director at Stennis Space Center (SSC), Miss., said SSC was looking at creating a "near-site research park," and that SSC was on the verge of releasing the notice of availability.

The official Notice of Availability was posted at FedBizOpps Dec. 4, saying NASA was searching for a non-federal partner to lead the development of Enterprise Park, a 1,100-acre technology corridor on the north side of the complex.

Gilbrech thinks the SSC role is key and expansive. He has looked at what other areas NASA sites have done, including Space Florida and Huntsville, Ala., with its Redstone Gateway, a

nearly 500-acre mixed use park outside Marshall Space Flight Center.

For SSC, the 15-mile buffer zone and security has been positive for many of the companies that have come to SSC. They like the privacy, but it also causes a type of void. Companies that want to be close by but don't want to go through the security procedure have to be seven or eight miles away from where the action is.

That's what prompted the idea of the "near-site research park," that would "fill the niche and really poise us toward growth in the future."

The objective is to find a private or public entity to enter into a partnership with NASA to lead in the multi-phased development and long-term operation of the park at the nation's largest rocket engine test facility. The park would be designed to attract private sector participation in space exploration and space transportation activities.

Recent master planning efforts identified a need for a technology park area at SSC, and the first phase of the Enterprise Park focuses on 1,100 acres identified as the most development-ready. The property is located on the northern edge of the 13,800-acre secured area and includes sites both inside and outside the security perimeter.

A research park at SSC could attract not only space-related companies, but those involved in advanced materials and geospatial technologies. A key to success is bringing in research universities. On top of that, if efforts to create an advanced manufacturing tech park near Michoud comes to fruition, it will have a major impact for future generations.

In the same area, the Hancock County Port and Harbor Commission is filing paperwork to have an airport near SSC designed as a spaceport.

The FAA has developed regulations that enable airports to host operations of reusable launch vehicles that take off and land like aircraft. Several kinds of such vehicles are currently under development.

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In early 2018 in South Mississippi, the Hancock County Port and Harbor Commission (HCPHC) began looking at the feasibility of creating a spaceport at Stennis International Airport (HSA) in Kiln, a general aviation airport just outside NASA's Stennis Space Center.

By early in 2019, the HCPHC decided to go ahead and seek a spaceport license, commissioning RS&H Inc., which did the previous feasibility study, to complete the application for HSA to obtain a Launch Site Operator License from the Federal Aviation Administration. Filed with the FAA's Office of Commercial Space Transportation, it would enable horizontally launched reusable launch vehicles to operate out of HSA and could open the door to commercial space flight out of the airport.

The license application will establish regions over the Gulf of Mexico where the launches could be conducted safely and ensure the airport has the infrastructure required to support those launch operations.

Hancock County Port and Harbor Commission CEO Bill Cork said the commercial space industry is "poised for dynamic growth, and Hancock County is uniquely positioned to benefit from this growth."

- *David Tortorano*

¹ Mack R. Herring, "Way Station to Space," Chapter 1, *Decision for Mississippi*, citing Loyd Swenson Jr., "The Fertile Crescent: The South's Role in the National Space Program," *Southwestern Historical Quarterly* 71 (January 1968), pp. 382-87; Edward R. Ling Sr., "The Space Crescent: The Untold Story," (Huntsville, Ala.; The Strode Publishers, 1984), p. 24.

² Herring, citing Swenson, p. 388

Military space

In a strategic shift, the Air Force is no longer treating space as a benign domain used to monitor, senses and report, but instead as a warfighting domain where it would fight, should war start or extend into space.

"It's obvious, but it's probably worth repeating, that the U.S. is heavily dependent on space, and (our adversaries) know it is a vulnerability," said Air Force Secretary Heather Wilson during a May 17, 2017 Senate subcommittee hearing. "In any conflict, space will be contested – and we haven't always assumed that in the past. There's been a change in culture – a change in planning and training going on in the United States military because we cannot take space dominance for granted."¹

More than 80 percent of the Defense Department's space actions are handled by the Air Force, and it sees space as a core mission.

"We have to acquire at a pace that allows us to be faster than our adversaries who are all investing in ways to take away our advantage," said Air Force Chief of Staff Gen. David L. Goldfein during the Senate subcommittee hearing.²

President Trump, who wants to create a U.S. Space Force, signed Space Policy Directive 4 (SPD-4) in February 2019 centralizing all military space functions under a new Space Force overseen by the Department of the Air Force.

Ultimately, it's up to Congress to approve the creation of the Space Force as a sixth military branch that would organize, train and equip a corps of military space personnel. But SPD-4 marks the first time the administration made clear how the new service would fit into the existing military structure.

According to SPD-4, the Space Force will be led by a civilian undersecretary of the Air Force as well as a four-star general serving as the Space Force chief of staff, a measure that is less ambitious than the stand-alone service originally envisioned by the president. SPD-4 stipulates that all uniformed and civilian personnel currently supporting space operations will funnel into the Space Force, including Army and Navy personnel.

¹ "Senior leaders discuss US space posture," AFNS report in *Space War*, May 19, 2017.

² *ibid.*

Gulf Coast's space footprint

Two NASA facilities on the Gulf Coast are heavily involved in commercial space activities, but are more widely known for their NASA missions.

They are both crucial to the Space Launch System program, which Marshall Space Flight Center (MSFC) Director Jody Singer described as “America’s rocket” because more than 1,100 companies in 44 states are involved in building it, supporting more than 32,000 jobs and producing \$6 billion in economic benefit.

The following profiles the two NASA centers, along with the Gulf Coast’s other space-related facility at Eglin Air Force Base, Fla.

John C. Stennis Space Center

NASA

Bay St. Louis, Miss.

John C. Stennis Space Center, north of Interstate 10 in South Mississippi, is a 14,000-acre secure complex surrounded by a unique 125,000-acre heavily wooded buffer zone.

It’s where some of the most powerful rocket engines in the world have been tested, including 27 first- and second-stage boosters for the Saturn V. In 2008 the American Institute of Aeronautics and Astronautics named SSC an historic aerospace site.

Today SSC, which has more than \$2 billion in assets, provides test services for NASA, the Department of Defense and the commercial sector. It’s home to NASA’s Rocket Propulsion Test Program, which manages all the agency’s propulsion test facilities.

Over the years, SSC’s activities expanded to include other organizations that set up shop. It now has more than 40 resident agencies and over 5,000 employees. SSC has hundreds of scientists and technicians working in fields as varied as propulsion, geospatial technologies and



Aerojet Rocketdyne photo

Four RS-25 engines tested at SSC for the first SLS flight will be integrated in the core stage at MAF.

underwater research. It has the world’s largest concentrations of oceanographers.

The largest tenant is the Navy, which operates its oceanographic research community from SSC as well as one of the world’s largest supercomputers. It’s also the location of the National Data Buoy Center and NASA Shared Services Center. SSC also has data centers, geospatial and earth sciences work and activities of five universities and one community college. Several university cooperative programs operate at SSC.

SSC is where Lockheed Martin builds satellite components and Aerojet Rocketdyne assembles RS-68, AR1 and the AR-22 engines.

At SSC in early June 2018 Aerojet Rocketdyne completed assembly of the first AR-22 rocket engines, a variant of the RS-25, for the Boeing Phantom Express, an experimental, reusable military spaceship program. The work is being done as part of the U.S. Defense Advanced Research Projects Agency Experimental Spaceplane program. Phantom Express is intended to demonstrate a new paradigm for more routine, responsive and affordable space access. The AR-22 engine is capable of generating about 375,000 pounds of thrust and was designed to fly 55 mis-

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sions with service every 10 missions. This reusability feature makes the AR-22 ideally suited for Phantom Express. The reusable Phantom Express spaceplane will take off vertically and land horizontally.

SSC is close to three interstates and two commercial and one general aviation airports, and has access to water and rail transportation.

SSC is one of just four NASA facilities that can test large rocket engines. A former director once pointed out that there's no other place in the United States where the government or commercial companies can test 24 hours a day, seven days a week, 365 days a year with no fear of encroachment on surrounding communities.

SSC can test everything from engine components to full-scale engines and rocket stages at its vertical firing A-1 and A-2 test stands, the duel position, vertical-firing B-1/B-2 test stand and three-stand E complex, which includes seven separate cells capable of various tests activities. The stands can be used for both acceptance and developmental testing.

NASA rocket test facilities

- John H. Glenn Research Center's **Plum Brook Station**, 6,400 acres (10 square miles), Sandusky, Ohio
- Lyndon B. Johnson Space Center's **White Sands Test Facility**, 60,160 acres (94 square miles), Las Cruces, N.M.*
- **George C. Marshall Space Flight Center**, 1,800 acres (2.8 square miles), Huntsville, Ala.**
- **John C. Stennis Space Center**, 13,542 acres (21.1 square miles), Bay St. Louis, Miss.***138,542 acres (216.4 square miles), Bay St. Louis, Miss.***

*WSTF is within the 2,560,000-acre (4,000 square miles) White Sands Missile Range (U.S. Army)

**MSFC is within the 5,056-acre (7.9 square miles) Redstone Arsenal (U.S. Army)

***SSC is surrounded by a 125,000-acre (195.3 square miles) acoustical buffer zone (NASA)

The 300-foot-tall A-3 test stand will let engineers simulate conditions at altitudes up to 100,000 feet. SSC will be the only facility in the country capable of testing J-2X engines fully in simulated high-altitude conditions.

SSC tests two engines that will be used in NASA's Space Launch System: the J-2X, which will power the upper stage, and the lower stage's RS-25. In early April 2019, SSC had another test of the RS-25, wrapping up four-plus years of testing for the engines that will send the first four Space Launch System (SLS) rockets into space. The engines are now a "go" for missions, one NASA official said.

The RS-25 rocket engine test era began Jan. 9, 2015, with a 500-second hot fire of RS-25 developmental engine No. 0525 on the A-1 Test Stand. Altogether, NASA has conducted 32 developmental and flight engine tests for a total of 14,754 seconds – more than four hours – of cumulative hot fire – all on the A-1 stand at SSC.

But SSC is also involved in commercial test programs. The Aerojet Rocketdyne RS-68 is tested on the B-1/B-2 stand for United Launch Alliance's Delta IV, and the Aerojet AJ26 was tested for Orbital Science Corp. on the E-1 stand until the company dropped the engine in the wake of a malfunction on the launch pad. Blue Origin's BE-3 engine thrust chamber assembly, the engine's combustion chamber and nozzle, is also tested on the E-1 Test Stand.

In 2010, officials at Stennis Space Center identified 3,900 acres along existing roadways with existing utilities as prime locations for aerospace companies. Called the Stennis Space Center Technology Park, the site already has Lockheed Martin, Aerojet Rocketdyne, and Rolls-Royce North America, which tests its largest commercial jet engines at an outdoor facility.

In December 2017, NASA/SSC launched an effort to find a non-federal private partner to lead development of a 1,100-acre technology corridor called Enterprise Park. It's designed to attract companies that want to work with federal, state and private operations located at SSC.

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By February 2018, 16 “entities” and 58 individuals had expressed interest.

In addition, just outside SSC there are other efforts to provide acreage to aerospace and technology companies. The similarly named, privately owned Stennis Technology Park, near Stennis International Airport, is 100 acres but has another 900 to develop.

Michoud Assembly Facility NASA New Orleans, La.

Some 40 miles to the southwest of SSC in an area known as New Orleans East is the massive Michoud Assembly Facility. It’s one of the world’s largest manufacturing facilities, with 43 acres under one roof.

Originally established in 1940 to build plywood cargo planes and landing craft for the military, it became part of NASA in 1961 because the agency needed a plant that could manufacture large aerospace structures, and ship them out aboard barges.

MAF is one of the few manufacturing facilities owned by NASA. Traditionally one of the largest employers in Louisiana, the numbers dropped with the end of the Space Shuttle program, but are slowly recovering.

MAF sits on an 832-acre site and has a port with deepwater access. Manufacturing capabilities include 2.2 million square feet of manufacturing space with high bay areas, full complement of plant equipment, tooling and skills. Testing capabilities, component and full scale, include hydrostatic and load testing.

Michoud was used to make the first stage of the massive Saturn V rockets, and later built all the external fuel tanks for the Space Shuttle program. That work ended in 2010 with the end of the Space Shuttle program.

NASA chose MAF as the site where the next generation of space vehicles for the Constellation program would be built. The plan was to give MAF a multifaceted mission: manufacturer of the upper stage of the Ares I launch vehicle,



NASA photo

In 2016 technicians at MAF finished welding the primary structure of the Orion destined for deep space.

components of the Orion crew vehicle and stages of the heavy lift Ares V launch vehicle.

When the Constellation program was killed by the Obama administration and work shifted to commercial companies, NASA replaced Constellation with a program to build a heavy-launch system and crew vehicle to take astronauts to deep space, the Space Launch System (SLS). Michoud was chosen to assemble portions of the SLS as well as the Orion crew capsule.

In February 2018, Lockheed Martin began construction on the Orion crew vehicle. This capsule, known as a pressure vessel, will be used for Exploration Mission-2 (EM-2), the first Orion flight that will have astronauts on board. The work on the capsule was finished in August 2018 and was shipped to Kennedy Space Center in Florida for final assembly. The first pressure vessel for EM-1, the unmanned flight, was also built at MAF.

MAF also built the massive liquid hydrogen tank. In December 2018 the tank was barged from MAF to Marshall Space Flight Center in Huntsville, Ala., for testing designed to mimic the conditions of traveling into space. The 149-foot-long tank, a test model that won’t actually launch, weighs more than 100,000 pounds and holds 537,000 gallons of liquid hydrogen that along with liquid oxygen will help propel the

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rocket and its cargo into space.

Even before Constellation was killed and replaced by SLS, MAF had excess space and was working on a business model that involved attracting other public and private entities, as SSC did years earlier.

MAF already has several federal agencies, including the Department of Agriculture's National Finance Center, the Defense Department's Contract audit agency and Defense Contract Management Agency and the U.S. Coast Guard Integrated Support Command.

While MAF is heavily involved in NASA programs, there's also room for commercial space activities. At MAF, Lockheed Martin assembled for Sierra Nevada the composite structure for the first space-bound Dream Chaser vehicle.

Michoud's is for advanced manufacturing businesses, aerospace or otherwise. It has more than a million square feet of space in a self-contained facility equipped with established infrastructure and services. Louisiana's low-cost manufacturing environment, regional transportation network and experienced regional workforce add to the site's attributes.

One of Michoud's key assets is the National Center for Advanced Manufacturing, a partnership dating to 1999 that involves NASA, the state, academia and industries. Louisiana committed \$20 million through the University of New Orleans on key pieces of equipment, including welding machines.

At Michoud Assembly Facility, one of the little-publicized ideas is NASA's interest in using the under-utilized acreage around MAF for an advanced manufacturing research park. As far back as 2008 the former transition chief first mentioned the idea, saying the acreage could form the nucleus of something along the lines of Cummings. The agency said as recently as 2010 that it's still interested.

Site C-6
Air Force
Eglin Air Force Base, Fla.



U.S. Air Force photo
AN/FPS-85 Phased Array Radar at Eglin Air Force Base, Fla., looks for objects in near and deep space.

The U.S. Air Force has been keeping its eye on space for the past 40 years from a remote location in the eastern portion of the Eglin Air Force Base complex.

Some 35 miles east of the main gate is an area called Site C-6, home to one of the most powerful phased array radar systems in the world. The site has a 13-story structure with 250,000 square feet of floor space and keeps an eye on man-made objects in near and deep space 24/7.

The 20th Space Control Squadron tracks more than 16,000 near-Earth and deep-space objects. The squadron is under the 21st Space Wing, Peterson Air Force Base, Colo.

The 20th operates the AN/FPS-85 Phased Array Radar, the only phased array radar dedicated to tracking near-Earth and deep-space objects. It's one of 29 sensors that comprise the global Space Surveillance Network (SSN).

It collects 16 million-plus observations each year, 30 percent of the SSN's workload. Phased array allows near simultaneous tracking of multiple targets in the coverage area. The AN/FPS-85 can detect, track and identify up to 200 satellites and track an object the size of a basketball at a distance of more than 22,000 nautical miles.

Construction of the radar began in October 1962 and space operations started in February 1969. It became deep-space capable in 1988.

– *Gulf Coast Reporters League*

III: Military aviation



*'Aviation is proof that, given the will, we
have the capacity to achieve the impossible.'*

- Eddie Rickenbacker, 1890-1973

U.S. Air Force photo

Military aviation key to region

Damage from a hurricane altered one base's mission, but the region remains a multibillion-dollar military aviation fortress

When Hurricane Michael hit Panama City, Fla., in October 2018, it brought death and destruction, and also changed the future for one of the region's premier bases.

Tyndall Air Force Base, where every F-22 fighter pilot was trained, suffered damage or destruction to 90 percent of its buildings. Although the base is being rebuilt, the F-22 training is gone. Instead, Tyndall will be the future home of up to three F-35 squadrons.

The Category 5 hurricane was just one of the significant developments for military aviation in the region since the last aerospace book was published in 2017.

- Eglin will be getting an additional F-35 training squadron
- The 4th Special Operations Squadron took possession of an upgraded gunship
- Air Force will put mini-detachments of AT-6 and A-29 turboprops at Hurlburt Field
- Naval Air Station Whiting Field received new helicopter training simulators and a new outlying field
- AR-22 engine for DARPA's Phantom Express spacecraft was assembled and tested at Stennis Space Center

No matter how you look at it, whether it's through the value of their infrastructure, their

Chapter highlights

- Hurricane Michael causes mission change at Tyndall Air Force Base
- Gulf Coast is a vast technical schoolhouse for all the services
- Region provides initial and advanced flight training for military aviators
- DoD sites here valued at \$25 billion, aviation bases at \$21.9 billion
- Region contractors awarded \$95.5 billion in contracts between 2000-2017

depth of talent, the businesses awarded contracts or their critical missions, the Gulf Coast's military bases are a multibillion-dollar ongoing asset for the region.

The Gulf Coast is one of the most military friendly regions in the nation, a place where the roar of a jet or distant rumble of exploded munitions are considered the sounds of freedom.

According to the *Department of Defense Base Structure Report FY 2018*, a summary of the military's real property inventory, there are 44 DoD properties in the corridor between New Orleans and Panama City, Fla. That includes bases and associated annexes with a combined replacement value of nearly \$25 billion.

Of that, the aviation-focused military bases had a combined replacement value of more than \$21.9 billion - include outlying fields and other aviation-related annexes and it goes up another \$1 billion-plus.

The bases account for a large amount of incoming dollars through active and retiree payrolls, as well the contracts awarded to local companies for work here and elsewhere. Between

Photo page 36: An F-35 Joint Strike Fighter gets its fuel replenished by an aerial tanker.

Chapter III: Military aviation

2000 and 2017, 5,153 contractors in 19 I-10 counties/parishes were awarded 111,732 DoD contracts valued at more than \$95.5 billion. Work ranged from crucial military programs to simple maintenance and more.

The range of military activities in the region is considerable. The Navy Blue Angels flight demonstration team is headquartered at Naval Air Station Pensacola, Fla., and the Air Force trains pilots to fly the fifth-generation F-35 at Eglin Air Force Base, Fla.

It's also home to the Air Force Special Operations Command at Hurlburt Field, Fla., and the busiest naval air station in the nation at Naval Air Station Whiting Field near Milton, Fla. Eglin, which boasts a huge R&D program that develops Air Force aerial-deployed conventional weapons, is one of the nation's largest bases.

Active duty troops and reservists come to the region from near and far for the variety of test and training ranges that are available, including land ranges at Eglin and Camp Shelby, Miss., and water ranges over the Gulf of Mexico.

In the field of cyber warfare, Keesler Air Force Base, Miss., provides initial training. The Navy's Corry Station in Pensacola provides further training in the field of information dominance. Students come to Corry Station, Fla., to receive technical training in cryptology, equipment maintenance and communication, signal analysis and the operation and maintenance of the technology required to conduct electronic warfare. Hurlburt Field provides intermediate level cyber soldiers with schooling at a 17,000-square-foot building set up for the Air Force's 39th Information Operation Squadron. At Hurlburt, officers take classes in military deception and operational security. Deception classes are offered to operational level planners.

Every military branch is represented in activities that range from training to logistics. The military is so much a part of the region's fabric that military appreciation events are common

Communities from New Orleans to Panama City, Fla., have come to rely on military spend-

ing as pillars of their economies. While there is almost no place on the Gulf Coast between New Orleans and Northwest Florida where the presence of the military or Coast Guard isn't felt, Northwest Florida and South Mississippi have the most bases in the region.

FLORIDA

There are 188 Department of Defense sites in Florida with all military branches represented. DoD's base structure report of 2018 lists 132 "other sites" of less than 10 acres and with a replacement value under \$10 million.

The DoD sites in Florida total 690,994 acres, with a replacement value of \$32.5 billion.

These are the aviation-focused military bases in Northwest Florida, listed in order of their plant replacement value as listed by the Defense Department:

Eglin Air Force Base

PRV: \$6.1B

Eglin Air Force Base is a 724-square-mile reservation spanning three counties. Its dominion extends over 134,000 miles of air space and 123,000 miles of water range.

Eglin's facilities, from laboratories to training ranges and test facilities, are used by every military branch as well as contractors. And testing is not limited to military items.

The Eglin complex includes Duke Field, Hurlburt Field and Camp Rudder, along with Eglin itself. It employs an estimated 15,000 military and associated personnel.

Eglin is also home of the Air Force's aerial weapons program. It's here where non-nuclear aerial weapons systems are developed, managed, maintained or tested.

