ALABAMA

2020 ECONOMIC DEVELOPMENT GUIDE

A comprehensive resource for site selection

INSIDE

Development Incentives
Workforce Solutions
Development Agencies
Foreign Direct Investment
Regional Economies
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MAZDA TOYOTA JOIN FORCES IN ALABAMA

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ECONOMIC DEVELOPMENT AGENCIES

ON THE COVER: Gov. Kay Ivey joined Masamichi Kogai, president and CEO of Mazda Motor Corp., left, and Akio Toyoda, president of Toyota Motor Corp., in January 2018, to announce Alabama as home to a Mazda Toyota joint venture — a greenfield automotive plant. Mazda Toyota Manufacturing U.S.A., located near Huntsville, is under construction and will begin operations in 2021, employing about 4,000 workers who will produce one new SUV for Toyota and another for Mazda. Alabama's strong automotive supply lines, Huntsville's megasite and trained workers eager to make $50,000 a year yielded the winning bid. *Photo by Robert Fouts*

Opposite page, left: The Legislator course at Capitol Hill on the Robert Trent Jones Golf Trail. *Photo courtesy of RTJ Golf Trail/ Mike Clemmer*
Opposite page, right: Regions Financial's Amala Duggirala and other top IT leaders offer tips for recruiting IT talent. *Photo by Cary Norton*
Top: Mercedes-Benz US International kicked off Alabama's auto industry in the 1990s. Now the state is poised to be the nation's number four automaker. *Photo courtesy of MBUSI*
Above, left: Weida Tan, CEO of startup Fledging, talks about the value of innovation education. *Photo by Joe De Scioce*
Above, right: Breakthrough technology is born in the labs at the University of Alabama. Here, in the lab of UA startup ThruPore Technologies, are researchers Trupti Kotbagi (left) and Endre Mihaly. *Photo by Joe De Sciose*

GOVERNOR'S LETTER

Greetings from the great State of Alabama

I would like to introduce the 2020 Alabama Economic Development Guide.

Alabama is the location of choice for all emerging sectors of the economy, specifically automotive manufacture, aerospace, biotechnology, and information technology. Companies and industry leaders throughout the world choose Alabama for our infrastructure, workers, worker training and skills development, and Southern hospitality. You will be amazed at the many advantages that the State of Alabama has to offer.

Alabama is consistently ranked as one of the top states for doing business, and we have sharpened our focus on high tech and knowledge-based jobs. By partnering with our research universities, Alabama aims to imagine, develop, and design products to be competitive around the world. Companies quickly find that our hard-working citizens are our greatest asset. You will not find a more loyal, dedicated, and motivated workforce. Companies that choose Alabama know that our state is a great place to live and work. From the white sandy beaches of the Gulf Coast to the rustic mountain terrain of northern Alabama, I encourage you to visit and experience all that Alabama The Beautiful has to offer.

Sincerely,

Kay Ivey

Kay Ivey
Governor

ALABAMA
ECONOMIC DEVELOPMENT GUIDE

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At Bradley, we combine legal experience and knowledge with a sophisticated understanding of the industries that drive Alabama. We handle economic development projects across the state and beyond, assisting clients with every aspect of a new project or expansion — including incentives, real estate, tax, governmental, planning and zoning, environmental, permitting, financing, labor and employment, and construction. Bradley's multidisciplinary team leverages a broad range of perspectives to help achieve the results that we expect and our clients demand.

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STATEWIDE ECONOMIC OVERVIEW

After a record-setting economic development year in 2018, Alabama collected the accolades in 2019 — learning that it was tops for jobs from foreign direct investment, winning a Gold Shovel award that recognized $8.7 billion in capital investment, watching unemployment drop to an unprecedented 3.5 percent.

And projects that were just announcements and ceremonial shovels in 2018 began to take shape across the state.

In Huntsville, it's the new Mazda Toyota Manufacturing USA plant. Some 2,500 construction workers have placed 1,600 steel beams — about 52 million pounds of steel — as the framework for a 3.1 million-square-foot plant. By fall of 2019, the roof is about 70 percent complete and plans call for some 4,000 workers once the plant is at full production. And before the year was out, four auto supplier firms announced their own plans to open new plants close to the new OEM.

The North Alabama activity looks likely to cement Alabama's ranking as the nation's number four automaker. It all started some 20 years ago when Mercedes-Benz opened a plant in Tuscaloosa County, followed a few years later by a Hyundai plant in Montgomery, a Honda plant in Lincoln and a Toyota engine plant in Huntsville. All of those plants have grown over the years, till Honda's and Hyundai's investments each top $2 billion and Mercedes' has surpassed $6 billion and Toyota's engine plant investment is well over $1 billion.

Alabama's contribution to the nation's ground transportation doesn't stop at cars and SUVs. We build railroad cars in the Shoals, buses in Anniston and trucks in Huntsville and Birmingham.

Hankering to move cargo? We build ships, too. Mobile has been a shipbuilding hub for centuries. Today Austal USA dominates the Mobile waterfront, building aluminum-hulled ships for the U.S. Navy. And our Port of Mobile is the 10th busiest in the nation.

Want to get there faster? We build airplanes, too. Mobile is home to the only U.S. final assembly line for European aircraft giant Airbus. The plant has been delivering A320 family commercial jets to airlines in the U.S. and abroad since 2015, and this year began building a new smaller, economical A220 jet.

And if you need to get there really, really fast — think Huntsville and Decatur. That's where we build rockets. The workaday rockets that take most of America's payloads to space are crafted at United Launch Alliance in Decatur and the spacecraft of the future at NASA in Huntsville with key elements coming from an array of the nation's biggest space and defense contractors — Boeing, Lockheed Martin and Raytheon along with newcomers like Blue Origin and Sierra Nevada.

Ceremonial shovels gave way to construction equipment in the tech sector, too, as Google began building a data center in Jackson County and Facebook in Huntsville, while DC Blox opened the first phase of a major tech campus in Birmingham. Montgomery has created an all-encompassing cyber works including government, business and military elements.

Big names abound in other sectors, too. Walmart and Amazon have both opened distribution and sorting centers near Mobile, for example.

Defense industries flex their muscle in north Alabama, clustered around Redstone Arsenal in Huntsville. The missiles to protect America from threats are designed and built there and in Pike County, while other contractors create high tech gear to protect and train military personnel. Dynetics, for example, is hard at work developing the

LCS 22, the USS Kansas City, moves to the waters from Austal USA in downtown Mobile.

Alabama's economic development team delivered in 2018, bringing home a record annual tally for new capital investment — $8.7 billion. Prime projects included Amazon, which is building its first Alabama fulfillment center, creating 1,500 jobs. And with new investment still flowing into the state, strategic industries are taking off, showing the world that the future is being Made in Alabama.

madeinalabama.com

MADE IN ALABAMA

first real ray gun for the military — one that can roll into position on the back of a standard military vehicle. Military folks also tend to the maintenance of land vehicles in Anniston and to helicopters in Dothan. The old Fort McClellan in Anniston now trains the nation's first responders for whatever catastrophe may arise — from an Ebola outbreak to an earthquake. And the Coast Guard trains its aviators in Mobile, ready to thwart drug smugglers, protect ports and rescue those stranded on the high seas or in flooded communities.

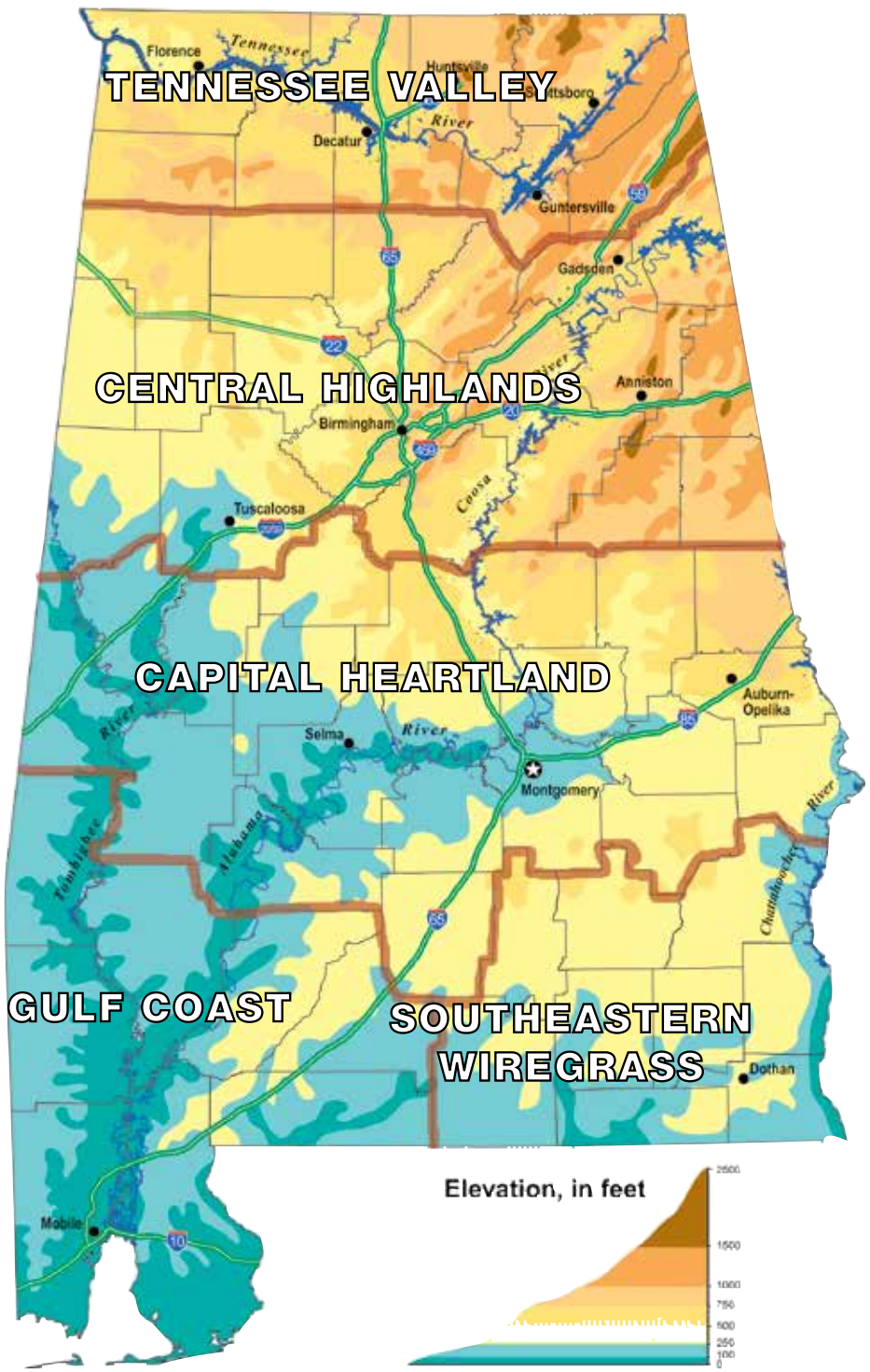
Medical research and healthcare are core economic sectors in Alabama, led by physicians and scientists at the University of Alabama at Birmingham, Southern Research and the HudsonAlpha Institute for Biotechnology. UAB will begin offering proton therapy for cancer care in 2020; and scientists at HudsonAlpha are teaming to understand rare diseases — the conditions that can be so frustrating for patients and physicians alike.

For decades, Alabama's universities have built football legends, but the university of Alabama system is much more than sports. Arts, law, medicine, pharmacy, business — all help today's students flourish as tomorrow's leaders. Working in partnership with the state's college and universities and with its industrial sector, the Alabama Community College system prepares students to follow a pathway to a higher degree or a high-tech industrial career.

For all that Alabamians build, create, blast off, launch or study, the state's roots run deeper still. Crops thrive on farms rich with Black Belt soil; cotton creates a landscape of white; trees soar to the skies. Seafood thrives in the Gulf waters, while catfish swim in inland ponds. And Alabama chickens feeds millions here and abroad. Beneath the surface there's coal — Alabama shipped $2 billion worth of metallurgical coal overseas in 2018, while overall exports topped $21 billion.

All the while that manufacturing thrums, commerce hums, research expands our horizons and agriculture grows, Alabama continues to attract more and more people who just want to enjoy — staring in awe at the rockets towering overhead at the U.S. Space and Rocket Center, thrilling to the zoom of Nascar at Talladega, fishing, hunting, hiking, canoeing, watching Shakespeare or just lolling on the sugar white sand of Alabama's Gulf Coast beaches.

REGIONAL OVERVIEW



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TENNESSEE VALLEY

Alabama's Tennessee Valley region includes one of the most firmly established technology economies in the U.S.

Alabama aims for the stars.

For nearly three-quarters of a century, scientists have worked diligently in Huntsville to convert dreams of space exploration into the realities of rockets, satellites, telescopes and propulsion systems.

In the mid 1950s, the federal government brought a team of former German rocket scientists to the nearly defunct Redstone Arsenal.

From that quiet start, the U.S. leaped into the space race — an effort that continues today as NASA and a host of other companies big and small work to develop the mighty new Space Launch System. No longer aiming just for the moon but also to the planets beyond, the Space Launch System will be bigger and faster, able once again to carry humankind beyond the known.

Working alongside NASA are firms like Boe-

Left: Test Stand 1 is part of a three-phase project by Dynetics, which has a NASA contract valued at $221 million to manage the development and assembly of the Space Launch System Universal Stage Adapter. *Photo courtesy of B.L. Harbert*
Right: The Space Launch System for testing. *Photo courtesy of Huntsville/Madison County Chamber of Commerce/Claire Aiello*

ing and Lockheed Martin, who design elements of the Space Launch System in Huntsville, along with smaller firms like BWX Technologies, which is working on a nuclear propulsion system that can whittle months off the flight time between the moon and Mars.

Even as they work on the newest of rockets in Huntsville, Boeing and Lockheed Martin team in a joint venture called United Launch Alliance in nearby Decatur, building the Atlas and Delta rockets that have long been the mainstays of U.S. spaceflight. Blue Origin is newest to the flock, chosen to develop a new engine for those ULA rockets — one that will replace the Russian-made version. And Aerojet Rocketdyne has now joined the mix.

Always at the cutting edge, Huntsville is also working with Sierra Nevada Corp., hoping the firm's Dream Chaser space craft will one day land on the workaday runways at Huntsville International Airport.

As glamorous as its rocketry may be, the northernmost region of Alabama has many more facets. National defense goes hand in hand with Huntsville's space science. Clustered around Redstone Arsenal are firms that design and build missiles to protect the country and simulations to help soldiers learn to make the right decision in an instant. Among the cool projects in development today is the first-ever ray gun — long the stuff of legend, but now being created as a practical reality by Huntsville's Dynetics.

Cummings Research Park, one of the largest in the nation, and the newer Redstone Gateway are home to an array of defense firms like those that encircle the Pentagon. The synergy of space science and defense engineering has attracted an array of scientific minds to Alabama's northern tier — not limited to those original fields.

Rockets and defense notwithstanding, auto-making was the biggest headline maker in northern Alabama when Huntsville was chosen in 2018 for a Toyota-Mazda joint venture that many another state had coveted. Ground work is underway for the plant, set to open in 2021, employing 4,000 workers and crafting 300,000 vehicles a year.

Mazda Toyota has attracted its own supplier firms, just as the state's other major automakers — Mercedes-Benz, Honda, Hyundai and Toyota — have done over the past two decades. Toyota Boshoku has kicked off a $50 million plant to make seat systems. Y-tec Keylex Toyotetsu broke ground for a $220 million plant to make body stampings and assemblies plus functional and chassis parts. Vuteq USA announced a $60 million plant to make interior and exterior plastic injection parts. And DaikyoNishikawa US broke ground for a $110 million plant to make large resin parts like bumpers and instrument panels.

At the same time, Toyota announced a $288 million investment in its existing engine plant in Huntsville, which was already the only one in the country building 4-cylinder, V-6 and V-8 engines. Big truck maker Navistar announced plans for a $125 million investment in its Huntsville plant to produce next-generation big-bore powertrains with partner Traton.

Another newcomer to Huntsville is

The Facebook data center site in North Huntsville.
Photo courtesy of Huntsville/Madison County Chamber of Commerce/Larry Callahan

Facebook, which announced plans last year for a massive data center. Meanwhile ground was broken for a Google data center in Jackson county, at the northeast corner of the state. The Google site is a creative re-use of a former TVA power plant.

The Tennessee Valley is also home to some of the state's brightest lights in biotechnology.

HudsonAlpha Institute for Biotechnology focuses on encouraging biomedical researchers and entrepreneurs to work together so that new developments can come efficiently to the marketplace. The Institute is making a name for itself and for Alabama in the intricate world of genetic research.

The northern tier's other industry is as varied as your imagination. FreightCar America makes railroad cars in the Shoals; Polaris makes powersport vehicles in Huntsville and Remington Outdoor makes sporting rifles and semi-automatic pistols there. Constellium makes the sheet metal for food and beverage containers in the Shoals, and its new furnace can recycle 20 billion aluminum cans a year. Carpenter Technologies has added a $52 million research center in Athens, where it works on additive manufacturing technology.

Keeping the workforce up to date, Alabama's new robotics center at Calhoun Community College trains workers in how to operate and maintain the high-tech machines, while offering space for industry to design and test robotic components.

Agriculture is strong here, too. Marshall County leads the state in poultry processing and ranks second for producing poultry for processing.

The northern counties offer fashion and fun, too — outdoor opportunities abound along the Tennessee River, music is nearly as fundamental to the Shoals as the water itself, there's a chance to snow ski up near Mentone, and fashionistas can enjoy the hometown spaces of designers Billy Reid and Alabama Chanin.

And baseball is on the horizon as Madison builds a new ballpark as home to the Los Angeles Angels Double-A team that's moving north from Mobile for the 2020 season.

CENTRAL HIGHLANDS

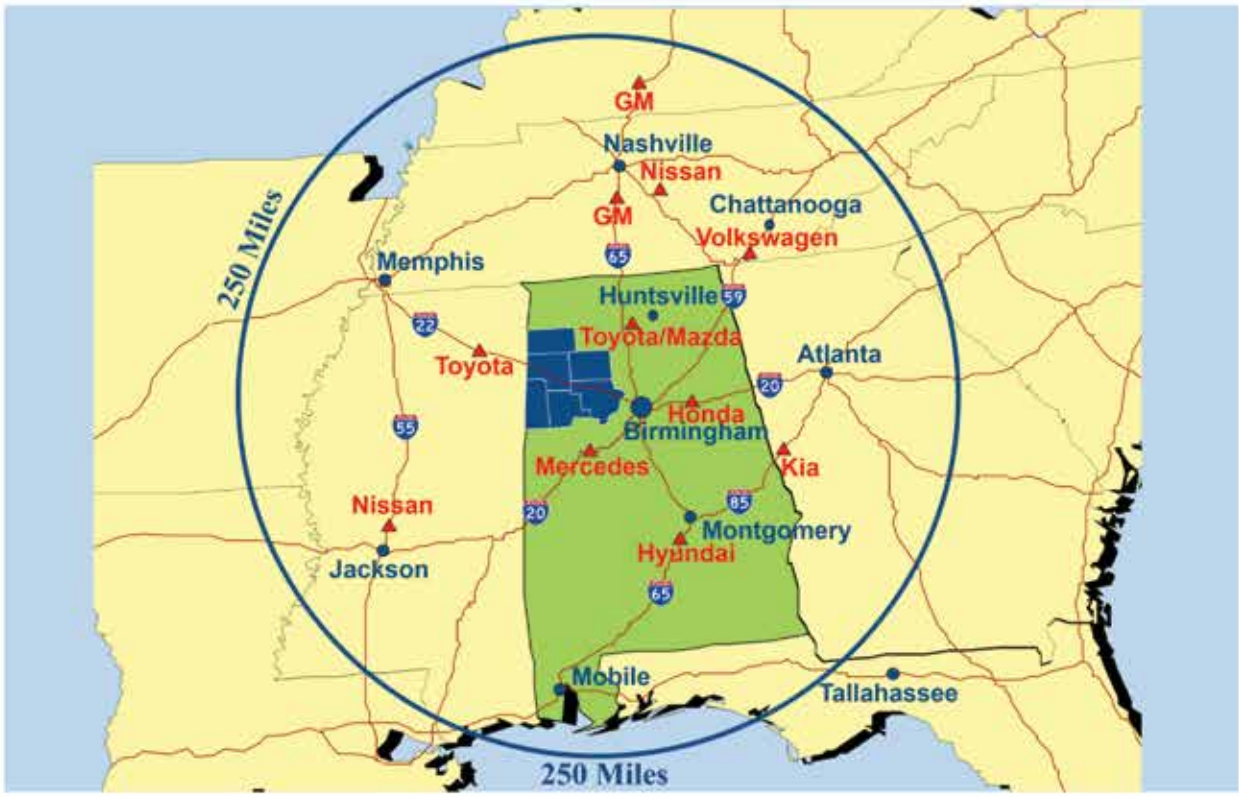
Banking, automotive, biotech, infotech are all firmly established and thriving in the Central Highlands.

Already the largest city in Alabama, with a long history of steel and coal and a newer chapter of banking, insurance and healthcare, Birmingham — heartbeat of the Central Highlands — this year made major strides in info tech and internet commerce.

Newcomer DC Blox announced plans for a technology and innovation campus in Birmingham, starting small but with plans for growing into a $785 million flagship data center. Homegrown internet-based grocery service Shipt sold out to Target last year year, but the name still blazes on the

Revamping the downtown Birmingham interchange between Interstates 59 and 20 to keep traffic flowing smoothly. *Photo courtesy of Volkert/Art Meripol*

Center of the Automotive South



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The statue of Vulcan that looks out over Birmingham is a tribute to the steel industry that built the city and still thrives today.

Birmingham skyline because the service itself maintains its headquarters here. And an Amazon fulfillment center, with an anticipated 1,500 employees, began to take shape in suburban Bessemer.

The changes prompted Forbes Magazine to ponder whether Birmingham may earn a new moniker as "the Southern Silicon Valley."

The updated image is another tribute to the adaptability of Alabama's Central Highlands.

Birmingham and the 19 counties that surround it are home to the state's flagship university and two of the automotive plants that revved up Alabama's economy just a quarter century ago.

Born in the steel industry, Birmingham still counts major manufacturers, such as American Cast Iron Pipe Co., U.S. Pipe and Foundry, McWane Inc. and O'Neal Industries, among the stalwarts of its economy. Just this year, U.S. Steel announced plans to invest $215 million in an electric arc furnace in Birmingham.

Banking gives Alabama its own homegrown Fortune 500 company — Regions Financial. Downtown is also home to Infinity Property & Casualty, now part of Kemper, and to ProAssurance, as well as the former world headquarters of Protective Life, recently purchased as a U.S. foothold for Dai-Ichi Life of Japan.

Biotechnology is a major player here, too. Nurtured by the University of Alabama at Birmingham and Southern Research, medical care is offered for those in need today while teams of scientists search for the causes and cures for ills still hard to treat. New medicines and medical devices are always in development. Seven current FDA-approved cancer drugs were developed at Southern Research, while UAB expects to have the state's first proton therapy facility offering advanced cancer care by 2020.

Thirsty? Milo's Tea is expanding, taking a taste of the South to Oklahoma. And Dread River Distilling is bringing spirits — and a tasting room — to Birmingham.

Arts, sports, entertainment and an array of eateries show Birmingham for the major city it is — among the largest in the Southeast. After nine years as a finalist, in 2018 Chef Frank Stitt and his Highlands Bar and Grill won the coveted James Beard Foundation award as the best among restaurants.

Tuscaloosa is home to the University of Alabama. A highly ranked educational institution, Bama also fields one of the most recognizable football squads in the nation, repeatedly winning national championships while attracting crowds to the university city.

Moreover, the Tuscaloosa County city of Vance boasts another claim to fame as the wellspring of Alabama's auto making industry. More than 20 years ago, Mercedes-Benz U.S. International announced plans to launch a U.S. plant, and Tuscaloosa beat out all rivals for the honors. MBUSI has grown and expanded repeatedly over the years, building the popular luxury SUVs and sedans.

Talladega County has a pair of auto-related success stories. Like Tuscaloosa, it's home to one of Alabama's major auto plants. Honda builds the Odyssey minivan, the Pilot SUV, the luxury Acura MDX in the city of Lincoln, and since the advent of the new Ridgeline, it's also the light truck leader for Honda. And across the county, speed dominates the auto scene at the Talladega Superspeedway, famous for its sizzling speeds and challenging curves. If


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speed's your thing, don't miss the Barber Motorsports Museum, with hundreds of vintage motorcycles and a great view of the motorcycle races.

The Central Highlands are also home to the cities of Cullman, Anniston and Gadsden — all big contributors to the Alabama economy. Gadsden, lying along the Coosa River at the foot of the Appalachians, boasts a major Goodyear Tire & Rubber plant, and is looking forward to a new $15 million Motus Integrated Technologies plant, joining other Tier 1 automotive suppliers. As the gateway to Alabama's mountains, it's a tourist attraction with a charming riverfront and a popular park that showcases Noccalula Falls.