The nerve center of this work is the Air Force Research Laboratory/Munitions Directorate (AFRL/RW), which develops the conventional air-launched weapons. It does basic research, exploratory development, advanced development and demonstrations for weapons used against air, land and space targets.

Chapter III: Military aviation

There are 500 employees, including 300 scientists and engineers, who use the lab and 13 outlying facilities of about 330,000 square feet stretching over several hundred acres.

Core competencies include munition system effects, fuze technologies, damage mechanisms, energetic materials, munitions aerodynamics, guidance/navigation and control.

AFRL/RW works closely with defense companies, including international partners, who use AFRL facilities at Eglin. The nation’s key aerial weapons builders have offices close to Eglin in and around communities like Fort Walton Beach, Crestview, Niceville and others.

Eglin also is widely known as one of the bases where F-35 pilots and maintainers are trained. Eglin was the location of the F-35 initial joint training site hosting Air Force, Navy and Marine Corps F-35s. The Marines relocated F-35Bs in 2014 and the Navy plans to deactivate Strike Fighter Squadron 101 (VFA-101), which trains F-35C instructors, pilots and maintainers to Naval Air Station Lemoore, Calif., and combine it with VFA-25 in July 2019.

Eglin will get a new F-35A training squadron.

“By basing the next F-35A training squadron at Eglin Air Force Base, we are taking advantage of existing facilities and training air space,” Secretary of the Air Force Heather Wilson said in May 2019. Additional F-35As are expected to begin arriving in the fall of 2021. The new squadron is expected to reach full operational capability by spring 2023 and bring some 500 personnel to the base.

Eglin will only receive the additional F-35 training unit if the F-22 Raptor formal training unit temporarily operating at Eglin is permanently moved to Joint Base Langley-Eustis, Va.

The F-35 has had its critics, but in February 2017 it gave an impressive performance during the Red Flag war games in Nevada. The plane, with costs per unit coming down, dominated the air space and improved the lethality of other legacy aircraft. In mock combat the F-35 had a kill ration of 15-1.

Military activities at a glance

- Air Force and Navy technical training
- F-35 pilot training
- Army helicopter aviation training
- Navy primary aviation training
- Air Force combat systems officer training
- HQ Air Force Special Operations Command
- HQ Naval Education and Training
- HQ Naval Meteorology and Oceanography Command
- Aerial weapons RDT&E
- Air Force and Navy cyber training
- Aviation specialties training
- National Guard aerial combat center
- National Guard helicopter repair depot
- Home of the Blue Angels
- Home of Army 7th Special Forces
- Army Ranger Training Center
- HQ East Coast Seabees
- Supervisor of Shipbuilding Gulf Coast

Pilot and maintainer training has been underway at Eglin now for more than eight years, churning out instructors, pilots and maintainers.

In addition to the F-35 training, Eglin has had a reprogramming lab for the F-35 since 2010 that provides coding that gives the F-35 its battle smarts. The coding enables flight controls, radar functionality, navigation and identification, sensor fusion and more.

Eglin is now home to a second F-35 reprogramming lab, this one for Australia, Canada and the United Kingdom. It moved to Eglin from a Lockheed Martin facility in Fort Worth, Texas. The multimillion-dollar lab allows those allies to program the F-35 for their own needs.

The United States military policy is to never share source codes for any U.S. weapons system, but a compromise was reached with the F-35, funded in part by partner nations, through additional labs. The development of the new lab for Australia, Canada and the United Kingdom, allows them to customize mission data for their F-35s to suit their needs.

Chapter III: Military aviation

Naval Air Station Pensacola

PRV: \$3.06B

The Naval Air Station Pensacola complex includes NAS Pensacola, Saufley Field and Corry Station, all in Pensacola, and NAS Whiting Field in Milton. Together they employ about 10,000 military personnel and 7,000 civilians.

Best known as home to the Blue Angel flight demonstration team, NAS Pensacola also has Training Air Wing SIX, which provides flight training to Navy and Marine aviators and naval flight officers, as well as Air Force combat systems officers.

NAS Pensacola is likewise home to the Naval Education and Training Command, responsible for Navy training worldwide. The base houses hangars, classrooms and laboratories in a huge facility known as The Mega Building. There, aviation specialists for the Navy, Marines, Coast Guard, Air Force and Army, as well as those from allied nations, receive training.

Saufley Field, not far from NAS Pensacola, is used by aviators for “touch and go” landing practice. But Saufley’s real focus is the technical education of military members. Saufley has 1,000 military and civilian workers and houses 10 Defense Department tenants with an education function, including the Naval General Library Program, an information network available to Naval personnel at home and abroad, the Navy Voluntary Education program and the Naval Education and Training Command Automated Information system.

Tyndall Air Force Base

PRV: \$1.9B

Tyndall Air Force Base, part of the Virginia-based Air Combat Command, and the Naval Surface Warfare Center, both in Panama City, were damaged by Hurricane Michael.

Before it hit, Tyndall was home of the 325th Fighter Wing, comprised of two F-22 squadrons. One was operational, one was training. The base also was home to the 1st Air Force, the 53rd Weapons Evaluation Group, and the

Air Force Civil Engineering Center.

In October 2018, Tyndall Air Force Base took a direct hit from Hurricane Michael and suffered extensive damage, but no injuries. The base is 12 miles southeast of Panama City and northwest of hard-hit Mexico Beach.

The Air Force expects it will take up to five years to repair the base, where 95 percent of the buildings were damaged. The base’s F-22 training unit and Raptor schoolhouse for pilots in training were moved temporarily to Eglin, some 60 miles west of Tyndall. The operational squadrons of F-22 Raptors formerly at Tyndall can be accommodated at bases in Alaska, Hawaii and Virginia and would allow for an increase in squadron size from 21 to 24 aircraft.

In December 2018, the Air Force recommended Congress use supplemental funding for rebuilding the base for up to three squadrons of F-35A fighters. If approved and funded, F-35s could be based at Tyndall in 2023.

Hurlburt Field

PRV: \$1.96B

Hurlburt Field is home to the U.S. Air Force Special Operations Command (AFSOC), the Air Force component of the unified U.S. Special Operations Command. Hurlburt is home to AFSOC’s 1st Special Operations Wing and Air Combat Command’s 505th Command and Control Wing.

Special operations units are one of the most frequently deployed personnel in the military in an age where conventional warfare has yielded to low-intensity conflicts and asymmetric warfare. The Special Operations forces stationed at Hurlburt deploy to hotspots worldwide. One of the best-known, highly specialized aircraft used by Air Force Special operations is the side-firing AC-130 gunships. Special Ops also use CV-22 Osprey tilt-rotor aircraft.

Hurlburt’s 4th Special Operations Squadron, part of the 1st Special Operations Wing, received an upgraded version of the Ghost rider gunship, the Block 30 model AC-130J in March

Chapter III: Military aviation

2019. The 4th SOS, the Air Forces most deployed squadron, currently uses the AC-130U Spooky, which is slowly being retired from active duty after more than 20 years of operation.

The new model will have the same role as the current one, air interdiction, armed reconnaissance and close air support, but with upgraded avionics, navigation systems and a Precision Strike Package that includes trainable 30mm and 105mm weapons. It also costs less to operate per flying hour because of upgraded turboprops.

The base is scheduled to get an MQ-9 Reaper squadron by late 2019, making it the second Air Force Special Operations Command (AFSOC) installation to host a drone unit. AFSOC's active-duty MQ-9 Reaper drone personnel have previously been assigned only to Cannon Air Force Base, N.M.

The squadron will bring an additional 60 personnel to the AFSOC headquarters installation, according to the Air Force. The unit coming to Hurlburt is a Mission Control Element Squadron. Drone operations require two separate aircrews, a mission control element that is responsible for executing missions, and a second aircrew to handle takeoffs and landings.

Another drone unit at Hurlburt Field is the 2nd Special Operations Squadron, part of the Air Force Reserve's 919th Special Operations Wing located at Duke Field. Personnel fly drones remotely in various places around the world.

The Air Force also plans to put a mini-detachments of AT-6 Wolverines and A-29 Super Tucano turboprops at Hurlburt and Nellis Air Force Base, Nev. Chief of Staff Gen. Dave Goldfein told lawmakers that the exact numbers would depend on the costs of the planes, but an Air Force spokeswoman put the number at two or three of each type.

Goldfein said the Air Force will buy a handful of A-29 and AT-6 aircraft as a show of confidence for Sierra Nevada and Textron that have made internal funding investments toward the Air Force's light-attack experiment.

Naval Air Station Whiting Field

PRV: \$759.5M

Naval Air Station Whiting Field in Santa Rosa County just north of Milton is called "the busiest naval air station in the world." It accounts for 1.5 million annual flight operations. It's the home of Training Air Wing FIVE.

The orange and white paint schemes of the training aircraft are ubiquitous in the region as new, young pilots are frequently seen utilizing not only the air strips from their own base, but 14 outlying fields that dot Northwest Florida and South Alabama.

Whiting Field houses three fixed wing (VT 2, 3, 6) training squadrons and three helicopter (HT 8, 18, 26) training squadrons, as well as a helicopter and fixed wing instructor training unit, HITU. It accounts for 160,000 flight hours per year, 14 percent of the Navy's total. Some 1,200 military pilots complete flight training at Whiting Field each year.

NAS Whiting Field also provides learning opportunities to aspiring mechanics and technicians at its Center for Aviation Technical Training Detachment.

In February 2019 Whiting began receiving new TH-57 helicopter training simulators, the first new ones at the base in nearly 40 years. The base is getting three Level 6 simulators and seven Level 7, which is full-motion. The base is also getting a central control station that will provide the capability to link all 10 simulators together in a single virtual environment.

Whiting also got a new outlying landing field in January, the 600-acre Site X. The Navy ceased operations at OLF Site 8 in neighboring Escambia County. The National Defense Authorization Act in 2015 authorized the land exchange, the first of its kind for the Navy. In June 2016, the Navy and Escambia County signed a land exchange agreement to formalize the intentions to transfer the property at OLF Site 8 to Escambia County, in exchange for a suitable landing field in Santa Rosa County to

Chapter III: Military aviation

Other Florida aviation bases

- **Naval Air Station Jacksonville**, largest Navy base in the Southeast and third largest in the nation.
- **Cape Canaveral Air Force Station** is responsible for ensuring America's safe and assured access to space. It co-joins Kennedy Space Center.
- **Patrick Air Force Base**, part of Air Force Space Command, provides combat capabilities through launch, range and expeditionary operations.
- **MacDill Air Force Base** hosts U.S. Central Command, responsible for U.S. security interests in 20 nations in Northeast Africa as well as Southwest and Central Asia. MacDill also hosts the U.S. Special Operations Command.
- The **U.S. Coast Guard Air Station Clearwater**, the largest and busiest air station in the Coast Guard, operates in the Gulf of Mexico, the Caribbean basin and the Bahamas.
- **Avon Park Air Force Range**, the largest live ordnance bombing and gunnery range east of the Mississippi River. It includes 400 square miles of restricted airspace, 1,000 square miles of military operating area and 106,035 acres inside the fence.

replace Site 8. Escambia County plans to develop the former Site 8, possibly as a commerce park.

Duke Field

PRV: \$475.3M

Duke Field, five miles from Crestview, Fla., and 20 miles north of Eglin's main gate, is home to the 919th Special Operations Wing, which has transitioned to a new mission: Aviation Foreign Internal Defense for the Special Operations Command. This unit, the only special operations unit in the Air Force Reserve, reports to the AFSOC at Hurlburt Field in times of national emergency.

For its new mission advising foreign partners in the use of aviation, the 919th gave up its MC-130E Combat Talon I's for a fleet of C-145As, which started showing up on the Duke Field flight line in 2013. The unit also has MC-130P Combat Shadow aircraft used for special ops mission that include aerial refueling.

Duke Field's neighbor is the Army's 7th Special Forces Group (Airborne), the Green Berets. It joins the long-established Army Ranger training center at Fort Rudder, located further to the south on the Eglin reservation.

Eglin emerged from the 2005 Base Realignment and Closure process a big winner, getting the 7th SFG, which had been based at Fort Bragg, N.C. Hopes are high that the base will emerge similarly well positioned following any future BRAC hearings.

Florida lawmakers have pushed for several years now to ensure the region remains a military stronghold, and budgeted \$22 million just five years ago to support the military community by buffering bases from encroachment, providing education and technical training and modernizing the National Guard Armories.

MISSISSIPPI

Mississippi has 99 military sites representing all branches of the service, along with 82 other sites that are less than 10 acres and less than \$10 million in replacement value. The DoD sites in Mississippi total 176,745 acres, with a replacement value of \$8.4 billion. The figures do not include the Navy's large mission at NASA's Stennis Space Center

These are the aviation-focused military bases in South Mississippi, listed in order of their plant replacement value. Stennis Space Center is included because of its large Navy presence. The PRV for SSC is not included:

Keesler Air Force Base

PRV: \$2.14B

Keesler Air Force Base in Biloxi is the home of the Air Force's 81st Training Wing and its electronics training programs. That training includes computer and communication systems and, notably, cyber security. The base, one of the Air Force's largest technical schools, has graduated more than 2.2 million students since 1942. Some 20,000-25,000 students go through the system annually.

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The base also has a flying mission. It's home to the 403rd Reserve Wing, whose 53rd Weather Reconnaissance Squadron is known far and wide as the "Hurricane Hunters." Its role during hurricane season is critical in saving life and limb whenever tropical storms threaten.

The 815th Airlift Squadron completed its quest to reach full operational capability, four years after the squadron's future was uncertain. The squadron and its C-130J Flying Jennies are again ready to deploy and provide combat-ready airmen for airlift mission.

Camp Shelby

PRV: \$1.42B

Between Gulfport and Hattiesburg lies Camp Shelby, the largest state-owned training site in the nation. It has 135,000 acres to provide for air-to-ground weapons use in low-altitude airspace. Camp Shelby is home of regional flight center for the Army National Guard's unmanned systems.

During wartime, the camp's mission is to serve as a major independent mobilization station of the United States Army Forces Command (FORSCOM).

Camp Shelby Joint Forces Training Center is the largest reserve component training site, allowing up to battalion-level training.

It's the normal annual training location for National Guard and Reserve units in Mississippi, Alabama, and Tennessee, but units from across the country use its assets to support a variety of missions.

The training center was established during World War I and it has served almost continuously since then as a training site. The training site consists of a mix of state, Department of Defense, and U.S. Forest Service lands in the DeSoto National Forest.

Combat Readiness Training Center

PRV: \$152.5M

Combat skills training occurs in Mississippi at the Air National Guard Combat Readiness

Training Center at a 220-acre site at Gulfport-Biloxi International Airport.

The Gulfport facility is one of the nation's four Air National Guard Combat Readiness Training Centers.

An estimated 17,000 to 20,000 men and women Air National Guard and Air Force Reserve flight personnel are schooled at the location, logging 5,000 training days a month.

Scores of pilots from across the nation hone their combat skills every year at the center, which provides a year-round realistic joint training environment with air space, ranges, facilities and equipment, for units to enhance combat readiness.

With offshore airspace that's fully instrumented for recording air-to-air engagements, it also utilizes air-to-ground ranges at Camp Shelby, near Hattiesburg.

The CRTC has two tenant Air National Guard units at the base: the 255th Air Control Squadron and the 209th Civil Engineer Squadron. It's also home to the 1108 Theater Aviation Sustainment Maintenance Group, a full Army aviation maintenance depot facility.

Stennis Space Center

NASA's John C. Stennis Space Center near Bay St. Louis, Miss., has some 40 federal and state tenant organizations, including the Naval Meteorology and Oceanography Command. It's responsible for gathering oceanographic information for U.S. armed forces worldwide.

The commands' Naval Oceanographic Office utilizes aircraft, satellite and unmanned underwater vehicles, to collect oceanographic and atmospheric data from around the globe.

NAVOCEANO, which maintains 630,000 square feet of space at Stennis, including a new \$42 million Ocean Science Building, converts the intelligence information it collects into data that can be used to the benefit of Naval and other military units in planning operations and making tactical decisions.

About 200 Navy SEALs, comprising several

Chapter III: Military aviation

teams, train each year at SSC. They use the Naval Special Warfare Group 4's Western Maneuver Area. They've been training there with Special Boat Team 22 since completion of a facility built along two rivers, the Pearl and the Mikes, that allows live ammunition practice and training in jungle fighting techniques.

Other Mississippi aviation bases

- **Naval Air Station Meridian**, one of the Navy's two jet strike pilot training facilities in the nation.
- **Columbus Air Force Base**, about half of Air Force pilots today went through training at Columbus.

ALABAMA

Alabama has 104 DoD sites and 67 "other sites" that are less than 10 acres and less than \$10 million in replacement value. The DoD sites in Alabama total 166,800 acres, with a replacement value of \$16.8 billion.

These are the aviation-focused military bases in South Alabama, listed in order of their plant replacement value:

Fort Rucker

PRV: \$2.8B

Fort Rucker, established during World War II as Camp Rucker, is the primary flight training base for Army aviation - home to the Army Aviation Center of Excellence and Army Aviation Museum. The base, the largest in Alabama, is bordered by Daleville, Ozark and Enterprise and is northwest of Dothan.

All Army aviation training has been handled by Fort Rucker since 1973, as well as the training of Air Force and allied helicopter pilots and air crew. The center of excellence is home to the U.S. Army Aviation Technical Test Center, which conducts developmental aircraft testing.

It's home to the 1st Aviation Brigade, 110th Aviation Brigade and the 128th Aviation Brigade, responsible for Army aviation training. Also at Fort Rucker is the Air Force's 23rd Flying Training Squadron, responsible for training Air

Force helicopter pilots for special operations, search and rescue and other missions.

Fort Rucker also houses air traffic control services and flight simulation support. Graduate level training is provided for the pilots and crews of Apache and Kiowa helicopters.

Aviation Training Center

Mobile is home to the U.S. Coast Guard's Aviation Training Center, a 221-acre, 55-building complex and one of the largest Coast Guard aviation bases. It's responsible for training pilots and aircrew and setting standards for all Coast Guard aviation activities. Aviation students complete training at Navy facilities and come to ATC to learn specific Coast Guard aircraft.

ATC Mobile is adjacent to Mobile Regional Airport and shares two runways with the commercial airport. It has hangars, offices, a health care center and a base exchange, plus fitness and recreation facilities and simulator buildings.

The base also is an operational air station that responds to everything from drug interdiction to saving boaters to natural disasters.

Other Alabama aviation bases

- **Redstone Arsenal** in Huntsville, home of the Army Aviation and Missile Command, DoD Missile Defense Agency, and NASA's Marshall Space Flight Center.
- **Dannelly Field**, home of Alabama National Guard's 187th Fighter Wing, will host a new F-35 mission.
- **Maxwell Air Force Base** (Maxwell-Gunter), headquarters of Air University, and is the center for Joint Professional Military Education.

LOUISIANA

Louisiana has 35 DoD sites and with 27 other sites of less than 10 acres and less than \$10 million in replacement value. DoD sites in Louisiana total 272,357 acres, valued at \$9.3 billion.

Naval Air Station JRB New Orleans

PRV: \$1.26B

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Naval Air Station Joint Reserve Base New Orleans in Belle Chasse is one of only two joint reserve bases in the nation. It hosts the Louisiana Air National Guard 159th Fighter Wing's F-15s, and a Coast Guard Air Station.

The Army's 377th Theater Support Command, the 3rd Battalion 23rd Marine Infantry unit and attack helicopters from Marine Air Group 42 are also housed at the base.

NAS JRB New Orleans is home to a Navy Reserve strike fighter squadron, a fleet logistics support squadron, a Coast Guard Air Station, detachment of a Marine Reserve light helicopter attack squadron and other Navy and Army

activities.

Its two-runway military airport south of downtown New Orleans, is used by F/A 18 Hornets, F-15 Eagles, UH-1Y Huey, AH-1 Cobras, C-130 Hercules and MH-65 Dolphins.

Other Louisiana aviation bases

- **Barksdale Air Force Base**, home of the 8th Air Force and the 2nd Bomb Wing's three squadrons of B-52H Stratofortress bombers.

- David Tortorano

Defense contracts			
<i>Location</i>	<i>Defense contractors</i>	<i>Contracts 2000-2017</i>	<i>Dollars awarded 2000-2017</i>
Jackson County, MS	178	1,832	\$36,186,660,590
Jefferson Parish, LA	686	7,918	\$11,399,450,271
Okaloosa County, FL	614	12,499	\$10,913,630,373
Orleans Parish, LA	480	9,006	\$8,809,523,522
Mobile County, AL	522	6,469	\$8,757,538,657
Bay County, FL	448	9,663	\$6,597,959,550
St. Tammany Parish, LA	261	30,649	\$4,409,039,719
Escambia County, FL	672	21,873	\$4,084,892,919
Harrison County, MS	547	4,475	\$1,981,445,127
Baldwin County, AL	159	1,366	\$732,640,765
Santa Rosa County, FL	207	1,769	\$463,368,353
Walton County, FL	52	508	\$309,905,390
Plaquemines Parish, LA	97	1,374	\$252,380,844
Hancock County, MS	69	675	\$250,310,465
St. Charles Parish, LA	49	737	\$230,775,847
St. Bernard Parish, LA	46	550	\$113,279,572
Gulf County, FL	22	127	\$37,043,052
St. James Parish, LA	10	37	\$19,273,895
St. John the Baptist Parish, LA	34	205	\$10,666,973
TOTALS	5,153	111,732	\$95,559,785,884

Source: GovernmentContractsWon.com. (Compiled May 22, 2019)

Chapter III: Military aviation

Military aviation-related base replacement values 2017

Site	Branch	Nearest city	State	Acres owned	Total acres	PRV (M)
Eglin Air Force Base	AF	Holt	FL	319,076	449,421	\$6,104.2
NAS Pensacola	Navy	Pensacola	FL	2,296	5,809	\$3,064.4
Fort Rucker	Army	Enterprise	AL	57,928	8,727	\$2,803.6
Keesler Air Force Base	AF	Biloxi	MS	892	1,670	\$2,148.8
Tyndall Air Force Base	AF	Panama City	FL	26,734	28,891	\$1,908.2
Hurlburt Field	AF	Mary Esther	FL	6,341	6,341	\$1,968.0
MTA Camp Shelby	AG	Hattiesburg	MS	7,530	136,215	\$1,422.3
NAS JRB New Orleans	Navy	Belle Chasse	LA	5,009	5,210	\$1,265.1
NAS Whiting Field Milton	Navy	Milton	FL	3,533	5,058	\$759.5
Duke Field (Eglin Auxiliary Field 3)	AF	Crestview	FL	1,512	1,946	\$475.3
Total				430,851	649,288	\$21,919.40

Source: Department of Defense Base Structure Report Fiscal Year 2018 Baseline (as of Sept. 30, 2017)

Outlying fields, other placement values 2017

Site	Branch	Nearest city	State	Acres owned	Total acres	PRV (M)
Cairns Basefield	Army	Daleville	AL	1,322	1,351	\$324.7
Gulfport-Biloxi Regional Airport	AFG	Gulfport	MS	10	144	\$152.5
NOLF Choctaw	Navy	Navarre	FL	1,450	1,450	\$101.9
Eglin Air Force Base Site 2 (SR Island)	AF	Fort Walton Beach	FL	0	3,173	\$100.0
NOLF Holley	Navy	Navarre	FL	698	698	\$69.1
NOLF Santa Rosa	Navy	Milton	FL	738	738	\$53.6
Barin Field	Navy	Foley	AL	763	818	\$45.9
OLF Bronson	Navy	Pensacola	FL	967	1,098	\$36.5
Toth Stagefield	Army	Dothan	AL	125	128	\$36.2
NOLF Evergreen	Navy	Evergreen	AL	138	444	\$35.5
NOLF Brewton	Navy	Brewton	AL	0	653	\$32.0
NOLF Summerdale	Navy	Summerdale	AL	565	567	\$31.7
Hunt Stagefield	Army	Ozark	AL	134	154	\$30.2
NOLF Silverhill	Navy	Daphne	AL	400	400	\$29.7
NOLF Wolf	Navy	Summerdale	AL	422	422	\$29.3
Goldberg Stagefield	Army	Ozark	AL	99	101	\$27.5
NOLF Spencer	Navy	Pace	FL	640	640	\$25.8
Stinson Stagefield	Army	New Brockton	AL	530	550	\$25.0
Skelly Stagefield	Army	Kinston	AL	164	197	\$22.7
Cape San Blas Missile Tracking Annex D-3	AF	Port St. Joe	FL	831	831	\$12.7
Dothan Regional Airport	AFG	Dothan	AL	0	21	\$14.0
Total				9,996	14,578	\$1,236.5

Source: Department of Defense Base Structure Report Fiscal Year 2018 Baseline (as of Sept. 30, 2017)

IV: Education pipeline



'I have never let my schooling interfere with my education.'

- Mark Twain, 1835-1910

NFA photo

Can aviation pipeline be filled?

The region has the attention of the aerospace industry, and it's taking steps to show it can train a quality workforce

It's been apparent to anyone paying attention to aerospace-related news. Education and training are grabbing headlines locally as the aviation industry continues to grow in the Gulf Coast region.

In May, aerospace giant Airbus announced two training programs in Mobile, one for high school students, another for people already in the workforce with no aviation background who want to shift to the aerospace field.

And there's more. Late last year, there was a groundbreaking for Flight Works Alabama, a combination hands-on learning center designed to pique interest in the industry and an adult education center with nine education partners.

But it's hardly just Mobile. In Pensacola, ST Engineering has launched a scholarship program, and plans to develop a training program as well to ensure it has the workers for its growing maintenance, repair and overhaul campus at Pensacola International Airport.

All this emphasis on education and training is for a good cause. In the immediate future there will be a need for people to fill some 2,000 positions in Mobile and Pensacola. And it's likely more, considering the continued interest the aerospace industry has in this region. And these new jobs are coming at a time when the industry

Chapter highlights

- *Mobile and Pensacola will need 2,000 aviation workers in a few years*
 - *Airbus launches two new programs to help train workers for aviation industry*
 - *ST Engineering establishes scholarship program for aerospace students*
 - *Mississippi turns to NASA for its expertise on STEM-focused programs for students*
 - *Flight Works Alabama and National Flight Academy pique interest in aviation*
-

worldwide is facing a shortage of aerospace works, from pilots to mechanics and more.

Today, Airbus produces about four aircraft a month from its \$600 million A320 production facilities at the Mobile Aeroplex. Now it's expanding the A320 line, and also building a \$264 million A220 assembly line next door.

It's having no problem right now finding workers, but the growth has prompted Airbus to launch FlightPath9 and Fast Track.

FlightPath is a nine-month program to encourage young people to explore careers in aviation and aerospace. The Fast Track program is a 12- to 15-week program that will recruit individuals lacking aviation manufacturing experience and give them the skills, knowledge and ability required for an aerospace maintenance career.

Meanwhile, by the end of 2019, Airbus plans to open its \$6 million, 18,000-square-foot Flight Works Alabama education center. The interactive, hands-on facility's goal is to bolster Alabama's workforce development efforts and inspire young people to pursue careers in aero-

Photo page 47: National Flight Academy's virtual reality program teaches aviation maintenance.

Chapter IV - Education pipeline

space. Besides serving as an education and workforce training center, it will also be a tourist attraction and museum.

“Success for Airbus, and any company, means we can’t just look at what we’re doing now; we need to look at what we need later, whether it be next year, next decade, or the next five decades,” Airbus Americas Chairman and CEO Jeff Knittel said. “What Airbus and other companies in our industry need to be successful in the future is a skilled, knowledgeable workforce that is ready for that future. Flight Works will help us create that workforce in a fun, creative way.”

Regional need

From New Orleans to Mobile and from Pensacola to the Florida Space Coast, business leaders, government officials, and educators are focusing like never before to train future generations of skilled aerospace and aviation workers.

The aerospace industry is facing a crisis as the sector grows and the workforce shrinks, and Alabama, Florida, Louisiana and Mississippi are pressing forward to ensure they have a healthy aviation pipeline that’s full at every point.

The pluses of a region are minimized if there are not enough trained aerospace and aviation workers to fill the jobs. Some big aerospace companies with operations in the region say they are getting what they need right now, but what the future will hold is less clear given the retiring workforce and competition for talented workers.

Leaders along the Gulf Coast seem committed to ensuring the region remains an aerospace and aviation hot spot, and know that if they are successful filling positions, it will be noticed by the industry and have a long-term positive impact.

Even the National Flight Academy in Pensacola, Fla., which teaches Science, Technology, Engineering and Math (STEM) for six years has a new mission: job training.

In mid-March NFA introduced career training for the first time to its young participants in the 7th to 12th grades. Its newest virtual reality program emphasizes aircraft maintenance.

Workforce crisis and being cool

The aerospace industry is in a crisis: the number of jobs is growing and the talent pool is not keeping up.

The key is to get people interested. That was brought up during the Federal Aviation Administration Workforce Symposium in September 2018.

George Novak of the National Air Carriers Association called the shortage an “acute and chronic crisis” in need of immediate and long term solutions.

“Our members don’t have enough mechanics or pilots to provide all the services they want. They are turning down business now,” he said.

Marty Lenss, vice chair of the Air Services Committee of American Association of Airport Executives, said the shortage is hitting the market today and hurting the economic development efforts of communities.

Frank Slazer of the Aerospace Industries Association said the industry is not tapping into the full diversity of America. With 47 percent of the aerospace workforce close to retirement, a key is reaching out to youth in the sixth to eighth grades.

With so many industries competing for talent, there must be a push to show youth that aerospace is “cool,” participants said. Part of the problem is that the industry, unlike the communications industry, doesn’t come up with a new product every year, so it’s not seen as a creative environment.

Brett Levanto of the Aeronautical Repair Station Association said that the entire industry knows about the challenges in finding technicians to keep aircraft airworthy ... Without good people on the ground, the pilots and passengers and cargo are not going anywhere.” He said there will be fewer technicians than the market demands by 2020, and by 2027 the market will be 9 percent short of what it needs.

“We are on the playing field with every other industry that demands technical skills,” Levanto said. “The industry needs a healthy pipeline that’s full at every point.”

Levanto said it’s a cultural problem. Ask a parent if they want their child to be an aircraft mechanic and they’ll admit it’s an important job, but they would rather their child “go to Dartmouth and be on the crew team for four years.”

*-Condensed from October 2018
Gulf Coast Aerospace Corridor Newsletter*

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The game-play like learning includes scenarios, such as following pre- or post-flight checklists on aircraft. Another allows students to get their hands on different types of aircraft engines and change out various parts. Students learn to maneuver planes onto an elevator that brings them to the top deck of the “USS Ambition” aircraft carrier.



Entrance to NFA's "carrier."

Vincenzo Kauffman, a 13-year-old from Pensacola Beach, was in the first group to ever use the virtual reality program that NFA developed with ViziTech USA. They nearly got the X-12B Triad onto the elevator on their second try.

“I enjoy stuff like this,” he said. “After a couple of minutes you feel like you’re actually in it. It really highlighted the importance of communicating so everyone gets the message.”

Heidi McBride works in aviation maintenance for Ansell & Brown Aviation at Ferguson Airport in Pensacola. She has talked several times to NFA students about what she does.

“I wanted to be a teacher,” she said. “Then someone put a wrench in my hand. I liked pulling things apart and putting them back together again. You never know what you love doing until you’re given the chance to experience it.”

A shortage of 189,000 aviation maintenance technicians in North America alone will exist by 2037, Boeing forecasted. That’s clear locally. ST Engineering will need some 1,300 maintenance, repair and overhaul (MRO) workers at Pensacola International Airport in the next few years.

NFA officials said they want to do their part to supplement the ongoing massive effort on Florida’s Gulf Coast to prepare young people for high-paying aerospace and aviation jobs.

Space Florida CEO Frank DiBello continually trumpets his top worry for the future: the demand for a highly-skilled, highly-trained workforce to make sure the state accomplishes its mission to “Make Florida the Place for Space.”

DiBello told a group of top space decision-makers that industry must play a role in developing the next generation of aerospace workers: “If we are not responsive to these concerns, this will become Florida’s aerospace Achilles heel.”

The shortage predicted in aerospace jobs is not just a Florida issue. In this region the issue was raised in 2011 during the first Aerospace Alliance Summit in Destin, Fla. During the meeting of the four-state group, aerospace representatives called workforce training the key to the growth of the region’s aviation footprint. Subsequent Aerospace Alliance summits also discussed the issue, including the most recent 2018 summit in Point Clear, Ala.

All four states boast aerospace-oriented programs at vocational training centers, public and private schools, museums and education centers. They all focus on improving the talent from elementary-aged to college-aged youth. Considering what they already have, it says a lot that they are launching efforts to add even more to the mix.

Florida

Today, Florida is a global leader in the aerospace industry. Florida consistently ranks in the top five U.S. states for aerospace industry employment, with more than 130,000 workers in 2017. More than 17,144 aerospace-related companies make their home in Florida, contributing \$19 billion in revenue to the state economy, according to Enterprise Florida.

Across the state aerospace and aviation organizations have responded by implementing remedies to avoid workforce shortages.

One big effort includes Embry-Riddle Aeronautical University and state leaders partnering in 2004 to create what’s now called the Gaetz Aerospace Institute, named after former Florida Senate President Don Gaetz.

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- Florida's A&D employment is between 127,100 and 130,000, largest of four Gulf Coast states
- Gaetz Aerospace Institute dual enrollment program serves 140 plus schools
- Florida universities are among the nation's top producers of STEM graduates
- Miami has nation's largest cluster of simulators and flight training facilities
- UCF supplies more graduates to A&D companies than any college in nation
- Florida consistently among top five states in aerospace industry employment
- Florida added more aerospace and aviation organizations than any other state in 2017

- *Gulf Coast Aerospace Corridor Newsletter*
October 2018

The academy focuses on increasing participation among high school students in both aerospace and STEM-related classes.

This year, the program, the largest aerospace/aviation dual enrollment program in the country, serves 140-plus schools across Florida in about 40 counties and enrolls about 6,500 students.

It even expanded outside the state to Louisiana, Illinois and Ohio. Students can earn up to 17 hours of college credit and industry certifications in classes that include STEM, aviation fundamentals, flight training, unmanned aircraft systems and spaceflight operations.

“By preparing students with real-life skills and knowledge, we are working hand-in-hand with government, industries and local school district partners to guarantee a pipeline of talent for Florida's growing aerospace and aviation industry,” said Colleen Conklin, Gaetz Aerospace Institute executive director and Embry-Riddle assistant professor.

The collaboration between state and local officials continued with ST Engineering Aerospace. The Singapore-based conglomerate opened a \$46 million, 173,500 square-foot MRO hangar at Pensacola International Airport June 2018 for some 400 aircraft maintenance employees. But that's just the start.

Three more hangars for the company are being built, which will increase the need for workers. ST Engineering in March 2019 announced it would establish by 2020 scholarships of \$2,500 for students accepted into an aviation-related post-secondary educational program

Additionally, Florida Gov. Ron DeSantis has called for \$507 million for “workforce education” in his proposed 2019-20 budget. It also includes \$71.6 million for high school and post-high school career and tech programs.

Triumph Gulf Coast, which will distribute \$1.5 billion from BP for its 2010 Deepwater Horizon oil spill to eight Northwest Florida counties through 2033, has approved \$12.2 million for primarily aerospace and aviation training.

Escambia High School has partnered with Embry-Riddle and provides unmanned aerial vehicles training. More than 100,000 new high-paying jobs will need to be filled by 2025 as commercial opportunities involving drones skyrocket, including for scientific research and surveying crops, the Association for Unmanned Vehicle Systems International projected.

Booker T. Washington High School and George Stone Technical College provide training and certification for aircraft maintenance.

Meanwhile, Pensacola State College offers manufacturing certification, airframe and powerplant (A&P) certification, and an airframe coatings and corrosion control certification.

The University of West Florida partners with the U.S. Air Force ROTC program that offers an aerospace studies degree. Additionally, UWF offers engineering, electronics and computer degrees that all support the aerospace industry.

Enterprise Florida, the state's economic development agency, points to Pensacola efforts as a model for other communities and businesses.

“It's a good example of training programs supplying ST Engineering Aerospace's growing workforce,” said Katie Hogan, Enterprise Florida's manager of aviation/aerospace and defense. “There are tremendous opportunities like that all over Florida to find employees and train them.”

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Targeted investments in aerospace and aviation clusters can spur more companies. Florida currently ranks No. 2 in the nation for aerospace and aviation organizations and added more than any other state in the Southeast in 2017.

“We are very high on aerospace jobs,” said Don Gaetz, Triumph board chairman. “These are high paying jobs that our people can do and make a decent living.”

Alabama

In Alabama, Enterprise State Community College has prepared airframe and powerplant mechanics at the Alabama Aviation Training Center since 1976, and more recently developed a composites program.

David Trent, site manager of the Airbus Engineering Center in Mobile, Ala., has praised the Gulf Coast region’s for its low cost of doing business and business-friendly attitude. However, he has said the training started as far back as 2011 must ramp up and reach children as early as the 5th grade.

“The question is always, where’s the workforce coming from, and I can’t stress enough this idea that you’ve got to have world-class public education in this region and a real strong concentration on STEM,” Trent said.

- Alabama’s A&D employment is between 53,470 and 61,000, 2nd highest of four Gulf Coast states
- Pushing to get more companies involved in working with education, training officials
- State officials and educators see the need to attract young people to STEM careers at an earlier age
- Aviation programs available in a handful of public schools in areas with strong aerospace presence
- Some high schools and community colleges offer dual enrollment programs
- Three universities offer advanced degrees and three community colleges training in aerospace
- Alabama Industrial Development Training considered a key tool to recruit aviation companies

- Gulf Coast Aerospace Corridor Newsletter
October 2018



Artist’s rendering of Flight Works Alabama in Mobile.

Airbus has ensured a pipeline of future workers, in part, by mentoring students in robotics competitions, such as BEST Robotics, and by encouraging more young women to consider engineering and manufacturing careers, such as with the Girl Scouts Wing It and Women in Aviation programs.

From middle school robotics to university level aerospace engineering, Alabama schools and job training programs continue expanding to keep up with economic development in the aviation and aerospace industry.

When state officials gathered in September at the Mobile Aeroplex at Brookley for the ceremonial groundbreaking for Flight Works Alabama, there seemed to be as many kids around as state officials, Airbus employees and business partners. Flight Works will be an “aviation experience center,” a partnership of the state and Airbus aimed at educating young people interested in the subject matter and visiting adults about the industry.

With Airbus pulling together a second jetliner assembly center at the Aeroplex, it will need even more engineers and skilled technicians. At the gathering, students from public and private schools across Mobile County were playing music, marching and demonstrating miniature robots. Many were students of robotics, an extra-curricular piece of AMSTI, the Alabama Math Science and Technology Initiative.

“These kids, they’re kind of scary, they’re so smart,” said Tracy LePiane, language arts teacher at Semmes Middle School. “They come with ide-

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as and we try to find a way to help make it happen.”

Students are learning in a temporary Flight Works facility. LaPiane said her robotics group is made up of engineering students recruited beginning in about sixth grade, but they can be as young as second grade.

Leontyne Jones, a seventh-grade life science teacher at Calloway-Smith Middle School in Mobile, has a robotics group of 15 students who do everything after school and on weekends. She wants them to be exposed to careers and to realize they have choices about their futures.

“They’re excited about it,” Jones said. “If I’m excited about it, they’ll be excited about it. I try to set the tone to get them excited about it. I let them know that it’s the real world and this is what you’re going to be exposed to in the real world.”

High school aerospace and aviation programs are available in a handful of Alabama public systems, said Chris Kennedy, an education administrator in the state department of public education. Kennedy oversees several workforce oriented clusters of subjects including transportation.

The public school systems with their own programs tend to be concentrated in parts of the state where the industry is strong and are related to the greatest employment needs, Kennedy said. Currently there is a need for pilots and air traffic controllers in the military and flight sectors such as Fort Rucker and the Enterprise area, while Airbus is expanding from one assembly line to two in Mobile.

Kennedy urges employers to work with local public school systems to support programs that will funnel students into careers with hometown companies. The state’s role is to provide assistance for technical education geared to individual school systems.

“I would encourage industry to get engaged at the school level, to encourage more programs, and then how can they support the programs that are there now,” he said. “In education

you’re only as good as the curriculum we have. We want support from local industry.”

Students can also take advantage of dual enrollment with community colleges to get a jump on post-secondary education. High school students can take community college courses that count for both high school and college credit. Three community colleges systems have aviation colleges within their systems: Enterprise State, Snead State, and Coastal Alabama. The colleges and their associated campuses offer a variety of technical certification programs and associate degrees, with options to move on to four-year degrees.

“We work with a lot of different high school systems that are near those aviation colleges across the state, and set up programs where they can start their path to a degree or to a certificate in high school and get credit for it,” said Jeff Lynn, vice chancellor, workforce and economic development for the community college system as a whole.

Total dual enrollment in aviation, aerospace and avionics programs is fairly small at about 300, Lynn said, but it is growing. “We’re really excited about the opportunity to create these really strong, solid, workforce pipelines for aviation in our state.”

Lynn also works with a vital component of recruitment and workforce development, Alabama Industrial Development and Training (AIDT). It supplies future employees for specific positions with companies using its services as part of an incentive package.

“AIDT is an incentive program to help companies start up or expand,” Lynn said. “What they’ll do is work directly with the company and do recruitment and screening of the people that they want to interview. They’ll do some pre-employment training to help screen out or to help train people to go through the application.”

For someone who needs to change careers in midlife, for example, AIDT is the place to go to find a job with a company such as Airbus, Lynn

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said.

Flight Works is touting connections with nine higher education partners, including Auburn University, Bishop State Community College, Coastal Alabama Community College, Embry-Riddle Aeronautical University, Troy University, Tuskegee University, University of South Alabama, University of Alabama and University of West Alabama.

Mississippi

In Mississippi, the education system turned to NASA employees at the John C. Stennis Space Center to fashion a curriculum to prepare high school students to meet the expansion in future aviation jobs.

A study done recently for the Hancock County Port and Harbor Commission urged development of the Mississippi Aerospace Academy, to serve youth across the state.

“STEM education is very important to the future of Mississippi,” said Kendra L. Taylor, the program supervisor for the Mississippi Department of Education’s Technology Education and STEM Cluster. “Introducing students to STEM occupations will ensure a future workforce that can compete globally.”

Mississippi Gulf Coast Community College, which is among the top associate degree producers in STEM programs in the United States, offers courses for students who plan to continue their education at a university, including computer networking, engineering and programming; electronics technology; instrumentation and control, and logistics.

Those who want to go on for a bachelor’s, master’s or doctoral degree, also have plenty of job opportunities available to them. Five universities in Mississippi offer aerospace-related programs that are certified by the Accreditation Board for Engineering and Technology: Jackson State, Mississippi State, Mississippi Valley State, University of Mississippi and the University of Southern Mississippi.