A pacesetter city, Anniston was the first in Alabama to be wired for electricity, in 1882, and added telephones in 1884. Its major employer is the Anniston Army Depot, the maintenance center for tracked vehicles. Nearby McClellan, a planned community growing on the site of the former Fort McClellan, also hosts the Department of Homeland Security's Center for Domestic Preparedness, helping first-responders from across the nation be prepared, whether they face Ebola or an earthquake. Like its Central Highlands neighbors, Anniston and Calhoun County are also home to automotive supplier firms that have emerged in the past 20 years.

Cullman, not too far north of Birmingham nor too far south of Huntsville along

Top: A night view of UAB and downtown Birmingham. *Photo courtesy of the Birmingham Business Alliance*
Bottom: Autocar opened its $120 million manufacturing plant in April 2018 and is expected to employ 746 people. *Photo courtesy of Birmingham Business Alliance*

Interstate 65, has kept its agricultural roots strong. One of the nation's top 60 counties for agricultural income, it learned in 2019 that it'll be home to the new $5.7 million Farmer Automatic Aviary Systems — termed "a significant step for all of rural Alabama," by Gov. Kay Ivey. But Cullman has taken to the highways as well. The county is also home to three relatively new Tier 1 auto suppliers and a host of smaller firms. And looking to the skies, Cullman is home to Axsys Technologies, charged with shaping the lenses for the James Webb Space Telescope, in development to replace the Hubble. In fact, Cullman County was tops in the state for new industry just a few years back.

Not to be outdone by their bigger neighbors, three counties in the western reaches of the Central Highlands — Lamar, Marion and Fayette — teamed up to create a single economic development agency, the C3 of Northwest Alabama Economic Development Alliance, that is promoting location along new Interstate 22 and bringing new industry to the region. When a Wrangler jeans factory was destroyed by tornadoes in 2011, C3 convinced the company not only to rebuild but to rebuild bigger and better.

CAPITAL HEARTLAND

The hub of state government is also the homeland of auto manufacturers, information technology centers, agribusiness, advanced manufacturing, aerospace and Auburn University.

Cotton and catfish, cars and the Capitol, universities and history — all abound in Alabama's Capital Heartland — a rich and varied land that's both prosperous and forward thinking.

This Alabama heartland lies in the famed Black Belt and once produced cotton to clothe the world. The sounds of agriculture still fill the air, but the crops now sprout products undreamed of when plantation life was at its peak. Today you'll find catfish ponds, where the farmers raise $120 million in fish and harvest the algae to make biodegradable plastic, and even an inland shrimp farm or two.

Down the road, former cotton fields now produce bamboo, where Resource Fibers plans a harvest of flooring materials and other household products.

Trees grow here, too, for construction and paper and more. And the leftovers — the sawdust and chips and bits and pieces from tree trimming — are processed into pellets that substitute for coal. More traditional forest products thrive here. International Paper recently invested more than $550 million to boost productivity at its Selma mill. And Ikea Group invested in its first U.S.

forest, purchasing 25,000 acres in rural Lowndes County.

Also growing here is one of the most sophisticated cyber networks in the nation, a partnership among local government, the Air Force internet experts at the Maxwell-Gunter base plus education and industry.

There's another new product growing here, too — popular Elantra and Sonata sedans and Santa Fe SUVs rolling off the line at Hyundai Motor Manufacturing Alabama. The $1.7 billion, 2 million-square-foot plant opened in 2006 and today produces nearly 400,000 vehicles a year. The plant has attracted 35 Tier 1 suppliers and another 43 Tier 2, bringing an added $650 million in industrial investment and employing another 7,000 workers. Hyundai invested $388 million in a facility dedicated to engine heads and support of current models last year and this year announced an additional $292 million investment in new machinery and equipment.

In 2018, German auto supply firm MollerTech opened a $46 million plant in Bibb County, alongside a Mercedes-Benz expansion there. And in 2019, another German firm, Gerhardi, opened a plant in Montgomery.

The Heartland is watching progress on a new type of building product, too — a $220 million James Hardie Building Products plant under construction in Prattville.

Montgomery is a living mix of history and trendy lifestyle options.

The city centers on the Capitol complex and all the myriad offices that handle the public's business. But just down the street one way is Old Alabama Town, showcasing the area's pioneer roots. Down the street another way are the remembrances of the hard times of the Civil Rights era. Turn yet another way and you find an array of nightspots, restaurants, riverfront parks and loft apartments.

And just for fun, the city and county are building a new $40 million water park — starting with a whitewater course and growing into a venue with restaurants, hotels and entertainment near the Alabama River.

Education is a cornerstone of the Capital Heartland. Auburn University, the state's original land grant university, lies in the eastern edge of the region. Programs in engineering, architecture and veterinary medicine are hallmarks of the school.

The state's newest medical school, a branch of the Virginia-based Edward Via College of Osteopathic Medicine, is now offering classes.

The campus region is also home to a variety of high tech businesses, including GE Aviation's new factory, which includes 3D printing to make jet engine components. GE recently announced an expansion, with plans to invest another $50 million.

Six of the top employers are auto suppliers, making components such as wheels, bumpers, springs, axles and drive shafts. Newest of the auto suppliers is Yongsan Automotive USA, investing $5.5 million in a plant to make automotive interior parts like sun visors and seat parts. Two more firms announced expansion plans in Opelika – West Fraser, which makes wood products, and Hanwha Advanced Materials America. Together the investment totals $75 million. And Italian firm 2A USA is expanding its Auburn foundry. Briggs and Stratton continues to make its industry-standard air-cooled gasoline engines that power lawn equipment and more — and recently brought some production back to Alabama and Georgia from overseas. Baxter, a medical device maker crafting products like dialyzers, finished a $270 million expansion in Opelika.

Opelika recently made headlines by wiring the entire city with fiber optic cable to provide a city-owned Internet utility.

Smaller cities in the Capital Heartland are making their own headlines.

Sumter County got word of plans for a $175 million biomass plant to be built by Maryland firm Enviva at the Port of Epes.

Phenix City is now home to a world-class whitewater course on the Chattahoochee River. The waterway attracted some 18,000 river runners in its first year, many more than expected, and Phenix City is spiffing up its downtown to give those visitors a good welcome. The whitewater course is a joint endeavor with Columbus, Georgia, on the opposite bank.

Selma, in Dallas County, is home to auto suppliers, newfangled agricultural products and Bush Hog — maker of agricultural and lawn care implements.

And you can get a close-up look at the history of the Civil Rights Movement by following U.S. Highway 80 from Selma to Montgomery, travelling in the footsteps of the Civil Rights marchers from the Edmund Pettus Bridge to the Capitol steps.

Top: The massive autoclave (top) waits to play its part in production at GKN Aerospace in Tallassee, where workers in two plants create aircraft parts including fuel tanks, engine fans and more. *Photo by Cary Norton*
Bottom: HMMA has invested more than $2 billion in its Alabama operations since 2002.

SOUTHEASTERN WIREGRASS

The Wiregrass region has cultivated economic mainstays in agriculture, forest products and defense — especially helicopters and missiles.

On the ground and in the air, Alabama's Wiregrass is thriving.

On the ground are crops to feed the Southeast and beyond — especially if they're hankering for peanuts or chicken.

Pointing skyward are the trees to feed the lumber and paper mills.

And in the air are the aircraft — especially missiles and helicopters — that are the new face of the Wiregrass economy.

This southeastern corner of the state, nestled alongside Georgia and just north of the Florida Panhandle, is the epicenter of the nation's peanut crop. More than half the peanuts grown in the U.S. are grown within 100 miles of Dothan, which honors the tasty legume with an annual festival. It's such an important crop that the city of Enterprise has a statue honoring the boll weevil, which forced farmers to find an alternative to cotton.

Chickens are part of the agricultural mix, too, with several plants that process broilers among the major employers. Wayne Farms opened a $55 million feed mill in Ozark in 2017.

And one more crop defines the agriculture of the Wiregrass — trees. Forests feed the lumber mills and provide the raw materials for sawmills, paper and wood-products plants big and small. Rex Lumber is a newcomer to the Wiregrass, but it moved in in a big way, with plans to invest $110 million on a brand new yellow pine saw mill that should be in operation in 2019.

Over in Henry County, Abbeville Fiber LLC is investing $40 million in a new mill to provide wood for Great Southern Wood Preserving Inc. The first logs arrived in July, with plans to handle 80 to 90 truckloads of logs a day at full capacity.

While farmers and foresters have tended to their crops, a new realm of industry has flown into the Wiregrass in the contrail of Fort Rucker. The Army base opened in 1942 to train troops, but in less than a decade was reimagined as the Army's aviation training facility. It continues to fill that role today, training Army and Air Force helicopter pilots, as well as those of U.S. allies around the world.

CAE USA won a major Army contract and opened a new facility in 2017, training Army aviators on rotary-wing aircraft. A major fleet of helicopters at Fort Rucker has attracted its own cluster of supporters. Lockheed Martin, Sikorsky and Bell Helicopter all maintain a presence nearby.

Dothan had been nurturing a new MRO sector — companies that perform aircraft maintenance, repair and overhaul — when its major player abruptly moved out. In 2013, local officials lured Commercial Jet into the empty property and the sector is moving forward again.

Yulista Holdings just opened a new facility to maintain both fixed and rotary-wing aircraft in Andalusia. That allows the region to take full advantage of the Alabama Aviation Center campus in nearby Ozark.

The Wiregrass is an important player in Alabama's higher education scene, too, as home to Troy University. Troy has built a reputation as an international campus, welcoming overseas students and offering Troy classes abroad. Now Dothan is home to one of the state's two new medical schools, the Alabama College of Osteopathic Medicine. The school's first students completed coursework in 2017.

Along with the staples of agriculture, aircraft, Army and medicine, the Wiregrass is also home to several of Alabama's most unusual businesses.

Lockheed Martin maintains its Pike County facility in Troy, building missiles to protect the world. This year, the defense powerhouse announced plans to double the size of its Pike County facility and nearly double its output of missiles.

Fishing is big business in Eufaula. The city is home to Humminbird-Johnson Outdoors, which makes fishfinders, depth sounders, marine radios and GPS systems for anglers, while a neighboring company, Strikezone Lures, makes fishing lures. Also in Eufaula look for Southern Plastics, maker of wiggly plastic fishing worms for some of the nation's biggest retailers.

And over in Enterprise you'll find Enterprise Electronics. Lest you expect an appliance store, be assured that this is the home of a remarkable product — the Doppler weather radar used around the world to protect us all from approaching storms.

1. The Alabama Aviation Center in Ozark prepares students in aviation maintenance through both coursework and hands-on experience.
2. Reclaimed wood brings its own history into a home's floors, walls, mantels and more.
3. Troy County, Alabama-made Lockheed air-launched cruise missile AGM-158 JASSM Joint Air-to-Surface Standoff Missile on exhibition at the ILA Berlin Air Show in 2018.
4. CAE Dothan Training Center provides fixed-wing flight training for the U.S. Army and C-12 transition training for the U.S. Air Force in its facility that houses full motion simulators, classrooms, briefing rooms, a cafeteria and more. *Photo courtesy of the Dothan Regional Airport*

GULF COAST

Alabama's Gulf Coast region has launched emerging industries in aircraft and steel manufacturing, alongside shipbuilding, forest products and an international port.

Mobile's deepwater seaport has long been Alabama's connection to the wide world. Shipbuilding and shipping have been mainstays for centuries.

That tradition continues today, but now airships thrive alongside the waterborne variety. On the waterfront are modern variations of the shipbuilding craft that has flourished here for nearly three centuries. Austal USA, making ultramodern aluminum ships for the Navy, dominates the downtown waterfront and is the largest employer by far.

Hidden farther from the public eye, along the bayous of south Mobile County, smaller shipyards rear above backcountry roads, crafting tugboats, offshore platform tenders, shrimp boats and more.

Just a few miles away, Airbus builds commercial jets from the A320 family, that have been augmenting the fleets of U.S. and overseas carriers for four years now. Starting in 2019, Mobile is also building Airbus' new smaller commercial jet, the A220. A second final assembly line is under construction next door to the first one.

It's sometimes hard to remember that aviation was big business in Mobile before Airbus came to town a dozen years ago. One of the region's very first international firms was Singapore-based Mobile Aerospace Engineering — now VT MAE — repairing and overhauling planes from the world's fleets. It's still among

the region's top three industrial employers. Continental Motors, another face of Mobile's aerospace cluster that predates Airbus, kicked off a $70 million upgrade this year.

Baldwin County, across the bay, also boasts a major cluster of aerospace firms — UTC Aerospace, making nacelles and more, is that county's largest industrial employer and growing. Also growing fast in Baldwin is Owa, an amusement park owned and operated by the Poarch Band of Creek Indians. Not long after its grand opening, the parked kicked off a $100 million expansion.

And the air over coastal counties frequently thrums with the sound of Coast Guard helicopters, taking off from their national training facility, at Mobile's commercial airport.

Meanwhile, the Alabama State Port Authority operates Alabama's gateway to the world, where ships laden with coal, steel, chickens, chemicals and wood products head for ports around the world. Steel and chemicals and timber are also big business along the Gulf Coast.

Just a few years ago, German-based ThyssenKrupp built a massive, $5 billion steel mill at the Mobile-Washington County line. When the steel market nosedived and ThyssenKrupp backed away, the prospects looked bleak. But almost before you could say "fire up the furnace," world stainless leader Outokumpu Oyj, a Finnish company, had purchased the stainless mill, and a partnership between the world's largest and second largest steel producers — Arcelor-Mittal and Sumitomo Metals — had the cold rolled steel mill up and running. Chemical plants line the riverbanks, winding inland from the Bay — making products from herbicides to sugar substitutes.

A Tate & Lyle plant in McIntosh is the only producer of Splenda sweetener. And polymer producer Kenmira, based in Finland, is investing $70 million to expand its Mobile plant.

And now the coast is sorting out a new line of work — an Amazon sortation center and a Wal-Mart distribution center opened within a few miles of each other, taking advantage of the interstate, port, air and rail connections.

The port itself is hard at work on facilities specially designed to transport the cars and SUVs being built farther north in the state, hoping to win a greater role in the state's burgeoning automotive industry. In the meantime, it ships steel, coal, aviation products, chemicals, chickens and forest products — so much cargo that it's ranked No. 10 among U.S. ports in total trade.

Cooperation has been key for inland Gulf counties that have formed the Coastal Gateway partnership to recruit business. And there have been economic successes — most recently Georgia-Pacific's announcement that it has selected Naheola in Choctaw County for a $120 million tissue machine and roll storage facility. Up in Conecuh County, the state's thriving automotive business is boosting the economy as Guyoung Tech USA, a supplier for Hyundai and Kia, has announced plans for a multi-million-dollar expansion.

But the glory of the Gulf Coast is the beach. Baldwin County's economy thrives on an aviation cluster, established agriculture, suburban living and great schools. When Alabamians think of the sprawling county, however, they're more likely to think of the beach — white sand, clear water, exciting entertainment, sports venues, condos with a view and fabulous seafood. It's Alabama's playground.

Left: Port of Mobile, on the Mobile River. *Photo by John Dersham*
Below: Alabama Gov. Kay Ivey signs the beam that will top a new Airbus final assembly line in Mobile, during groundbreaking ceremony. *Photo by Mike Kittrell*

Expansions Continue to Roll

Alabama's auto sector won the grand prize in 2018, a $1.6 billion greenfield plant that led a year of industry expansion announcements.

BY CHARLIE INGRAM

Alabamians make important contributions every day to the state's vital automotive manufacturing industry. Clockwise from top left: Toyota Motor Manufacturing Alabama Inc., in Huntsville; Mercedes-Benz U.S. International, in Tuscaloosa; Hyundai Motor Manufacturing Alabama, in Montgomery, and Honda Manufacturing of Alabama, in Lincoln.

Despite sluggish vehicle sales nationally and uncertainty over President Donald Trump's trade and tariff policies, Alabama's auto industry continues holding its own as the nation's fifth-largest vehicle manufacturing state.

As parts of the U.S. were rocked in 2018 by General Motors' planned layoff of 14,000 workers and associated plant closings, Alabama announced or completed several major auto plants and expansions. The grand prize was Mazda Toyota Manufacturing USA, a joint venture that's building a massive, $1.6 billion facility in Huntsville.

Scheduled for completion by 2021, the plant will eventually have the capacity to build 300,000 vehicles a year and employ as many as 4,000 workers. That puts the facility in the same league as other large auto manufacturers in Alabama — Mercedes-Benz, Honda and Hyundai.

Expected traffic increases from the Mazda Toyota facility are so large that a portion of Interstate 565 near the plant is being expanded to prevent bottlenecks. Once Mazda Toyota is operational, it appears Alabama will become the nation's fourth-largest auto producing state.

Another key project was kicked off in 2018 when Mercedes-Benz broke ground on a 2 million-square-foot plant in Bibb County that will supply battery packs for electric SUVs the company will start producing in Vance at the start of the next decade. The Bibb County facility is part of a $1 billion plan Mercedes-Benz has announced to make electric vehicles in Alabama.

In Montgomery, Hyundai opened a $388 million addition to make its new SmartStream engine, then in 2019 announced another $292 million investment in machinery and equipment.

In Birmingham, Indiana-based Autocar opened a $120 million facility that will employ 746 people when fully operational. Autocar brings a new look to Alabama in that it will build heavy-duty trucks for commercial and municipal use.

Honda is also expanding, adding more than 425,000 square feet of space to the plant at a cost of $150 million.

Toyota, meanwhile, began producing a next-generation 4-cylinder engine recently, following a $106 million investment, then followed up in 2019 with another $288 million investment in the engine plant.

All of this is positive news given that Alabama's vehicle production numbers have slipped since 2016, when the state made a record 1.1 million units. That number fell to slightly less than 1 million in 2017 but jumped back to 1 million in 2018.

Those lower numbers reflect lackluster automotive sales nationally. Vehicle sales in the U.S. peaked in 2016 at 17.5 million vehicles and are forecast to be at 16.9 million this year. Despite the slowdown, Alabama's auto industry has fared well, making one of every four passenger vehicles produced in the South.

"I see a very positive picture for the automotive industry in Alabama," says Ron Davis, president of the Alabama Au-

tomotive Manufacturers Association. "We have the Mazda Toyota plant coming. Our OEMs are expanding and preparing for the future. Mercedes-Benz and others are positioning for electric vehicles and technologies of the future.

"Our educational institutions, Alabama Industrial Development Training, Alabama Technology Network, the community college system, the Department of Commerce, the local communities, the major automotive manufacturers, and I would include the AAMA — we're all working together as a team. As I look around the country, I think what we have in Alabama is unique. Greg Canfield at the Department of Commerce and Gov. (Kay) Ivey have worked closely with AAMA and been very strong partners with the industry."

Although the large auto manufacturers are the industry's flagships, most of Alabama's roughly 40,000 automotive industry jobs exist within an extensive network of more than 200 suppliers. New construction and expansion activity among those companies also has been brisk.

Supplier activity has been brisk in 2019, led by the magnetic pull of the new Mazda-Toyota plant.

Toyota Boshoku announced a $50 million, 400-worker plant to build seat systems; Y-tec Keylex Toyotetsu broke round for a $220 million, 65-job plant to make body stamping and make functional and chassis parts; DaikyoNishikawa US announced a $100 million plant to make big resin parts like bumpers and instrument panels, and a trio of suppliers to both firms announced a $60 million joint production facility to serve the new plant.

Suppliers are growing elsewhere in the state, too. Guyoung Tech USA which supplies Hyundai and Kia, announced a major expansion in Evergreen; Motus Integrated Technologies announced a $15 million plant to make interior parts and headliners in Gadsden; Yongsan Automotive USA announced a $5.5 million plant in Opelika while Hanwha Advanced Materials American announced an expansion there, and Gerhardi opened near Hyundai.

And Navistar invested $125 million in its Huntsville truck facility.

As part of its rise on the national automotive stage, Alabama's auto industry has grown into America's third-largest vehicle exporter, trailing only Michigan and South Carolina. Alabama's light vehicle exports — sedans, SUVs and light trucks — hit their peak value in 2016 at $7.9 billion. That slipped to $7.75 billion in 2017, but the state remains a major export player.

In support of the state's auto manufacturers, the Alabama State Port Authority is teaming with a South American partner to develop a $60 million facility that will allow vehicles to be driven directly onto cargo ships for export.

Despite Alabama's success, there is pervasive uncertainty here and throughout the nation's auto industry because of President Trump's trade and tariff policies. Prices for aluminum and steel have increased under Trump, and retaliatory tariffs are already impacting exporters of American-made vehicles, including those made in Alabama.

"Just as Gov. Ivey has expressed, we are concerned that import tariffs will damage Alabama's growing automotive industry and put good jobs in our state at risk," says Steve Spencer, president of the Economic Development Partnership of Alabama. "Already, companies in the state have been forced to respond to tariffs on steel and aluminum.

"All of this creates uncertainty, which is never good for economic development. If exports from the U.S. are hit with retaliatory tariffs, then products made by our automakers become less competitive on the world market."

What happens as a result of trade policy remains to be seen. In the meantime, the AAMA's Davis says the biggest challenge for Alabama's auto industry remains workforce development. "The largest challenge we have is to continue doing the right thing for building a pipeline of workers," he says. "We're blessed to have wonderful jobs in an expanding industry, and the biggest challenge we have is to make sure we have qualified workers to do the jobs.".

This story originally appeared in February 2019 Business Alabama *and has been updated with 2019 information.*

MAZDA TOYOTA AND AUTOCAR HEADLINE INDUSTRY'S ALABAMA PROJECTS

BY CHARLIE INGRAM

Heading into 2019, Alabama's manufacturing roster includes an industrial recruiting trophy that more than 20 other states had hoped to land — the massive Mazda Toyota plant in Huntsville, where ground was broken late last year with plans to start vehicle production in 2021. When completed, the $1.6 billion plant will have the capacity to build 300,000 vehicles a year and will employ up to 4,000 people.

With almost 6 million square feet of space, Mazda Toyota will be in the same league as Alabama's other automotive manufacturers, which together make roughly 1 million vehicles and 1.7 million engines a year. It will be one of the largest manufacturers in the state and the latest in a long list of prize automotive manufacturers and suppliers to choose Alabama.

Mazda Toyota officials have said they hope the partnership can start moving into the new plant in 2020, prior to production trials that would make possible official production in January 2021. Initial plans called for the plant to make the Toyota Corolla and, by the summer of 2021, a Mazda crossover vehicle. Before the year was out, however, Toyota said it planned a new SUV instead of the Corolla.

Michigan-based Ghafari Associates, a leading automotive plant designer, won the contract to provide comprehensive architecture and engineering services for the Mazda Toyota partnership. The complex is being built on a 2,400-acre greenfield site and will be one of the largest of its kind, according to a Ghafari press release.

Its campus will include a press shop, welding shop, paint shop, general assembly facility, test track, ancillary building

Masashi Aihara, Mazda Toyota Manufacturing US president, signs the beam that will sit atop his company's massive new facility, now rising in Huntsville.

Indiana-based Autocar opened its $120 million Birmingham plant in 2018. At full production, it expects to employ 750 workers in the manufacture of heavy-duty trucks, primarily sold to municipal waste disposal departments.

and an administrative building with offices, locker rooms and a cafeteria.

The Mazda Toyota recruiting battle came down to Alabama and North Carolina, with South Carolina, Texas, Kentucky, Illinois and Indiana among the contenders.

Bringing the plant to Alabama is expected to move the state up a notch to the nation's 4th-largest vehicle maker.

Meredith O'Connor, international director at Chicago-based JLL Associates, a commercial real estate consulting firm, was part of a JLL team intimately involved in the site selection process with the Mazda Toyota partnership. In an interview on a JLL blogsite, O'Connor says that Alabama's industrial recruiters, economic developers and others vying to land the project in the Huntsville region made the difference.

"They get it," according to O'Connor. "They really know this industry better than anyone, and they were ready. Their preparedness, not only of their team but of their site … the responses they gave us on a daily basis, an hourly basis … there were days when we worked 18 or 19 hours, and they never wavered.

"They were with us. They didn't care what time of day it was. They assembled that land for just this kind of project. There's a reason they have the talent. They have a long history of engineering talent, but there's a reason there are multiple OEMs in Alabama. Certainly, as a state, they get it. They're ready and I think we're going to continue to see success in Alabama for these types of (land) uses."

Although not as large as the Mazda Toyota project, Indiana-based Autocar's opening was a major shot in the arm for Birmingham's manufacturing scene in 2018.

Don't let the company name fool you.

Autocar manufactures heavy-duty trucks such as those used in the utilities and materials disposal industries. As such, it brings a new dimension to Alabama's vehicle production, various officials have noted.

Autocar's 1 million-square-foot facility on Pinson Valley Parkway will employ about 750 people when it's fully operational. Autocar's robust customer list includes major cities such as Chi-

cago, Los Angeles, Houston, Miami, Baltimore and Charlotte; most national waste-hauling fleets, and many of the largest retailers, food manufacturers and freight logistics companies in North America, according to company officials.

The University of Alabama Center for Business and Economic Research calculates that Autocar will generate $645.1 million annually in economic impact when fully operational. That includes almost $229 million contributed annually to the state's gross domestic product and more than $130 million in earnings to Alabama households from 2,655 direct and indirect jobs. In the Birmingham metropolitan area, the company will generate an economic impact of $600 million each year, including $224 million contributed to the metro area's GDP, and $123.9 million in earnings to households from 2,538 direct and indirect jobs.