- Mississippi aerospace & defense employment is 15,700, third largest of four Gulf Coast states
- JROTC in Mississippi is a path towards careers in aerospace and aviation
- Stennis Space Center Astro Camp can reach children as young as the second grade
- Emphasis on STEM education can lead to jobs in variety of fields, including aerospace
- Grants were recently awarded to a dozen school districts for STEM programs
- At one college a student can get an associates degree to operate drones
- State has nearly 100 Career Technical Education centers statewide

- *Gulf Coast Aerospace Corridor Newsletter*
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Mississippi State’s National Science Foundation Engineering Research Center in Starkville, Miss., offers bachelor’s, master’s and doctoral degrees in aerospace engineering. The university is also the home of Raspet Flight Laboratory, which specializes in the design and testing of materials to support rapid prototyping for lighter weight aircraft.

Southern Miss is a national leader in the area of polymer science with its Polymer Research Institute. It worked closely with GE Aviation on developing polymer parts, a factor in the company’s decision in 2008 to open a plant in Batesville, Miss.

Mississippi Air Force JROTC students are also likely to be directly exposed to aerospace and aviation, especially if they are part of one of the 15 Air Force units. With major corporations plus military bases throughout the state, AFJROTC is a logical place to explore the possibilities.

Students may fly with hurricane hunters from Keesler Air Force base, visit NASA’s Infinity Science Center to see space hardware like the Apollo 19 Saturn V S-IC stage, fly with the Civil Air Patrol or the Experimental Aircraft Association, or compete for a scholarship to attend a one-week program at the National Flight Academy at Naval Air Station Pensacola, Fla.

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By the time they graduate from high school, they'll have a good knowledge of the opportunities available both in the military and in the private sector, said retired Air Force Maj. Ed Butler, bureau chief for the Mississippi JROTC program.



Students at SSC engine test stand.

“We’re kind of like the Boy Scouts and the Girl Scouts. We’re just trying to teach them good values, to be a good citizen and have respect for our flag and what the United States stands for,” he said. “We also focus on college and career readiness.”

At Hinds Community College, a student can get an associate degree learning to operate Unmanned Aerial Vehicles (drones) or coordinating their systems. At Mississippi State University, the Raspet Flight Research Laboratory has five types of aircraft and a helicopter of its own.

Stennis Space Center (SSC) offers a summer Astro Camp for children as young as second grade, but public schools don’t offer specific education programs in aerospace and aviation.

“I couldn’t identify a single dedicated program to that point,” said Bill McGrew, division director of the Career Technical Education program for the Mississippi Department of Education.

However, the state promotes STEM education in high schools and community colleges. STEM stands for Science, Technology, Engineering and Mathematics. And the Mississippi State Board of Education in May awarded \$886,000 in grants to establish K-8 STEM programs in a dozen school districts.

STEM is also part of the Career Technical Ed-

ucation (CTE) program, McGrew said. The state has some 95 CTE Centers located statewide, some in high schools and others located centrally within school districts, to which students come during part of the school day for course work in everything from agriculture to hair-styling.

There’s a one-year STEM course in middle school and a two-year course in high school. Topics include computer design and programming, GIS, information systems, engineering and electronics, McGrew said.

CTE course offerings depend directly on the needs and desires of the school district and surrounding communities. For example, Nissan and McGrew’s department have worked together for several years to offer robotics in the Jackson and Canton areas, McGrew said. Students learn to operate the same equipment, including robots, they would use at the Nissan Canton automotive assembly plant.

“We base our programs on the local economic need,” McGrew said. “If a new industry comes into town we start looking into what do they need.”

Mississippi Gulf Coast Community College offers customized training for aviation electronics technicians at Northrop Grumman Aerospace Systems.

Community colleges and WIN Job Centers work with industries statewide to assess applicants and provide pre-employment training and customized workforce training, according to Glenn McCullough Jr., executive director of the Mississippi Development Authority.

The Mississippi Works Fund was established in 2016, providing \$50 million over the next 10 years to community colleges for workforce training. Seventy-five percent of the money is for new job creation and 25 percent for existing workforce training and certification.

One company using the Works Fund has been Northrop Grumman, which manufactures rotary and fixed-wing autonomous systems as well as manned platforms. The company is using

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MGCCC to train 60 new workers for sub-assembly work on the F-35 program at its Unmanned Systems Facility in Jackson County, according to McCullough.

The state has partnered with the commercial spaceflight company SpaceX and the Hancock County Port and Harbor Commission to locate rocket engine testing operations at SSC. Another partnership is with Rolls-Royce, which operates the Outdoor Jet Engine Test Facility, also located at SSC.

The state's Advantage Jobs Program rebates a percentage of payroll in Mississippi to qualified aerospace manufacturers for up to 10 years. Eligible jobs must pay as much or more than the average annual wage of the state or county in which the company locates.

Louisiana

Thanks to continued growth at NASA's Michoud Assembly Facility and activity at aircraft maintenance facilities in Shreveport and Lake Charles, the aerospace industry is one of nine sectors in the Louisiana economy with the greatest potential for economic development growth.

Louisiana Economic Development (LED) said it is working to attract new manufacturing, distribution, assembly and other operations within the aerospace sector that increase the amount of out-of-state sales by Louisiana operations.

Aerospace has been a component of the Louisiana economy for decades, and the state completed a key industry study in 2009 that emphasized aerospace as one of its leading economic development opportunities. Louisiana's estimated 10,350 aerospace jobs reflects a narrowly defined manufacturing and support sector. The extended aviation sector, including airports, supports 60,000 jobs with a \$7 billion economic output, and the state's military installations generate an additional \$8 billion in output.

LED officials note the state continues to see employment growth at Michoud, with major aerospace players such as Boeing, Lockheed Martin, Sinter Metal Technologies and Advance Cutting

- Louisiana aerospace & defense employment is 11,040, smallest of four Gulf Coast states
- State has put a renewed emphasis on aerospace, and sees it as one of nine growth sectors
- The state got a late start on getting training programs started for the aerospace industry
- In some cases the training programs are having trouble attracting potential employees
- State using its success in information technology as a model for what aerospace could become
- Dual enrollment programs have been set up so students can work toward certification
- FastStart is an innovative workforce training program offered through LED

- Gulf Coast Aerospace Corridor Newsletter
October 2018

Solutions adding jobs.

Paul Helton, LED FastStart director, said the biggest problem is the state in the past didn't emphasize aerospace jobs. FastStart is Louisiana's innovative workforce training program, offered through LED for major economic development projects.

"I hate to say it, but we're just starting," Helton said. "We have a number of programs in place, but we never took aerospace seriously until the last few years."

As part of that effort, the state has addressed the needs of the aerospace workforce and made investments in job training. Pathways have been set up so high school students can dual enroll at local technical colleges, allowing them to work on certification while they earn a high school diploma.

More detailed training has also been set up. The state has worked to establish training programs at the Southern University campus in Shreveport for airframe and powerplant technician jobs. This is one of four Federal Aviation Administration certified programs in Louisiana, that teach students about aircraft structures and systems and the engines that power them.

Helton said the Southern University program was modified at the request of Western Global

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Airlines, a cargo freight company. In May, Western Global announced it would open a fleet maintenance hub at Shreveport Regional Airport, a move that will create 170 jobs.

This tailored program will not only teach students how to use specific tools to maintain freight planes, but it will also discuss Western Global's company culture and procedures, Helton said.

This is one of the services FastStart offers to meet specific workforce needs and plug in training gaps, he said. A similar program has been set up at Nunez Community College in Chalmette to build a new two-year program to prepare students for careers in space technology. Helton said that came out of discussions with Boeing about the need for workers at Michoud.

"We're not providing money to a company, we are investing in institutions to build the workforce," Helton said.

The goal is that the programs at Nunez to train workers for Boeing lead to higher level technical jobs being established at Michoud, which would offer better pay.

"We want to create a capacity and capability to fill that workforce," Helton said.

But while there have been efforts to build the aerospace workforce, there's been a lack of response from potential employees.

Sunshine Radford, program supervisor of the School of Transportation & Applied Technologies at SOWELA Technical Community College in Lake Charles, said she's struggled with enrollment numbers. While SOWELA can have up to 75 students in its FAA certified aerospace programs "we barely have 35."

"The numbers are pretty consistent," she said. "We have to do a lot of outreach to make the numbers go up."

While the training at SOWELA may be aimed at Lake Charles employers such as Citadel Completions, Radford notes that after completing the two year program graduates can work anywhere across the Gulf Coast or U.S. "We talk that up," she said.

Are companies concerned?

GE Aviation: Mid-level positions are being filled without a problem, but it's a bit of a problem with hourly and entry-level jobs. Through partnerships with local universities and a healthy internal pipeline, General Electric's jet engine plant in Auburn, Ala., is able to fill mid-level positions readily. It's a different story for the more technical, hourly and entry-level jobs.

Airbus: For now, the workforce pipeline is meeting demand for production and professional workers at the Mobile assembly line. Sharon Field, head of Organization Development and Training at the Mobile plant, said that today is not a problem. "Where we will need to be working is on our future employment needs over the next two years. We are working with local and state workforce development agencies to meet that demand." Airbus partners with neighboring companies to build the future labor pool. "For the past two summers, and looking forward to next summer, we and several other companies at Brookley Field sent 36 Mobile kids to the National Flight Academy at Naval Air Station Pensacola (Fla.)," Tucker said. "We're teaming together because we're all trying to build our workforce right here in our community."

Boeing: To build the future workforce, Boeing invests heavily in both K-12 education – particularly STEM programs – and in universities, said Cindy Anderson, senior manager of Boeing's Government Operations Communications. Near New Orleans, Boeing is partnered with Nunez Community College to develop talent through an Advanced Manufacturing Technology program.

Lockheed Martin: There's a lot of competition for workers, particularly in an area like Orlando, Fla., where there are so many opportunities. Emily Rand, a spokeswoman in Lockheed's Strategic Communications, Antisubmarine Warfare, said being centrally located in the high-tech I-4 corridor enables healthy competition for the best and brightest talent. Local colleges and universities are doing a good job preparing prospective employees, but more is needed, she said. "Companies, universities, and STEM organizations need to accelerate that good work and continue to work together, supporting school efforts prior to college."

- Martha Simmons
Condensed from October 2018
Gulf Coast Aerospace Corridor Newsletter

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SOWELA photo

SOWELA students learn about aviation trade in Louisiana.

In order to enroll in the FAA programs, Radford said participants must have a high school diploma or GED and they are tested for math and English proficiency. The program does allow high school students to participate in dual enrollment.

“We want to grow mechanics from high school to the hangar,” Radford said. “That will get the companies to come and stay here.”

Growing mechanics is important, due to expected demands that will soon be placed on the aerospace workforce. Radford said the demand for aviation mechanics is expected to increase as Baby Boomers age and leave the ranks of the employed. By 2020, 30 percent of the current crop of mechanics are expected to retire, and there’s concern about who will come along to fill those jobs.

“We’re not replacing those workers like they used to. No one is taking their place,” she said. And while demands for offshore jobs are limited, there’s a real need for aerospace workers in the state. “We have a need for thousands of workers,” Radford said.

Federal government role

Besides education and training programs on the state and local level, the presence of federal technically trained employees goes a long way to increase the education level of the region. NASA and the military personnel are active participants in training programs in the region. They are also

valuable as potential employees when their time with the government is over, with companies eager to take advantage of their skills and experience.

Florida is a big player in defense, with 21 military installations. Alabama has five, Mississippi has four, including Keesler Air Force Base, and Louisiana has three. Many of them opt to stay in the region when their time in service is over.

Bill Hafner, vice president of operations for ST Engineering Aerospace, pointed out the large military and ex-military presence in the region makes it more attractive to aerospace companies looking to relocate.

“After a full career they’ve enjoyed with the military, we can do a cross-train and bring them into civilian aviation, while utilizing their previous skill set and training,” Hafner said at the Aviation and Aerospace Advisory Council in Mobile, Ala.

The military is a major part of Northwest Florida, home to Naval Air Station Pensacola, Naval Air Station Whiting Field in Milton, Hurlburt Field in Mary Esther, Eglin Air Force Base in Valparaiso, and Tyndall Air Force Base near Panama City.

“We have a huge defense presence in our state,” said Sean Helton, Enterprise Florida’s vice president of strategic communications. “So much work is being done here.”

But it’s not just the military that has highly trained technical personnel. NASA is one of the most technical of all federal agencies.

Florida’s crown jewel is the Space Coast that boasts the Kennedy Space Center, which has served as the launch site for every U.S. manned space flight since 1968. Florida also features Cape Canaveral and Cecil Spaceport.

The three space ports have attracted groundbreaking companies leading the rocket renaissance, including SpaceX, Blue Origin and OneWeb Satellites.

They draw on talent from about 8,000 former NASA employees laid off after the Space Shuttle program shut down in August 2011 and from

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Florida's universities, which rank among the nation's top producers of STEM graduates.

Scott Henderson, Blue Origin's orbital launch director, hopes to find lots of homegrown talent as the commercial company grows to 300-plus employees.

The company occupies a 750,000-square-foot rocket factory near Kennedy Space Center in Exploration Park. The facility will produce the New Glenn rockets scheduled for its first launch in 2020. Henderson predicted Brevard County will become for space what Silicon Valley is for high-tech.

"There's a certain cachet about the Space Coast and its historical gravitas," he said. "It's where space happens in the U.S. It's where the talent is, it's where the creativity is, it's where modern manufacturing is taking hold, it's where the regulatory environment is good, and it's a place where people want to live. Blue Origin is proud to help rekindle the excitement that was here back in the space heyday."

Alabama, too, has NASA facilities, as does Mississippi at Stennis Space Center and Louisiana, with the Michoud Assembly Facility.

- Duwayne Escobedo

The Embry-Riddle factor

When Airbus in May 2019 announced two programs in Mobile to train students and non-students for careers in aerospace, officials from one of the world's best-known aerospace institutions, Embry Riddle Aeronautical University, were there.

They will be involved in FlightPath9 and Fast Track at Flight Works Alabama - an endorsement of sorts for the value of the programs.

Embry-Riddle Aeronautical University is a non-profit, independent institution and the world's largest university specializing in aviation and aerospace. It has residential campuses in Daytona Beach, Fla., and Prescott, Ariz., and campuses at more than 130 locations in the United States, Europe, Asia and the Middle East. And in a nod towards modern learning, it also has online programs.

Established in 1926 as Embry-Riddle Flying School in Cincinnati, Ohio, today it awards associate, bachelor's, master's and doctoral degrees, and is accredited by the Southern Association of Colleges and Schools.

Programs in aeronautics, air traffic management, applied meteorology and aerospace studies are certified by the Federal Aviation Administration.

For this region and elsewhere, a key program of the school is Embry-Riddle Worldwide. Established in 1970, Worldwide has more than 130 campuses across the globe, with 75 on military bases.

The largest employers of Embry-Riddle graduates are the U.S. Air Force and Army, and it also can claim six graduates as NASA astronauts.

It's also involved in research. It's expanded its part-



Daytona Beach Campus, Fla.

Embry-Riddle photo

nership with industry in developing the Aerospace Research and Technology Park adjacent to the Daytona Beach campus.

In the Gulf Coast I-10 region, there are Embry-Riddle operations at Panama City-Tyndall; Crestview; Fort Walton Beach-Eglin; Fort Walton Beach-Hurlburt Field; Pensacola-NAS Pensacola; Milton-Whiting Field; Mobile-U.S. Coast Guard ATC; Fort Rucker, Ala.; Biloxi-Keesler; and New Orleans-Joint Reserve Base.

It is one of the partners in the recently announced Airbus programs, one for high school students and the other for those in the workforce who want to get involved in aviation.

It has also partnered with schools for dual enrollment programs.

- David Tortorano

V: Airports



'No flying machine will ever fly from New York to Paris.'
- Orville Wright, 1871-1948

PNS photo

Growth in airports, economy

In an era when the region is growing its aviation activities, airports with their runways play a particularly valuable role

Hancock County wants to position itself as Mississippi's Space Coast by turning Stennis International Airport into a spaceport.

It already invested \$35 million in infrastructure improvements this past year, including buying nearly 1,200 acres to prevent encroachment and add more land for aerospace and aviation development.

Hancock County Port and Harbor Commission (HCPHC) revealed its plan in April for strengthening South Mississippi's economy.

"Few communities can boast and offer space-exploration assets like ours," said Bill Cork, CEO of HCPHC. "Private companies are beginning to take advantage of those amenities. We were thrilled to see major announcements from top-tier commercial space and aviation companies here in our community. Each announcement further solidifies our position as Mississippi's Space Coast."

Hancock economic leaders have already applied for a spaceport license from the Federal Aviation Administration called the "Launch Site Operator License."

It is just one example of the importance to the economy from the unique airports that dot the Interstate 10 corridor along the Gulf Coast.

Chapter at a glance

- More than 40 commercial and general aviation airports dot the region
 - Mobile begins to shift commercial service to downtown airport
 - Pensacola airport becomes a key play in maintenance, repair and overhaul
 - Region's runways are a magnet for aerospace and aviation companies
 - One airport seeking federal designation as a spaceport
-

Every airport can lay claim to something that sets it apart. One is the largest, one has an air combat training center, one is among the nation's newest, one has three runways.

And growth is underway. At Pensacola International Airport (PNS), a huge project is underway to increase the size of its maintenance, repair and overhaul activity from one hangar to four.

In Mobile, a project is underway to shift commercial flights from Mobile Regional Airport to the Mobile Downtown Airport at the Aeroplex at Brookley, where Airbus is located.

These airports range from multi-runway commercial airports with scheduled flights and cargo service to small airfields used by weekend pilots and sky divers. The mix includes military runways used by training aircraft, as well as the most lethal, advanced, high-tech aircraft the world has ever seen. The largest aircraft in the world can use some of them.

And all of the airports are proven economic engines.

Photo page 60: One plane lands while another sits on the ground at Pensacola International Airport.

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While some have a reach that's primarily local, others have an impact well beyond their local area. They generate revenue and jobs, and have a ripple effect on businesses that have nothing to do with aviation. And with economic development professionals looking to draw more aerospace and aviation activities to the region, airports are some of the most important magnets.

In Florida alone, airports had a \$175 billion total impact on the state's economy, reported a 2019 study by the Florida Department of Transportation. It includes the combined aviation-related activities, like on-airport activity, visitor spending, industry reliance and military spending. District 3 that includes 15 Northwest Florida counties generated \$9 billion from the aviation industry, the study said.

For the aerospace-focused Gulf Coast region, they have an immediate impact on the economy and each has the potential to grow the economy even more.

Commercial airport assets

The most high-profile of the airports are the commercial facilities found in the primary cities. There are eight from Baton Rouge, La., to Tallahassee, Fla., that first and foremost address the needs of business, military and leisure travelers. In 2012, the latest figures available from the Federal Aviation Administration, those eight airports enplaned a combined 7,239,924 passengers - more than the population of Washington state but less than Virginia.

But there's another role that's becoming increasingly apparent as economic development officials start leveraging the spotlight that the Airbus plant in Mobile, Ala., has put on the region. With their stretches of runways and aircraft services, they're on the front line.

"Airports serve as a front door to a community and our runways are some of the most important stretches of pavement in the region," said Greg Donovan, Orlando Melbourne International Airport, who previously headed Pensacola International Airport, the region's second

busiest after New Orleans. Some years back he said the timing was right for the region's airports, Pensacola in particular.

He was apparently right. His successor at the airport, Pensacola native Dan Flynn, has been at the helm when some pretty amazing changes occurred for the airport, changes that in the long run will be good for the flying public.

The airport now houses ST Engineering Aerospace, which built a \$46 million, 173,000-square-foot maintenance, repair, and overhaul facility (MRO). Originally opening in Mobile in 1991, it expanded with a second facility in Pensacola. Now it's adding three more hangars.

Pensacola's airport is putting fresh emphasis on the more than 350 acres available for development that can be used to attract more aerospace operations to the westernmost city in Florida. It opened 191 acres of property with direct airside access for industrial sized hangars and aprons along the newly refurbished taxiways and runways.

In June 2018, PSA Airlines, a subsidiary of American Airlines, said it would open a new maintenance facility at the Pensacola airport and create some 30-35 jobs and support PSA's efforts to grow its fleet by about 20 aircraft. PSA said PNS was an ideal location for the new facility because the area provides a sustainable workforce, a strong local military presence and an abundance of technical schools.

In May 2019, Blue Air Training, which provides training for military close air support personnel, opened a facility at PNS. Founder and CEO James "Chef" Barlow says they have more than 20 employees in Pensacola now, but he's looking to grow that number. In 2011, Blue Air Training received approval to train Air Force attack controllers and fighter pilots. Its fleet includes A-90 Raiders, BAC-167 Strikemasters, IAR-823 Brasovs and AH-6 Little Birds.

What do new tenants mean for the flying public? They diversify the airport's revenue base. The more income that can be generated from sources other than the airlines, the better the

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chance for keeping their rate base from landing fees and other rents low.

ST Engineering Aerospace currently add about \$260,000 a year in ground rent. Each additional hangar will increase the annual payment by about a quarter-of-a-million dollars.

“That helps offset fees that we would otherwise have to charge the airlines. ... So from the pure revenue side, its just wonderful.”

Flynn said the addition of the MRO can be leveraged by the airport as another feature that may interest airlines.

“So it aides us in our air service development efforts when we go to an airline and we say, ‘hey you know we have these things to offer at Pensacola and by the way, we also have this maintenance facility who contracts with you and others that now has a presence on the airport,’” Flynn said.

Meanwhile, service at the airport is increasing. In February 2019 Silver Airways began nonstop service between Fort Lauderdale-Hollywood International Airport and PNS. “The commencement of direct service to Ft. Lauderdale and the South Florida area provides another link to one of the Pensacola Gulf Coast Region’s top ten market areas and important connecting opportunities on the Silver network to Key West and the Bahamas,” said Flynn.

And there’s good reason to come to the table. Mobile by itself cannot handle all that will eventually result from the \$600 million A320 final

assembly line that opened in 2015 with plans to add a \$224 million A220 line by 2020.

Pensacola, 60 miles to the east of Mobile, expects some of that spillover and has begun to improve its front door appeal with a 127-room hotel, an urgent care center and other land for commercial development.

Northwest Florida economic leaders say an operation as big as Airbus has not been seen before in the region. They predict it will benefit Pensacola, Northwest Florida and the whole Gulf Coast aerospace corridor.

Cargo is also getting fresh emphasis. It built a \$5 million cargo apron with FAA and FDOT funds to accommodate UPS, based in Louisville, Ky., and others large cargo carriers.

The Pensacola cargo center improvements will also facilitate two regional air freight operators, while giving the airport much needed capacity to meet Florida’s Trade and Logistics Plan expectations.

To the east of Pensacola near Panama City, Fla., is one of the newest airports in the nation, Northwest Florida Beaches International Airport. What separates this new airport from the rest in the region is the amount of land that’s available in and around the facility. There’s so much that the airport is expected to be able to meet air travel demands for the next 50 years.



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It was in the late 1990s that the airport authority started looking at ways to increase air traffic to the tourist destination. There were limited options for the downtown Panama City-Bay County Airport. One option was extending the runway, and another was relocating the airport to nearby Tyndall Air Force Base.

That's when St. Joe Co., the second largest private landowner in Florida and a major development company, offered to donate land 18 miles northwest of Panama City in West Bay, St. Joe's 71,000-acre master planned community. It opened in May 2010 and its first airline was low-cost carrier Southwest Airlines. The airport was able to get Southwest after St. Joe promised to pay the airline, if passenger counts were below projections.

One of the first developments in West Bay is the VentureCrossing Enterprise Center, which has 4.4 million square feet of industrial, commercial and retail space. Defense company, ITT Exelis, was the first to move near the brand new airport. Despite Hurricane Michael in 2018, economic leaders expect others aerospace-related companies to make it home.

In addition to the land surrounding the airport, the airport itself has 1,400 acres available for industrial development.

To the west in Mississippi, Gulfport-Biloxi International Airport has spent nearly \$100 million since 2005's Hurricane Katrina for a new air traffic control tower, cargo facility, taxiways, perimeter road and other airfield work. Private businesses have invested more than \$91 million on hotels, an office park, rental car center and refueling facility on airport property.

The airport's cargo facility contains both cold and dry storage and has fumigation and irradiation capabilities for perishable handlers.

The activity that really singles out the airport is the Mississippi National Guard's Trent Lott Readiness Training Center. It takes up 220 acres on the eastern edge of the airport, and is home to the Air National Guard Combat Readiness



Gulfport-Biloxi International Airport, Miss.

Training Center. The CRTC is one of just four operated by the Air National Guard in the United States.

The CRTC provides an integrated year-round environment with air, land and sea ranges. The small center has no aircraft assigned to it, but thousands of pilots come to Gulfport every year to engage in mock combat.

The airborne schoolhouse is equipped with a state-of-the-art, multimillion-dollar combat training system that keeps track of every move of the pilot, good or bad. The P5 Combat Training System provides training and debriefing capability and combines sophisticated electronic threat and scoring systems, as well. The combination of the Gulfport center, Camp Shelby to the north near Hattiesburg, Miss., and the Gulf of Mexico ranges provide supersonic airspace, gunnery ranges, facilities and equipment to enhance readiness.

Gulfport-Biloxi International Airport has a \$299 million annual economic impact, said Clay Williams, executive director of the airport. Ridership was up 11 percent last year and cargo up 16 percent. And new service helps.

In February 2019 the airport announced new service to Austin, Texas, and Ft. Myers, Fla., with Sun Country Airlines running from July to December.

The Mississippi congressional delegation in July 2017 announced 42 grants valued at \$7.54 million for airports throughout the state, including \$2.35 million from the Federal Aviation Ad-

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ministration to Gulfport airport for taxiway widening, runway rehabilitation and security enhancement. The grant also provides partial reimbursement for work completed in 2014.

While Gulfport has a lot of military activity, the Destin-Fort Walton Beach Airport (VPS) is actually on a military base. The airport takes up only a few hundred acres at Eglin Air Force Base, Fla., enough for the terminal and the 15 on-site aviation-related tenants. Because it's at Eglin, it uses two of the longest runways in the region.

In March 2018 Okaloosa County's lease of 130 acres of Eglin land that contains VPS was extended by 25 years and will expire on July 30, 2063. The county-Air Force partnership at VPS dates to 1957. The airport set a new record for fiscal 2017 with a total of 1,134,209 passengers.

In February 2019, Allegiant Air announced non-stop service from VPS to Des Moines, Iowa; Huntington (Tri-State), W. Va.; Little Rock, Ark.; Rockford/Chicago, Ill.; Shreveport, La.; Toledo, Ohio/Detroit, Mich.; and Wichita, Kan. The same month Silver Airways announced daily non-stop service from VPS to Orlando International Airport. A month earlier, Allegiant announced non-stop service from VPS to Omaha and Tulsa.

The airport is operated by Okaloosa County, which also runs a general aviation airport in Destin, Fla., and another airport in Crestview, Fla., that is heavily used by the military.

The largest and busiest airport in the Gulf Coast I-10 aerospace corridor is Louis Armstrong New Orleans International Airport. It has 11 airlines and in 2016 it had 6,022,318 enplanements, 38th highest in the nation. And it's sprucing up for the future.

The \$1.3 billion terminal, which will replace the airport's existing 50-year-old terminal, has been delayed several times but is finally close to opening. Initially construction was estimated at \$650 million with the hope of opening by 2018,

when the city celebrated its 300th anniversary of its founding as a French colony.

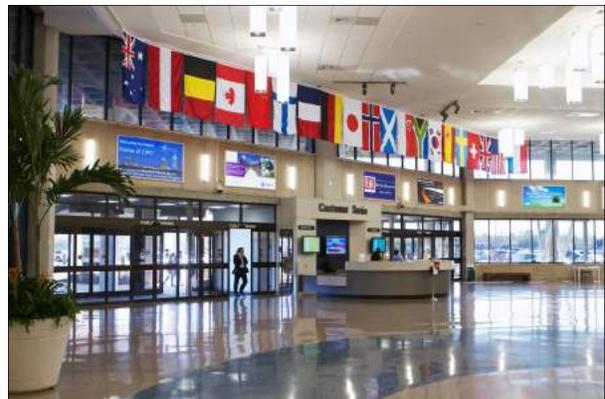
The existing terminal will be repurposed, possibly for commercial cargo and charter flight facilities along with space for airport staff, the Federal Aviation Administration and the Transportation Security Administration.

One of the fascinating airport stories in the region is being played out in Mobile, where the current Mobile Regional Airport will eventually lose its commercial air service to the Mobile Downtown Airport.

Mobile Regional Airport over the years has had trouble with its passenger count. Part of the reason has been its distance west of downtown in an area with no easy interstate access. That has been a problem attracting travelers from Baldwin County, which sits between Mobile and Pensacola. They tend to favor using the airport in Pensacola.

In June 2018, results of a study were released on the feasibility of moving passenger flights from Mobile Regional Airport in west Mobile to the Downtown Mobile Airport at the Mobile Aeroplex. It showed it would be beneficial, but could take three to five years to complete.

The Mobile Airport Authority (MAA), which oversees both facilities, launched the study. At the heart of the issue was finding a way get back travelers who current travel to airports to the east and west of Mobile.



Mobile Regional Airport terminal.

MAA photo

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MAA Executive Director Chris Curry said 47 percent of travelers who might be expected to use Mobile go to competing airports. Part of the problem is access.

One question was whether it would be more cost-effective to move commercial service or improve road access to Mobile Regional, and the move was deemed more cost-effective. The study did not address the specific cost.

Curry also said accommodating passenger traffic without inconveniencing the Aeroplex's industrial aviation tenants at the 1,200-acre airport will require a balancing act, but the challenge can be managed.

The Aeroplex, among other things, is where Airbus builds A320 jetliners and in the future will build A220s. ST Engineering operates a maintenance, repair and overhaul facility and Continental Motors builds small aircraft engines.

Downtown Airport's new Terminal 1 will have five ticket counters and is 22,000 square feet, but there are plans to expand at the end of summer. It costs about \$6 million. MAA chose remodeling an existing building used by Airbus over building a temporary structure.

The downtown airport at the Mobile Aeroplex had a historic flight May 1 when Frontier Airlines took off to Chicago's O'Hare Airport.

The Regional Airport, which is 1,700 acres, will continue to provide service for United, Delta and American Airlines. It's also home to Airbus Military, which maintains HC-144 aircraft used by the U.S. Coast Guard. It's also home to the Coast Guard Aviation Training Center.

In the extreme east and west of the Gulf Coast Aerospace Corridor, Tallahassee Regional Airport and Baton Rouge Metropolitan Airport, respectively, both have the advantage of being in the capital city of their states, and each serves a city that's home to major research universities.

The Tallahassee airport is southwest of the central business district and close to a half-dozen office and technology parks, including the 200-acre Innovation Park of Tallahassee. It is the



home of 35 high-tech operations, including the National High Magnetic Field Laboratory.

General aviation economic impacts

Of all the non-commercial airports in the region, the one that has received the most publicity is the Mobile Aeroplex at Brookley. The nearly 1,700-acre former Air Force base is the site of the Airbus A320 final assembly line. It's a strong intermodal economic engine with rail, highway and port access. It has 200 acres and 850,000-square-feet of building space available.

It's also home to piston engine-maker Continental Motors, established in 1929 and now owned by China's AVIC, Singapore-owned ST Engineering Aerospace, Star Aviation, Signature Flight Services, FedEx, Airbus Engineering Center and more than 70 other tenants. It's in foreign trade and economic-renewal zones, which provide enhanced business opportunities and tax incentives.

It's also the location of the Mobile Downtown Airport, a general aviation airport that's moving into the realm of commercial air service. It has a 9,600-foot and 7,800-foot runways, and several academic operations, including an Alabama Industrial Development Training office. It is also the future site of Flight Works Alabama.

The push now is to spruce up the Aeroplex to make it look like the world player it is. Part of that was a rebranding, including slowly moving away from the old name of "Brookley" and making the name of the city more prominent.

"We started the campaign to craft a new identity in November 2012," said Buddy Rice, former marketing director for the Mobile Airport

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Authority. “We have to make it easy for people to find us, and using Mobile to frame all our business units does that.”

The Aeroplex sits on Mobile Bay with access to the Port of Mobile. It has five class 1A railroads that come to a point right off its location. It possesses two airports, both with FAA-staffed towers. It has easy access to two major highway connections, Interstate 65 and Interstate 10.

Plus, the Mobile Downtown Airport can accommodate just about any aircraft, such as small general aviation aircraft, civilian and military helicopters, fixed-wing military aircraft, corporate jets, commercial jets like the 757 and A320, and jumbos like the A330, MD-11, 767, and 747.

The Bob Sikes Airport in Crestview, Fla., isn’t a military airport, but it caters to the military. It’s convenient to four bases that train military aviators: Naval Air Station Whiting Field in Milton, Naval Air Station Pensacola, and Eglin Air Force Base, all in Northwest Florida, as well as Alabama’s Fort Rucker, near Dothan. The airport has an instrumented landing system (ILS) and the Navy, Air Force and Army use it for training.

The general aviation facility of 1,080 acres is adjacent to 360-acre Okaloosa-Crestview Industrial Airpark. It has an 8,005 foot runway, large enough to handle the world’s biggest aircraft, like the C-17s that deliver helicopters to L-3 Crestview Aerospace, and C-5s, B-747s and AN-225. Local companies that frequently use the airport include military industrial contractors that work with the military bases in the region.

The tenant list includes the former L3 Crestview Aerospace – which has since been sold. It does aircraft modification, assembly and aerostructure fabrication for military, other government and original equipment manufacturers. Another tenant is Qwest Air Parts, a Memphis, Tenn., company that disassembles retired aircraft in a 76,000-square-foot building and sells parts.

BAE Systems also has an operation at the airport. At Bob Sikes Airport it performs modifications to both fixed-wing and rotary military air-

craft. Also at the airport is Sunshine Aero Industries (SAI) Flight Test, which provides support for the development of advanced aircraft and aircraft systems. It has its own aircraft inventory, including jets and prop planes.

“It’s a huge asset,” said Tracy Stage, airports director for Okaloosa County, about Bob Sikes Airport. It is estimated that at least \$500 million in commerce flows through the airport annually.

Recognizing the economic impacts airports can have both the Florida DOT and FAA have showered Okaloosa County with millions to use for infrastructure, Stage reported.

Among other things the money has gone into designing and developing an asphalt mixture that is impervious to airplane fuel. The county won an American Association of Airport Executives General Aviation Project of the Year award for that coup in 2010. It is the only airport completely surfaced with the material, Stage said.

All of the work and planning, Stage said, has put the airport in position to serve as a “second or third tier supplier” for Airbus, which opened an A320 final assembly line in Mobile, Ala.

“There’s a 100 mile bubble we want to stay out of so nobody’s competing for employees, and we are almost exactly 100 miles away from Mobile,” Stage said. “When Airbus gets going, suppliers will be looking for a place to go.”

Okaloosa County officials have said that Bob Sikes Airport is an absolute gold mine as it is equipped with an 8,000-foot runway with an instrument landing system, aviation compatible environments surrounding the airport, full service FBO, and hundreds of acres of land waiting to be developed.,” said Mike Stenson, deputy director of Okaloosa County Airports.

Other general aviation airports have also found niches. In Jackson County, Miss., Trent Lott International Airport in Moss Point is adjacent to the Jackson County Aviation Technology Park, which opened in 2006. The park’s first tenant is a real star: It’s home to the 101,000-square-foot Northrop Grumman Unmanned Systems Center, which opened in 2006 and does final

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assembly work on the Fire Scout unmanned helicopter. The most capable version, the MQ-8C, is a modified Bell 407 helicopter. The plant also does central fuselage work on all variants of the Global Hawk unmanned systems and does sub-assembly work for the F-35 Joint Strike Fighter.

The \$3.7 million expansion of the plant was announced in May 2017, with the promise of adding another 60 jobs and allowing the F-35 subassembly work. The state contributed \$7.5 million in BP restoration money to harden the runway at the airport. The expansion was formally opened in June 2018, and three months later the plant began flight testing Fire Scouts.

“Building on Northrop Grumman's recent announcement of new production capabilities in Moss Point and a 40 percent increase in employment at the site, the ability to now conduct MQ-8C Fire Scout flight tests where the production occurs will bring new efficiencies and effectiveness to our local operations and improve our ability to serve the U.S. Navy,” said Melissa Packwood, program director, Fire Scout, Northrop Grumman.

Executives from Northrop have said many times that more work is likely to go to the Moss Point plant that it has plans to expand. The company also has first crack at additional acres.

What can't help but be noticed by observers is that three types of aircraft, one a jetliner and the other two unmanned aerial systems, are being built all or in part at locations separated by just 35 miles (*see Chapter I*). That proximity has led to some level of cooperation between the Alabama county of Mobile and the Mississippi county of Jackson.

In addition to the 200 acres available for development at the airport's adjacent technology park, there are two more sites in Jackson County that with nearly 1,000 combined acres that are available for aerospace companies.

Near NASA's Stennis Space Center, Miss., Stennis International Airport in Kiln caters to the military, and is home of Tyonek Services Overhaul Facility - Stennis LLC. It is the former

Finmeccanica's Selex Galileo Avionics System Integration facility. It was purchased in May 2016.

The airport, which is seeking to be designated a spaceport, is 1,691 acres with an 8,500-foot grooved runway and more than 340,000 square feet of surfaced aprons and taxiways.

It's also used by Rolls-Royces to ship in and out the large jet engines it tests at its outdoor test facility at Stennis Space Center. The airport's terminal/hanger project includes an FAA-funded apron and state-funded aviation fuel farm relocation.

The 54,000-square-foot, two bay hangar—large enough for two C-130s—was completed using funds from what was then Selex and Community Development Block Grant funds. That project also included an FAA-funded apron expansion.

Two additional apron projects also helped the former Selex. The first to support helicopter operations is completed and the second to support C-130s was completed by 2015.

A 125-acre drop zone has been completed in the NASA buffer zone on airport property. This will allow military C-130s to practice air-delivery systems. The drop zone will be available to private and commercial customers as well.

One of the most interesting and historic airports in the region is New Orleans Lakefront Airport, which opened in 1934. It was built on a man-made arrowhead peninsula jutting into Lake Pontchartrain. In the 1950s, New Orleans Lakefront was designated as a general aviation airport. Three runways serve private, corporate, and military, and commercial air carrier aircraft. The 6,895-foot main runway is routinely used by B-727s, B-737s, C-130s, and occasionally C-17s and C-5s.

All of these Gulf Coast airports have the Gulf Coast well situated to welcome even more business in the future.

- Duwayne Escobedo

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Gulf Coast's airports

Alabama

- **Bay Minette Municipal Airport**

11981 Airport Road, Bay Minette, Ala. 36507
FAA code: 1R8
Established: 1962
Acres: 184
Runways (1): 8/26, 5,500 feet

- **Dauphin Island Airport**

Dauphin Island, Ala. 36528
FAA code: 4R9
Established: 1967
Acres: 22
Runways (1): 12/30, 3,000 feet

- **Dothan Regional Airport**

Dothan, Ala.
FAA code: DHN
Acres: 1,150
Runways (2): 14/32, 8,496 feet; 18/36, 5,500 feet
Enplanements CY 2017: 47,304 (2016: 49,411; 2012: 46,452)
Rank CY 2017: 282 (2012: 275)

- **Foley Municipal Airport**

510 Airport Dr., Foley, Ala. 36535
FAA code: 5R4
Established: 1967
Acres: 104
Runways (1): 18/36, 3,700 feet

- **H.L. Sonny Callahan Airport**

8600 County Road 32, Fairhope, Ala. 36532
FAA code: CQF
Acres: 144
Runways (1): 1/19, 6,604 feet
Enplanements CY 2017: 5 (2012: 31)
Rank CY 2017: 1,155 (2012: 1,028)

- **Jack Edwards National Airport**

3190 Airport Dr., Gulf Shores, Ala. 36542
FAA code: JKA
Established: 1942
Acres: 1,100
Runways (2): 9/27, 6,962 feet; 17/35, 3,599 feet
Terminals: 2
No. of security gates: 6
Enplanements CY 2017: 39 (2012: 49)
Rank CY 2017: 912 (2012: 979)

- **Mark Reynolds/North Mobile County Airport**

1931 Deadlake Marina Road, Creola, Ala. 36505
Code: 15A
Established: 1984
Acres: 100
Runways (1): 3/21, 2,000 feet

- **Mobile Downtown (Mobile Aeroplex at Brookley)**

1891 9th Street, Mobile, Ala. 36615
FAA code: BFM
Owner: Mobile Airport Authority
Established: 1940
Acres: 1,650
Runways (2): 14/32, 9,618 feet; 18/36, 7,800 feet
Enplanements CY 2017: 947 (2012: 1,038)
Rank CY 2017: 654 (2012: 663)

- **Mobile Regional Airport**

8400 Airport Blvd., Mobile, Ala. 36608
Code: MOB
Owner: Mobile Airport Authority
Established: 1942
Acres: 1,717
Runways (2): 14/32, 8,502 feet; 18/36, 4,376 feet
No. of terminals: 7
Enplanements CY 2017: 288,222 (2016: 288,209; 2012: 277,432)
Rank CY 2017: 162 (2012: 159)

- **Roy E. Ray Airport**

Bayou La Batre, Ala. 36544
Code: 5R7
Established: 1963
Acres: 80
Runways (1): 18/36, 2,600 feet

- **St. Elmo Airport**

North of U.S. 90 in St. Elmo, Ala.
Code: 2R5
Established: 1945
Acres: 736
Runway (1): 6/24, 3,998 feet

Florida

- **Apalachicola Regional Airport**

34 Forbes Street, Apalachicola, Fla. 32320
FAA code: AAF
Owner: Franklin County
Runways (3): 6/24, 5,271 feet; 14/32, 5,425; 18/36, 5,251 feet

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- **Bob Sikes Airport**

5551 John Givens Road, Crestview, Fla. 32539
FAA code: CEW
Owner: Okaloosa County
Acres: 1,020
Runways (1): 17/35, 8,004 feet
Enplanements CY 2017: 24 (2016: 0; 2012: 3)
Rank CY 2017: 965 (2012: 1,455)

- **Calhoun County Airport**

20095 SW Juniper Ave., Blountstown, Fla. 32424
FAA code: F95
Owner: Calhoun County
Runways (1): 18/36, 3,608 feet

- **Carrabelle-Thompson Airport**

1001 Gray Ave., Carrabelle, Fla. 32322
FAA code: X13
Owner: Carrabelle Port and Airport Authority
Runways (1): 5/23, 4,000 feet

- **Coastal Airport**

6001 West Nine Mile Road, Pensacola, Fla. 32526
FAA code: 83J
Owner: Coastal Airport
Runways (1): 18/36, 2,526 feet

- **Costin Airport**

167 Cessna Drive, Port Saint Joe, Fla, 32456
FAA code: A51
Owner: Calhoun County
Runways (1): 18/36, 3,140 feet

- **Defuniak Springs Airport**

71 U.S. Highway 90 West, Defuniak Springs, Fla 32435
FAA code: 54J
Owner: City of Defuniak Springs
Runways (2): 9/27, 4,146 feet; 18/36, 2,700 feet