This story appeared originally in February 2019 Business Alabama *and has been updated.*

With help from a robot, the first shovel of dirt was turned in late 2018 at the site of the $1.6 billion factory being built by Mazda Toyota Manufacturing USA. Back, from left: Huntsville Mayor Tommy Battle, Sen. Doug Jones, Gov. Kay Ivey and Commerce Secretary Greg Canfield joined Mazda Toyota executives (from left) Hironori Kagohashi, executive vice president; Masashi Aihara, president; Mark Brazeal, vice president of administration; Ikuo Sugiyama, senior vice president, and Janette Hostettler, vice president.

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WINNING THE PLANT, FINDING THE WORKFORCE

Alabama auto industry ramps up workforce development efforts in advance of the new Mazda Toyota plant.

BY NANCY MANN JACKSON

As the state's automotive manufacturers and automotive supplier companies have rapidly expanded in recent years and their work has become increasingly high-tech, the industry has consistently faced challenges in recruiting and retaining enough qualified workers.

Almost 40,000 employees work in Alabama's automotive manufacturing sector, and now, with Mazda Toyota Manufacturing USA constructing a new, $1.6 billion joint venture assembly plant in Huntsville, the state's need for qualified automotive workers will intensify. Construction began in 2019, and the facility will employ at least 4,000 workers, with an annual production capacity of 300,000 vehicles, says Ed Castile, deputy secretary of the Alabama Department of Commerce and director of the state's worker training agency, AIDT (Alabama Industrial Development and Training).

"The company has said they will need 4,000 people, so we're planning for that, but in many cases, Japanese companies are conservative on their numbers, so it could be even more," Castile says. "Before construction even began, we were laying out a process for how we'll recruit workers and the skills that will be needed."

Training automotive workers has been an ongoing project for AIDT and its partners since Mercedes-Benz announced it would build its first U.S. plant in Alabama more than 25 years ago. But the demand for 4,000 skilled automotive workers at Mazda Toyota, as well as expanding workforce needs at Mercedes and other Alabama-based auto manufacturers, adds urgency to the task.

Because Alabama has a history of success in recruiting and preparing an adequate workforce, business and governmental leaders say they're ready to face the challenge. "Toyota Manufacturing [which already operates an engine plant in Madison County] had a great deal of comfort when selecting this site because of their 15-year history in our area with

The 1,485 workers on the line at Toyota's Huntsville engine plant will soon be joined, by 2021, by 4,000 workers at the Mazda Toyota assembly plant across town.

the engine plant," says Chip Cherry, president and CEO of the Huntsville/Madison County Chamber of Commerce. "They've done five expansions, and AIDT was there to help with workforce needs each time. Also, we have a long history of being able to generate a long list of people to interview."

Neither the city of Huntsville, Madison County nor the state of Alabama made any guarantees regarding the number of workers that could be secured for the new Mazda Toyota plant. However, "we did guarantee that we'd be available to help as much as possible," Cherry says.

HARNESSING EXISTING WORKFORCE

While more workers are needed to fully staff the new plant, state leaders are quick to point out that a tradition for a strong workforce was one of the selling points that led Mazda Toyota to select north Alabama.

"One reason this area was popular is that there's a really good workforce in the [Tennessee] Valley," Castile says. "A lot of people live in north Alabama and drive to Tennessee to work, so it's a chance for them to stay home and work. In addition, there are three other automotive plants in the state that have been very successful, so we have a track record of finding and keeping good automotive workers."

Because Huntsville leaders have "chased large projects before," they knew that workforce would be an important piece of the puzzle, Cherry says. That's one reason they hired Deloitte to undertake an updated labor study.

"That study showed that we have the capacity to handle an additional 7,000 employees in the automotive sector over the next five years," Cherry says.

That means other automotive plants — such as the nearby Toyota engine plant — don't have to worry about experiencing employee shortages when the new factory comes online. "Our definition of success is not robbing Peter to pay Paul," Cherry says.

There's room for more skilled jobs partly because many residents are employed in jobs that do not meet their full potential. "There's a significant pocket of underemployed individuals in north Alabama and southern Tennessee," Cherry says. "They may not be unemployed, but they're interested in improving their prospects."

John Holley, dean of technologies at Calhoun Community College, explains the basics of a piece of automotive tech equipment to Shyanne Lansdell and Chandler Barber. *Photo by Dennis Keim*

For instance, when Polaris opened a plant in Huntsville in 2016, about 10,000 people applied for about 450 jobs, and more than 7,200 were qualified to move to the next stage of the process, Cherry says. Similarly, when Huntsville's Toyota engine plant announced a need for 100 new workers recently, 10,000 people applied.

PREPARING NEW TALENT

While north Alabama already has a valuable existing workforce, area leaders are also working to train new workers and students to be prepared for the jobs that will be available at Mazda Toyota now and in the future.

"The automotive industry will look completely different in the next five years compared to today," says Kim Ogle, manager of external affairs at Toyota Motor Manufacturing Alabama. "It is critical to have a workforce that can adapt to change, solve problems and quickly learn new technologies. Stronger partnerships and collaboration between the industry and educators is key for developing and maintaining a talent pipeline. Educators must understand what the industry needs so they can create programs that help develop students to meet the workforce needs. We also need

Learning the forklift basics at Calhoun are Nathan Steele (seated) with (from left) Caleb Counter, lab assistant Larry Owens and instructor Tad Montgomery. *Photo by Dennis Keim*

educators to help us overcome misperceptions of careers in manufacturing to help increase interest in the field."

To help meet an ongoing need for skilled maintenance technicians, Toyota partnered with Calhoun Community College in 2014 to develop the Advanced Manufacturing Technician Program (AMT), Ogle says. The AMT program is a two-year work and study program that allows students to gain industry work experience that aligns with classroom curriculum, making them ready for employment upon graduation. About 12 partner companies now participate to sponsor AMT students, so graduates help fill the gap for skilled workforce needs across the industry, not just at Toyota.

Toyota is also working with AIDT to develop innovative new hire assessment and training programs, Ogle says. For instance, at Toyota's request, AIDT is ramping up an apprenticeship program that supplies maintenance technicians and other skilled professionals to several local manufacturers and will now prepare more workers.

In partnership with Calhoun Community College, the Federation of Advanced Manufacturing Education (FAME) provides a two-year technical associate degree, along with paid work experience at a local plant and experience in advanced manufacturing technology. The program has operated successfully for several years, and at Mazda Toyota's request, AIDT is currently working to expand it. A new FAME center will be located in the Alabama Robotics Technology Park, located in Tanner, adjacent to Huntsville, Madison and Decatur.

Along with the FAME apprenticeship program, local community colleges also offer standalone courses and curricula, such as those that will be available at the new plant. "Calhoun, Northwest-Shoals, Wallace State and Drake State community colleges are all gearing up to offer programs in advanced manufacturing to help provide the workforce we'll need," Castile says.

High school technical education programs are also part of the effort. When the Alabama Legislature's 21st Century Workforce Act passed in 2013, it provided $50 million to equip high schools with high-tech equipment to teach students the skills needed for advanced manufacturing and other jobs of the future.

The investment is paying off, Castile says. "We're one of only a few states in the country that have high school career tech programs that allow kids to graduate high school with industry certifications," he explains. "Those students are successfully entering the workforce, or going on to college to become high-level engineers. These programs are supporting a wide range of workforce needs that are all important."

The Huntsville/Madison County Chamber of Commerce has recently developed a plan "to help people select a career path before they select an education path," Cherry says. "We want to provide opportunities for people who are interested and share the information with schools. With co-ops available, many students can cover the cost of their education and get out of school without debt."

ASSISTING WITH THE RECRUITING PROCESS

A highly trained workforce will clearly benefit companies across the Tennessee Valley and the state, not just the new Mazda Toyota plant. But at the moment, the new factory is top of mind.

When Mazda Toyota is ready to begin the process of sourcing new applicants, AIDT will help get the ball rolling, just as it has for other automotive plants when requested. "We'll craft a process for individuals to apply online for jobs, and those applicants will be reviewed automatically and organized into different buckets based on their experience and expertise," Castile says. "As closely as we can, we'll match the applicants to the precise skills the company is looking for. Those who are strong matches will be interviewed and go on through the process."

As construction continues on the plant, education and training continues to prepare its future workers. "We have the workforce to support this," Castile says. "We don't just have warm bodies, but we also have specific skills that have been built into this workforce."

This story originally appeared in January 2019 Business Alabama.

NUCLEAR POWERED MARS VENTURE

BWX Technologies is bringing its considerable nuclear expertise to Huntsville, supporting NASA hopes for a mission to Mars.

BY KATHERINE MacGILVRAY
PHOTOS BY DENNIS KEIM

In 2017, BWX Technologies Inc., a $1.7 billion nuclear technology company headquartered in Lynchburg, Virginia, was awarded an $18.8 million contract by NASA to begin designs for a nuclear thermal propulsion reactor in support of a possible future manned mission to Mars. Last year, the company opened a new facility in Huntsville's Cummings Research Park to support the development of that technology.

BWXT has an impressive history dating back to the 1850s, when, as the Babcock & Wilcox Co., it patented the first water tube boiler. B&W went on to supply boilers for the Brush Electric Light Co. in Philadelphia in 1881, the first subway in New York City in 1902 and Teddy Roosevelt's Great White Fleet in 1907. In 1953, when the U.S. Navy wanted to develop the world's first nuclear-powered submarine, it naturally turned to Babcock & Wilcox to provide the technology.

Today, BWXT is responsible for manufacturing naval nuclear reactors for every aircraft carrier and submarine in the U.S. Navy's fleet. In addition to its Naval Nuclear Propulsion division, BWXT develops nuclear reactors, nuclear fuel

Jonathan Cirtain, above left, at BWXT's new Huntsville location, is the firm's vice president of advanced technologies. Rex Geveden, above right, is CEO. Both have long histories with NASA and in the private sector. The Business Alabama cover, from November 2007, shows Geveden when he transitioned from Marshall Space Flight Center to CEO of Teledyne Brown Technologies.

Once complete, the BWXT nuclear thermal propulsion engine "could dramatically reduce the amount of time it would take to get human astronauts from Earth's orbit to Mars, from roughly eight months down to just five," part of an enabling technology for deep space exploration, says Jonathan Cirtain, who was featured on the cover of October 2018 *Business Alabama*.

and power conversion systems in its five U.S. and six Canadian factories. BWXT joint ventures also provide management and operations at more than a dozen U.S. Department of Energy and two NASA facilities.

"BWXT is the most prolific nuclear business, certainly, in the western world, if not the entire world," says President and CEO Rex Geveden. "What distinguishes us from other companies, in addition to our nuclear history, is the fact that we possess certain licenses that enable us to handle the type of nuclear fuel that would be necessary for a space mission. In this particular case, that's high-assay, low-enriched uranium, and we're the only commercial company in the U.S. licensed to handle such material."

He adds that should any of these missions require highly-enriched uranium, BWXT is also the only commercial entity authorized for its use as well. "Our licensing and material handling capabilities are unique, literally unique, and a very difficult credential to obtain."

Opening the Huntsville facility is a bit of a homecoming for Geveden and BWXT Vice President of Advanced Technologies Jonathan Cirtain, who both spent the majority of their distinguished careers stationed at NASA's Marshall Space Flight Center. Geveden was with NASA for 17 years, 14 of them in Huntsville, and served as chief operating officer responsible for a $16 billion portfolio of work that included the agency's technical operations of science, aeronautics, space operations and exploration, as well as overseeing NASA's 10 field centers. Cirtain spent nine years at the Marshall Space Flight Center, where he led and contributed to numerous space missions and concluded his tenure as the manager of the Science Research Office.

Though they now operate out of BWXT's Lynchburg headquarters, both men feel a strong connection to the Huntsville community, and when it came time to decide on a location for the headquarters of its latest project, Huntsville was their first choice.

"We were certainly drawn to the workforce," says Geveden. "Huntsville has a huge number of educated, bright, capable people, and that was a real attraction to us."

"So, the workforce is the number one reason; number two is access to facilities," Cirtain is quick to add. "Huntsville is replete with facility access, either on the Redstone Arsenal or in its many research parks, and those facilities offer a lot of unique capabilities for advanced technology development, deployment and manufacturing."

> "Huntsville has a huge number of educated, bright, capable people, and that was a real attraction to us."
>
> *— Rex Geveden*
> *President and CEO,*
> *BWX Technologies Inc.*

At the ribbon cutting in 2018, Geveden told reporters that BWXT's role in Huntsville will focus on creating new markets in the area, not competition. "There are a number of highly-advanced, well-vested technology companies in northern Alabama, and we collaborate very well with those companies, without carving up their wedge of the economic pie," Cirtain affirms. "There's a really good synergy for us there."

Under the leadership of Gene Goldman, BWXT's director for NASA programs, the Huntsville facility will work on developing a nuclear thermal propulsion reactor that, as part of a rocket engine, will be used to propel spacecraft at a much faster rate than that provided by a traditional chemical propulsion system.

"Once developed, the nuclear thermal propulsion engine could dramatically reduce the amount of time it would take to get human astronauts from Earth's orbit to Mars, from roughly eight months down to just five," says Cirtain. "This design also permits mission abort scenarios, whereas there are no mission abort scenarios for other propulsion options. So we see nuclear thermal propulsion as an enabling technology for deep space exploration."

To start, the BWXT team is focusing on the development of characteristic fuel elements that NASA would use for the nuclear thermal propulsion system, and testing those elements at the Marshall Space Flight Center.

"We just completed what we call the zero fuel element test, where we took a surrogate fuel element and demonstrated that the weld technology we would use for that element would stand up to the 2,200 K environment that fuel element would operate in," explains Cirtain. "In simpler terms, that means we just demonstrated that our fuel and welding process can handle the intense temperatures it would see during a trip to Mars. That's a pretty big deal. That's technology that did not exist when nuclear thermal propulsion was first imagined in the late 1960s."

It's a technology that could be used in interplanetary spaceflight, including a mission to the Red Planet. In the meantime, it's also a development that NASA and other agencies will look to for more near-term, in-space capabilities that aren't directly related to Mars exploration. And that could mean growth for the Huntsville office in the next few years.

"As we understand better what NASA and the U.S. government's aspirations are for demonstrating near-term success and technology maturation, we'll begin making decisions about what our staffing plans look like," says Cirtain. "Whether we're talking about steam vessels for boiling water or pressure vessels for advanced energy conversion, it's all about understanding how to manufacture high-consequence components. For over 160 years, BWXT has excelled at the development of manufacturing techniques for high-consequence systems," says Cirtain. "And we still do it every day."

This story originally appeared in October 2018 Business Alabama.

Business Catalyst Par Excellence: The Robert Trent Jones Golf Trail

It was part of the RTJ mission from the beginning: 11 sites and 26 masterful courses that would tee off on business opportunities across the state.

BY CARY ESTES
PHOTO BY ART MERIPOL

Raise the prospect of a five-hour long business meeting and watch the eyes glaze over. The mere suggestion can conjure up visions of cramped chairs, flickering fluorescent lights and lengthy power-point presentations.

Now take that meeting and move it to the golf course. Suddenly the participants are outside, getting exercise and soaking up the sunshine. They are able to be both casual and competitive. Yet, in one of the marvels of the game, they still can easily talk about business.

Indeed, golf is one of the few sports that people can enjoy while simultaneously having business discussions.

There is no significant time to chat during a basketball or softball game. Bowling is too noisy, and many group activities — such as escape rooms — are too distracting.

But with golf, you hit a shot and then leisurely walk or ride in a cart to where the ball landed. During that time, you have a few minutes to discuss business. And then you do it again — over and over and over, for several hours. It's a relaxing routine with a captive audience.

"Golf has always been a natural fit for the business community," says John Cannon, president of the Robert Trent Jones Golf Trail, a series of 26 courses at 11 sites throughout Alabama. "You have an environment where people really get to know each other pretty well over five hours. You can create trusts and friendships that relate to your mutual business interests.

"The atmosphere of the golf course and the social aspect of the game can

Golf is a natural fit for business, offering hours of time to get to know people while building trust and friendship, says John Cannon, president of the Robert Trent Jones Golf Trail. Here he relaxes at Ross Bridge.

definitely help cement further business relationships. I have some relationships that are over 40 years old that started with a day on the golf course."

Cannon says the longstanding connection between business and golf has been important to officials with the RTJ Golf Trail ever since the first courses were constructed in the early 1990s. While appealing to golfers was obviously the top priority, Cannon says the clubhouses at the courses were designed with the business community in mind as well.

"We want to make sure to have a place in each clubhouse with very flexible space where we can hold multiple meetings simultaneously," Cannon says. "We knew we had to integrate ourselves with the business community in every one of our markets to be successful.

"Now we have hundreds of business partners. Every day that we're open, we're hosting a business meeting of some sort. Without it, we wouldn't be nearly as successful as we are. We're always looking for avenues to maximize our relationship with the business community."

There are numerous places to play golf in Alabama, but the RTJ Golf Trail leads the way in terms of both scope and recognition. The trail hosts more than 1,000 events and 500,000 golfers each year, with visitors from all 50 states and an average of 20 foreign countries.

Here is a quick look at three of the trail courses and how they try to hit a hole-in-one with the business community.

Ross Bridge Golf Resort & Spa

Ross Bridge in Birmingham is sort of a Mount Everest-type challenge for golfers. If played from the back tees on each hole, Ross Bridge measures a staggering 8,191 yards in length, making it the second longest course in the United States and fifth longest in the world. Most courses are closer to 7,000 yards long.

The length of the course just means that the golfers have more time to get to talk to each other and possibly discuss business.

"Playing 18 holes at Ross Bridge allows you to really get to know somebody," says Jonathan McKinney, director of sales and marketing at Ross Bridge. "You're going to ask them where they're from and talk about their family. The conversations that can occur on a golf course are kind of like what you can have while sitting on your front porch. You take down your guard and get to know somebody in a more personal way."

Ross Bridge offers 16 events rooms with a total of nearly 20,000 square feet of meeting space, both indoor and outdoor. Rooms range from small spaces designed for no more than 10 people to a banquet room that can accommodate up to 1,200.

"A large part of what we do at Ross Bridge is group business with companies and associations," McKinney says. "The course is a fantastic amenity for the groups. It's one of the things that makes Birmingham stand out to these folks who are planning meetings. We can utilize and market the golf as a destination. These groups can come in to have a meeting, but they also have a world-class golf course to play."

Marriott Shoals Hotel & Spa

Located on the Tennessee River in Florence, the trail course at the Marriott Shoals helped usher in a new wave of tourism to northwestern Alabama, according to Director of Sales and Marketing Selena Miller.

"Since we opened in 2005, there have been 12 additional hotels that have opened in this area," Miller says. "We saw this area take a complete economic upturn. There were other golf courses around here, but nothing open to the public that was truly comparable to the Robert Trent Jones course. We were suddenly able to bring in business people who otherwise weren't coming to the Shoals area."

The Marriott Shoals has 19 event rooms with a total of more than 30,000 square feet of meeting space, including a room that can accommodate up to 2,000 people. Miller says many of the business groups, both large and small, incorporate a round of golf into their meeting schedule.

"We'll get a large group that will have several meetings over the course of two or three days, and then have a morning or afternoon where they'll take the whole group out on the golf course," Miller says. "That's such a great team-building experience.

"But we've also seen an increase in smaller groups, maybe a law firm or just some people who work together. Instead of a meeting, they're taking a work trip with 12 to 16 people where they're playing golf. And there are others who take their clients golfing and really have that one-on-one time where they can talk business and close those deals."

Grand Hotel Golf Resort & Spa

The Grand Hotel in Point Clear has been around for so long that when it first opened in 1847, golf was played with wooden clubs and leathers balls. Much has changed since then, though the Grand — with its 200-year-old oak trees dripping with Spanish moss and views of Mobile Bay — remains an attractive place to mix business with leisure.

"The Grand is a special setting. You could not build a hotel like the Grand today," says Kevin Hellmich, the Grand's director of sales and marketing. "Everything about the Grand Hotel is a networking opportunity. You can have a cocktail reception on the ballroom patio, or sit outside Bucky's Lounge around one of the nine fire pits.

"The setting here allows individuals to relax a little bit more and get to know fellow meeting attendees. They tend to be a little bit more unplugged at the Grand than they would be at a typical convention hotel."

The hotel's two trail courses also provide plenty of networking and business opportunities, which can be continued in one of the hotel's 18 event rooms. There is a total of more than 37,000 square feet of meeting space, with the ability to accommodate up to 1,400 people in a single room.

"Our hotel recreation department can plan special team-building activities, including golf, for the corporate events we host at the Grand Hotel," Hellmich says. "We feel like if we can get a first-time meeting here, then they'll come back a second and third time, and the golf is certainly a part of that."

This story originally appeared in February 2019 Business Alabama.

Plugging the Hypersonic Missile Gap — The First $1.4 Billion

Advances in hypersonic missiles by Russia and China have put the U.S. behind in airborne weapons. Recent Lockheed Martin contracts — including key work in Huntsville — appear to be aimed at getting the U.S. back into the game.

BY BILL GERDES

By the time you finish reading this sentence, a hypersonic weapon could have flown from Mobile to Huntsville, where Lockheed Martin Space is researching and developing just such a device.

The company has a $928 million contract to develop the Hypersonic Conventional Strike Weapon, known as HCSW, which Air Force officials say is pronounced "Hacksaw."

In addition to the initial contract, this past August Lockheed Martin received another contract to develop the Air-Launched Rapid Response Weapon (ARRW), a hypersonic weapon prototype expected to cost "no more than $480 million" to design, according to an Air Force press release.

All of this comes after China and Russia announced the successful testing of hypersonic weapons.

A hypersonic weapon travels at Mach 5 or higher — at least five times faster than the speed of sound. This means hypersonic weapons can travel about one mile per second. Its speed makes it very difficult to detect, track and destroy.

Russia's new Sarmat intercontinental missile is shown in a video grab at an undisclosed location in Russia. It is one of the hypersonic nuclear weapons Russian President Vladimir Putin says his military has successfully tested and is ready to deploy. *(RU-RTR Russian Television via AP)*

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In April, Mike Griffin, the U.S. undersecretary of defense for research and engineering, told the Senate Armed Services Subcommittee on Emerging Threats and Capabilities that "China has fielded or can field...hypersonic delivery systems for conventional prompt strikes that can reach out thousands of kilometers from the Chinese shore, and hold our carrier battle groups or our forward deployed forces...at risk."

Griffin, former administrator of NASA and later an engineering professor at the University of Alabama in Huntsville, added that the U.S. does not have a weapon that can similarly threaten the Chinese, and that the U.S. has no defenses against China's hypersonic missiles.

"We, today, do not have systems which can hold them at risk in a corresponding manner, and we don't have defenses against those systems," Griffin says. "Should they choose to deploy them we would be, today, at a disadvantage."

Russian President Vladimir Putin has also said that Russia successfully tested an "invincible" hypersonic cruise missile.

According to multiple reports, Russia is expected to begin production soon of its 3M22 Zircon, a hypersonic missile that will travel 4,600 miles per hour — five times the speed of sound — and will have a range of 250 miles. That's just three minutes and 15 seconds from launch to impact.

The Lockheed Martin contracts appear to be aimed at getting the U.S. back into the game.

According to a company news release, "Under the indefinite-delivery/indefinite-quantity contract, Lockheed Martin will develop the Hypersonic Conventional Strike Weapon (HCSW), a new air-launched weapon system. The company is working closely with the Air Force to finalize system requirements under the contract's initial task order.

"This is the first phase of a development program, with future phases progressing through design, flight test, initial production and deployment of the weapon system at early operational capability. The contract ceiling through early operational capability is $928 million."

"Our goal is rapid development and fielding of the HCSW system, and this contract is the first step in achieving that goal," says John Snyder, vice president of Air Force Strategic Programs on the Lockheed Martin website. "Design, development, production, integration and test experts from across Lockheed Martin will partner with the Air Force to achieve early operational capability and deliver the system to our warfighters. We are incredibly proud to be leading this effort."

The company says the HCSW team will primarily work in Huntsville; Valley Forge, Pennsylvania, and Orlando, Florida, with additional expertise in Denver, Colorado, and Sunnyvale, California.

As might be expected, at this stage Lockheed Martin and the Air Force have gone silent.

According to CNBC, a Lockheed Martin representative noted that the company will "not be able to host any interviews on this program" due to its sensitive nature.

By the time you finish reading this sentence, a hypersonic weapon could have flown from Mobile to Huntsville.

Similarly, a U.S. Air Force spokesman said the service will not be making any announcements in the near future regarding its work on hypersonics.

Xiaowen Wang, an assistant professor of aerospace engineering at the University of Alabama, studies the behavior of hypersonic craft and offers insight into the nature of hypersonic flight.

"I am focusing on how air flows around the vehicle," Wang says. "A lot of friction is generated at high speeds so the surface temperature can be very high, as high as 10,000 degrees Kelvin." The Kelvin Scale is a thermometric scale used in physical science to describe the absolute temperature of an object, substance or area. While Fahrenheit and Celsius scales measure temperature, the Kelvin Scale defines temperatures relative to an object's thermodynamic movement. Wang says the high temperature is one of the main differences between hypersonic and supersonic and subsonic.