- **Eglin AFB/Destin-Ft. Walton Beach Airport/Valpariso**

1701 State Road 85 North, Eglin Air Force Base, Fla., 32542
FAA code: VPS
Owner: Okaloosa County (terminal within Department of Defense-owned Eglin AFB)
Runways (2): 1/19, 10,012 feet; 12/30, 12,005 feet
Gates: 6
Enplanements CY 2017: 567,633 (2016: 440,002)
Rank CY 2017: 117 (2012: 135)

- **Destin Executive**

1001 Airport Rd., Destin, Fla. 32541

FAA code: DTS
Owner: Okaloosa County
Enplanements CY 2017: 58 (2016: 23; 2012: 119)
Rank CY 2017: 874 (2012: 885)

- **Ferguson Airport**

9750 Aileron Ave., Pensacola, Fla. 32506
FAA code: 82J
Owner: Brown Helicopter
Runways (1): 18/36, 3,200 feet

- **Fort Walton Beach Airport**

In Santa Rosa County, 2 miles east of Navarre, Fla.
FAA code: 1J9
Owner: Boomer Aviation Inc.
Runways (1): 18/36, 1,878 feet

- **Hurlburt Field**

Mary Esther
FAA code: HRT
Owner: Department of Defense
Enplanements CY 2017: 1,886 (2016: 2,161)
Rank CY 2017: 587

- **Marianna Municipal Airport**

3689 Industrial Park Drive, Marianna, Fla. 32446
FAA code: MAI
Owner: Marianna Municipal Airport Development
Runways (2): 8/26, 4,895 feet; 18/36, 4,896 feet

- **Naval Air Station Pensacola Forrest Sherman Field**

FAA code: NPA
Owner: Department of Defense
Enplanements CY 2017: 132 (2016: 632)
Rank CY 2017: 806

- **Northwest Florida Beaches International Airport**

6300 West Bay Parkway, Panama City Beach, Fla. 32409
FAA code: ECP
Acres: 4,000
Runways (1): 16/34, 10,000 feet
Gates: 7
Enplanements CY 2017: 454,712 (CY 2016: 434,302; CY 2012: 373,542)
Rank CY 2017: 130 (2012: 125)

- **Pensacola International Airport**

2430 Airport Blvd., Pensacola, Fla. 32504
FAA code: PNS
Owner: City of Pensacola

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Established: 1934

Acres: 1,400

Runways (2): 8/26, 7,000 feet; 17/35, 7,004 feet

Gates: 10

Enplanements CY 2017: 839,248 (2016: 792,916; 2012: 740,852)

Rank CY 2017: 98 (2012: 100)

- **Peter Prince Field**

6051 Old Bagdad Highway, Milton, Fla. 32583

FAA code: 2R4

Owner: Santa Rosa County

Runways (1): 18/36, 3,701 feet

- **Quincy Municipal Airport**

Quincy, Fla. 32322

FAA code: 2J9

Owner: Quincy-Gadsden Airport Authority

Runways (1): 14/32, 2,964 feet

- **St. George Island Airport**

1712 Magnolia Road, Saint George Island, Fla. 32328

FAA code: F47

Owner: St. George Plantation Owners' Association

Runways (1): 14/32, 3,339 feet

- **Tallahassee Commercial Airport**

Tallahassee, Fla.

FAA code: 68J

Owner: J.W. Hinson

Runways (1): 16/34, 3,249 feet

- **Tallahassee International Airport**

3300 Capital Circle SW, Tallahassee, Fla. 32310

FAA code: TLH

Owner: City of Tallahassee

Acres: 2,490

Runways (2): 2/27, 8,003 feet; 18/36, 7,000 feet

Enplanements CY 2017: 350,174 (2016: 345,404; 2012: 331,296)

Rank CY 2017: 146 (2012: 143)

- **Tri-County Airport**

1983 Tri-County Airport Road, Bonifay, Fla, 32425

FAA code: 1JO

Owner: Tri-County Airport Authority

Runways (1): 1/19, 4,000 feet

- **Tyndall Air Force Base**

FAA code: PAM

Owner: Department of Defense

Enplanements CY 2017: 968 (2016: 623)

Rank CY 2017: 651

- **Wakulla County Airport**

35 Moncoupe Circle, Panacea, Fla. 32346

FAA code: 2J0

Owner: Wakulla County

Runways (1): 18/36, 2,570 feet

Louisiana

- **Baton Rouge Metropolitan Airport (Ryan Field)**

9430 Jackie Cochran Dr., Baton Rouge, La. 70811

FAA code: BTR

Established: 1942

Acres: 1,800

Runways (3): 4L/22R, 7,500 feet; 13/31, 7,004 feet; 4R/22L, 3,799 feet

Gates: 7

Enplanements CY 2017: 377,670 (2016: 364,200; 2012: 406,318)

Rank CY 2017: 139 (2012: 129)

- **L. Armstrong New Orleans International Airport**

900 Airline Dr., Kenner, La. 70062

FAA code: MSY

Established: 1946

Acres: 1,600

Runways (2): 10/28, 10,104 feet; 1/19 length, 7,001 feet

Gates: 42

Enplanements CY 2017: 6,022,318 (2016: 5,569,705; 2012: 4,293,624)

Rank CY 2017: 38 (2012: 41)

- **New Orleans Lakefront Airport**

6001 Stars & Stripes Blvd., New Orleans, La. 70126

FAA code: NEW

Established: 1940

Acres: 473

Runways (3): 18R/36L, 6,879 feet; 18L/36R, 3,697 feet; 09/27, 3,114 feet

Enplanements CY 2017: 266 (2016: 81; 2012: 391)

Rank CY 2017: 767 (2012: 770)

- **Slidell Airport**

Slidell, La.

FAA code: ASD

Acres: 340

Runways (1): 18/36 5,001 feet

Enplanements CY 2017: 30 (2016: 0; 2012: 13)

Rank CY 2017: 939 (2012: 1,191)

- **Southern Seaplane**

Belle Chasse, La.

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FAA code: 65LA
Enplanements CY 2017: 325 (2016: 250)
Rank CY 2017: 989

- **St. Tammany Regional Airport**

Covington, La.
FAA code: L31
Acres: 42
Runways (1): 18/36 2,999 feet
Enplanements CY 2017: 120 (2016: 0; 2012: 75)
Rank CY 2017: 818 (2012: 930)

Mississippi

- **Gulfport-Biloxi International Airport**

14035 Airpor Road, Gulfport, Miss. 39503
FAA code: GPT
Established: 1942 by military; 1949 opened as civil airport
Acres: 1,700
Runways (2): 14/32, 9,002 feet; 18/36, 4,935 feet
Gates: 6
Enplanements CY 2017: 324,611 (2016: 305,157; 2012: 394,110)
Rank CY 2017: 155 (2012: 131)

- **Hattiesburg - Bobby L. Chain Municipal Airport**

29 Academy Dr., Hattiesburg, Miss. 39401
FAA code: HBG
Established: 1930
Acres: 1,200
Runways (1): 18/36, 6,502 feet
Enplanements CY 2012: 6
Rank: 1,329

- **Hattiesburg - Laurel Regional Airport**

1002 Terminal Dr., Moselle, Miss. 39459
FAA code: PIB
Established: 1974
Acres: 1,200
Runways (1): 18/36, 6,502 feet
Gates: 1
Enplanements CY 2017: 11,726 (2016: 12,367; 2012: 13,857)
Rank: 368

- **Picayune Municipal**

7250 Stennis Airport Road, Kiln, Miss. 39556
FAA code: MJD
Enplanements CY 2017: 15 (2016: 0)
Rank CY 2017: 1,028

- **Stennis International Airport**

7250 Stennis Airport Road, Kiln, Miss. 39556
FAA code: KHSA

Established:1970
Acres: 1,680
Runways (1): 18/36, 8,497 feet
Enplanements CY 2012: 305
Rank: 794

- **Trent Lott International Airport**

8301 Saracenna Road, Moss Point, Miss. 39563
FAA code: PQL
Established: 1990
Acres: 500
Runways (1): 17/35, 6,500 feet
Enplanements CY 2017: 2 (2016: 3)
Rank CY 2017: 1,308

*- Compiled by Gulf Coast Reporters League
Gulf Coast Aerospace Corridor 2014-2015
Enplanements updated, list of airlines removed, June 2019*

VI: The four states



'There is always competition for influence, but there are also opportunities for cooperation.'

- Lee Hsien Loong, Singapore prime minister

Aerospace in the four states

The I-10 corridor has plenty of aviation assets, and they are in four states that combined is one of the world's largest

Over the course of four issues of the bimonthly *Gulf Coast Aerospace Corridor Newsletter*, the aerospace and aviation activities of Alabama, Florida, Louisiana, and Mississippi were highlighted. What was clear was all four have significant activities, including space, assembly and maintenance, military and more. The following reprints that information, with selected updates.

Alabama



Long known for space and missile work in north Alabama, the south part of the state is a growing commercial aviation hub, and points in between are getting in on the action, too.

The Airbus assembly facility in Mobile, Ala., Hangar 9, only been around since 2015, with its formal opening in September. In April 2016 the first Mobile-built jet, an A321, was delivered to customer JetBlue.

And now plans are in the works to create a second assembly line for the former Bombardier CSeries, now called the A220 after Airbus took over a majority share of a joint partnership. While it initially was prompted by threatened tariffs, that went away but the need was still there for a second assembly line would help

Chapter highlights

- Louisiana home to NASA, a bomb wing, MROs, aircraft assembly and more
- Mississippi tests rocket engines, builds helicopters, drones, trains military pilots
- Alabama long known for space and missile work, now jetliner assembly
- Florida among most active aerospace centers in nation, clusters statewide

meet the expected demand for the for the highly efficient jetliner.

Mobile and its growing aerospace sector is just one of the hot spots in a state that has been a player in aviation since the Wright brothers in 1910 established a flying school in Montgomery. Today Alabama can say its aerospace activities run the gamut, from designing spacecraft to maintenance, repair and overhaul and more.

“When we measure project activity, the second-fastest growing sector in the state is aerospace and aviation,” said Alabama Commerce Secretary Greg Canfield for a February 2018 story. “I think for the future of aerospace in the state of Alabama, activity is going to continue to climb.”

Aerospace and aviation operations can be found across the state. According to Canfield, about 400 aerospace companies from 30 countries have operations in Alabama. Boeing, Airbus, Lockheed Martin, GE Aviation, Raytheon and GKN Aerospace are among them. Canfield said 83,000 Alabamians work in the aerospace and defense fields.

“We’re a state that’s built around an aerospace sector that is pretty diverse,” he said. “We do everything from Raytheon SM-3 and SM-6 missiles to 3D printing of jet fuel nozzles that go on

Photo page 73: The four states and areas where aerospace and aviation activities are clustered.

Chapter VI - The four states

the new neo engine ... from space to general aviation, we've got it covered."

The Aerospace Industries Association says that aerospace and defense accounts for 1.7 percent of Alabama's Gross Domestic Product, higher than aerospace-intensive Florida. Alabama in 2015 had \$8.7 billion in sales revenue and \$887 million in A&D export sales.

Aerospace is one of the largest industrial groups in the state of Alabama, along with automotive, with wages among the highest.

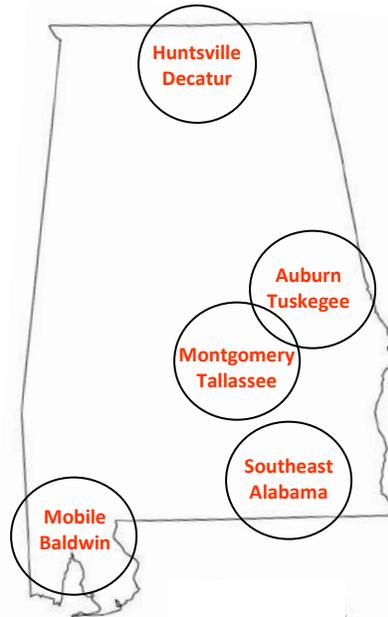
Alabama has the third highest employment for aerospace engineers after California and Texas, and the highest concentration of jobs and location quotient in the nation, according to the Bureau of Labor Statistics data from May 2018.

Made in Alabama, a service of the Commerce Department, reported that by November 2017, aerospace companies unveiled plans to invest at least \$500 million and bring more than 2,200 jobs to Alabama in new facilities or expansions of existing operations. In 2016, project announcements involved \$260 million in new investment and 2,000 additional jobs.

Huntsville-Decatur

Long the place most think of when it comes to aerospace, north Alabama is home of NASA's George C. Marshall Space Flight Center and Redstone Arsenal, a major research, engineering, and test center that houses the Army's missile defense and aviation programs.

Huntsville has the nation's highest employment level of aerospace engineers, with 3,310 and a location quotient of 33.11, according to May 2018 Bureau of Labor Statistics data.



Home to Cummings Research Center, the second largest research and technology park in the United States, Huntsville's reputation as a high-tech haven is underscored by the highly popular U.S. Space and Rocket Center.

The transformation of Huntsville from a cotton town into one of the nation's premier technology centers began in the 1950s, when the Army transferred its missile program to Huntsville, followed by the arrival of NASA and its space program. Companies involved with the Army and NASA came, thanks in no small measure

to the establishment of the University of Alabama in Huntsville and the development of a research park that would become Cummings.

The growth has continued. Last year Blue Origin announced it would make its BE-4 engine in a \$200 million facility. In addition, Aerojet Rocketdyne said it would expand its Huntsville operation with a manufacturing plant for its AR1 rocket engine and other parts.



Huntsville welcome center

Decatur, west of Huntsville, is known for its United Launch Alliance production facility, a joint venture of Lockheed Martin and Boeing created in 2006. Next door to ULA, work got underway in the summer of 2017 on a three-structure \$21 million Dynetics facility. The test stand, test control center and integration facility is designed to support NASA's Space Launch System program and commercial customers. It's

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set to open this year. RUAG Space of Switzerland leases space in the ULA facility.

“If we look at aerospace from a space perspective and missile defense, with the Blue Origin announcement in Alabama and with Aerojet Rocketdyne moving its defense headquarters from California to Huntsville, Ala., I think that Alabama’s looking good,” said Canfield.

Mobile-Baldwin

It could be argued that Mobile has for years been a sleeping giant in aerospace. Today it’s fully awake.

Mobile has been interested in aerospace and aviation since the days of World War II-era Brookley Air Force Base. But the city took a hit when the base was shut down in the ’60s.

Converted to Brookley Industrial Complex, it did manage to attract some aerospace companies as well as a range of other tenants. But the trajectory of the former base, today called the Mobile Aeroplex at Brookley, changed when Europe’s Airbus picked Mobile as a site to build aerial tankers for the Air Force.

But the Mobile-Airbus story actually began earlier. In April 2004, as part of a strategy to build its U.S. industrial base, the company decided to establish a customer service and training facility at Mobile Regional Airport to support Coast Guard’s HC-144 (CN235) aircraft. It became operational in 2005.

That was followed in June 2005 with the announcement that the company chose Mobile’s Brookley Complex to build tankers should it win the Air Force contract. The decision to build the engineering center followed. It opened in 2007.

The Air Force contract eventually went to Boeing, but Mobile ended up getting the A320 series assembly line, arguably a better deal in the long term.

Mobile, which assembles the jetliners from sections shipped from Europe, is the newest A320 series plant. The others are in Hamburg, Germany; Toulouse, France; and Tianjin, China.

Then came the startling news in October 2017 that Airbus would partner with Canada’s Bombardier to bring a new production line for Bombardier’s CSeries jets to Alabama. It was finalized in July 2018, and the plant is being built for what’s now called the A220.

Between the first announcement that Airbus would build a plant in Mobile and the Bombardier joint venture, at least two dozen suppliers have come to Mobile, and more are expected with a second assembly line.

Safran was the first Airbus supplier to announce it would open an operation in Mobile in the wake of the Airbus announcement. The planned engineering center didn’t work out, but Safran opened a manufacturing operation to produce and install aircraft engine nacelles, the housing for an aircraft engine and its related components. Safran’s Messier-Bugatti-Dowty also has an operation at the Mobile Aeroplex.

Across the bay in Baldwin County, UTC Aerospace Systems in August 2017 unveiled a new 80,000-square-foot manufacturing and nacelle assembly facility at its Foley campus.

The site assembles nacelles for integration with the Pratt & Whitney Geared Turbofan engine for multiple air-



Engine for Airbus A321

craft, including the A320neo, CSeries, Mitsubishi Regional Jet and Embraer E-Jet E2.

Now called Collins Aerospace after UTC bought Rockwell Collins and created a new company, the plant in Foley trucks finished A320 engines to the Airbus U.S. manufacturing plant about an hour away. In February 2018 it delivered the first two fully integrated propulsion systems for the A320neo to the final assembly line in Mobile. It also ships finished nacelles to other manufacturers worldwide.

The Aeroplex is also the home of ST Engineering, which has operated a large MRO com-

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plex since 1991, and Continental Motors, which builds piston engines for small aircraft.

Mobile is also home to the U.S. Coast Guard Air Training Center, which trains pilots to fly Coast Guard-specific aircraft.

“I think that we will continue to see a lot of growth in the commercial aerospace and aviation sectors,” said Canfield, who noted a lot of preliminary interest after the Airbus-Bombardier announcement. “We think that’s all going to portend a really good future in terms of a supply chain that will go to support aviation and aerospace in the state.”

Southeast Alabama

Fort Rucker, established during World War II as Camp Rucker, is the primary flight training base for Army aviation, home to the Army Aviation Center of Excellence and Army Aviation Museum. The base is bordered by Daleville, Ozark and Enterprise and north-west of Dothan.

All Army aviation training has been handled by Fort Rucker since 1973,

as well as the training of Air Force and allied helicopter pilots and air crew. The center of excellence is home to the U.S. Army Aviation Technical Test Center, which conducts developmental aircraft testing for the Army.

Fort Rucker is the nucleus for the area’s aerospace activities. The helicopter-related activities are a magnet for suppliers providing everything from fleet support to flight simulation.

Miami-based Commercial Jet has a 400,000-square-foot maintenance, repair and overhaul (MRO) operation at Dothan Regional Airport that provides passenger-to-freight conversions. It also operates CJET Academy, an eight-week training course for jobs at Commercial Jet.

There’s also the Alabama Aviation Center (AAC) campus in Ozark, which has trained



Training at Fort Rucker

students to become FAA-certified aircraft mechanics for more than five decades. The AAC offers programs on unmanned aerial systems, advance material composites and flight simulation technology.

In Enterprise, Alabama Aircraft Support has an MRO facility for helicopters, and Vector Aerospace, an Airbus company, has an MRO in Andalusia. In Troy, Lockheed Martin produces the Joint Air-to-Surface Standoff Missile (JASSM) and long-range anti-ship cruise missiles.

Auburn

The 300,000-square-foot GE Aviation advanced manufacturing plant in Auburn produces precision, super-alloy machined parts for GE jet engines that will power future commercial and military aircraft, and also to support the fleet of GE jet engines now in service.

The plant uses additive manufacturing to mass produce fuel nozzle injectors. The company said the nozzle is the first complex jet engine component produced with 3-D printing technology. GE chose Auburn as one of eight universities to participate in an innovative program focusing on 3-D printing research and education initiatives. Auburn was picked by GE Aviation in part because of its access to skilled workforce and proximity to Alabama’s university system.

Montgomery

It was big news Dec. 21, 2017 when Montgomery learned Alabama National Guard’s 187th Fighter Wing at Dannelly Field would host a new F-35 mission. It will mean 1,000 jobs over the next few years and have a \$24 million annual economic impact.

Montgomery is also home of Maxwell Air Force Base (Maxwell-Gunter), under the Air Education and Training Command, at the site of the first Wright Flying School. The base is the headquarters of Air University, and is the center for Joint Professional Military Education.

The host is the 42nd Air Base Wing, and tenant units are the Air Force Reserve’s 908th Airlift

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Wing, the only operational flying unit at Maxwell. It operates C-130H for airlift worldwide.

About 35 miles from Montgomery in Tallahassee is the 380,000-square-foot GKN Aerospace facility, which has been in operation since 1985. It has a new composite design engineering center at its advanced composite structures facility.

Initially, work at the new Elmore County center focuses on design and development of advanced composite technologies for rotorcraft.

Tuskegee

A highly anticipated contract between Boeing, Lockheed Martin and Leonardo to build 350 training jets for the U.S. Air Force to replace the T-38 was settled in late 2018.

And Alabama's hopes to build it in Tuskegee were dashed when the contract was awarded to Boeing and Saab.

In the T-X competition, Alabama would have won the jobs had Leonardo been chosen to build the jets.

Italy's Leonardo, originally partnered with Raytheon, initially planned to build the planes in Mississippi. That changed when Raytheon pulled out of the partnership.

Leonardo opted to go it alone by teaming up with subsidiary Leonardo DRS. It shifted the site where it would build the twin-engine jet to Tuskegee's Moton Field.

The project would have meant 750 jobs over a 10-year period beginning in 2019. Moton Field is where the legendary Tuskegee Airmen trained during World War II.

The states commercial airports are heavy with aviation jobs. Birmingham, Dothan, Huntsville, Mobile and Montgomery all have primary airports that are the welcoming for visitors, and provide an important first impression.

General aviation airports dot the state and can attract aviation businesses. Some are also locations for aviation education activities.

The state also hosts Army and Navy air fields that are used for touch and go and other training

operations. Four in Baldwin County are used by aviation students for Naval Air Station Whiting Field in Milton, Fla., a primary military aviation base in the Florida Panhandle.