Hypersonic craft generally have a sharp, needle-like nose, a slender fuselage, thin wings and tail surfaces and very sharp leading edges, Wang says.

An article on Thedrive.com last year says hypersonic weapon design generally "involves a booster of some sort, often a rocket motor, which gets the craft going fast enough for an air-breathing high-speed jet engine to take over. Once at its cruising speed, these power plants become highly efficient.

"But more importantly, this air-breathing engine generates a very different signature from a rocket motor, meaning space-based surveillance assets might not be able to spot one as quickly or keep tracking of it during flight, or even spot it at all for that matter. On top of that, prototype designs look much more like super-fast flying cruise missiles or drones, able to fly in more erratic ways well within the atmosphere, maybe even changing course in mid-flight relatively rapidly. This could make any such weapon more accurate, since it could make more corrections before impact, as well. A projectile flying at a mile a second would be too much to process in general for even the most fast-scanning surface- and airborne-radars that exist at present, and even if they could be tracked, engaging something going that speed within the atmosphere represents a huge set of problems of its own."

Another component is the "SCRAMJET," or supersonic combustion ramjet, which relies on high vehicle speed to compress incoming air forcefully before combustion and the airflow is supersonic throughout the entire engine. The engines can be used to power hypersonic missiles.

Wang says the engines are "very, very efficient so they can develop a very high thrust."

"The weapons are so fast that if there is any sort of air disturbance they may fly away from the target," he says.

Wang says there are only a few places in the U.S. where hypersonic vehicles can be tested. "Computers can mimic the airflow, but it is very expensive," he says.

Has Wang ever seen one?

"No, no. There is no chance of seeing any of them," he says.

This story originally appeared in October 2018 Business Alabama.

A New Universe of MedicalResearch

Alabama is well represented in this newest field of medical research. Perhaps more promising than the genome is the new frontier of the microbiome — your gut microbes and "all of the bugs that are living in symbiotic relationship with us."

BY ALEC HARVEY

In Birmingham, a researcher wants to discover what specific microorganisms in the stomach cause Parkinson's disease.

In Mobile, the goal is finding new and better treatments for cancer.

And in Huntsville, they're trying to create better antibiotics by looking at hot springs, thermal vents at the bottom of the ocean and other extreme conditions.

This is top-tier medical research going on throughout Alabama, and though the projects are not related, they do have something in common — all of these researchers are focusing on the microbiome, which at its simplest is defined as the microorganisms in a particular environ-

Dr. Haydeh Payami is relating the microbiome to her longtime study of Parkinson's disease.

ment. In humans, that's primarily bacteria in the gut.

It's a relatively new field of study, particularly when it relates to complex diseases, says Dr. Haydeh Payami, professor in the UAB School of Medicine Department of Neurology and the John T. and Juanelle D. Strain Endowed Chair.

"At first, microbiome was pretty much ignored in all of the studies of diseases like heart disease, diabetes, Parkinson's and Alzheimer's," she says. "Everybody first was looking at diet and exercise. Then people concentrated on genetics. No more than 10 years ago, maybe six or seven, literature started picking up on the importance of the microbiome. There's a whole other world that we've been ignoring, and that's all of the bugs that are living in symbiotic relationship with us."

Payami now is studying that "whole other world" as it relates to Parkinson's, but it's her previous three decades of experience studying the disease that prepared her to do it. She is lead investigator for the NeuroGenetics Research Consortium, which has assembled one of the largest datasets of Parkinson's patient information in the world.

"When the genomics era rolled in, we were ready to go with a large sample size," Payami says. "We had data on 2,000 people with Parkinson's disease and 2,000 without it."

Payami and her colleagues are putting that data to work with a four-year, $2.7 million grant from the U.S. Army Medical Research and Materiel Command. They're looking for a "missing link" between genetic and environmental causes of Parkinson's disease.

"Hopefully, we'll find what we're after, which is microorganisms in the gut that might be the trigger for susceptibility," Payami says.

At the University of South Alabama's Mitchell Cancer Institute, the institute's division director of hematology oncology is continuing microbiome research that he had started at the University of Texas Southwestern Medical Center.

"I was following up on some observations that had been made in Chicago and Paris," says Dr. Arthur Frankel. "They had studied mice and showed that particular bacteria in the gut of mice predicted whether the animals' melanoma would respond to immune checkpoint blockade. They found particular bacteria that were in the gut of the mice were linked to whether or not the mice would respond to treatment."

Frankel, who had done immune therapy research and also was seeing a lot of patients, saw that while many patients can respond to immune checkpoint blockades, many did not.

"My interest was whether there was some way we could improve the percent of patients that responded to the therapy," he says. The two researchers who won 2018's Nobel Prize for Medicine were doing research that helped him along the way.

"It wasn't until I adjusted what I was studying based on their discoveries that the role of what you eat and the gut bacteria became clear and important," Frankel says.

Frankel was working on this with a company named Vedanta, and when he left Dallas for Mobile, the relationship continued, and there has been some success.

"Vedanta has developed a cocktail that, at least in animal models, appears to markedly improve the response to immunotherapy," says Frankel. Further research shows that it may translate to human response, too.

"The first thing that excited me was that what we find in patients we find in mice and vice versa," he says. "Many experiments on humans don't work on mice and vice versa. Surprisingly, this has worked both in the animal and the humans."

Clinical trials should start within a few months, Frankel says, but more patients are needed.

"We desperately need patients to call us and work with us," he says. "I have enough funds to analyze people's gut bacteria from all over the country, but we need to find them. We have a way now that they can ship samples to us that we can analyze. People think they discover things with 10, 20 or 40 patients, but really you need hundreds of patients to know if any treatment or bacteria is good for people."

Frankel doesn't expect to find a cure for cancer, but he is happy to contribute in any way he can.

"I would love to tell you that I make major discoveries, but I don't think that is true," he says. "I try to help and advance it just a bit. If we can improve the response rate incrementally, I believe that's saving lives and giving people a better quality of life."

While Payami and Frankel are doing research on standard microbiome in the human gut, Dr. AJ Singhal, senior research scientist at Huntsville's CFD Research, is doing something a little different.

"It's not what you typically talk about when you talk about microbiome," he says. "We're talking about the microbiome in extreme environments. We're looking in hot springs, thermal vents at the bottom of the ocean and places like that. It's different, but it's the same. Microbiome is simply the world of microbes. That can be anywhere, on the side of the road or in an intestine."

Singhal is hoping to develop better antibiotics through his research, and, like Payami, he's doing this through a grant from the Department of Defense (the research includes developing antibiotics that can fight biological weapons, as well as superbugs). He started the research at iXpressGenes, but last year, CFD Research acquired his division. Both companies are affiliated with Huntsville's HudsonAlpha Institute for Biotechnology.

Specifically, Singhal and his team are extracting DNA in certain places — soil samples from the bottom of the ocean, for instance — and recreating microbes that haven't been able to grow in a lab before.

"We take all the DNA out of the soil, then you have access to all the microbes and you can put that DNA into the microbe that will grow in the lab," he says. "We're trying to figure out exactly what the chemistry is and increase the yield of it. The kinds of enzymes there that can synthesize antibiotics are not like anything we've seen before."

Singhal and his team have had about 15 potential "hits," meaning "potential compounds that may be promising as antibacterials," he says.

"In general, it is going very well," Singhal says. "The hypothesis was that since these environments have not been exploited for drugs, there will be a lot of potential there."

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ACCELERATING A SMARTER PATH TO MARKET

HOW TO RECRUIT TOP IT TALENT

Recruitment of top information technology talent is essential these days. Here's how some of Alabama's largest employers go about it.

BY NANCY MANN JACKSON // PHOTO BY CARY NORTON

At Birmingham-based construction firm Brasfield & Gorrie, information technology staffers have developed a safety application that allows the firm's safety team to manage safety walks and monitor deficiencies and report the data in a dashboard that helps leaders address trends across jobsites. Another mobile app developed in house, Connect, ties together multiple technology needs in the project lifecycle, including preconstruction, resource management, internal project dashboards and communication, says Rickey Whitworth, director of IT architecture at Brasfield & Gorrie.

While construction is hardly a new industry, its leaders — like Brasfield & Gorrie — are harnessing modern technology to improve their work. Across all industries, even those that would be considered traditional, such as construction, banking and utility services, information technology is a valued skill and IT pros are in high demand.

ESSENTIAL TO CUSTOMER RETENTION

In the financial services field, for instance, customers want increasingly advanced digital services — which means that financial institutions need tech employees who can make those services happen.

"To meet the needs of today's customers, we are consistently working to be quicker to market with the types of new and innovative services people expect," says Amala Duggirala, enterprise chief information officer at Regions Bank. "We must respond to, and anticipate, our customers' needs. And we must constantly provide a positive customer experience. All of this is putting a greater emphasis on technological solutions. Technology

Regions Bank needs first-rate IT professionals to meet and exceed customer expectations, says Amala Duggirala, enterprise chief information officer for Regions.

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While highly qualified IT staffers help companies like Regions provide better services to customers, the solutions they provide can also help the organization operate more efficiently, like the IT pros at Brasfield & Gorrie. A robust technology department has become increasingly important for organizations in all industries to better serve their customers and perform their jobs more efficiently.

ADAPTABILITY IS PREMIUM

Regions looks regularly for IT talent in three key areas: security engineers to protect customers' information; front-end developers focused on designing features that thrive online, on mobile and everywhere, and enterprise data and architecture professionals who can focus on reusability and create technological solutions that can be applied enterprise wide. "I look for engineers who are focused on agile techniques, on test-driven development and on enterprise thinking," Duggirala says. "And I always want security-first thinking."

At Alabama Power and parent company Southern Company, recruiters frequently seek entry-level to seasoned technology professionals for positions such as project managers, IT security and cyber security analysts, IT field ops technicians, network engineers and application developers.

Brasfield & Gorrie has made significant investments in software developers over the past couple of years, and technical support positions remain the company's primary hiring need. And as the company grows, it is currently working to expand its business intelligence team, Whitworth says. "Many of our other positions start out in technical support and then transition to other areas," he says. "We are also hiring a lot of developers as direct hires, and network and systems engineers are also needed."

While each type of business has specific IT needs, the technology field changes so quickly that sourcing professionals who have an ability to learn and adapt is often just as important as having specific skills. "The types of information technology professionals we look for are people who are advanced in digitalization technical skills," Duggirala says. "The agility with which we need to respond to customer needs totally changes the landscape of traditional software development versus agile software development. That is, we need people with skill sets that are much more advanced, nimble and hands-on. We place a greater emphasis on mobile, Java and full-stack development skills. That is where the need is increasing."

At Southern Company, which recently acquired AGL Resources, now Southern Company Gas, recruiters look for people who can help the company reach its goal to build the future energy, according to Bonnie Parker, technology business partner at Alabama Power. "We seek not only qualified and talented technology professionals, but those who also embrace and possess an innovative spirit to move our organization forward," she says.

TIGHT IN-STATE TALENT POOL

For some Alabama companies, filling open technology positions can be challenging. For some positions requiring specialized skill sets, there is a "small talent pool of individuals with skills needed for the available roles," Parker says. "[And we have a] tight labor market; it can be difficult to find qualified technology professionals in Alabama."

Of those who are qualified, many technology professionals look to startups or digital-only firms to launch or grow their careers, so it can be tricky for legacy companies to attract top talent. For years, Brasfield & Gorrie has relied on its robust internship program to source up-and-coming construction professionals, and recently, the firm has begun using IT internships to locate promising technology graduates, Whitworth says. Also, its in-house recruiting team sometimes relies on outside recruiters for highly technical positions.

Other successful strategies for recruiting talented technical professionals include getting involved in online tech forums and on college campuses. "We have to immerse ourselves in the environments where the best technology minds come together," Duggirala says. "In addition to college programs, technology conferences and similar forums, there are also codeathons, where industry leaders — such as the best coders in a certain area — gather to be presented with complex challenges and then solve those challenges. It's a place where the brightest technology minds can shine. It's also a place where we can share with these experts what Regions is doing to evolve, innovate and meet the needs of not only today's customers, but tomorrow's customers as well. It puts us on their radar. And it shows how Regions is committed to technology and is providing a positive work environment for people whose skills can help us continue to differentiate ourselves among consumers."

Alabama Power recruiters also attend conferences such as the Society of Women Engineers (SWE) and National Society of Black Engineers (NSBE), Parker says. They are also active on LinkedIn and career sites, such as Indeed and DICE, and rely on referrals from current employees.

As technology permeates modern business and life, it has become increasingly important as a competitive advantage for most companies. And gaining that advantage depends on each company's ability to recruit and retain cutting-edge IT professionals. For instance, for banks and other businesses that provide products similar to those of their competitors, "the differentiation really is how we provide those services and the ease with which we provide them," Duggirala says. "When we make it highly intuitive, and when we understand the pulse of the customer, we can offer the types of strong digital products that give us a greater competitive edge. What we create, the speed with which we create it and our ability to understand the pulse of the next-generation customer are keys to standing out in the marketplace."

This story originally appeared in October 2018 Business Alabama.

INSIDE THE BATTLE TO BUILD WARSHIPS

Following 10 years of building one of the most sophisticated ships in the Navy fleet, the Littoral Combat Ship, Austal contends for an even bigger prize — the new Navy frigate.

BY BRECK PAPPAS // PHOTO BY MIKE KITTRELL

Inside the cavernous Module Manufacturing Facility at Austal USA, a thick sheet of uncut aluminum enters the production line. Fourteen months later, that same piece of metal will exit the 700,000-square-foot facility as part of a module, or a building block, of one of the world's most sophisticated military vessels.

From there, the module will be shuttled to an assembly bay down the road by multi-axle transporters, capable of moving modules weighing more than 400 tons. It's in the assembly bay that these building blocks, lifted into place by crane and welded to an existing framework, will slowly begin to resemble a Littoral Combat Ship (LCS).

The speedy, shallow-water LCS has been a familiar sight on the Mobile River for almost a decade. At the end of 2010, the U.S. Navy awarded Austal a block-buy contract for the construction of 10 LCS Independence-class ships. Over the intervening years, they have ordered an additional nine.

Standing beside LCS-22, the recently christened USS Kansas City, Austal USA President Craig Perciavalle reflects on the LCS program.

"We're delivering ships on budget and on schedule," Perciavalle says. "We're putting them out fast and furious."

Of the 19 LCS ships Austal is contracted to construct for the U.S. Navy, nine have been delivered and another six — LCS 20, 22, 24, 26, 28 and 30 — are in various stages of construction. Lockheed Martin is building an almost equal number of LCSs under a different design — Freedom-class — at a shipyard in Wisconsin.

Founded in 1999, Austal USA is a subsidiary of Australian-based Austal Limited. Its shipbuilding facility has become a staple of the Mobile waterfront, occupying 164 acres on the eastern shore of the Mobile River.

With 4,000 employees, Austal is the sixth largest industrial employer in the state, a standing owing, in large part, to the company's ability to land high-profile contracts with the U.S. Navy. Following the procurement of a contract in 2008

Left: Austal USA President Craig Perciavalle says his firm has "the best workforce in the country" to build warships at a "fast and furious" pace. Right: Austal USA launches a vessel in downtown Mobile. *Photo by Mike Kittrell*

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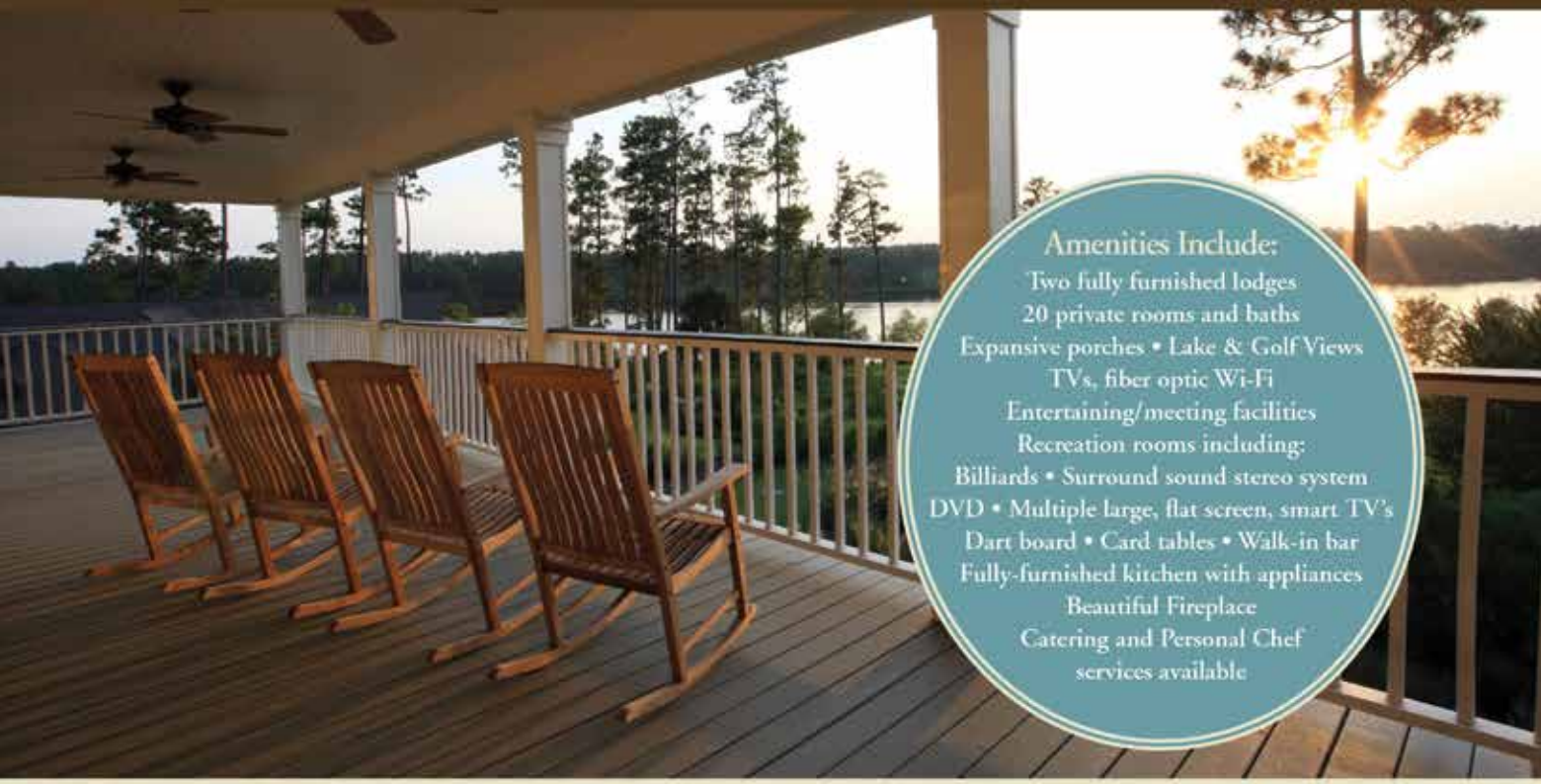

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to build 10 Joint High Speed Vessel ships (now known as Expeditionary Fast Transport vessels) and the LCS contract in 2010, Austal was able to make $160 million in capital investments to its facility along the Mobile River, while adding 3,100 employees.

But the LCS program hasn't been without controversy. When cost increases, schedule delays and concerns about the vessel's survivability in combat cast a shadow of doubt in the early years of the contract, Perciavalle remained determined to adhere to any changes the Navy deemed necessary.

"As the requirements were maturing with the Navy and, quite frankly, as we were going through the design maturity process, there were a lot of challenges," Perciavalle says. "We've certainly overcome them now."

U.S. Rep. Bradley Byrne, whose district includes the massive shipbuilder, says he's proud of the way Austal has coordinated with the Navy on LCS.

"The LCS program has truly been a team effort between the Navy and Austal. As with any new program, there have been challenges, but the Navy and industry have worked together on tackling setbacks and evolving the ship's capabilities to best serve the Navy's requirements."

LCS WOES

In 2014, cuts in military expenditures and concerns about the vessel's combat power put the LCS program in the spotlight. U.S. Defense Secretary Chuck Hagel directed the establishment of the Small Surface Combatant Task Force to review the viability of LCS and to explore possible design modifications.

In 2016, following a spate of LCS breakdowns, two of which were owing to sailor error, the Navy ordered a handful of changes to the vessel, aiming to improve its combat punch. The Navy also set out to reevaluate sailor training.

Designed for speed and flexibility, one of the signature traits of the LCS design was its modularity — the ability to swap out weapons and sensors to suit a particular mission. Critics, citing the sailor error breakdowns, accuse the Navy of wanting the ship to be more versatile than was practical.

The LCS program illustrates several of the challenges associated with fulfilling a contract for the Department of Defense.

"They're the most demanding customer on the planet, and they should be, quite frankly," Perciavalle says. "The vessels that we build do pretty important stuff in support of our nation's defense, and the number one priority is having ships that are very capable to do that and also understanding that we have sailors that are sailing on these ships. So there's a lot of demand put on us or any defense contractor."

It's important to recognize, Perciavalle says, that a client like the U.S. Navy has evolving needs.

"There's no doubt that, as years go by, the Navy requirements change because the threat could change," he says. "The beauty about our ships is that we have the adaptability to actually flex the capabilities of the ships and to adapt them to increases or changes in requirements. That's the beauty of a multi-hull vessel."

Of course, unexpected modifications required by the Navy can affect cost estimates for government contractors. In 2016, following Navy shock trials on the USS Jackson (LCS-6), Austal entered into a trading halt and issued an earnings announcement warning about an increase in its cost estimate for future hulls "due to design changes required to achieve shock certification and US Naval Vessel Rules." The modifications required on the USS Jackson and 10 other ships under construction resulted in a full-year loss for fiscal 2016.

Furthermore, in January of 2019, Austal confirmed in a release filed through the Australian Stock Exchange that it was "assisting an investigation by ASIC into market announcements by the Company with respect to earnings from its Littoral Combat Ship program." The investigation is said to be focused on statements Austal issued in 2015 relating to cost increases during the construction of the USS Jackson. In regards to the investigation, Perciavalle says that Austal is "supporting the process."

LOOKING AHEAD TO 2020

In February 2018, Austal was one of five companies awarded a $15 million contract for conceptual design of the Navy's new guided-missile frigate. The FFG(X) program, which the Navy is developing as it phases out LCS, seeks the construction of 20 frigates with more lethality. The multi-billion-dollar contract is slated to be awarded in 2020. Austal is proposing a variation of its aluminum Independence-class LCS, leveraging the ability of the multi-hull vessel to accommodate new frigate requirements without drastically changing the existing production process.

"We've got a whole team internally here in Mobile that is working on the concept design for frigate," Perciavalle says. "That collaborative environment has been very, very good. So there's been a lot of good dialogue making sure we understand the requirements the Navy has and making sure the Navy understands things that can be leveraged in our parent design, so that they can leverage that and help develop a cost-effective solution."

The impact of winning the 2020 contract, which could guarantee years of production following the conclusion of the LCS program, can hardly be overstated. The Navy is considering awarding the contract to a single builder. The ramifications of not winning the contract would be felt in Mobile and across the state, which is home to almost 400 of Austal's suppliers.

"To us, it's a competition," Perciavalle says, "and you know what, we've been in competitions since, certainly, the first day I got here.

"We have the best team in the country here working on these ships," he continues. "The work ethic, the pride, the ownership in what's happening has really enabled us to improve performance dramatically over the years and really enabled us to provide a cost-effective solution to the Navy."

Perciavalle points out four areas of focus when looking at the future of Austal USA. "Expeditionary ships, small surface combatants, unmanned autonomous [vessels] and the service business," he says. "All of which have plenty of opportunity and all of which we're in a very good position to excel in.

"We have to continue to mature and continue to build. That's our culture, and that's what we're going to continue to do going forward."

This story originally appeared in June 2019 Business Alabama.

Invested for the Long Run

75-year-old EBSCO is long-term focused, accumulating companies with one common factor — they make money serving fundamental markets.

BY GAIL ALLYN SHORT // PHOTO BY ART MERIPOL

In an age when some of the most iconic American companies are no longer around, EBSCO Industries Inc., at age 75, is proving it has staying power.

EBSCO Industries' founder, Elton Stephens, started out selling magazine subscriptions to pay for college during the Depression. After realizing he had a knack for sales, he soon organized a sales team. Then in 1944, he incorporated the business, and over the next several years, EBSCO grew, becoming one of the largest subscription services in the world, serving schools and universities, libraries and the military.

Today, the family-owned company is a model of endurance and business fundamentals. It is one of the largest privately held companies in Alabama and is no.166 on Forbes Magazine's listing of America's top 200 private companies for 2018. It is a conglomerate of diverse businesses operating as one company — a juggling act requiring steady performance. The performance comes from more than 5,000 employees worldwide, including 1,600 in Alabama, producing $2.8 billion in revenues.

EBSCO has experienced much organic growth but also growth through acquiring middle-level companies from industries ranging from research databases and promotional products to fishing and hunting supplies.

"We like to see, above anything else, organic growth," says Stephens' grandson

EBSCO leaders work to grow the company organically. CFO Eric Essary (left) and Board Chairman Bryson Stephens (right) encourage business unit leaders to be, in Stephens' words, "seekers and hunters" — conversant with their marketplaces, aware of their competition and "on the lookout for potential acquisition targets." *Photo by Art Meripol*

CEO David Walker says Ebsco's acquisition strategy is to look for "companies that are solving problems that have existed in the past and will exist in the future, because we feel like these are durable businesses in durable markets serving durable customers." *Photo courtesy of EBSCO*

and EBSCO Chairman of the Board Bryson Stephens. "We like to see internal, entrepreneurial initiatives within our businesses, where we are expanding our product lines or our geographic markets."

One of the earliest examples of EBSCO's organic growth is the birth of Vulcan Industries, which today makes store fixtures and custom retail signs, Stephens says.

In 1946, Elton Stephens and wife, Alys, launched Metal Fabricators and Finishes — which later became Vulcan Industries — to make and sell their own magazine display stands.

EBSCO Industries acquired numerous companies over the years since then, such as the National Publications Co. in 1967 and furniture maker H. Wilson Co. in 1977. But in 2001 it launched its own private equity arm, EBSCO Capital, and hired David Walker — EBSCO Industries' current chief executive officer — as manager.

"The addition of the mergers and acquisitions' role and team gave our businesses the resource needed to complement their organic growth with acquisition growth," says Walker. "I was very fortunate to be the first quarterback of the EBSCO Capital team, which provided me an opportunity to work across our portfolio of businesses to develop and execute acquisition strategies."

Walker says EBSCO Capital also developed a network of relationships with investment bankers, business brokers, lawyers, accountants and other professional service providers in the "deal community" to generate the deal flow needed to make investments in new platform businesses.

Currently, EBSCO Capital has $300 million in equity capital and several investment "platforms" for which it acquires companies. The platforms include EBSCO Information Services, which provides research databases, e-journals and e-books to libraries, universities, medical institutions and corporations.

Another platform, EBSCO Health, sells medical journals, e-books and databases to clinicians, while platform PRADCO Outdoor Brands has companies that manufacture fishing lures and several types of hunting supplies. Earlier this year, PRADCO acquired Whitetail Institute, a Pintlala firm credited with creating the food plot industry.

"We really want our business unit leaders to be seekers and hunters," says Stephens. "We want them to know their marketplaces, and we want them to be active and communicating and engaging with the markets in which they sell, including their competitors. And we want them to be on the lookout for potential acquisition targets."

This spring, another platform, called Luxor, which produces workspace solutions, closed a deal to purchase Kwik-Boost, a company that makes mobile device charging stations and other products. Meanwhile, the platform Imagen includes companies that make promotional products; while the All Current platform resells electrical components.

EBSCO acquired the S.S. Nesbitt insurance agency in 2001. But in February, EBSCO renamed the risk consulting and insurance division the Valent Group.

"As it relates to new platform acquisitions," says Walker, "we look for businesses that fit well with our natural ownership advantage, which we define as including our long-term investment philosophy and our desire to make significant follow-on investments in the businesses that we acquire."

"One of the benefits of being a moderately diversified conglomerate is that we own a portfolio of assets, and those assets serve different roles within the portfolio in terms of their cash contribution and investment and growth potential," Walker says.

Eric Essary, EBSCO Industries' chief financial officer, added that "Typically, when we're buying a business for one of our existing companies, we're looking for a solid track record and reputation, and we're looking for a good, solid strategic fit with what our existing business is doing."

"On the new platform front," says Essary, "we're looking for companies that are of a certain size. Typically, from a revenue standpoint, we want those companies to have anywhere from $10 million in revenue to a couple hundred million in revenue."

EBSCO Capital not only favors companies that offer products or services that are likely to be around for several decades, they also consider the strength of a company's existing management team.

"We look for a management team that's humble, driven and growth-oriented in their approach," says Essary, "and wants to come with their business into our family of companies, a management team that has integrity, a long track record of success in whatever business they're in, and third, we're looking for a management team that has a good cultural fit with EBSCO and an appreciation for our permanent, capital approach."

As a result, Essary says that even when EBSCO Capital owns more than 50 percent of a business, it strives to resist micro managing the company or its management teams.

EBSCO Capital, in fact, markets itself as the alternative to private equity, Essary says.

"We view ourselves as permanent capital," says Essary, "meaning that when we buy a company, we plan on owning that company for the long term. Whereas a private equity firm is very different. For them to generate returns for their stakeholders, they have to sell a company within a three- to five-year period.

"Because of that," says Essary, "we have aggressive but rational, long-term growth and returns expectations. We don't get too upset about economic cycles or short-term investments that have long-term payoffs."

This year, EBSCO announced plans to expand its portfolio again with a new platform called BiSo Collective, a company based in downtown Birmingham. Under the leadership of former Daxko CEO Dave Gray, BiSo Collective will acquire B2B, Software-as-a-Service (SaaS) companies and help grow and scale those businesses.

"We wanted to be in the SaaS space," says Stephens. "We feel like it has good growth characteristics. It's a great example of an area where we've developed a conviction around an investment theme, SaaS, and partnered with a great leader, Dave Gray."

Meanwhile, EBSCO continues on its quest to find new companies to acquire.

"We're looking for companies that are solving problems that have existed in the past and will exist in the future," says Walker, "because we feel like these are durable businesses in durable markets serving durable customers."

This story originally appeared as the cover story in July 2019 Business Alabama.

MAKER OF PLACES

The tracks of developer Cathy Sloss Jones run straight to the heart of downtown Birmingham and a long line of places rediscovered.

BY CARY ESTES // PHOTOS BY ART MERIPOL

Like so many children, Cathy Sloss Jones grew up listening to tales of adventurers and their grand accomplishments. But instead of stories about King Arthur or Paul Bunyan, young Cathy was treated to the exploits of Emil Hess with Parisian department store and with grocery chain developer Joseph Bruno.

These were the exemplars in the Sloss household, as Cathy's grandfather and father often regaled the family with anecdotes about business leaders and their achievements. "They said these were the types of people and companies I needed to watch. That they were the ones taking on new frontiers," Sloss Jones recalls.

It's a message Sloss Jones has long embraced, from her childhood in Birmingham (where the historic Sloss Furnaces iron production facility was founded by her great-great-grandfather, James Withers Sloss) to her current role as president and chief executive officer of Sloss Real Estate, which was formed nearly a century ago, in 1920, by her grandfather, Arthur Page Sloss. In order to stay ahead you need to keep moving forward, sometimes by embarking on a path others are avoiding.

Arthur Page Sloss demonstrated that concept with Sloss Real Estate. Along with business partner Everett Shepherd Sr., Sloss was one of the first commercial developers in Birmingham to venture outside of downtown, creating the 24-acre Five Points West shopping center in 1940. In 1948, Sloss convinced a downtown butcher to move his operation to Five Points West, the initial step in what became the Western Supermarket chain.

"My grandfather was really a forward thinker," Sloss Jones says. "He was the idea guy, the visionary, and Everett Shepherd was the builder, the balance point. So they worked well together for a long time."

Arthur Page "Pete" Sloss Jr. joined his father at Sloss Real Estate in the 1950s, and Sloss Jones did the same shortly after graduating from Converse College, in

Left: Cathy Sloss Jones
Right: Shopping at the Pepper Place market, Sloss Jones joins Pardis Stitt of Highlands Bar and Grill and Frank Stitt's other Birmingham restaurants.

Spartanburg, South Carolina, in 1975. By then, Sloss Real Estate had truly become a family business.

"It's impossible to be in this family and not have the company be a part of you," says Sloss Jones' sister, Leigh Sloss Corra, who is executive director at the Market at Pepper Place. "That's what we talk about. It's the passion of our family.

"Nearly every morning when I was growing up, my grandfather, my dad and Cathy would have a business debrief over coffee. What can we do with this building? How can we make this neighborhood more vibrant? It was problem-solving and dreaming time."

For Sloss Jones, the dream in the 1980s once again involved taking a road less traveled. But this time it was in the opposite direction, back toward downtown Birmingham. She had watched in despair as suburban sprawl had eaten away at the surrounding countryside, while the heart of her hometown slowly deteriorated.

"My interest was to stop all this sprawl and start rebuilding the urban core," Sloss Jones says. "I've always loved being in the wilderness. Our family would take canoe trips and ride horses and camp out. I saw that the woods and the farms were being cut down and built over.

"We have this gorgeous infrastructure right in front of us downtown. So why don't we refocus on that? I became determined to try to shift the company focus and mission, and my dad said OK. That's when we really started looking at how to convince people to come back downtown."

Sloss Jones turned to the model designed by Main Street America for the revitalization of smaller cities — with an emphasis on historic preservation and community-based initiatives — and began using it as a guide for urban planning in Birmingham. She focused on the Lakeview District just southeast of the city center, near Sloss Furnaces, creating a new home base for such non-profits as the Cahaba River Society, the Alabama Environmental Council and Southern Danceworks.

"That area was pretty blighted," Sloss Jones says. "We bought all these empty buildings and could provide inexpensive rent. So we moved our office over there and created a little community around non-profits. Then we started thinking about design and construction as our economic hook for revitalizing Lakeview."

The first big step took place in 1988, when Sloss Real Estate purchased the old Dr. Pepper plant and the Martin Biscuit Building. Some of the buildings had been empty for nearly 20 years, and the entire two-block complex had been closed since 1982. Yet during a time when most developers were focused on the suburbs, Sloss Jones saw the potential to create more than 350,000 square feet of retail and office space — dubbed Pepper Place — in downtown.

"We started building a community in that building," Sloss Jones says. "We were beating the drum for downtown, trying to convince people to come back. It felt a little lonely for a while."

The second major step occurred in 2000, when Sloss Jones teamed up with local chefs Frank Stitt and Franklin Biggs to help start a weekly Saturday farmers market on the Pepper Place grounds. There were only seven vendors at the inaugural market (there are now more than 100), but an important seed had been planted. Slowly but steadily, people began coming downtown on the weekend for the market, and along the way rediscovered some of the joys of city life.

"People came to the market and went, 'Wow, this is awesome. What else can we check out around here?'" Sloss Corra says. "That's the heart and spirit that Cathy brought to the market. She wanted it to be more than just a shopping place."

Indeed, Sloss Jones often makes business projects sound more like community projects, which helps Sloss Real Estate attract national assistance for some of its developments. For example, urban design director Steven Lewis, from the Los Angeles offices of architecture firm ZGF, is working with Sloss Jones on a master plan for the proposed Sloss Industrial Arts District.

"It's obvious how committed Cathy is to Birmingham," Lewis says. "She's interested in mixed-use, vibrant neighborhoods with diverse people from both ethnicity and income. Pepper Place fits into her bigger plan of connectivity for the city. She's been putting these pieces together through her company's holdings, as well as collaborations with other landowners. She's been a champion of making a 'there' there."

Tom Walker has come to a similar conclusion after just two years as Sloss Real Estate COO. "Cathy was way ahead of the crowd as far as the revitalization of Birmingham's urban core," says Walker, who joined Sloss from Bayer Properties in 2017. "I enjoy being around her because she is so passionate about this city. She has a strong desire in her heart for what she's doing."

That will continue in the coming years with a series of projects Sloss Real Estate plans to establish along the railroad tracks that run east-west through the heart of Birmingham. This includes the current renovation of the 120,000-square-foot Sloss Docks warehouses, which already is anchored by the second location of Gadsden-based Back Forty Beer Co.

"We don't have a river in Birmingham, but we have a river of steel with the rail line. So let's build along that," Sloss Jones says. "We've worked very hard for a long time to try to convince people to come back, and now we're seeing this resurgence. It feels wonderful to see all this positive momentum."

In fact, it's the type of thing people might tell stories about one day.

This story originally appeared in September 2019 Business Alabama.

CAN YOU REALLY TEACH INNOVATION?

You better bet on it, say the students and educators at UAB, which has just opened the Bill L. Harbert Institute, devoted to the methodology.

BY BILL GERDES // PHOTO BY JOE DE SCIOSE

Weida Tan was born in China and arrived in Pell City 10 years ago as a 17-year-old high school exchange student. He is now a doctoral student in computer science at the University of Alabama at Birmingham (UAB), having already earned bachelor's and master's degrees.

But he also is chief executive officer of a start-up company called Fledging, which makes software/hardware solid-state drive replacement solutions for MacBook users. The company came through the UAB Commercialization Accelerator and into Innovation Depot, and his company is now bringing in $65,000 a month and is developing another product.

The Commercialization Accelerator is an initiative of the Bill L. Harbert Institute for Innovation and Entrepreneurship at UAB, which is now housed, along with the Collat School of Business, in a brand new, $37.5 million, 108,000-square-foot building. The new building, which had its ribbon cutting in 2018, was designed with input from students and community business leaders and features breakout rooms, an innovation lab, classrooms designed for team-based learning, a high-tech finance lab, sales role-playing rooms, a three-story atrium, an auditorium, a career center and quiet study spaces.

UAB is one of many universities across the country that have established learning facilities billed as innovation/incubator/design centers — focused on multidisciplinary inquiry, fostering partnerships with industry and bringing in available grants and funding for projects and research. Tan and his company are one example of what can result.

But questions are being raised about whether innovation or "design thinking" can be taught, and articles have appeared in the Chronicle of Higher Education lately questioning whether innovation centers are worth the money. The folks at UAB think they are.

"It is not just can it be taught, it should be taught much more on a deeper and broader scale," Tan says. "As an entrepreneur who put my invention through the entire commercialization cycle and making revenue and growth out of it, I have seen so many other peers that have ideas no less disruptive or less profitable with potential businesses, but they didn't put it through. They could be a fellow engineering student who came up with a design for a new cup holder for a car, it could be an art student that came up with this idea for decorative accessories, it could be a computer science student who came up with this software idea, but none of them put their time or effort or resources into it to make it happen, to push it through the way I did. It is not their fault, because those resources are not that accessible.

Weida Tan (left) is now CEO of Fledging, working with business partners COO Steven Robbins (center) and Research Assistant Daniel Bolus.

"It definitely could be taught, because starting a start-up is not a difficult thing. It is the same experience, and there are a lot of commonalities that could be taught and should be taught. There is no need to invent the wheel over and over again."

Molly Wasko is associate dean for research, innovation, entrepreneurship and faculty success at the Collat School of Business at UAB. She agrees with Tan that innovation can be taught.

"Of course innovation can be taught," she says.

"If you look at the organizations that have successfully innovated and succeeded over time, it's been because they actually have a business process for innovation," she says. Wasko says the business process UAB focuses on is the one developed by Stanford University's business school, which is called design thinking and has four different stages.

"When we teach innovation, we teach the model, and the different twist to it is that we actually start teams with a design challenge, so they learn it by doing it. So, for instance, we did a program with McWane Science Center where executives could sign up for a series of four Sunday afternoons," she says. "They have to actually understand the users they are trying to design for. We have them go out into the museum and do observations and interviews and get to know the actual users, what they like about the museum, what they would like to see differently. So that is step one, actually understanding the museum from a user's point of view."

Step two, she says, is defining the problem you are trying to solve, followed by brainstorming or ideation. "That has a whole series of processes as well. Most organizations actually have no idea how to brainstorm. Brainstorming involves trying to generate as many ideas as is possible in a fixed amount of time and considering what resources are available."

And when talking about innovation, entrepreneurship is usually part of the conversation.

Patrick J. Murphy, Ph.D., was recently named the inaugural Goodrich Endowed Chair in Innovation and Entrepreneurship in the Collat School of Business.

Murphy has been an entrepreneurship professor for more than 15 years and is well versed in cutting-edge entrepreneurship training and the enhancement of entrepreneurship education through outreach to entrepreneurial ventures, community engagement and program development.

"I would contrast innovation and entrepreneurship in the following way. Innovation is the most early stage part of the process that you can imagine. You have peoples' experience, peoples' knowledge, peoples' activities, peoples' thinking styles combined with different technologies that are not yet ready for market and different programming languages and different coding and all of the information that goes into that almost like art," Murphy says.

"After that whirlwind of activity that defines innovation, we have what I call kind of a valley of death that you have to get through before whatever you innovated is ready to take to the market. And then when we think about taking it into the market, we are getting into the realm of entrepreneurship."

Murphy agrees with colleague Wasko that innovation and entrepreneurship can both be taught. "I like to think of these areas as kind of a discipline, and, like any discipline, it can be learned. And so with innovation, and entrepreneurship for that matter, one of the big things that we focus on when we teach people how to do these things is not be afraid to make mistakes."

Failure is a recurring theme when talking about innovation and entrepreneurship.

"Errors and mistakes are a big part of the process," Murphy says. "In fact, just like in the biological or the natural world, where error is like fuel for the ecosystem, that is how it works here. And by error in the natural world, I mean like leaves falling off of trees and snakes shedding their skins, all of which in essence becomes fertilizer for the overall ecosystem. In the entrepreneurial and innovation realms, these sorts of mistakes fulfill the same function and some of our strongest game-breaking innovations have been the most profitable mistakes."

But, Murphy cautions, "You have to put boundaries around that, because it can get out of hand."

Tan says becoming an innovator or an entrepreneur requires a certain mindset. "From my personal perspective, it is about how to be persevering, how to be humble, how to be observing."

Add to that, Tan says, you need a problem-solving mindset and the willingness to take risks. "For example, most of my peers consider their destination is to land a job to live a life that the world expects them to. You don't have to be that way. If a situation is not good, change it."

Tan says he thinks a start-up "is a string of failures. Whether we can resurrect ourselves, that is the make it-break it factor. It takes hard work and strong will. Things happen all the time. It is just a matter of how you deal with it. Road blocks are for people who don't want it enough."

That philosophy appears to be working for Tan.

"Business is going great. We reached a monthly revenue of $65,000 last month, and, in the primary market, we are on eBay. We are at about 22 percent market share of this $3 million market. We are launching our second product soon, and we are expanding our team. Right now it is five people."

The late Peter Drucker, a leader in the development of management education, is credited with saying "Innovation is the act that endows resources with a new capacity to create wealth."

Alabama may have the resources, but it is number 30 out of the 50 states in innovation and entrepreneurship, according to the U.S. Chamber of Commerce Foundation.

"Our organizations have to innovate," Wasko says. "My experience here in Alabama is that we don't have a culture that naturally embraces innovation, like Silicon Valley or Stanford. So we need to learn some new behaviors, and engaging in workshops or different types of opportunities around design thinking where we can learn some new skills, or learn how to change the culture, I think would make a huge difference.

"So, for employers, it is good to recognize that this incoming group of new hires they are going to have is going to be trained in design thinking and naturally be innovative, and how can we help prepare our organizations to embrace innovation and not kill it."

This story originally appeared in November 2018 Business Alabama.

UA Sees Two Ready to Break Big

How the University of Alabama is bridging the gap between bright insights and commercial mass production. Two research initiatives have evolved to promising thresholds.

BY CARA CLARK // PHOTO BY JOE DE SCIOSE

Universities, with resources of raw talent and costly high-tech equipment, are the ideal venue to incubate ideas. At the University of Alabama's AIME (Alabama Innovation and Mentoring of Entrepreneurs) Center, students and professors can take their inventions a step further by exploring the opportunity to move their intellectual property to the marketplace. And UA has the success stories to prove the formula works.

No matter the sector for a prototype, AIME helps inventors make the transition to entrepreneurship. First, it provides access to work space and to high-tech, high-cost equipment. Second, it assists with obtaining grants to research scalable feasibility.

Dan Daly, executive director of the program, came to the university from a background in industry, where he knew the processes for evaluating steps for the intellectual process for patents.

The National Science Foundation I-Corps Site became part of the program in 2015 to foster entrepreneurship that will lead to the commercialization of technology. The methodology pivoted to helping with customer discovery. When the patent is disclosed, the program helps make sure a customer base exists for the invention, providing infrastructure, advice, resources, networking opportunities and training.

Leadership at 525 Solutions, from left, Julia Shamshina, CEO Gabriela Gurau and President/Founder Robin Rogers.

"The I-Corps process answers the question for us by going out and talking to potential customers and getting good feedback from the customers," Daly says. "Of the teams we teach, 70 percent are student ideas. What we really try to focus on is more of the higher technical and intellectual properties of the University of Alabama."

Daly says finding the right idea or the next great thing is only the beginning. It's having the business acumen to make a company a success that is difficult, and the University of Alabama program closes the gap between germinating the idea seed and taking it to mass production. UA is also teaching other universities how to implement similar programs.

"It's exciting to see the potential," Daly says. "One thing that is really encouraging is when students finally get the concept, to see the enthusiasm in them escalate. You can see the potential and learn the skills to take an idea and move it into commerce. We're seeing more and more success stories."

POTENTIAL DISRUPTOR FOR $654-BILLION PLASTICS INDUSTRY

The University's AIME program's full methodology is embodied in 525 Solutions, an entity that began in the incubator's early days and has undergone a sea change with its growth and spin off of Mari Signum, an independent Virginia-based company taking this technological breakthrough and its multiple applications to real-world use.

President, owner and founder of 525 Solutions Inc., Robin D. Rogers has been a faculty member at the University of Alabama since 1982. From his work in ionic liquids, Rogers became fascinated with green industry and the concept of sustainability. The name 525 Solutions was derived from the 525-nanometer wavelength for green light.

In 2004, Rogers, along with a graduate student and other partners, came up with 525 Solutions to take results beyond what had been done in the academic lab to the market.

As the project grew, developing biorenewable sorbents from shrimp shells for the extraction of uranium from seawater, so too did its potential to diversify. 525 Solutions received a $1.6 million award (2014-2017) to continue its work, and formed a joint venture, Mari Signum Limited (MSL), with Global Blue Technologies, a zero-waste shrimp farm. MSL raised $25 million and built the first chitin production facility in North America, based on a technology developed by Rogers.

Gabriela Gurau, now CEO and coowner of 525 Solutions, and Julia Shamshina, chief technology officer of Mari Signum Limited, were both post-doctoral students of Rogers. AIME "not only generates technologies and companies but generates entrepreneurs — people able to take this forward. Julia and Gabby are both responsible for doing the work on the scale-up of chitin to the 1.5 million phase," says Rogers. "That was the origin of 525, and chitin is the latest iteration of the concept — how to get technology from a university setting to a corporate setting."

In the early days of AIME, Rog-

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ers helped recruit Dan Daly to mentor faculty and entrepreneurs starting a company.

"If you're a chemist or engineer, you've never had training (in business)," Rogers says. "The goal behind AIME was to facilitate prototyping and facilitate teaching what people need to know to start a company. We wanted people to be able to learn to write a research plan, in addition to working on research."

Rogers says that access to university resources was critical in 525 Solutions' accomplishments, becoming a poster child for the AIME program.

"The more money you get, the more you can do," Rogers says. "With the first SBIR (Small Business Innovation Research), we were able to do the chemistry. With Phase II, we were able to scale up the engineering work. That's how 525 evolved. Without the AIME facilities, we would never have been able to afford it."

Shamshina says there were important steps along the way: "While at 525, seeking for funding to scale up chitin production, we turned our attention to the USDOE Nuclear Energy program, aimed at the extraction of uranium from seawater. While we focused on delivery of product to government-designated mining companies, we at the same time proposed leveraging the USDOE resources to generate a sustainable business around chitin products. (There) was no existing industry base for extraction of uranium from seawater, and the entry decision thus revolved more about how to build a successful business around this opportunity.

"The ultimate goal of this project was collecting the industrial process parameters, conducting reliable economic estimates, and, ultimately, a generation of data for the full-scale operating plant design. This project resulted in a fully engineered system, development of key engineering data and diagrams, as well as an assessment of the equipment needed in a full-scale operating plant."

Mari Signum Mid-Atlantic was formed as a chitin materials production company. The ultimate goal of Mari Signum Mid-Atlantic is to become a sustainable source of high-quality chitin, as well as chitin-based products developed in-house.

"Mari Signum utilizes a proprietary extraction process to produce premium-quality chitin and chitin derivatives, which have the potential to impact the world in numerous, beneficial ways," Shamshina says.

"We are continuing to innovate new chitin-based products — for instance, textiles and drug delivery," Rogers says. "The other half of what we are doing is herbicide, cellulose-based textiles, and we are trying to do pharmaceuticals. 525 is where we incubate our ideas to bring them to commercialization."

The 525 team has the products, including bandages used by the military and with the capacity to heal diabetic wounds, but it's a matter of waiting for the finances to move projects forward, including producing a sustainable alternative to plastics — a project that would require a tremendous influx of dollars. It's something Rogers hopes to see in his lifetime.