Florida



When it comes to aerospace and aviation, Florida is among the most active in the nation with clusters spread throughout the state, including the

military intensive Panhandle.

The new \$46 million ST Engineering maintenance, repair and overhaul hangar at Pensacola International Airport is now open. The 173,000 square-foot hangar is another addition in a state that is one of the nation's aerospace leaders.

Richard Aboulafia, vice president of analysis at Teal Group, said for an April 2018 story that he sees many reasons the state is a national leader.

"Florida is business-friendly, has superb weather, good infrastructure, and considerable political clout. The workforce is getting more skilled as aerospace facilities open there, which certainly helps," he wrote in an email asking for his assessment of Florida's aviation future.

"We're the No. 1 state for MROs, we have over 600 establishments statewide," said Tim Vanderhoof, senior vice president of business development for Enterprise Florida, the state's principal economic development organization.

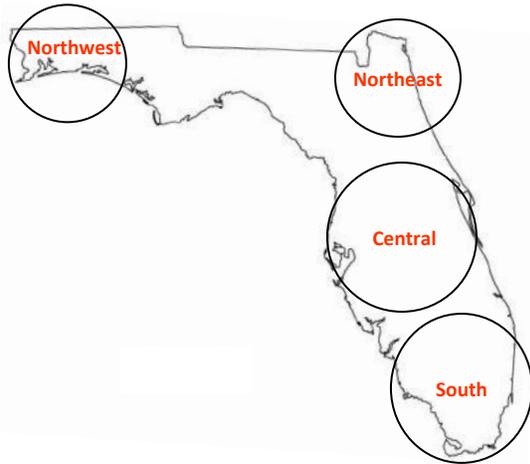
Florida has long been a gateway to space, the air traffic hub for the western hemisphere, a center for flight training and home to aircraft and component manufacturing.¹

The big names in aerospace and defense have operation in the state. Enterprise Florida says more than 85,000 Floridians work in aviation and aerospace with large numbers of rocket scientists, machinists, pilots, engineers, and more.

In the PwC 2018 Aerospace Manufacturing Attractiveness ranking, Florida is 15th.²

Florida is a big player in defense, with more than 20 major military installations. In fiscal year 2016, the state had 124,500 Department of De-

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fense personnel, fifth largest in the nation, and \$14 billion in defense contracts, fifth largest in the nation. It's also home to the second largest military retiree population, and 1.56 million veterans, third largest in the nation, according to the December 2017 *Florida Defense Factbook*.

According to Enterprise Florida, the state's universities are among the nation's top producers of STEM graduates, including many specializing in aviation and aerospace.

"For the third year in a row, the University of Central Florida has produced more graduates getting hired by aviation/aerospace defense companies than any other university in the nation," said Vanderhoof in April 2018.

The state is home to two spaceports. It's best known for Kennedy Space Center, which has been the launch site for every U.S. manned space flight since 1968.

Space Florida, the state's aerospace and spaceport economic development organization, was created to strengthen Florida's position as a global leader in aerospace research, investment, exploration, and commerce. The agency consolidated three entities – Florida Space Authority, Florida Space Research Institute, and Florida Aerospace Finance Corporation – through the Space Florida Act of May 2006.

Vanderhoof pointed to Blue Origin's new facility and OneWeb's satellite plant as examples of what's happening in Florida.

"From a space perspective, we're continuing to see that volume increase."

Vanderhoof said the 85,000 plus aviation and aerospace workforce and the name recognition of aerospace companies in the state "speaks volumes" about the infrastructure and business climate. "We're going to continue to see our trajectory upward."

Northwest Florida

While the 19-acre ST Engineering operation at Pensacola International Airport is getting the most publicity, Northwest Florida's main claim to aerospace fame is military aviation. It's home to Naval Air Station Pensacola, Naval Air Station Whiting Field in Milton, Hurlburt Field in Mary Esther, Eglin Air Force Base in Valparaiso, and Tyndall Air Force Base near Panama City.

With nearly 44,000 active duty Air Force, Navy and Army personnel and more than 19,000 civilians employed in aerospace and defense, there are scientists, engineers, production workers and more, according to Florida's Great Northwest, the regional economic development organization for the Panhandle.³

The bases have attracted many of the largest U.S. defense contractors, international companies, and commercial aviation businesses involved in a variety of cutting-edge research and development activities, including aerial weapons development.

In addition, there is a regional university-based research and development infrastructure that includes Florida State University, the University of Florida, Florida A&M University, and the University of West Florida, with university centers of research in propulsion, robotics, commercial space flight, and composite materials and systems, according to FGNW.

The Gulf Coast is home to one of the largest concentrations of aviation, aerospace, and defense assets in the world. Expansive areas of restricted airspace over land and the Gulf of Mexico are used for test and evaluation activities, including testing of unmanned air systems.

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Primary pilot training is done at NAS Pensacola and NAS Whiting Field, while Eglin trains pilots and maintainers for the F-35. Hurlburt Field is home of the U.S. Air Force Special Operations Command.

“Aerospace is not new to Northwest Florida,” said Rick Byars, economic development chief for Gulf Power.

“We’ve been doing aerospace for a long time. What’s new to Northwest Florida is just a real strong concentration on the opportunity to serve Airbus and Boeing now in South Carolina, so we’ve expanded what we’re chasing but it’s not new to us.”

He said the region has a strong workforce and is developing more training tools, which he thinks is the biggest concern for any company, but especially aerospace.

One of the most significant aerospace activities in this region is the research and development done at Eglin on aerial weapons development. It does as much R&D as some of the leading universities. Nearby is DEFENSEWERX, with the mission of removing some of the barriers to help contractors work with the military to rapidly bring innovative products to the military.

Northeast Florida

The economy of Northeast Florida also is heavily reliant on the U.S. military. It’s the region’s biggest job generator, dwarfing the region’s corporate players, according to *Florida Trend*. The region has about 75,000 active duty, reserve and civilian personnel, some 14 percent of the area’s workforce.⁴

Jacksonville is home to Naval Air Station Jacksonville with about 12,000 military personnel and 7,000 civilian workers. It’s the largest Navy base in the Southeast and third largest in the nation. It’s home to more than 110 tenant commands, including the Fleet Readiness Center Southeast (FRCSE), the base’s largest tenant.

FRCSE performs depot-level rework operations on weapons systems. It manufactures parts and assemblies and provides engineering ser-

vices. It’s the largest industrial employer in the region with 3,000 civilians, 1,000 military personnel and 1,000 contractors.

NAS Jacksonville is home of the MQ-4C Triton Mission Control Center and Unmanned Patrol Squadron 19 (VUP-19). The city also has the Jacksonville Air National Guard. Camp Blanding Joint Training Center is in nearby Clay County.

The defense impact is 115,965 jobs and \$5.2 billion in direct defense spending, according to *Florida Defense Factbook*.

Central Florida

One of the best-known regions for aerospace is the Space Coast, the region around Kennedy Space Center and Cape Canaveral Air Force Station. All of NASA-launched manned spaceflights, beginning with Project Mercury in 1961, have been from KSC or Cape Canaveral. The last manned flight was aboard the Space Shuttle in 2011.

One reason rockets are launched in Florida has to do with the Earth’s rotation. It rotates most quickly at the equator, and to take advantage of this, in adding to the orbital velocity of the rocket, it is most beneficial to launch from a southerly location (near the equator).

Cape Canaveral Air Force Station is controlled by the 45th Space Wing and is responsible for ensuring America’s safe and assured access to space. It co-joins Kennedy Space Center and consists of 47 Launch complexes used to launch Atlas, Titan and Delta rockets.

Brevard County, in addition to Cape Canaveral Air Force Station, is home to Patrick Air Force Base, a major component of the Air Force Space Command. It provides com-



Falcon 9 liftoff

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bat capabilities through launch, range and expeditionary operations. Host group is the 45th Space Wing.

Orange County is also home to the Naval Support Activity Orlando - Multi-Service Modeling, Simulation and Training Acquisition, and the Naval Ordnance Test Unit. NSA Orlando is home to a variety of private industry, government and academic organizations, many specializing in high-tech research and development programs, including modeling and simulation.

NSA Orlando, a 40-acre facility located in the Central Florida Research Park adjacent to the University of Central Florida, provides shore installation support services.

In the Tampa region, Hillsborough County is home to MacDill Air Force Base, which hosts U.S. Central Command, one of six geographically defined DoD unified commands. It's responsible for U.S. interests in 20 nations in Northeast Africa, Southwest and Central Asia.

MacDill also hosts the U.S. Special Operations Command, with its primary mission of disrupting and defeating terrorist networks that threaten U.S. interests worldwide. MacDill also hosts the 6th Air Mobility Wing, whose primary mission is airlift and aerial refueling.

Pinellas County is home to the U.S. Coast Guard Air Station Clearwater, the largest and busiest air station in the Coast Guard. It operates in the Gulf of Mexico, the Caribbean basin and the Bahamas. The station maintains H-60s for anti-drug and smuggling operations in the Bahamas, and Turks and Caicos. The station also has C-130s in support of Caribbean operations.

Polk County is home to Avon Park Air Force Range, the largest live ordnance bombing and gunnery range east of the Mississippi River. It includes 400 square miles of restricted airspace, 1,000 square miles of military operating area and 106,035 acres inside the fence. It's utilized by active, reserve and Gulf units from the Army, Navy, Air Force, Marines, and Coast Guard, special operations and Homeland Security.

South Florida

South Florida is home of the U.S. Coast Guard 7th District Headquarters Miami, Homestead Air Reserve Base, the U.S. Southern Command and Naval Air Station Key West. Defense activities account for over \$4.5 billion in direct spending and 130,000 jobs.

Miami itself has been a commercial and military flight center going back to the early 20th century. In the past five years, local aviation-sector jobs have grown from a total of \$1.2 billion in payroll to \$2 billion, accounting for one of every four local jobs.⁵

The industry's top trade group, the International Air Transport Association, chose Miami for its confab in 2017, the Wings of Change conference. It's held every two years.

The Miami-Dade Beacon Council is the county's economic development agency, whose 20-year initiative is to grow the aviation industry.

The number of aviation and aerospace companies in Miami-Dade has grown from 448 in 2011 to 483 in 2017, resulting in industry-sector job growth of 23 percent and an increase of average salaries from \$60,491 to \$82,811. In Broward County, industry jobs have grown nearly as much, by 20.8 percent over the past five years.⁶

Miami is the gateway to the Americas. It has an industrial cluster with airports, commercial and private aviation, parts/services, pilot training, and attorneys specializing in aviation law. It's the nation's busiest airport for international cargo; third busiest for international passengers.

Aviation is also big in Broward, according to the Greater Fort Lauderdale Alliance. The hub is the Fort Lauderdale-Hollywood International Airport.

Miami International Airport has 200 plus companies in maintenance, repair and overhaul. Hundreds of others are located elsewhere in the county and in Broward. Jobs involve a range of skills, including maintenance, repair, air traffic control, fuel services, catering, freight, security, customs and freight logistics, engineering, pas-

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senger services, clean manufacturing of electronics and complex parts.

Miami has the nation's largest cluster of flight-training facilities and simulators, including Boeing and Airbus pilot training facilities. In 2017, ATR opened a Miami training center.⁷

Miami's flight simulation training attracts thousands of pilots worldwide. Boeing and Airbus have simulation training, as does the Pan Am International Flight Academy, spun from Pan Am World Airways in 1992 and now owned by the parent of Japan's All Nippon Airways.

In a Miramar warehouse, workers repair and maintain airplane parts. And at North Miami Beach, a company deploys drones to survey difficult-to-reach property.⁸

Pratt & Whitney, in northern Palm Beach since 1958, has a 7,000-acre campus with more than 1,000 workers that manufactures and tests F-135 engines used in the F-35. In 2013, it completed a 100,000-square-foot jet engine production facility to go with its 400,000 square-foot plant. It operates 24/7, including engine testing.

Pratt & Whitney's plant has PW100 engines, which are installed in planes such as the Airbus A320neo. The engines are suspended from an assembly line built into the ceiling and manufactured by hand. Pratt & Whitney, part of United Technologies, leases space at its campus to Lockheed Martin subsidiary Sikorsky, for helicopter manufacturing and testing, and Aerojet Rocketdyne, for rocket propulsion.



F135 engine

Louisiana



The western-most state of the Aerospace Alliance is a key player in aerospace thanks to a NASA facility,

but it's also home to a bomb wing, MROs, aircraft assembly and more.

The massive Michoud Assembly Facility in East New Orleans has been an integral part of NASA's since the early days of the agency.

It has 2.2 million square feet of manufacturing space under one roof, an area large enough for 31 football fields, making it one of the largest manufacturing facilities in the world. It was where Saturn Vs were built and later the fuel tanks for the Space Shuttle.

At Michoud Assembly Facility (MAF), Lockheed Martin is building the Orion Multi-Purpose Crew vehicle and Boeing is make the first stage of the Space Launch System, a NASA program will take astronauts deep into space.

"Louisiana, and specifically, Michoud, is the critical nexus for the refinement of prototypes and the manufacturing of final assemblies for those space flights," Don Pierson, Secretary of Louisiana Economic Development (LED), wrote to the Gulf Coast Reporters League in 2017 in response to a request for information about the state's aerospace activity. "We're proud to host that aerospace production in Louisiana, and proud of what it represents for our nation."

For Louisiana, a member of the four-state Aerospace Alliance, the NASA facility is enough to make the state a major player in aerospace. But there's a lot more.

Workers in the state did subassembly work on Bell helicopters along the Interstate 10 corridor in Lafayette, but Bell has left and in its place is the Kopter Group of Switzerland, which plans to build SHO9 helicopters. Further west there are maintenance, repair and overhaul facilities at Chennault International Airport and in Alexandria there's England Airpark. In northwest Louisiana is Barksdale Air Force Base, home of the 2nd Bomb Wing's B-52H Stratofortress.

According to LED, Louisiana has 6,200 aviation and aerospace jobs. The Department of Transportation and Development counts nearly 60,000 and \$1.8 billion in annual payroll directly

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supported by the 68 public-use airports in the state. It also has 82 LED certified sites in 32 parishes, indicating they are ready to develop.

Pierson wrote that aerospace is one of nine industries where Louisiana has a strong presence or strong growth opportunities. “In the case of aerospace, it’s both. We’re strong now, and we see great potential for the future of aerospace in Louisiana,” he said.

Five centers for aerospace are located in the state. Two are former bases that closed and are now commercial centers. Three are along the Gulf Coast I-10 corridor.

In the Paris Air Show in June 2017, Louisiana pursued major and minor component suppliers for aircraft, rotorcraft and space flight.

“We have an intriguing pipeline of prospects that we’ve been accruing over time, at many air shows and prospect-specific visits to headquarters and operational sites,” Pierson wrote. “We came back from Paris enthused, and ready to hit the airstrips and hangars and the corporate boardrooms that power them.”

New Orleans

New Orleans, home of busy Louis Armstrong International Airport, also hosts MAF and Naval Air Station Joint Reserve Base (NAS JRB) New Orleans in Belle Chasse.

The Michoud center puts the city in a select league of locations with NASA operations, traditionally a lure for companies. Within the multi-tenant facility is the National Center for Advanced Manufacturing (NCAM), a research and production center focused on applying advanced manufacturing technologies to lightweight composite and metallic materials in support of the NASA space program and adjacent industries.

From 1979 to 2010, MAF produced 136 fuel tanks for the Space Shuttle program, which fol-



lowed the site’s production of Saturn booster rockets for the Apollo missions beginning in 1961. Today it’s home to more than 3,000 federal and private-sector workers.

“By the end of 2017, we believe Boeing may well be pushing toward employment of 700 as activities accelerate in the space program,” wrote Pierson. “We’re seeing growth and diversification with other

subcontractors and non-NASA development.”

MAF’s proximity to Mississippi’s Stennis Space Center, where rocket engines are tested, makes the area along the state line a hot spot for space activities. In 2008, there were meetings to establish a Stennis-Michoud group to jointly promote the two, but it appears to be idle. In 2010-2011, the International Economic Development Council did a marketing strategy for a Stennis-Michoud Technology Corridor to “help build cooperation and collaboration ... in growing and sustaining this technology corridor...”

“The IEDC team believes that the region is in need for a major marketing effort to brand the technology corridor and raise awareness of its valuable technology assets,” the study said.

Having two sites actively involved in space exploration programs “presents a unique opportunity to grow and attract other similar technology-based businesses to this multi-state region,” the study said.

Combined the two NASA sites have plenty of acres to develop. MAF has 600 acres on site and hundreds of additional acres outside the site. Stennis Space Center also has several thousands of acres within its buffer zone.

South of Michoud, NAS JRB New Orleans is home to a Navy Reserve strike fighter squadron, a fleet logistics support squadron, a Coast Guard Air Station, detachment of a Marine Reserve light helicopter attack squadron and other Navy and Army activities.

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Its two-runway military airport south of downtown New Orleans, is used by F/A 18 Hornets, F-15 Eagles, UH-1Y Huey, AH-1 Cobras, C-130 Hercules and MH-65 Dolphins. It's part of a large Gulf Coast military aviation complex that includes all branches of the military and spans the region between New Orleans and Panama City, Fla.

Lafayette

A roughly two-hour drive west from New Orleans is the city of Lafayette, fourth largest city in Louisiana and best known for its petroleum and gas industries. But it's also the site of the 82,300 square-foot Kopter Group assembly facility at Lafayette Regional Airport.

Funded by the state in an intergovernmental agreement with the previous tenant, Bell, the facility is owned by Lafayette Regional Airport with Kopter now as the long-term lessee. It began assembling SHO9 helicopters in 2021.

The helicopters ultimately will be assembled in Lafayette with U.S.-sourced components representing at least 50 percent of the aircraft value.

The original lease, Bell, said in May 2016 it was moving final assembly of the 505 from Lafayette to Mirabel, Canada, but in exchange Lafayette would do cabin subassembly work on the Bell 525 Relentless, which had been done in Amarillo, Texas. In addition, modification work on the Bell 407, platform for the Northrop Grumman MQ-8C Fire Scout unmanned aerial vehicle, would move from Ozark, Ala., to Lafayette.

However, the employment goal was not reached and Louisiana canceled the deal with Bell. The site was empty until Kopter Group decided to move in.

The new assembly operations to a market where Louisiana already has a strong presence in helicopter transportation services for offshore oil and gas exploration and production in the Gulf of Mexico.

There's additional aerospace activities south of Lafayette. There is AvEx (Aviation Exteriors Louisiana), a world leader in precision painting

for aircraft exteriors, located in New Iberia, a town 30 miles southeast of Lafayette.

And between New Iberia and Lafayette in Broussard, there are two OEM service facilities for composite panels and rotor blades.

Lake Charles

Slightly more than an hour's drive west from Lafayette along I-10 is Lake Charles, fifth largest city in Louisiana. Known for petrochemical production, Lake Charles is also home to a former military base that was established in 1941 and has made a successful transformation to commercial operations.

Lake Charles was the site of an Army school for aviators during World War II. It was closed after the war but reactivated in the '50s and became part of the Strategic Air Command. By then renamed Chennault Air Force Base, its military mission ended in 1963.

In the mid-80s the push was on to use it for economic development, with its marketable 10,700-foot long, 200-foot wide runway and the extensive property available for tenants.

Today's Chennault International Airport has, according to Pierson, "what could be one of the premier, available wide-body hangars in the United States, along with ramp space capable of supporting any type of aircraft."

Chennault's mix of maintenance and paint hangars provides aircraft owners and operators with the ability to have one-stop operations for maintenance and painting, wrote Pierson.

"You're talking about 13 million square feet of concrete, over 1.5 million square feet of hangar, office and warehouse space, including wide-body hangars," he said.

One major tenant is the Northrop Grumman Lake Charles Maintenance and Modification Center, which works on, among other airframes, the Joint STARS military surveillance aircraft for the Air Force at its 105,000 square-foot fabrication shop.

In addition, Landlocked Aviation Services has three hangars at Chennault and does painting

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work on wide and narrow-body aircraft.

Chennault has about 600 acres of prime property available for development. With rail on the eastern side of the airport and I-10 a short hop away, Chennault is developing as an intermodal complex. Among other projects, it's looking to attract refrigerated warehousing near the rails, as well as manufacturing and air cargo operations.

Chennault, in Foreign Trade Zone 87, has a direct, 9-mile link to Port of Lake Charles.

The National Aircraft MRO Center of Excellence is nearby SOWELA Technical and Community College to support the ongoing demand for new hires and continuing education. The center trains about 130 aviation-related students every year.

Alexandria

Chennault was not the only former military air base in Louisiana to close and convert to commercial use.

"One huge aerospace asset that Louisiana offers, and that's perhaps a little under the radar, is England Airpark," wrote Pierson.

England Airpark is a 90-minute drive from I-10 via Interstate 49 in Alexandria, in the geographic center of Louisiana.

Once the site of England Air Force Base, the Airpark is a 3,000-acre industrial community that began developing in 1992 after the base closed. It's home to Alexandria International Airport and a mixed community that includes commercial developments and homes.

Because it connects via I-49 to I-10 in South Louisiana and I-20 in North Louisiana, Pierson sees it as a huge intermodal opportunity for industry, especially aerospace.

The site opened in 1942 as Alexandria Army Air Base, but was put on inactive status in 1946. It was reopened in 1950 during the Korean War and was closed at the end of the Cold War in 1992, a casualty of an early round of BRAC military base closures.

England Industrial Park and Community is a multimodal commerce center and community. It

has the airport, office and warehouse facilities, golf course, hotel and restaurant, day-care center, and more than 300 units of housing and 1.5 million square feet of commercial space. The housing includes a retirement community and general housing. It has 60 businesses employing 2,000 people. It's run by England Authority (England Economic and Industrial Development District.), an independent political subdivision of the state.