"You never know when the right confluence of investment and government interest will come together," Rogers says. "Using our technology, we can

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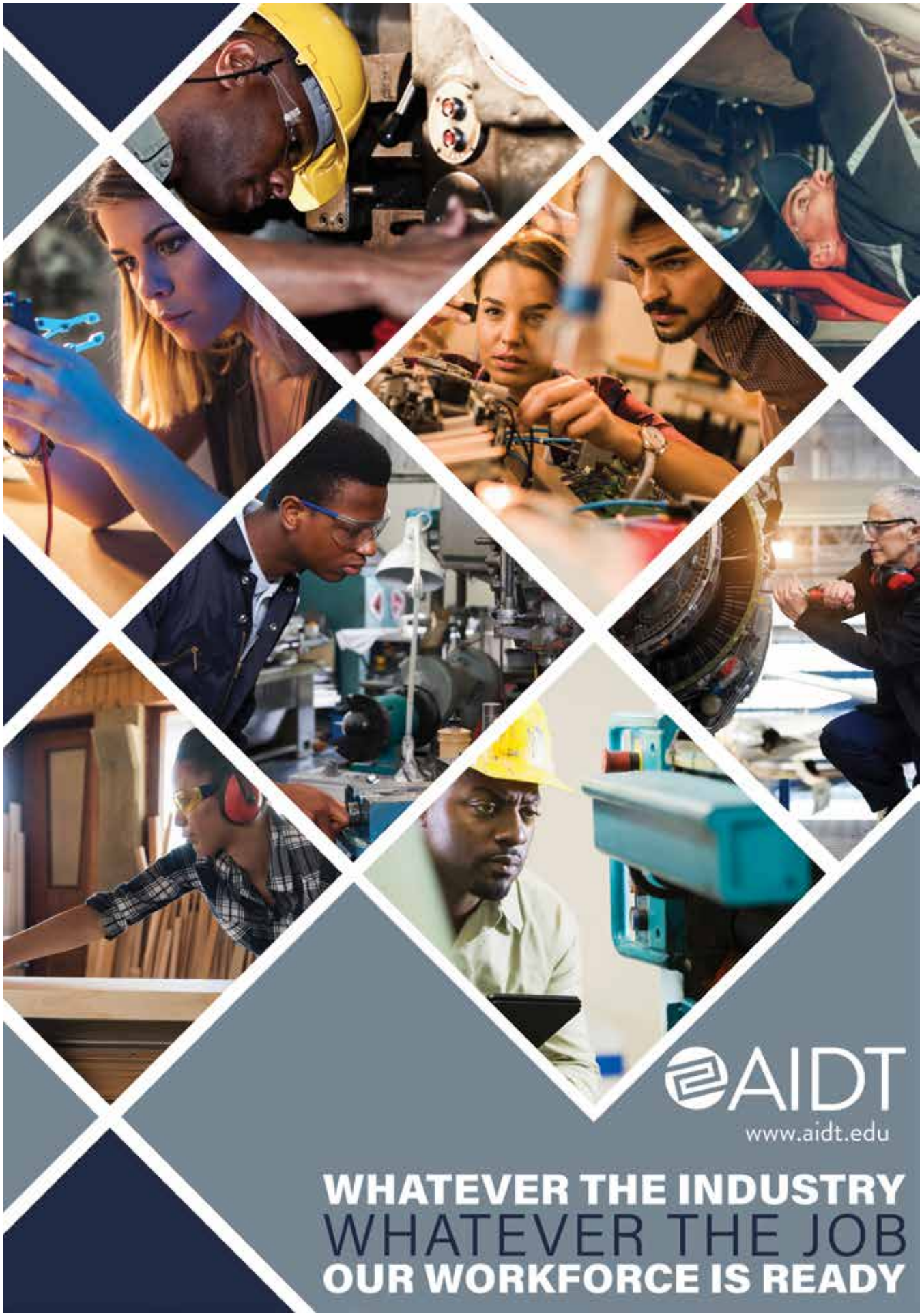
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The name Mari Signum comes from the Latin, "sign of the sea," or, Rogers says, "miracle from the ocean." The true miracle will be Rogers' dream of seeing alternatives to plastics, an expensive challenge in the face of a $654 billion plastics industry.

"We've built a plant based upon this technology, and we're building a research company that should be a sustainable company from the University of Alabama," says Rogers. "This is technology invented at the University of Alabama, developed by 525, an incubated company at the University of Alabama, and now graduated into a joint venture."

Gurau says the company founded in 2004 went to the next step in commercialization with technology developed in 2010. Phase 1 and Phase 2 of the chitin extraction were smaller scale research taking the invention from the laboratory on the scale of 1 milliliter to the two-liter scale.

"We have all the engineering data necessary to scale this technology further to at least the 500-liter scale," Gurau says.

"There are no other chitin products in North America," she says. "We are using a solvent, ionic solution, table salt in a liquid form. It's something you can compare to vinegar. That tells people it's not a harsh chemical. It's something you find in everybody's kitchen."

The solvent dissolves chitin from the shrimp shell, and after the extraction, it can be further manipulated. "You can modify the surface with chemicals that act like a magnet to attract uranium," Gurau says. "It will take some time for the technology to get to a commercial level.

"Chitin can be used in other metal extractions. Water purification for us is very important because it has medical applications. We can show that we can make composite fiber using chitin and alginate and make bandages to cure diabetic ulcers."

Chitin has antimicrobial properties to keep a wound clean while forming a seal.

"Chitin has many applications from low end to high end and biomedical applications considered to be high end, very expensive," Gurau says. "If you look at medical-grade chitin, you would pay up to $50,000 per kilogram."

Gurau says chitin imported from Asia uses harsh chemicals, while the University of Alabama alternative does not. The chitin can be used in medications and cosmetics.

"There are a myriad of applications," Gurau says.

The industrial applications proposed for chitin are overwhelming. Chitin is used in animal feed as a dietary supplement to promote animal growth, improve adsorption of nutrients and inhibit the effect of harmful microorganisms, and as an ideal material for use in agriculture as a fertilizer, fungicide and pesticide, as an agent to improve seed quality, and as a plant growth stimulator.

The absence of an environmentally sound chitin extraction technology that produces consistent quality product was holding back the whole chitin industry,

but now these University of Alabama professionals have opened new vistas for the technology.

"Mari Signum's ability to produce not only chitin itself, but also products from chitin gives us a competitive advantage to diversify the range of our products and enter several profitable specialized markets," Shamshina says.

REVOLUTIONARY CATALYST FOR SMOKESTACK INDUSTRIES

ThruPore Technologies has been one of the super success stories to emerge from the chemistry department at the University of Alabama. The company, with its tag line of "make more, use less," illustrates how the program should and did work for Franchessa Sayler, Ph.D., president & CEO, and her partner, Professor Martin Bakker.

Sayler was a graduate student when ThruPore Technologies began developing commercial applications for a structured carbon catalyst support. The technology uses highly porous synthetic carbon pellets, combined with precious metals, to create faster reactions in the refinery processes. The more efficient process creates less waste and uses fewer precious metals and has the potential to revolutionize industry by reducing the refiner's carbon footprint, while also significantly reducing the cost of the process.

Sayler was looking at the technology for a completely different application when she realized it would be effective for catalyst support.

"This particular catalyst is a carbon-supported catalyst," Sayler explains. "We make it porous so we can put the metal throughout so it sparks. We're able to use as little as 1/6 of the precious metal. It's cleaner and weighs a lot less. It also works longer. We have been able to demonstrate sometimes it works as long as four times longer."

The carbon pellets are used in the production of chemicals and have the potential for automotive applications and cleaner-burning fuel.

Sayler's involvement began when a staff scientist at the university said he was having difficulties developing a catalyst. He asked her, because of her material science background, to take a look at the process. She immediately identified the need for more porous structures.

"I think a lot of scientists find that when they see a solution to a difficult problem, they wonder why no one else thought of that," Sayler says. "But putting an idea into practice is harder than it looks."

When the idea went to the AIME program, it was an immediate hit, leading to National Science Foundation Small Business Innovation Research grants, as well as two smaller grants for commercialization exploration. The research funding for the development totaled $1.2 million from 2014 through 2017.

"They said it was great, and we got to be a cohort of the I-Corps program," says Sayler.

ThruPore, co-founded with Martin Bakker, found a market for the product and licensed the patent for it, which was owned by the University of Alabama.

"I took complete leadership of the company, and it has been exciting," Sayler says. "We had one employee at the time, and now we have five. I moved the company headquarters to Delaware to run the business side of things in an area with a lot of chemical industry, but we still have the manufacturing and R&D in Tuscaloosa."

With her training in chemistry, Sayler never anticipated she would be a business owner.

"I wanted to go into product development, so I'm still doing pretty much the same thing," she says. "I'm just not in the lab as much anymore."

The development actually involves two patents, both owned by the university — one for putting the catalyst onto a porous carbon and the other for being able to scale the porous materials, making massive quantities of material.

"We took the material from the lab, less than a pound at a time, and now through a partnership with Inventure Renewables, a company that grew out of University of Alabama, ThruPore can make 100 tons a year," Sayler says.

Partnering with Inventure Renewables was key to scaling up the manufacturing process, but the work of the university was the true catalyst for success. It's not hand-holding but more a sturdy clasp and boost through AIME that gives potential businesses the incentive and know-how they need to develop ideas and launch companies.

"We would absolutely not have been able to get off the ground without university support," Sayler says. "The reason we still have labs and manufacturing in Alabama is because of the support system they have created. The people at University of Alabama and in Tuscaloosa have been phenomenal. The university has so many things to access that we need scientifically. You don't have to buy them. You can just rent time on them."

The idea seemed counterintuitive at first — a porous structure roughly the size of a pencil eraser would not seem to have the crush strength of a denser material — particularly when the pellets needed to be stacked for the process. But the essence of science is summed up as let's find out.

"You would think when you packed them in, the crush strength would not be high, and that might have stopped us from pursuing it industrially," Sayler says. "If you don't make the material, you don't know the answer to the question. Once we made it in bulk quantities, we learned the crush strength was actually higher. If you don't pursue an idea, you'll never know."

ThruPore's big break came through an I-Corps grant program in 2014. A Phase II grant, totaling $750,000, allowed the company to scale up the technology with a larger amount of catalyst for customers.

"That's where the difficulty was — scalability, proving it could be applied at the scale of a real smokestack industry," Sayler says.

"Once we proved that, we went to private investment," Sayler says. "We just closed on a total of $856,500. We also have applied for another grant to match that funding, for another $250,000 from a phase IB supplement grant."

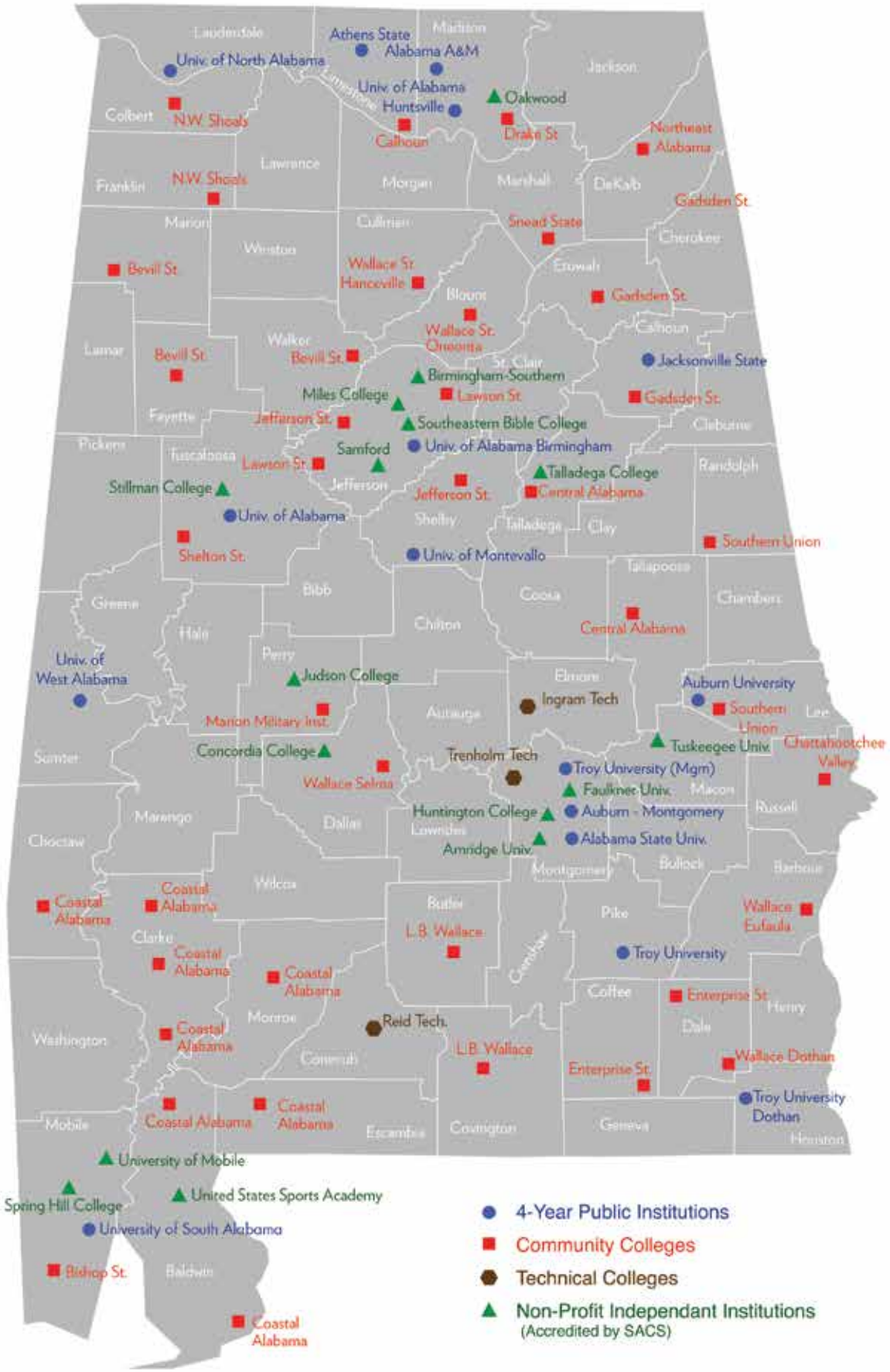
Sayler projects exponential growth for the company in the next five years, with the pellets shipping direct to customers from Tuscaloosa.

"It feels like we're sitting on the next big thing," she says.

"Within three years, we're achieving large scale goals production-wise, and from there, we want to continue duplicating what we've accomplished."

This story originally appeared in November 2018 Business Alabama.

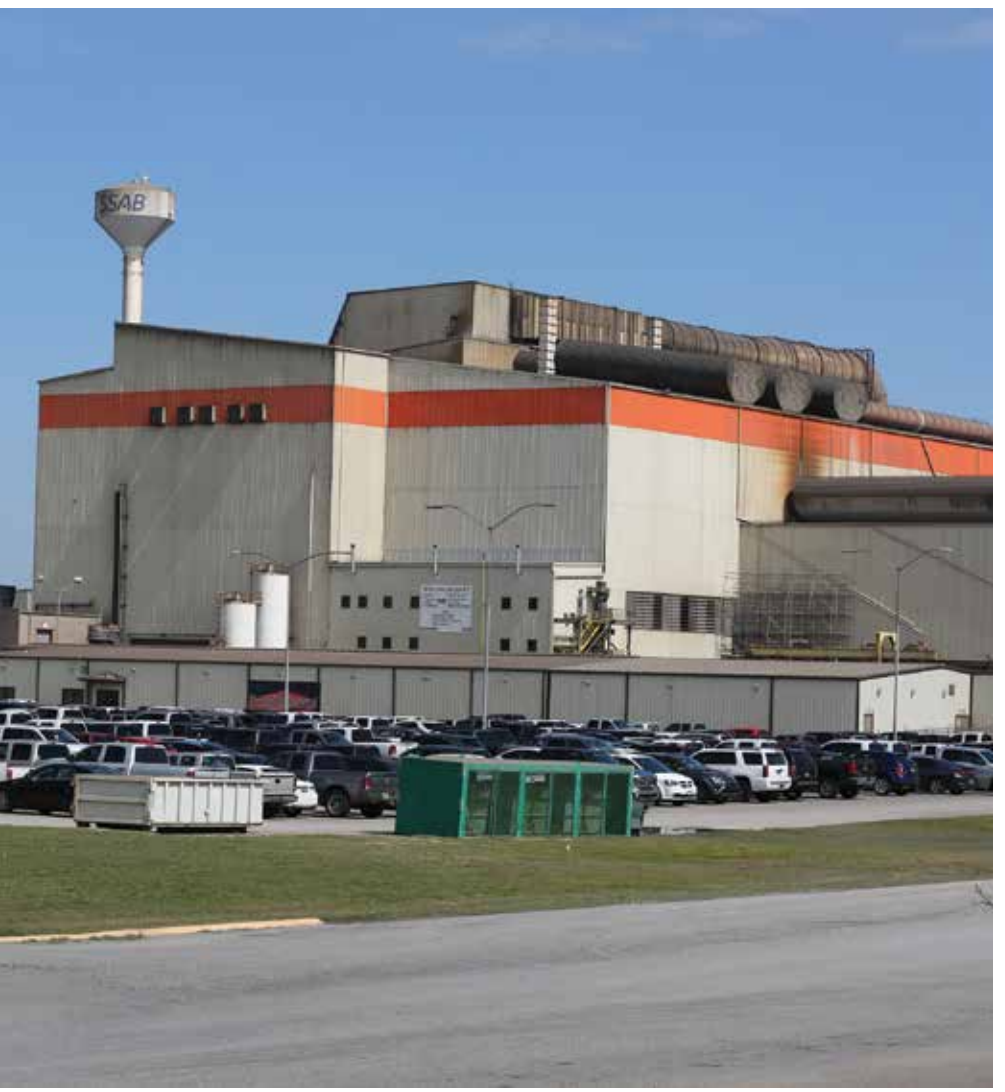
Alabama Colleges and Universities



SWEDISH STEEL MAKES ALABAMA ITS NORTH AMERICAN HOME

A leveling of trade inequities and improved steel demand are the foundation of a $100 million new investment in one of the premier electric-arc steel mills in the country — SSAB America's flagship in Mobile, the new company headquarters, after a move from Chicago.

BY JANE NICHOLES // PHOTOS BY MIKE KITTRELL



Worn-out cars, children's retired little red wagons and beaten-down bicycles are some of the sources of the scrap metal that turns into steel at the SSAB Americas mill in Axis in north Mobile County. It's a recycling plant of sorts.

"We do bring a lot to the environment," says Tom Toner, vice president of operations for SSAB. "It's a cleaner, friendlier, more efficient operation."

And with a planned investment of up to $100 million in the mill and the relocation of corporate headquarters from the Chicago area to the RSA Battle House Tower, Toner says, Mobile County is becoming the flagship of the SSAB Americas division of the Swedish steelmaker.

Basically, SSAB uses scrap metal rather than the more traditional iron ore to make stronger but lighter steel plates and coils that eventually are used in new automobiles, trucks, ships, cranes, tractors, booms and bridges among other heavy

The enormous SSAB mill in Axis, on the Mobile River. Scrap metal arrives by truck and barge, makes its way to the mill's electric arc furnace and emerges ready for a new assignment.

duty items. The $100 million investment will go into improved technology rather than a physical expansion of the plant, although administrative offices also are being built near the Axis mill.

"The overall output of the mill does not increase. We will just be able to make more of the higher-value, high-strength steel than we currently can," Toner says.

About 600 people work at the mill. It operates 24/7, shutting down one day each month for maintenance. Sixty corporate jobs are in the process of being moved to Mobile, while up to 50 more may be added as a result of the upgrades in Axis.

It's all a result of what once was considered a gamble by the steel industry, according to Chuck Schmitt, president of SSAB Americas. At the time, older plate mills using older technology were going out of business in Alabama and in the rest of the country.

"Over time we really grew our product mix, and we're making new plate products today that no one ever thought a steel mill could back 15 or 20 years ago," he says. "We placed a big bet on the technology, a big bet on the location to Mobile."

SSAB Americas runs two plate and coil production steel mills, the one in Axis and one in Montpelier, Iowa. There are three cut-to-length facilities in St. Paul, Minnesota; Houston, and Toronto. The corporate headquarters had been in Lisle, Illinois, some 25 miles west of Chicago.

"When I walked around our corporate office in Chicago, I was a bit shocked at the number of people that had not been to our steel facilities, weren't terribly acquainted with exactly what we do and how we make money in this business," Schmitt says.

SSAB executives considered a completely new location, but Schmitt says an important consideration was being somewhere where they would be more directly engaged with their products.

"We've had quite a bit of success on our investment in Mobile up to now that we thought we could leverage. Once we engaged the city of Mobile and the chamber and the state of Alabama, we found a very receptive audience in terms of promoting our company and the pride of our company."

The Axis mill was the more technically advanced of the two, and transportation options were more flexible. Transportation was a crucial factor. Finished products can be trucked out, shipped by rail, barged by river or shipped overseas through the Port of Mobile.

"We have a growing business globally, as well as out of Mobile," Schmitt says. "We enjoy that flexibility. We transfer a lot of our products from Mobile to other operations, whether to Houston, Iowa, Minnesota, Canada and so forth. We rely very much on the ease and availability of transportation in Mobile."

More than half of the corporate employees have agreed to move to Mobile, as SSAB has worked on selling the area to its existing staff and their families.

SSAB's environmentally friendly reputation is a national one. In three of the last four years — 2015, 2017 and 2018 — the company won the American Metal Market Award for Steel Excellence in Environmental Responsibility/Stewardship.

So how does scrap metal get recycled into steel?

According to Toner, about 200 tons of scrap metal at a time from those junked cars, wagons, bikes and such is

SSAB is investing $100 million in the Axis mill, where tons of scrap steel is transformed by electric arc furnace into stronger, lighter steel plates and coils — ready to be made into new automobiles, ships, cranes, bridges and more.

Top Right: Chuck Schmitt, president of SSAB Americas, which just moved its North American headquarters to Mobile.

put into the mill's electric arc furnace to be melted into 180 tons of liquid steel. The traditional iron ore blast furnace used in steelmaking creates considerable air pollution, and the entire process is less efficient. The electric arc furnace is much less expensive to operate and more flexible in its operations when orders are slow, Toner says.

Liquid steel goes into a caster that resolidifies it into six-inch thick slabs of steel. In turn, the slabs go into a rolling mill that rolls it into various thicknesses. The finished product is usually a plate but can also be a coil of steel. The process takes four to five hours.

The Axis mill has the ability to quench and temper steel, which creates a stronger product via heating and rapid cooling. The Iowa mill does not have that capability, Toner says.

The planned upgrade includes installation of a new accelerated cooling system. All the changes are scheduled to take place between 2019 and 2021, but exactly what will be done and when depends on customer needs and other factors.

Toner calls the technology involved "the latest and greatest." He says the original design of the Axis mill helped position it to move forward now.

"Over in Sweden — I was in production operations — they've been making these type of products for many, many, many years. So they played an integral part in the design of that facility, because they've had years and years of experience that we didn't have at the time," Toner says.

The proposed improvements will increase the mill's capacity for high-strength steel production by 130,000 metric tons a year.

While an economic incentive package was provided by state and local governments for the headquarters relocation, discussions are ongoing about possible incentives for the potential $100 million investment.

The equipment purchases and further advances in technology are factors, in addition to what customers in both the United States and globally want, Schmitt says. Global trade issues may also have an impact.

"We've come out of a tough period a couple of years ago for all steel companies. There's been a better economy, a lot of trade talk," he says.

"I won't necessarily get into the gory details of all of that. But with the improvement in the economy, a better steel demand than we've seen in quite some time and with some of the trade actions that have identified companies that have been dumping in the U.S. and North America and not playing by the rules, and some of those restrictions being put in place today, have improved our opportunities.

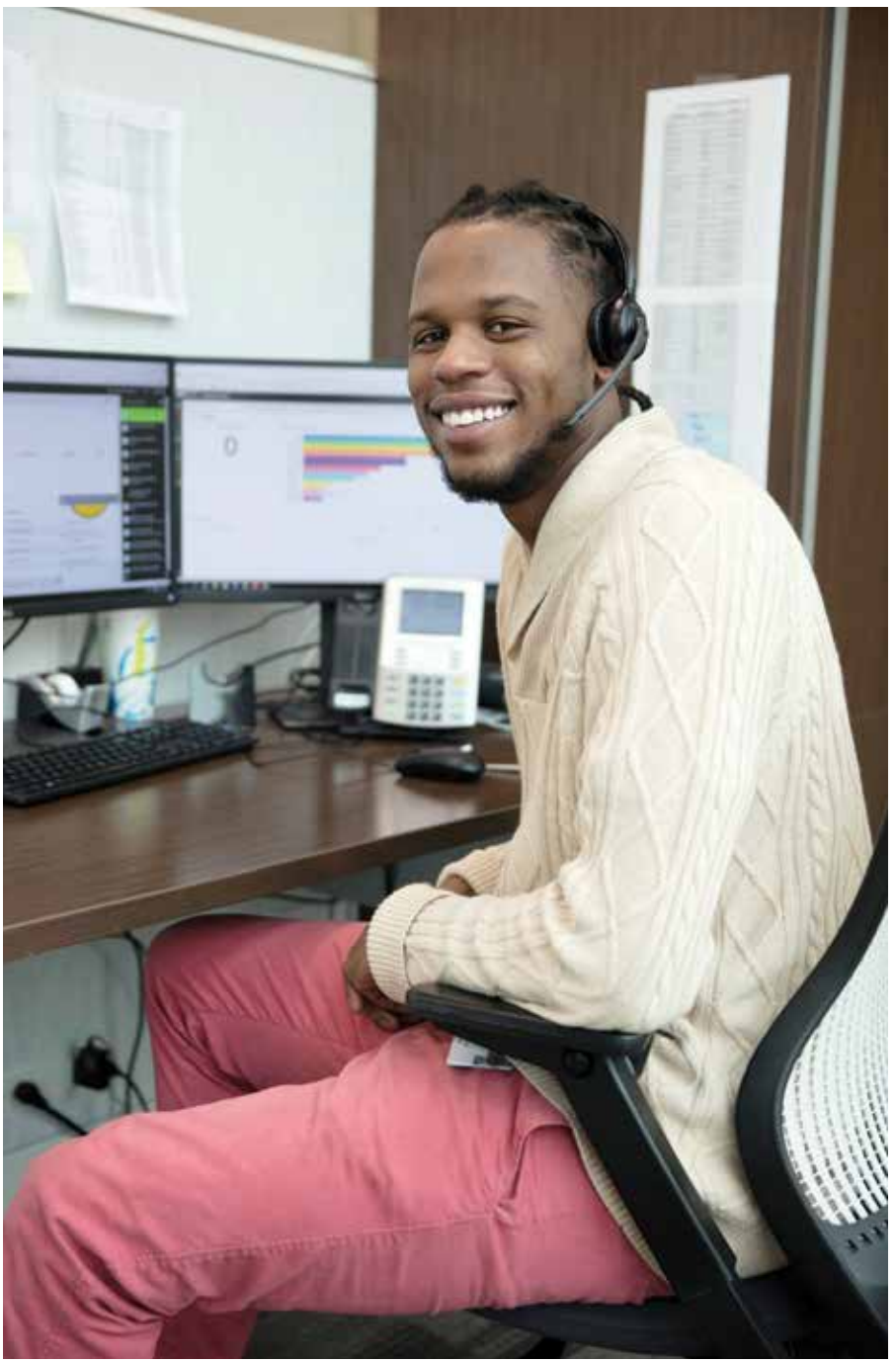
"We think both now and certainly through 2019 and the future that we're set up for a pretty good run, to outperform most of our competition."

This story originally appeared in April 2019 Business Alabama.

Opportunity Zones IncentivesEnhanced

Alabama has boosted the incentives offered by the federal government for investments in economically disadvantaged areas.

BY CHRIS McFADYEN // PHOTO BY CARY NORTON



Alabama Opportunity Zones will open a gateway to knowledge-based jobs, such as the IT position that Allanté Jowers earned at the University of Alabama at Birmingham, through an earlier workforce program developed by Innovate Birmingham.

The Opportunity Zones program is a new alternative economic development program, established by Congress in the Tax Cuts and Jobs Act of 2017, to foster private-sector investments in low-income rural and urban areas.

There are 158 qualified Opportunity Zones in Alabama, at least one in each of the state's 67 counties, and Alabama has enhanced federal incentives through the Alabama Incentives Modernization Act, enacted in 2019.

Alabama boosts opportunity zone impact with aligned state-level capital gains tax benefits, potential state investment and impact investment tax credits to lower investment risks. Communities, developers and businesses benefit from positive community impact. The state benefits from the ability to steer investment for more equitable, high-impact growth. The AIM Act enhances opportunity zones by:

- Offering opportunity zone investors the same capital gains tax cut allowed by federal law.
- Investing at least $135 million in Alabama's opportunity zone funds.
- Guaranteeing minimum returns on investment via $50 million in tax credits.
- Returning excess profits to the state.

To take advantage of these benefits, investors either contribute to existing Opportunity Funds or create one by applying through the Alabama Department of Economic and Community Affairs. ADECA uses a three-pronged test to evaluate applicants:

- Capacity: Does the fund have the ability to raise capital? Do they have management experience? Is their project concept strong? What are their anticipated returns? Can they track impact? Can they garner strong community engagement?
- Impact: Is the project community-oriented? Does it create living wage jobs? Will it aid in blight remediation or urban revitalization? Does it prioritize a rural area? Technology or advanced manufacturing? Workforce training? Affordable housing? Does it have a substantial social, environmental or economic impact?
- Alabama-based: Are at least 75 percent of the applicant's projects located in Alabama?

More information about Opportunity Zones in Alabama is available at: OpportunityAlabama.com.

PORT OF HUNTSVILLE

Huntsville has historically been the hub of Alabama aerospace enterprise — the builders of spacecraft — but Huntsville also sets the pace for using aircraft to get things and people from one place to the other in record time. Now, these two meet, with Huntsville International Airport continuing to work towards landing Sierra Nevada Corp.'s Dream Chaser spacecraft on one of their commercial runways. This would make the first commercial airport to land a vehicle from space be right here in Alabama.

HSV celebrated 50 years of operation in October 2017, however, Huntsville International Airport is not content to rest on the laurels of reaching this milestone, but rather is proactively looking to the future as innovators and visionaries. Since its inception in 1967, the airport has grown to more than 7,300 acres, which makes it one of the largest commercial airports in the Southeast United States. The Port of Huntsville has three key units — the Huntsville International Airport (HSV), International Intermodal Center and Jetplex Industrial Park.

Passenger service is provided by five commercial airlines (American, Delta, United, Frontier and Silver). HSV has more than 65 flights per day and ten nonstop destinations. More than 1.2 million customers are served annually.

The airport features two parallel runways — 12,600 feet, which is the second-longest runway in the Southeast U.S., and 10,000 feet. It also has 2.3 million square feet of air cargo ramp space. As of 2018, HSV ranks as the 17th largest international air cargo airport in the continental United States. Cargo carriers located at HSV are Atlas Air, Cargolux Airlines, Federal Express, DSV-Panalpina and UPS. This high-tech air cargo market is served by domestic and international all-cargo carriers. Weekly international nonstop is available to Europe, Mexico, Hong Kong and Sao Paulo, Brazil.

The Huntsville Airport Authority began promoting its cargo capacities in the early 1980s, with an air cargo ramp that had 50,000 square feet of cargo space. Those efforts culminated in a rail intermodal facility in 1986. The International Intermodal Center celebrated 30 years of serving the region in April 2016 and today provides a single-hub location that delivers world-class, multimodal (rail, air and highway) services and facilities. Nationwide rail service is provided by Norfolk Southern.

HSV currently owns three air cargo buildings totaling close to 300,000 square feet of warehouse and office space adjacent to 2.1 million square feet of ramp area. In 2018, HSV completed construction on a 18,750-square-foot perishables facility. Combined with two existing cold

The airport's International Intermodal Center provides a single-hub location that delivers multimodal services and facilities.

storage units of 5,250 square feet and 11,000 square feet, HSV now has 35,000 square feet of cold storage space. To date, Huntsville International Airport's investment for air cargo growth is $212 million with $52 million planned in future expansion. This brings investment to a total of $264 million towards air cargo growth.

In 1990, Swiss-based international carrier Panalpina (now DSV-Panalpina) opened operations in Huntsville with one 747 flight a week, gradually adding flights over the years. Panalpina will celebrate 30 years of operation at the Port of Huntsville in 2020. They operate the only non-stop 747-8 freighter international air cargo service in the State of Alabama to Europe, Mexico, Asia and South America. These markets are currently served with 7 to 10 flights weekly.

Panalpina also provides fully integrated and customizable supply chain solutions at its U.S. hub in Huntsville. Panalpina's Huntsville Logistics Center serves many of the company's largest hi-tech customers in healthcare and the chemicals industries with temperature-controlled storage and transport capabilities. Advanced warehouse services, customizable IT enhancements and direct access to its road feeder service in Huntsville allow Panalpina to also provide last-minute solutions for needs of all customers.

The Port of Huntsville completed upgrades that make it operational for Group VI aircraft. Both the 12,600-foot west runway and 10,000-foot east runway meet requirements set for the 747-8s. While the 747-8 has a payload increase of 16 percent over the 747-400 model, it has substantial reductions in fuel burn, noise and CO2 emissions. This Group VI aircraft boasts a 224-foot, 7-inch wingspan and measures 250 feet, 2 inches from nose to tail. The new model is 18.3 feet longer and 13 feet wider than the earlier 747 models.

"Huntsville International Airport is part of a small group of U.S. airports that have been FAA-certified to support these 747-8s," said Dr. Carl Gessler Jr., Huntsville- Madison County Airport Authority board member. "We share this distinction with cities like Miami, New York, L.A. and Chicago. Considering the size of our community as compared to the others on the list, this truly is an accomplishment for our region."

For more information, visit the port's website at www.flyhuntsville.com.

Huntsville International Airport is the 17th largest international air cargo airport in the continental United States. Swiss-based DSV-Panalpina celebrates 30 years of operation at the Port of Huntsville in 2020.

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Like an airport duty-free shop, Foreign Trade Zones offer businesses a place for international trade without the encumbrance of tariffs — a level playing field with international competitors.

The U.S. Department of Commerce designates FTZs, mostly near ports and major industrial sites. The designation allows companies within the zones to import foreign goods without paying any duty, store them, mix them with domestic parts, and convert them into new products for sale here or abroad.

Until goods leave the FTZ, they technically have not been imported into the United States.

As trade wars escalate and new tariffs abound, U.S. manufacturers have looked more than usual to the potential benefits of FTZs, trade consultants say.

The National Association of Foreign Trade Zones estimates in a 2019 statement that merchandise received at FTZs was valued a $669 billion, mostly from domestic sources. Exports from FTZs were up more than 15 percent in 2017, to $87.1 billion — accounting for two-thirds of all U.S. exports. Research firm Trade Partnership performed the study for NAFTZ.

Five of Alabama's major cities — Mobile, Huntsville, Birmingham, Montgomery and Dothan — have an FTZ. State economic development officials estimate that 12,000 workers are employed in FTZ companies, making $1 billion worth of products that are later sold overseas. Autos, ships, oil and chemicals are among the key products.

Recent additions include sites for Airbus Americas in Mobile, MH Wirth Inc. in Theodore, Toyota Motor Manufacturing Alabama in Huntsville and Outokumpu Stainless in Calvert.

QUICK FACTS ABOUT ALABAMA'S FIVE MAJOR FTZS

Mobile: Administered by the City of Mobile, the southernmost FTZ covers 9,848 acres in several locations. Several international firms are located within the FTZ, while Evonik Degussa, Austal USA and Shell all benefit from smaller business-based subzones. The Mobile zone also has four sites in Baldwin County.

Huntsville: FTZ facilities are clustered on 1,700 acres around the intermodal center, plus another 1,000-acre complex at Mallard Fox Creek Industrial Park and the Port of Decatur. DaimlerChrysler has its own subzone in the Huntsville group, as do VF Jeanswear, General Electric and Toyota Motor Manufacturing Alabama.

Birmingham: Birmingham's FTZ is scattered over seven sites including parts of AirportNorth/Northeast Industrial Park, Shaw Warehouse facilities, ACIPCO industrial area, Oxmoor Industrial Park, Birmingham International Airport's air cargo facility, and Munger/Valley East. Industrial giant Mercedes-Benz has its own subzone in Vance, as do ZF Industries, JVC America and NACCO Materials Handling Group Inc.

Montgomery: Montgomery has more than 5,000 acres in four sites — near the airport and I-65, along the northern and eastern bypass, at the Airport Industrial Commercial Park and at Montgomery County Technology Park. Montgomery also has subzones for Hyundai Motor and Quantegy Inc.

Dothan: Dothan has six sites in its FTZ, with no industry-specific subzones. Dothan's international commerce is handled by the airport and the port of Panama City, Florida.

Freight is unloaded from a Panalpina cargo plane at the 1,700-acre foreign trade zone at the intermodal center of the Huntsville International Airport. *Photo by Tyler Brown*

ALABAMA STATE PORT AUTHORITY

Alabama's deep-water seaport, at the Port of Mobile, is located just 32 miles from the Gulf of Mexico and handled more than 58 million tons of cargo in 2018, making it the 10th largest U.S. seaport in total trade (U.S. Army Corps of Engineers Waterborne Commerce Statistics). The full-service public seaport terminals are owned by the Alabama State Port Authority and are served by major ocean carriers transiting today's global trade lanes. In 2018, the Journal of Commerce named the Port of Mobile as one of the top five fastest growing container ports in North America.

APM Terminals' and the Authority's continued investments support traditional markets and new emerging growth markets, including retail distribution, refrigerated products, and advanced manufacturing in aviation and energy. In 2018, MTC Logistics broke ground on a state-of-the-art, temperature-controlled, international distribution center that will be completed by year-end 2020. The new facility is located outside the gates of the container terminal and provides shippers with 12 million cubic feet and 40,000 racked pallet positions for handling refrigerated cargoes. The facility will also offer a comprehensive suite of services including blast freezing, port drayage and LTL Consolidation. Also in 2018, CMA CGM inserted 8,500+ TEU capacity vessels into its direct Asia service. This is the second Post-Panamax vessel to service the port providing both capacity and economies of scale for shippers. Further, Alabama's metallurgical coal exports are surging to support global steel production. Construction has also begun on a new automotive logistics investment. The $60 million finished automobile terminal will provide a world-class RO/RO processing and handling facility by early 2021, to support North American automotive original equipment manufacturers (OEMs). The Port Authority's new terminal will be operated by Terminal Zarate S.A., a Murchison Group company, one of the largest finished automobile terminal operators in the Americas.

With over $1.2 billion invested to date in public port facilities, the Port of Mobile ranks as the second largest steel and third largest coal port in the nation.

In September 2019, the U.S. Army Corps of Engineers issued its Record of Decision to deepen the Mobile Harbor to 50 feet. The project also includes a channel widener to provide for vessel transit efficiencies in and out of the port. Engineering and design is underway and construction should begin in late 2020, with project completion scheduled for 2024.

Updated coal handling facilities at McDuffie Coal Terminal have solidified the Port of Mobile as the third largest coal handling port in the nation.

ROADS

The public terminals are connected to two interstate systems (I-10 and I-65) and U.S. Highways, including US90, US98, US43 and US45.

WATERWAYS

Extending from the deep-water port terminals are more than 1,200 miles of navigable waterways in Alabama, among the most of any state in the nation, with lock and dam structures along the Tennessee-Tombigbee Waterway, Black Warrior, Coosa-Alabama and Tennessee rivers that provide access to not only Alabama's heartland but also to the Tennessee and Ohio valleys and the Great Lakes. The Port of Mobile is also accessible to the Gulf Intracoastal Waterway, providing coastal connections from Texas to Florida.

RAIL, AIR AND HIGHWAY ACCESS

Five Class 1 railroads access the port — Burlington Northern/Santa Fe/Alabama & Gulf Coast Railroad, CSX Transportation, Canadian National, Norfolk Southern and Kansas City Southern. Port linkage is provided by the Alabama State Port Authority's Terminal Railway. The Port is also served by the Alabama & Gulf Coast Railroad (AGR) and the CG Railway. The CG Railway's unique service provides shippers railed cargo via ship to Mexico's Veracruz region. The seaport is located approximately 4 miles from the Mobile Aeroplex at Brookley, which is home to Airbus's assembly line for its A320 aircraft family with a second line for A220 aircraft under construction. Mobile Aeroplex also serves as the region's air cargo terminal, with daily service provided by UPS and FedEx.

GENERAL CARGO

The Alabama State Port Authority offers 31 general cargo berths, with approximately 2.4 million square feet of open yards adjacent to piers and railroad tracks, and more than 2.6 million square feet are under roof. The general cargo facilities also feature heavy-lift terminals, along with a heavy-lift crane capable of lifting cargo up to 400 tons from ship to barge, rail, truck or specialized carrier. Other facilities include a freezer terminal, a cement terminal, a grain terminal and three RO/RO berths, all of which can accommodate vessels up to 40-foot draft.

STEEL

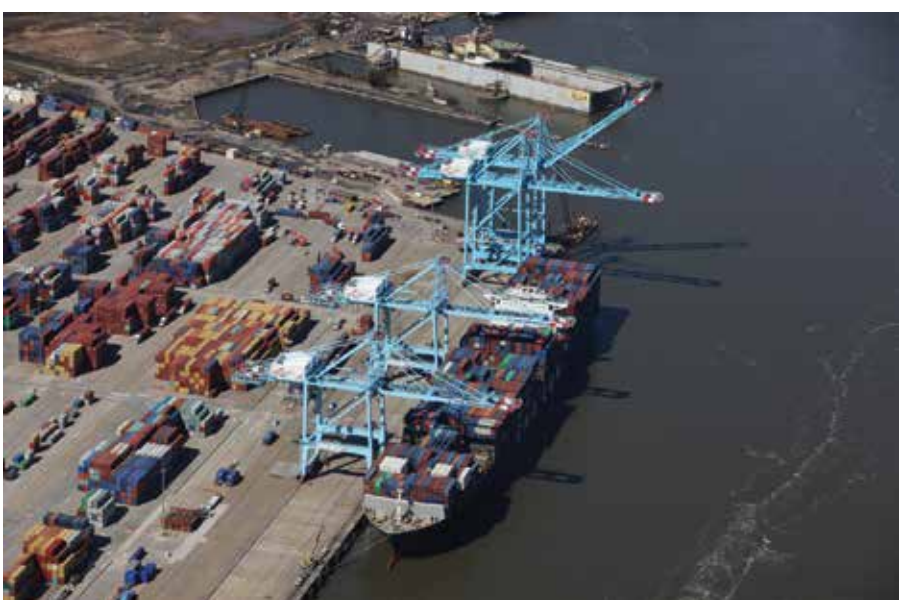
Investments in the Authority's steel handling facilities are contributing to Alabama's rapid growth in the steel market. The automated Pinto Terminal applies innovation and technology to meet its 5 million ton annual throughput capacity. The terminal has a 45-foot draft, a 1,050-foot-long ship berth, an automated barge handling system and a slab storage yard. Pinto Terminal is equipped with three post-Panamax gantry cranes, which are the first in North America to use magnet technology in a ship-to-shore cargo handling operation. At the port, stainless and carbon steel coils are handled through a state-of-the-art, multi-modal steel coil handling facility. The assets include a 178,200-square-foot warehouse equipped with four 50-ton bridge cranes, an adjacent 168,000-square-foot open yard and supported by integrated technology that provides shippers real time cargo data and tracking. Another key steel terminal investment includes a $26 million modernized Pier C North terminal to handle both inbound and outbound carbon and stainless steel articles.

COAL

The McDuffie Coal Terminal is the most versatile facility in the nation, with import/export handling capability to ship, barge and rail transportation. More than $150 million has been invested and export throughput can reach to 16 million tons annually. Overall investments at McDuffie have generated annual import and export throughput capacity to 30 million tons.

APM TERMINALS MOBILE/ CONTAINER INTERMODAL INVESTMENTS

The recently completed Phase 3 yard expansion added twenty acres. Phase 3 improvements also include a 400-foot dock extension and a fender system that support 14,000 TEU class vessels. The dock extension will be completed by February 2020. The latest expansion compliments two new Super Post-Panamax and two Post-Panamax ship-to-shore gantry cranes, bringing the terminal's capacity to 650,000 TEUs (20-foot equivalent units). Maersk, China Shipping (CSCL), CMA CGM, COSCO, Evergreen, Mediterranean Shipping Company (MSC), OOCL, and ZIM provide weekly ocean carrier services on most trade lanes. The container terminal is part of the Authority's 380-acre Choctaw Point container intermodal project, which includes an intermodal rail transfer facility and development land for logistics. The intermodal container transfer facility (ICTF) is served by the Canadian National and is accessible to all



New Post-Panamax and Super Post-Panamax ship-to-shore gantry cranes load and unload containerized cargo, giving the terminal a 650,000 TEU capacity.

LARGER SHIPS
Welcome

THE PORT
Alabama State Port Authority
www.asdd.com

five Class I railroads serving the Port of Mobile.

RAIL FERRY TERMINAL

The Authority's Terminal Railway operates a rail ferry terminal that provides rail shippers twice weekly sailings into the Veracruz region of Mexico. The CG Rail Terminal is the first of its kind, with a twin-deck design for quicker loading. The ships can haul 120 standard rail cars per voyage without loading and unloading cargo, shaving nearly two weeks off the typical rail services into Mexico. The service provides four-day rail service between Mobile and Coatzacoalcos, Mexico.

TERMINAL RAILWAY

The Port Authority's Terminal Railway (TASD) is one of the nation's largest port authority-owned railroads, providing switching service for seven railroads serving the port authority's terminals. It handles more than 158,000 revenue-producing rail cars annually and maintains more than 75 miles of track and eight locomotives. The Terminal Railway serves the general cargo and over-dimension cargo berths, McDuffie Terminal, and private industries located as far north as the Port of Chickasaw and as far south as the Alabama State Port Authority's Intermodal Container Transfer Facility (ICTF).

INLAND PORT FACILITIES

To take full advantage of Alabama's waterway system, which comprises nearly 1,500 navigable inland barge miles, the Alabama State Port Authority owns 9 inland dock facilities that can be served by either barge or rail. The facilities are located throughout the state's river systems — at Bridgeport, on the Tennessee River; Demopolis, Tuscaloosa/Northport and Cordova on the Warrior River; Selma and Montgomery on the Coosa Alabama River; Columbia and Eufaula on the Chattahoochee River, and at Axis on the Mobile River.

PORT FACTS - 2019*

(Fiscal Year ending September 30, Extrapolated Volumes)

Acreage: 4,000
Number of Berths: 41
Channel Depth:
45 Feet in the lower harbor
40 Feet in the upper harbor
Warehousing and Open Yards:
4.8 million square feet
Number of vessel calls: 1,611
Tonnage: 26 million
Containers: 387,328 TEUs
Imports: heavy lift and oversized cargo, containerized cargoes, thermal coal, aluminum, iron, steel, copper, woodpulp, plywood, fence posts, veneers, automotive components, frozen fish, furniture components, retail goods, cement and chemicals
Exports: metallurgical coal, heavy lift and oversized cargo, containerized cargoes, iron, carbon and stainless steel, automotive components, lumber, plywood, woodpulp, OSB, laminate, flooring, roll and cut paper, iron, steel, frozen poultry, soybeans and chemicals

ALABAMA ECONOMIC DEVELOPMENT INCENTIVES

"Alabama has one of the most competitive business climates in the nation," says the Alabama Department of Commerce. And the fact that tax incentives are statutory — part of the state's Constitution and Codes — "gives industry a stable framework for long-term investment."

Citing Alabama's tax burden as among the lowest in the nation, the Economic Development Partnership of Alabama says, "Alabama is one of a small number of states that allow a full deduction of federal taxes paid from state income tax liability."

That provision drops an actual 6.5 percent corporate tax rate to an effective rate of 4.5 percent.

In 2019, the Alabama State Legislature approved new incentives designed to attract tech-based companies and entrepreneurs, boost rural development and enhance opportunity zones.

Here's a quick look at these new features:

BUILDING RURAL COMMUNITIES

• Population ceiling raised to 50,000
• Job quota dropped from 25 to 10, as long as the project includes at least $2 million in capital investment
• Jobs Act Investment Credits extended 15 years for all beneficiaries
• Sale of Jobs Act Investment Credits enabled to banks and insurance companies
• Growing Alabama Credit available to industrial parks, inland ports, intermodal facilities and Alabama Farm Center

RECRUITING TECH COMPANIES

• New job quota dropped from 50 to 5
• Percentage of wages available for additional jobs fees raised to 5 percent
• Sale of Jobs Act Investment Credits enabled to banks and insurance companies
• Growing Alabama Credit made available to tech accelerators, research parks and marketing for STEM workers
• Some capital gains taxes eliminated for some tech companies moving to Alabama

ENHANCING OPPORTUNITY ZONES

By investing in an Opportunity Fund or creating a new one, investors can take advantage of state investment.

Here's a quick look at major tax incentives and credits:

JOBS ACT INCENTIVES

• **Jobs Credit.** Annual cash refund up to 3 percent of the previous year's gross payroll for up to 10 years, with additional credits for companies employing many veterans or in targeted counties.
• **Investment Credit.** Credit of up to 1.5% percent of the qualified capital investment costs for up to 10 years.

ALABAMA REINVESTMENT AND ABATEMENTS ACT

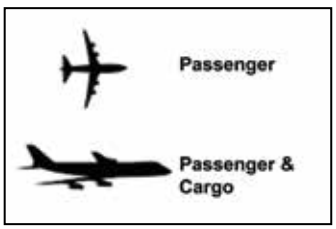
• **New Facility and Expansion.**
1. Abatement of non-educational portion of sales and use taxes on construction materials, and
2. Abatement of non-educational portion of property tax for up to 20 years.
• **Existing Facility:** Refurbishments, Upgrades, or Placed Back in Service.
1. Abatement of non-educational sales and use taxes on construction materials and equipment
2. Abatement of non-educational property taxes for up to 20 years of the incremental property tax increases
3. Exemption from taxes for increased utility services for up to 10 years, and
4. AIDT worker training.
• **Property Tax Abatement.** New and expanding businesses can abate all of the state and local non-educational portion of the property taxes on all real and personal property incorporated into a qualifying project, for up to 20 years, 30 years for data centers.
• **Sales and Use Tax Abatements.** Companies can abate all state and the local non-educational portion of the sales and use taxes on the acquisition, construction and equipping of a qualifying project. Data processing center projects can receive an extended abatement.
• **Full Employment Act Credit.** Employers with less than 50 employees are eligible for a $1,000 nonrefundable income tax or financial institution excise tax credit for each qualifying job created.
• **Heroes for Hire Credit.** A $1,000 nonrefundable income tax or excise tax credit for hiring a qualifying veteran.
• **Net Operating Loss Carryforward.** Companies may carry forward any operating losses for up to 15 years.
• **Alabama Enterprise Zone Credit.** Credits and exemptions for businesses locating in depressed areas of the state.
• **Income Tax Education Credit.** Tax credit for 20 percent of the cost of an employer-sponsored program to improve basic skills though high school level.