In September 2017, the England Authority received four grants totaling \$17,867,492 from the Federal Aviation Administration. It's from the airport's involvement in the Airport Improvement Program's Military Airport Program, designed to help facilitate missions associated with the Joint Readiness Training Center at Louisiana's Fort Polk.

Grants provided additional runway space, construction of new service roads, repaving existing runways, installing wildlife perimeter fencing and noise mitigation measures.

Twenty-five percent of the airport's travel is military-related, thanks to the 14,000-plus military and civilian jobs associated with Fort Polk and the Joint Readiness Training Center, to the west of Alexandria. It has moved thousands of military personnel and millions of pounds of cargo in support of wars in Iraq and Afghanistan. It also has a history of being used in hurricane recovery efforts.

England has runways of 9,350 feet and 7,000 feet and 350,000 passengers per year. It has more than \$144 million in annual aviation-related activity.

LED has worked with England Airpark to certify a 1,600-acre megasite that will be shovel-ready for a major industry to locate there. What might come there is up in the air.

"There will be advanced manufacturing -- we hope an aerospace prospect -- and whatever we're ultimately successful in landing there will be a significant player and a significant project for economic development along the Gulf Coast corridor," wrote Pierson.

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Jon Grafton, long-time executive director of England Airpark/Alexandria International Airport who resigned in 2018, said in 2017 that of the 1,600 acres, 400 is “really a great piece of property for primary aircraft operations or an MRO” with access to the air field. The larger, 1,200 portion is seen as a good location for the automotive industry, but Grafton notes any of the acreage could be used by the aerospace industry. It’s in Foreign Trade Zone 261.

Shreveport-Bossier City

Northwest Louisiana is home of Barksdale Air Force Base, headquarters of the Global Strike Command, which oversees 67,000 personnel. It’s responsible for the nation’s three intercontinental ballistic missile wings, including B-52, B-1 and B-2 wings.

It’s also home of the 8th Air Force and the 2nd Bomb Wing’s three squadrons of B-52H bombers. The 11th Bomb Squadron is the training squadron, and the 20th Bomb Squadron and 96th Bomb Squadron are operational. Barksdale is also home to the Air Force Reserve Command’s 307th Bomb Wing. The only other B-52 wing, the 5th Bomb Wing, is at Minot Air Force Base, N.D.

Shreveport’s available 150,000-square-foot hangar complex is joined by a certificate- and degree-based Airframe & Powerplant (A&P) program at Southern University at Shreveport, which has an Aerospace Technology Program supported by LED’s FastStart program.

Louisiana has two public flight schools: Louisiana Tech University (Ruston, fixed wing aircraft) and South Louisiana Community College (New Iberia, rotorcraft), and in addition to the A&P school in Shreveport, there are A&P schools in Lafayette, Baton Rouge and Lake Charles.

“Louisiana remains a competitive location with low overall tax burden, innovative workforce development training programs and attractive incentives,” wrote Pierson, adding there’s plenty of room to grow at locations across the state.

Mississippi

The state with the nation’s largest rocket engine test facility is also where unmanned aerial vehicles, radar systems and helicopters are built, and military pilots trained.



Just north of Interstate 10 in Moss Point, Miss., is a manufacturing center that has seen its share of expansion.

When first announced in 2004, it was to be the final assembly point for the Northrop Grumman Fire Scout unmanned helicopters. Then, before construction began, it was doubled in size to also handle fuselage work for the Global Hawk unmanned surveillance aircraft.

In May 2017 it was announced that the 101,000-square-foot plant would handle more, including sub-assembly work for the F-35 Joint Strike Fighter, the first manned aircraft to be assembled in part in Moss Point. And there’s still room to grow. Northrop has an option to expand its footprint should it find the need.

The plant at Jackson County Aviation Technology Park, adjacent to Trent Lott International Airport, is just one of the activities in a state that has become a hotspot for unmanned activities.

North of Moss Point just south of Hattiesburg, Camp Shelby is home of regional flight center for the Army National Guard’s unmanned systems. And even further north in Starkville, Mississippi State University was chosen by the Department of Homeland Security as a center for drone research.

As large as the footprint is in unmanned activities, it’s just one of the aerospace segments in the state. It’s also involved in space activities in north and South Mississippi, and is a major player in training military pilots. It also has a footprint in commercial aviation through testing jet engines in South Mississippi, producing jet engine parts and coatings at two facilities and making fuel and motion control systems. On top of all that, it’s where Airbus builds helicopters for the military.

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Space

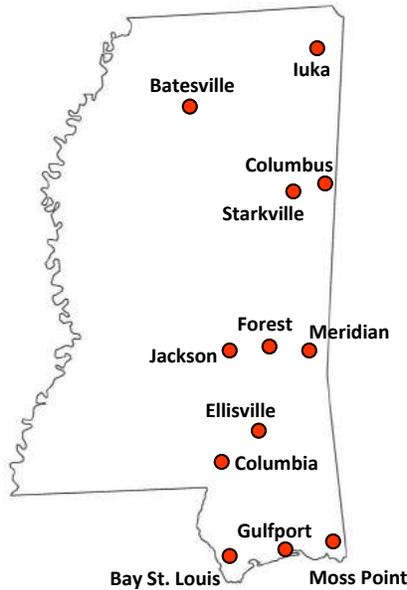
The best-known aerospace operation in the state of Mississippi is John C. Stennis Space Center (SSC), established in the early days of the nation's space program. It is the largest rocket engine test complex in the nation, and has more than 40 federal, state, academic and private organizations and numerous technology-based companies.

The 13,500-acre test area, called a fee area, is surrounded by a 125,000-acre acoustical buffer zone that allows for rocket engine testing at any time without disturbing surrounding residents.

In addition to testing engines for NASA projects, commercial companies also use the facilities. In 2014, California's SpaceX opened its rocket engine component testing program at SSC. The company does initial testing of its Raptor methane rocket engines at the E-2 test stand. SpaceX upgraded the stand with methane capability, making it one of the most sophisticated high-pressure testing facilities in the world.

In November 2017 California-based Stratolaunch opted to use SSC to test engines on the E1 stand. Relativity Space, also of California, has a long-term lease to use the E4 complex to test its rocket engines.

In northeast Mississippi's Iuka, Orbital ATK Inc. builds composite rocket structures. Established in 1998, the Large Structure Center of Excellence manufacturing plant has produced Atlas V, Delta II and Delta IV large composite structures for United Launch Alliance space vehicles. The 320,000-square-foot plant houses one of the



largest autoclaves in the world, 20 feet in diameter and 83 feet in length.

The ULA Delta IV composite structures made by Orbital ATK include nose cones and aero skirts, fairings, payload attach fittings and diaphragms, interstages, centerbodies and thermal shields. Structures manufactured for ULA Atlas V include heat shields, interstages and boat tails.

In October 2017, it was announced that Orbital ATK would expand its complex in Iuka, investing \$10.48 million

and creating 50 jobs to the more than 100 already there. The company will begin production of large composite aerospace structures for its Antares, Pegasus and Minotaur launch vehicles and a large aerospace and defense program at the facility.

"This expansion signifies the commitment Orbital ATK has to the employees, community and state of Mississippi to continue bringing high quality manufacturing work into the area," said John Kain, Orbital ATK Aerospace Structures Division's Director of Operations, Iuka.



RS-25 test at SSC

Military aviation

Mississippi plays an essential role in training the nation's military pilots. East central Mississippi is home of Naval Air Station Meridian, one of the Navy's two jet strike pilot training facilities in the nation.

The air station is the home of Training Wing One and training squadrons VT-7 and VT-9, which operate the T-45 Goshawk and T2-C Buckeye, respectively. The air station, which also supports aviation and technical training, is some 8,000 acres and has an additional 4,000 acres at Outlying Field Joe Williams and a target facility.

Mississippi is also home to Columbus Air Force Base, which has trained pilots since

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World War II. About half of Air Force pilots today went through training at Columbus.

In addition to providing training for new military pilots, Mississippi is also home to one of the nation's four Air National Guard Combat Readiness Training Centers.

The Mississippi Air National Guard's Combat Readiness Training Center (CRTC) is at Gulfport-Biloxi International Airport. Scores of pilots from across the nation hone their combat skills every year at the center, which provides a year-round realistic joint training environment with air space, ranges, facilities and equipment, for units to enhance combat readiness.

With offshore airspace that's fully instrumented for recording air-to-air engagements, it also utilizes air-to-ground ranges at Camp Shelby, near Hattiesburg.

The CRTC has two tenant Air National Guard units at the base: the 255th Air Control Squadron and the 209th Civil Engineer Squadron. It's also home to the 1108 Theater Aviation Sustainment Maintenance Group, a full Army aviation maintenance depot facility.

But the military aviation role goes beyond pilot training. Airbus Helicopters in Columbus produces the H125 commercial helicopter and the U.S. Army's UH-72A Lakota helicopters. The Columbus location also produces the assembly and customization of other Airbus Helicopters models and manufactures components for use on new-production helicopters.

In 2013, Raytheon announced the expansion of its Forest, Miss., facility, which produces some of the company's most advanced radars and other electronics.

The \$100 million expansion facilitates growth in the electronic warfare and international air-



National Guard photo

F-15 at Gulfport-Biloxi Airport

borne radar markets. The Forest location builds sophisticated airborne and ground-based radars, electronic warfare technology and communications systems for U.S. and allied forces.

In Columbia, Zodiac Parachute and Protection America makes parachute recovery systems. It began producing military parachutes in 1938 when it was known as Pioneer Aerospace.

Commercial aviation

Mississippi for quite some time now has pointed out that "every commercial airplane in the world has had a least one component made in Mississippi," according to the aerospace section of the Mississippi Development Authority's website.

Eaton Aerospace, then operating as Vickers, opened a facility in Jackson in 1957 to design and manufacture hydraulic pumps. It became part of Eaton in 1999, and today Eaton Corp's 500-employee facility is a part of Eaton Aerospace Group, Fuel and Motion Control Systems Division.

The 270,000-square-foot Jackson facility is home to one of the most advanced aircraft hydraulic test labs in the world. Eaton is a leading supplier of hydraulic, electro-hydraulic pump and generator products and integrated systems, engine and airframe fuel pumps, electric motors, aircraft door actuation, flight and flow controls, fluid, fuel and air delivery products and systems, nose wheel steering systems and more.

Eaton's Jackson facility manufactures and services hydraulic system parts and products for commercial and business jet aircraft and military vehicles which include the following types of products and system applications: Vickers Hydraulic Pumps, Hydraulic Motors, Electric Motorpumps, Power Transfer Units, Pump Packages and Hydraulic Systems.

GE Aviation operates a jet engine component plant in Batesville, which produces advanced composite jet engine components.

GE Aviation partnered with the Mississippi Polymer Institute to support the company's hir-

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ing and workforce development needs. In addition to training employees, MPI helps companies in the plastics/polymer industry solve technical challenges and improve their processes and products.

The company initially demonstrated the manufacture of composite components at Mississippi State University's Raspet Flight Research Laboratory before opening the Batesville plant.

In 2016, Praxair Surface Technologies and GE Aviation announced the formal creation of joint venture PG Technologies in Ellisville.

Located in the former GE Aviation facility, the joint venture provides the development, support and application of specialized coatings for GE Aviation's and CFM International's current and future engine models, including the GE9X and LEAP engines. CFM International is a 50/50 joint venture company between GE and Safran Aircraft Engines of France.

In addition to the facility in Ellisville, coating operations for PG Technologies are also in Indianapolis, Ind., and Singapore.

GE Aviation delivers jet engine parts from its locations throughout the U.S. to PG Technologies to undergo surface coating through various processes.

Stennis Space Center also plays a role in commercial aviation. In 2013, Rolls-Royce opened its second jet engine test stand at the company's Outdoor Jet Engine Test Facility. The company performs jet engine testing on the most advanced Rolls-Royce civil aircraft engines. The company opened its first test stand at Stennis Space Center 12 years ago.

Unmanned aerial

One of the most dynamic fields of aerospace is unmanned aerial systems. According to the Teal Group's 2017 market study, the field will more than triple in the next decade. The study estimates that UAV production will increase from the current worldwide UAV production of \$4.3 billion annually in 2017 to \$10.3 billion in 2026, totaling \$80.5 billion in the next ten years. Mili-

tary UAV research spending would add another \$26 billion over the decade.

Drones of every size and shape are becoming ubiquitous, and orders for Fire Scout and Global Hawk are going to come in for years into the future. The Federal Aviation Administration predicts that combined total hobbyist and commercial unmanned aerial system sales will increase from 2.5 million in 2016 to 7 million in 2020.

And several operations in the state make Mississippi a key player in the field. Northeast Mississippi is home of the Raspet Flight Research Laboratory, part of the Bagley College of Engineering at Mississippi State University. Established in 1948, it provides leading-edge research, development and testing of manned and unmanned flight vehicles and composite materials while supporting MSU's goals of teaching. It has also been an incubator for aerospace industries.

The Federal Aviation Administration selected Mississippi State University as the location for its Unmanned Aerial Systems Center of Excellence.

Twenty-three of the world's leading research institutions and a hundred leading industry, government partners comprise the Alliance for System Safety of UAS through Research Excellence, or ASSURE.

ASSURE possesses the expertise, infrastructure and outstanding track record of success that the FAA Center of Excellence for Unmanned Aircraft Systems demands.

In October, Insitu opened its new facility on the campus of Mississippi State University in partnership with the FAA's Center of Excellence for Unmanned Aircraft Systems.

Insitu creates and supports unmanned systems and software technology that deliver end-to-end solutions for collecting, processing and delivering superior information. At MSU, the company supports a combination of engineering, software development and business development/customer service support functions.

The unmanned aerial division produces the ArrowLite small UAS, specially created for U.S. Special Forces, the Army Hunter MQ-5B and

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the Heron at its production center at the Golden Triangle Regional Airport. The Columbus location is Stark's main UAS production and support facility.

Stark Aerospace's main facility is at Golden Triangle Global Industrial Aerospace Park at the regional airport. It operates divisions for Unmanned Aerial Systems, Sensors, Production Services and Engineering.

In April 2017 the U.S. Department of Homeland Security chose Mississippi as the new base for small drones. The DHS drone demonstration range in Mississippi will use 2,000 square miles of restricted airspace up to an altitude of 60,000 feet, mainly in the southern and coastal regions. Multiple sites will participate, including the National Guard's Camp Shelby, Joint Forces Training Center, NASA's John C. Stennis Space Center buffer zones and Singing River island, a former naval base in the Mississippi Sound.

Northrop Grumman builds portions of two cutting-edge unmanned aircraft systems. The 101,000-square-foot Northrop Grumman Unmanned Systems Center in Moss Point, Miss., does final assembly work on the Fire Scout unmanned helicopter and central fuselage work on the Global Hawk fixed-wing unmanned aerial system.

The first Fire Scout, using a Schweizer airframe, rolled out of the Moss Point plant in December 2006 and went to Naval Air Station Patuxent River, Md., for testing. According to the *Gulf Coast Aerospace Corridor's* June 2017 issue, by early 2017, 33 MQ-8Bs models and 19 of the larger MQ-8C Fire Scouts, which use the larger Bell 407 airframe, have come out of the Moss Point plant. There have also been 23 ground control segments for Fire Scouts produced in Moss Point.

Moss Point also handles the central fuselage work for all variants of Global Hawk, including



Fire Scout

the Navy's Triton. Although the Mississippi plant was not involved in early versions of the Global Hawk, it's been involved in all variants built after the plant opened. As of early 2017, Moss Point has done central fuselage work on 45 of the high-flying aircraft, according to company officials. It's all a part of a major change for Jackson County.

"Shipbuilding and petrochemicals is our heritage, and will always be the backbone of our economy," said George Freeland, head of the Jackson County Economic Development Foundation. And as the county pushes to diversify its economy, "the unmanned systems center is the absolute centerpiece of that plan."

"In context, we just resolved to make a significant run into the aerospace arena 16 years ago. That's not very long in the economic development continuum," he said. But in that time frame Northrop has expanded and is now about the double in size. The company also has an option on 30 additional acres contiguous and north of its current 20-acre site.

Importantly, both the drone and F-35 program are projects with a long life many years into the future.

"There's no question, given the scope and the future of these programs, both the manned and the unmanned, Northrop Grumman is going to have so many a compelling reasons to maintain a presence in this community for many, many, many years to come," Freeland said.

- David Tortorano

¹ [Aviation & Aerospace](#), Enterprise Florida.

² [2018 Aerospace manufacturing attractiveness rankings](#), September 2018, PwC.

³ [Aerospace & Defense](#), Florida's Great Northwest.

⁴ [A Mighty Military Presence](#), Dec. 28, 2017, Florida Trend.

⁵ [Powerful aviation industry soars in Miami-Dade](#), April 2, 2017, Miami Herald.

⁶ *ibid.*

⁷ *ibid.*

⁸ [Aviation and aerospace: South Florida's \\$41 billion economic engine - and growing](#), June 16, 2017, South Florida Business Journal.

Library/research

Aerospace books

The Gulf Coast Reporters' League aerospace books were annual between 2011 and 2015, and biennial after the 2015-2016 edition. All editions, including individual chapters, are available at the Gulf Coast Aerospace Corridor website.

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Newsletters

The Gulf Coast Reporters' League aerospace newsletters, initially quarterly, shifted to a bimonthly schedule in August 2014. All newsletters and articles are available at the Gulf Coast Aerospace Corridor website.

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A giant leap for robotkind
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Airport growth a Katrina silver lining

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AA gets planes; BluesMobile \$\$

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Farnborough: Cementing bonds
Drones grow SSC science repertoire
DI: Putting innovation on fast track
SSC key for next gen engines

October

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VT MAE, MAAS start new service

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Unheralded stars of the SLS program

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Companies: So far, so good

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F-35s for storm-damaged Tyndall?

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Quiet jet promises big impact
Navy opens more capable OLF
MRO funds in; airports add service

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NFA inspiring future workers
Assembly footprint growing

Underwriters

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The Southeast United States is home to some of the world's most advanced aviation manufacturing companies, engineering facilities, industry suppliers, NASA installations and research and development institutions. For more than one hundred years, the region has been core to the nation's aviation and aerospace growth across defense-related assets and private-sector innovation. Every major global aerospace company has significant operations in the four-state Aerospace Alliance region supported by a robust supply chain. The region serves as an epicenter of innovation, exploration and discovery.

The Aerospace Alliance's member states of Alabama, Mississippi, Louisiana and Florida share the goal of promoting their common assets and combined advantages to grow the aerospace sector in the region. Members advocate for policies, programs and specific aerospace projects on the local, state and national level, work with education across the region to elevate the aerospace workforce, and advance the region's preeminence as a world-class manufacturing location.

For more information about the Aerospace Alliance region or about the organization, please visit www.aerospacealliance.com or call 850-558-6909.



From our underwriter



One of the World's Most Robust Aerospace Corridors

The Aerospace Alliance's mission is to establish the Southeast region as a world-class aerospace and aviation corridor. Its member states of Alabama, Mississippi, Louisiana and Florida share the goal of promoting the region's common assets and tradition of excellence in the aerospace industry. Members advocate for policies, programs and specific aerospace projects on the state and national level and along with business leaders, economic development and workforce professionals, and government officials, work to promote the region's shared advantages, elevate the workforce, advance its preeminence in manufacturing, and draw attention to the Gulf Coast states as one of the largest, most robust aerospace corridors in the world.

For more than one hundred years, the Southeast United States has been core to the nation's aerospace growth. Every major global aviation/aerospace company has significant operations in the region supported by a robust supply chain. Numerous installations critical to the Department of Defense and NASA offer government expertise and provide a business ecosystem that supports private-sector business partnerships as well as entrepreneurial opportunities. The Aerospace Alliance region serves as an epicenter of innovation, exploration and discovery.

Other priorities include the growth of space initiatives in the Alliance states driven by both private-sector companies and the nation's space program. In the region, four of NASA's most significant centers, Kennedy, Marshall and Stennis, as well as the Michoud Assembly Facility employ thousands and impact hundreds of associated industry partnerships. In addition, some of the most innovative commercial space companies in the world routinely launch sophisticated payloads from Florida's Cape Canaveral.

Member states' pro-business climate has spawned hundreds of aerospace entrepreneurs further enriching and supporting the growth of the industry across the region.

The Aerospace Alliance states have a deep supply of aerospace professionals in all industry skill sets. The four member states each support extensive defense-related assets that generate a portion of the skilled workforce through military separatees and retirees. The Aerospace Alliance states are home to more than 92,000 active duty personnel, nearly 68,000 civilian personnel and 1.24 million veterans.

In total, nearly 200,000 professionals work in aviation and aerospace industries ranging from manufacturing-related occupations, engineers, designers, pilots, computer technologists, machinists to yes, even rocket scientists. Some of aerospace's brightest minds are tasked with building today's aircraft and imagining and designing tomorrow's spacecraft.

The region's schools, colleges, universities, training centers and centers of excellence inspire and help develop the talent that fills today's demand for outstanding workers continually look to the needs of industry for tomorrow's workforce. Colleges and universities in the Aerospace Alliance states are among the nation's top producers of STEM graduates. Further, the region produces thousands of "badgeable" workers certificated in a range of pertinent skills.

The Aerospace Alliance works collaboratively to focus these assets towards the benefit of aerospace companies in the region. For more information about the four-state Aerospace Alliance, visit www.aerospacealliance.com.

Melissa Medley, Executive Director
mmedley@aerospacealliance.com

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*United States Department of Transportation, Bureau of Statistics



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