Here's a look at financing incentives:

• **Industrial Development Grants.** Local governments and authorities can receive state grants to help businesses with the cost of site preparation for industrial, warehousing and research firms or headquarters facilities.
• **Industrial Revenue Bonds.** Tax-exempt bonds up to $10 million can be issued for land, building acquisition, construction and some other costs.
• **Alabama Infrastructure Grant Program.** Helps finance water, sewer and roads.
• **Alabama Industrial Access Road and Bridge Program.** Helps finance the roads and bridges to industrial projects.
• **Certified Capital Company Program.** Provides financing for projects considered to be too risky for conventional financing.

More Information: Alabama Department of Revenue, Alabama Department of Commerce and other state agencies.

ALABAMA COMMERCIAL AIRPORTS



MAJOR ALABAMA HIGHWAYS

Source: Center for Business and Economic Research, The University of Alabama

bhm

flybirmingham.com

$1,000,000,000 in Annual Economic Impact

It's good business for our city when you fly Birmingham.

Cities Served Nonstop

Atlanta (ATL)
Baltimore-Washington (BWI)
Charlotte (CLT)
Chicago Midway (MDW)
Chicago O'Hare (ORD)
Dallas Love Field (DAL)
Dallas/Fort Worth (DFW)
Denver (DEN)
Detroit (DTW)
Fort Lauderdale-Hollywood (FLL)
Houston Hobby (HOU)
Houston Intercontinental (IAH)
Las Vegas McCarran (LAS)
Miami (MIA)
New York LaGuardia (LGA)
Orlando (MCO)
Philadelphia (PHL)
Tampa (TPA)
Washington National (DCA)

ALABAMA MAJOR RAIL SERVICE

Alabama offers
4,728 miles ~ 7,608 kilometers
of railroad track serviced by
five Class I railroads

- Federal Interstate Highway System
- Burlington Northern
- CSX Transportation
- Kansas City Southern
- Norfolk Southern
- Canadian National

ALABAMA'S WATERWAY SYSTEM

Source: Alabama State Data Center, Center for Business and Economic Research, The University of Alabama.

ALABAMA DEPARTMENT OF COMMERCE

Alabama's lead economic development agency

Alabama's economic development efforts focus on creating jobs that provide meaningful, long-lasting opportunities for citizens while attracting investment that injects vitality into communities across the state. Leading this push is the Alabama Department of Commerce, which coordinates and supports the strategic efforts of its partners and allies across the state to secure new capital investment and jobs. Under the direction of Secretary Greg Canfield, Commerce's project managers maintain a global outlook as they build relationships and pursue economic development projects that can make a difference to Alabama's future. Commerce also plays a critical role in the state's workforce development efforts, which ensure that businesses operating in Alabama have the highly motivated, skilled workers they need to succeed.

Commerce and the Alabama economic development team have a long track record of winning game-changing projects that expand opportunity and add new dimensions to the state's economy. In recent years, this team has worked with an expansive roster of industry leaders, including Boeing, Airbus, Lockheed Martin, Facebook, Google, Amazon, and global automakers including the Toyota-Mazda partnership. In 2018 alone, economic development activity in Alabama attracted more than $8.7 billion in new capital investment, including $4.2 billion in foreign direct investment. Both are record annual totals for the state. As a result, Alabama's economic development team has received numerous awards, and site-selection consultants consistently recognize Alabama as a top state for doing business.

Alabama's updated strategic economic development growth plan, called Accelerate Alabama 2.0, reflects a robust focus on recruiting knowledge-based jobs in activities such as R&D, engineering and design, as well as a greater alignment with the state's seven research universities. By outlining a clear set of objectives, Accelerate Alabama introduced a framework for economic development when it was launched in 2012. Since then, Alabama has seen a high level of economic development activity, with companies announcing projects involving roughly 122,000 jobs and $36 billion in new capital investment

Gov. Kay Ivey (center) joins Hyundai Motor Manufacturing Alabama officials to celebrate the company's investment of $388 million in a new SmartStream engine line at the multi-billion-dollar Montgomery plant.

In addition, Commerce is tightly aligned with the state's primary non-educational workforce development initiatives, which serves to streamline the process for prospects. AIDT, the state's highly regarded job-training agency, remains at the core of Commerce's Workforce Development Division. Other state workforce programs are also part of the division, whose goal is to act as a comprehensive and convenient conduit for worker recruitment and training needs.

A critical Commerce objective is to identify prospects for partnerships that can broaden Alabama's economic base and create jobs for its citizens. Other objectives are to attract domestic and foreign investment, expand international trade and Alabama exports, facilitate small business growth, and attract film and entertainment projects to the state. Commerce has also strengthened its commitment to facilitating economic growth in the state's rural areas with the hiring of its first rural development manager.

KEY CONTACT

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BBA BIRMINGHAM BUSINESS ALLIANCE

BBA promotes economic growth in the seven-county Birmingham metro area

Birmingham, the largest city in the state, is a major driver of Alabama's economy, and the Birmingham Business Alliance's (BBA) work helps propel that momentum forward.

The BBA is the regional economic development organization for the Birmingham seven-county metro, which encompasses Bibb, Blount, Chilton, Jefferson, Shelby, St. Clair and Walker counties. Through its work in economic development, workforce development, public policy, innovation and technology, image enhancement, and business retention and expansion, the BBA fosters a climate in the region where business can boom.

The region had a record-breaking year in economic development in 2018, with upwards of 4,500 jobs and over $1 billion in capital investment announced. Driving these numbers were economic development successes like Amazon's $325 million state-of-the-art fulfillment center, expected to employ more than 1,500, DC BLOX's up to $785 million investment in the region to build a data center, and Shipt's announcement it would keep its headquarters in Birmingham after its acquisition by Target and add 881 additional jobs.

Inside the Birmingham region is Alabama's largest employer, the University of Alabama at Birmingham (UAB), which has 23,000 employees, and the headquarters of Alabama's only Fortune 500 company, Regions Financial Corp. The region is home to over 1.1 million people who make up a diverse, motivated workforce that drives the regional economy.

Birmingham's economy is as diverse as its workforce. Historically, manufacturing, banking, insurance, health care, logistics and construction industries have been the region's most dominant business sectors. More recently, life science, technology and automotive have become major growth industries. Mercedes-Benz is completing three facilities in Bibb County, a Global Logistics Center, an After-Sales Hub and a battery plant that will supply Mercedes-Benz U.S. International's industry-changing electric vehicles, and Autocar opened its heavy-duty truck assembly facility.

State and local officials celebrate the grand opening of the DC Blox data center.

The BBA leverages Birmingham's greatest assets, including UAB, which annually conducts research funded at over $560 million, and Southern Research, a contract research organization with nearly 500 scientists and engineers who focus on drug discovery and drug development. Seven FDA-approved cancer drugs currently on the market were developed at Southern Research. Entrepreneurs thrive in Birmingham, home to incubator Innovation Depot, which houses more than 100 startups and is the Southeast's largest technology incubator.

fDi magazine named Birmingham one of its "American Cities of the Future" for its business friendliness, connectivity and emphasis on human capital and lifestyle. Indeed.com named Birmingham the No. 4 best city for job seekers where job seekers face the least competition for jobs, command the highest salaries, work at the highest-rated companies and face a low likelihood of unemployment.

The region is the headquarters of construction aggregates company Vulcan Materials Co.; national retailers Hibbett Sporting Goods and Books-A-Million; mining giant Drummond Co. Inc.; Blue Cross Blue Shield of Alabama; global life insurance provider Protective Life Corp., and many others. There are 80 international-based companies located throughout the region, and most of the workforce for two of the premier automotive assembly plants in North America — Mercedes-Benz in Vance and Honda in Lincoln — as well as a growing base of automotive suppliers, are located in the area. The region has a $64 billion GDP and a workforce that comprises over a quarter of Alabama's total employment.

The quality of life in the region is unmatched throughout the state. Since 2015, $1.2 billion has been invested in downtown Birmingham, creating a hub of nationally ranked restaurants and new apartments, condos, hotels and entertainment venues. The cost of living in Birmingham is an impressive 85 percent of the national average, which dropped six percentage points from the year prior, showing that Birmingham is a region that is constantly bettering itself.

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ADECA ALABAMA DEPARTMENT OF ECONOMIC AND COMMUNITY AFFAIRS

Managing economic incentives and community development grants

The Alabama Department of Economic and Community Affairs (ADECA) was created by the Alabama Legislature in 1983. Under the leadership of Kenneth W. Boswell, ADECA distributes hundreds of millions of dollars each year to Alabama cities, counties, non-profit organizations and others to support economic development projects, infrastructure improvements, job training, energy conservation, law enforcement, traffic safety, recreational development, assistance to low-income families and more. Community development leads to economic development, and all of ADECA's investments support the agency's mission to "Build Better Alabama Communities."

There are five ADECA divisions and numerous programs that focus all available resources to address a variety of local challenges.

Three ADECA grant programs are often used to help Alabama communities with economic development projects:

• Community Development Block Grants are funded through the U.S. Department of Housing and Urban Development and support local efforts to attract and prepare for new or expanding industries, rehabilitate neighborhoods, provide water and sewer services or fund other infrastructure improvements that support business development or enhance the quality of life. Many of the funds are awarded annually on a competitive basis, but a portion of the allocation is kept in reserve for economic development projects that help industries and businesses locate and expand in communities and provide jobs. In 2018, ADECA received a total of 114 competitive applications from small cities, large cities, counties and planning organizations across Alabama, and the agency awarded a total of 55 projects totaling nearly $17.8 million enabling local governments to address critical infrastructure needs. Seventeen grants, amounting to $4.8 million, were awarded through ADECA's economic development CDBG program. Those funds are used to supply infrastructure necessary for new businesses and industries to locate in a community and provide community jobs.

ADECA supplied a $200,000 CDBG Economic Development Grant to AGCOR Steel to build a plant in Cullman County. The grant supplied sewer services for the plant which relocated and expanded in Good Hope.

• Grants from the Appalachian Regional Commission (ARC) are awarded to encourage economic development and improve the quality of life of Alabamians living within 37 north Alabama counties considered part of the Appalachian Region. Projects that develop and improve infrastructure and support education, workforce development and community development are funded through the program. In 2018, $6.67 million was invested in 32 projects in ARC counties.

• Delta Regional Authority (DRA) is another state-federal partnership that encourages the development of new jobs and helps with basic community improvements in a rural region that includes 20 counties primarily in the Black Belt region of Alabama. In 2018, ADECA partnered with DRA to fund 10 projects totaling $2.1 million.

• Two recreational programs are managed by ADECA, the Land and Water Conservation Fund and the Recreational Trails Program (RTP), to fund parks and recreational facilities that attract tourists who boost local economies by patronizing hotels, restaurants and shops. Nine projects were funded in 2018 with the Land and Water Conservation Fund, representing $1.55 million in investments. The RTP invested $2.7 million for 11 projects in Alabama.

A new tool in Alabama's industry recruiting efforts are Opportunity Zones. Unveiled in 2018, the program establishes U.S. Census tract areas within each of Alabama's 67 counties where jobs are greatly needed. Industries and businesses locating within any of the 158 Opportunity Zones in the state are eligible for tax and additional incentives.

Alabama continues to move forward in its efforts to provide high-speed internet to rural Alabama with ADECA at the helm. The Broadband Accessibility Fund, established in 2018 by the Alabama Broadband Accessibility Act, has awarded $2.2 million to support 13 projects, bringing affordable high-speed internet to almost 2,000 households and businesses.

ADECA also helps manage the state's water resources, supports law enforcement and traffic safety efforts, and distributes state and federal surplus property.

KEY CONTACT

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AIDT ALABAMA'S WORKFORCE TRAINING AGENCY

Workforce development provided by AIDT is among the strongest incentives for businesses choosing to locate or expand in Alabama.

Alabama has one of the strongest workforce training programs in the world in support of Alabama's commitment to new and expanding industries.

AIDT has long been recognized among the nation's top workforce training programs by industry observers. AIDT's pre-employment training program holds an ISO 9001:2015 certification for quality and continuous improvement.

AIDT has assisted new and expanding companies in recruiting, selecting and training more than 700,000 job seekers. AIDT training produces a workforce that employers recognize for high performance achievement — a result of both the technical assessment and training AIDT trainees receive and the process by which they are selected.

From automotive to aerospace, logistics, warehousing and biomedical, AIDT researches and identifies the needs of each company served and uses that information to develop a full range of technical pre-employment selection programs customized to each company.

In a continued effort to meet the needs of industry, Alabama has embarked on an aggressive plan to open regional Workforce Centers of Excellence, managed and operated by AIDT. The Alabama Workforce Training Center in Birmingham is designed to meet the growing needs of companies engaged in the manufacturing and construction industries in north and central Alabama. The Montgomery Regional Workforce Training Center provides entry-level training, employee upgrade training, two-year technical college level training, and K-12 career training to adequately supply businesses with a trained workforce for the Montgomery region.

AIDT's Maritime Training Center, in Mobile

AIDT SERVICES INCLUDE:

• Identification of needed employee skills and knowledge, training criteria and curricula content definition, and required behavior and performance criteria the company expects of employees.

• Recruitment of trainee candidates for potential employment. AIDT interviews and enrolls applicants in training programs that are acceptable to the company.

• Program development, instructors, equipment, consumable supplies, and training aids such as manuals, workbooks and videos. All AIDT services are provided at no cost to trainees or employers.

• Pre-employment training. Job seekers who meet the selection criteria designed by AIDT and the employer are enrolled in job-specific training for detailed assessment of attitude, character, work ethic, literacy, teamwork and technical learning ability.

A division of the Alabama Department of Commerce, AIDT also provides leadership development, on-the-job training, industrial maintenance assessment and industrial safety assessment. Leadership development conducted by AIDT is designed to develop and retain quality leaders, improve retention and create loyal and dedicated employees. Industrial maintenance and safety assessment services help identify candidates best qualified for effective and efficient operations through corrective and preventive maintenance of equipment and processes.

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ATN ALABAMA TECHNOLOGY NETWORK

Experts in technical assistance and innovation work directly with Alabama's existing industry to increase productivity, profitability and competitiveness.

The Alabama Technology Network provides innovative technical assistance and training to Alabama businesses, enabling them to improve continually.

As part of the Alabama Community College System, the network's 19 sites are located at 15 community colleges and the state's three research universities — Auburn University, the University of Alabama and the University of Alabama in Huntsville. ATN's team of experts helps solve the needs of industry and business through innovative, sustainable, cost-effective solutions. ATN can conduct detailed needs assessments, outline potential solutions based on the results, and then provide technical assistance to help you solve those problems or identify those who can. Services include lean enterprise, quality services training, continual improvement methods, environmental health and safety training, industrial maintenance training, sustainability in manufacturing, and innovation engineering.

ATN is an affiliate of the National Institute of Standards and Technology's Manufacturing Extension Partnership, which provides hands-on assistance and training to smaller manufacturers. As the state's MEP, in FY2017 Alabama companies served by ATN reported with economic impacts as follows:

- Created and Retained Jobs: 1,464
- Increased/Retained Sales: $112.9 Million
- Saved Manufacturers: $26.1 Million
- Client/Workforce Investments: $37.7 Million
- Total Impact Exceeding: $176.7 Million

In addition to its training services, ATN partners in presenting the Alabama Manufacturer of the Year awards. These awards recognize the state's top manufacturers, in three size categories, for their accomplishments.

KEY CONTACT

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EDAA ECONOMIC DEVELOPMENT ASSOCIATION OF ALABAMA

An association of professionals committed to Alabama's economic development

Toyota Motor Manufacturing Alabama was one of many companies announcing expansions in 2019. David Fernandes (left) announced a $288 million investment to add engine lines at the Huntsville plant.

Economic development can have a multitude of meanings, but at its core, it is a collaborative effort between businesses, communities, organizations and government agencies. Since 1968, the Economic Development Association of Alabama (EDAA) has facilitated that collaboration in an effort to both attract new investment to the state and work to expand those companies that are located here. EDAA provides a forum for discussion of specific issues affecting economic development and provides programs, training and expertise to create successful development programs.

The EDAA membership of 500 consists of individuals involved in economic development from many different areas and disciplines. EDAA members are economic development professionals, attorneys, engineers, architects, state agency personnel, utility employees, bankers, contractors, real estate agents and educators, municipal and county officials.

A voluntary member association, EDAA conducts workshops and seminars covering the ideas, principles, practices and ethics of economic development. Most of the EDAA educational programs focus on enhancing the skills of economic development professionals by providing them with new tools to address the challenge of remaining one of the nation's top states in economic development. Additionally, EDAA works with other organizations in the state to improve Alabama's economic development environment. Strategic alliances with the Alabama Department of Commerce, Alabama Department of Economic and Community Affairs and the Economic Development Partnership of Alabama enable EDAA to provide its membership with substantive skills.

EDAA is diligent in addressing state and federal legislation and regulatory issues impacting economic development in Alabama. With a full-time lobbying presence when the Alabama Legislature is in session, EDAA is a leader in forming economic development policy and legislation for its members. Legislative efforts on the state level in recent years have seen EDAA lobby for competitive and sustainable economic development incentives, adequate funding for state recruitment efforts and worker training programs and to defeat legislation that would pose a threat to Alabama's economic development effort.

EDAA actively seeks innovative solutions to challenges that could negatively impact the state's economic development efforts. EDAA holds multiple networking opportunities, publishes a membership directory, conducts two major conferences each year, and holds quarterly workshops. EDAA is also a partner with Auburn University's Government and Economic Development Institute (GEDI) in conducting the Economic Development Leadership Institute.

Additionally, EDAA has partnered with the University of Alabama's Economic Development Academy to offer an Applied Economic Development Honors program. This program is specifically aimed at increasing the skills and abilities for those new to the profession.

The EDAA Leadership Institute represents a partnership between EDAA and GEDI to educate and engage elected officials, ED board members and other community leaders about key issues in economic and community development. For more information contact: EDAA (334) 676-2085

KEY CONTACT

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EDPA ECONOMIC DEVELOPMENT PARTNERSHIP OF ALABAMA

A private, non-profit organization, EDPA works with state, local and corporate allies to attract new investment, support existing business expansion and encourage innovative startups with high growth potential.

For more than 25 years, the Economic Development Partnership of Alabama has been a catalyst for economic growth in the state. During that time, the Partnership has been involved in Alabama's greatest economic development successes. A totally private, non-profit organization, EDPA is uniquely positioned to partner with state, local and private entities involved in Alabama's economic development efforts.

In 1993, EDPA assisted in the effort to attract Mercedes-Benz. EDPA provides services to businesses looking to locate in the state, encourages emerging business development and assists companies and communities that want to improve their competitive edge.

EDPA is supported by more than 60 leading companies from various sectors that are committed to the state's long-term economic growth. The organization's board of directors is comprised of top business leaders in Alabama.

By aligning its resources with the Governor's Office, the Alabama Department of Commerce and key state agencies and institutions of higher learning, EDPA works to market Alabama and to provide prospective companies a smooth site selection process and tools for a sustainable operation in Alabama.

EDPA actively assists companies searching for a location. Equally as important, EDPA works to provide resources and networks for existing industries and communities in Alabama.

EDPA has also led efforts to encourage innovation, commercialization and entrepreneurship. Alabama Launchpad, a program of the Economic Development Partnership of Alabama Foundation (EDAPF), helps high-growth companies Start, Stay and Grow in Alabama. Started in 2006, Alabama Launchpad is the state's largest virtual accelerator and early seed investor and drives innovation and job growth through startup competitions and ongoing mentoring for launching and growing businesses in Alabama.

EDPA President Steve Spencer addresses the annual imerge event, promoting the area's innovation and entrepreneurship landscape.

EDPA's imerge is an annual event that celebrates the achievements of innovation and entrepreneurship in the state.

By participating in collaborative efforts in Alabama, EDPA works to foster a cooperative spirit among the diverse organizations involved in the many areas that affect the state's growth.

KEY CONTACT

Steve R. Spencer, President || **Steve Sewell, Executive Vice President** || Economic Development Partnership of Alabama
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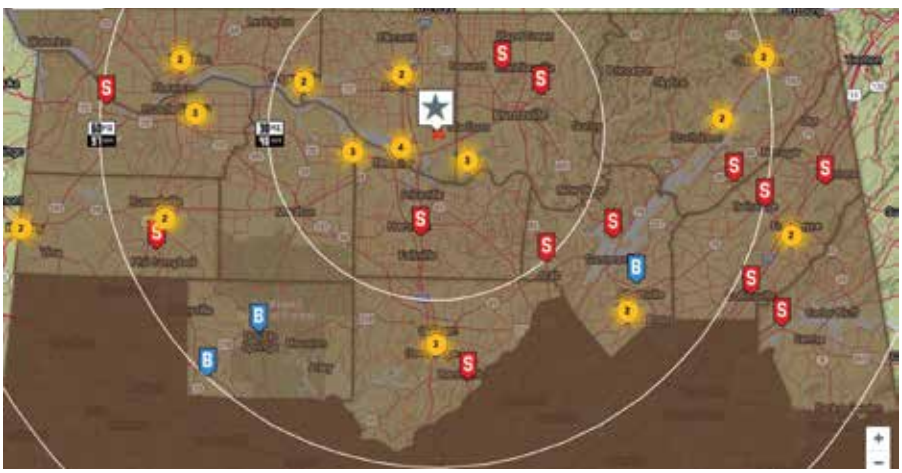
NAIDA NORTH ALABAMA INDUSTRIAL DEVELOPMENT ASSOCIATION

NAIDA is a 70-year-old regional economic development organization that works to create quality jobs in the 13 North Alabama counties served by TVA power.



NAIDA created this map of potential industrial sites in the 13 counties of Northern Alabama. View it interactively at: automotivesites.us

North Alabama has more than twice as many individuals employed in manufacturing occupations as the national average. This current industrialization of the region owes its roots to the 1950s when heavy industry began locating along the Tennessee River, and the development of the Saturn V rockets that took man to the moon began taking shape here. The North Alabama region continues to build on those successes.

The aerospace and defense sectors are among the strongest in the region with companies such as Boeing, Raytheon, Northrop Grumman, Ruag and ULA (United Launch Alliance). ULA continues the tradition of building rockets in North Alabama with the Delta IV, the Atlas V and the new Vulcan Centaur. Blue Origin will build rocket engines in North Alabama, Lockheed Martin will develop and integrate a new hypersonic weapon and GE is producing state-of-the-art SiC and CMC materials.

Our automotive sector is strengthening its base of over 100 current automotive companies with the addition of the $1.6 billion Mazda/Toyota joint venture. Toyota Boshoku, YKTA, DaikyoNishikawa, Vuteq and Sanoh have new locations on or near the Mazda/Toyota site. Rehau has expanded and Navistar has expanded with a $125 million investment. We've created a new microsite, automotivesites.us, featuring sites and buildings pre-selected by each of our counties as readily available for development.

Alloys/Metalworking companies such as Carpenter Technology, Constellium, FreightCar America, and Progress Rail also find success in North Alabama. Nucor Steel recently invested $102 million, Nucor Tubular Products invested $27 million and GH Metals invested $3.5 million.

The HudsonAlpha Institute for Biotechnology and its 40 associate companies are the shining stars for the Life Sciences sector.

Over 70 chemical companies operate in the region including 3M, Ascend, Hexcel, OCI, Occidental Chemical, Toray and Daikin, which recently announced a $195 million expansion.

Other new additions include $750 million Facebook, $600 million Google and $13 million DC Blox datacenters.

We have created an online industrial services directory to assist new and existing companies in finding the suppliers and services to meet their needs. Access this new tool at industrialservices.naida.com.

Some of the reasons companies in North Alabama flourish include

- Twelve institutions of higher education.
- World-class automation training provided at no charge to Alabama industries by AIDT through the Robotics Technology Park.
- The robust TVA electric power system.
- Two commercial airports. Huntsville International provides direct flights to major cities and air cargo to international destinations and offers an intermodal facility along with FTZ #83.

With offerings that include over 3,000 acres designated as AdvantageSites, and speculative buildings ranging from 21,600 SF to 227,600 SF along with other available sites and buildings, North Alabama is prepared for your company's growth.

KEY CONTACT

Brooks Kracke, President/CEO || North Alabama Industrial Development Association
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BUSINESS COUNCIL OF ALABAMA

For over 100 years, our firm's history includes working with a variety of auto manufacturers and suppliers in the Southeast to drive economic development for our region.

At Burr, we collaborate with our manufacturing clients as business partners, working alongside them on matters including economic incentives, land acquisition, construction, operations and workforce management.

Being able to take care of our clients' multiple legal needs in one place is part of what makes our client relationships successful.

At Burr, we work across offices, practices, and communities to serve our clients as one team.

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