Aviation Week Special Report

South Carolina Manufacturing Highlighted by Steadying in Demand, Requirement for More Advanced Skills

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Methodology

Aviation Week conducted a survey of aerospace and defense manufacturing and maintenance operations in five Southeast region states during May and June 2016. States included were Alabama, Florida, Georgia, North Carolina and South Carolina.

The purpose of the study was to better gauge the need for manufacturing workers in the Southeast, the region experiencing the highest rate of growth in terms of greenfield manufacturing operations in the United States. These new factories meet the needs of various sectors of the A&D enterprise, from missiles to aircraft engines, avionics to aerostructures.

Lists of potential respondents were provided by state agencies and economic development organizations in each of the states, supplemented by contacts provided by Aviation Week. Working together, these organizations developed and piloted a base survey, and then extended the final survey to the larger population of manufacturers.

Respondents completed a “live cell” workbook, with survey data then feeding into an aggregation form. Each state was also able to add questions specific to that geographic area and its specific infrastructure needs.
Overview
During the Great Recession, one of the strongest success stories was that of aerospace and defense. The U.S. industry was maintaining a strong export record, which helped steady the wobbly economy at a critical point. Today, the U.S. economy is of course much stronger, but the commercial air transport boom that fed the industry during the recession is now softening. Defense budgets around the world are once again gaining steam, particularly as European Union and NATO members pledge 2% of GDP to defense expenditures by 2020. However, these increases are mainly the result of geopolitical, economic and terrorist activity that has created an era of unparalleled uncertainty.

Regardless of other factors, the fact is that the A&D industry is driven in large part by the global economy. Workshare programs have been replaced by innovative partnerships and alliances that are creating sales strength and growth around the globe.

However, this is not to say there aren’t issues. The materials sector of the industry is going through consolidation and transition, with new materials like composites but also new production methods such as additive manufacturing. Since first-quarter 2015, the fabricated metal products category has lost 36,000 jobs and primary metals 22,000 jobs.

While job losses make the headlines, less publicized is the fact that there is a new generation of work taking place in high-tech factories using advanced technologies. Collaboration between humans and machines is feeding the production line in all-new ways. And in large part, the growth in the Southeast region is a reflection of this new manufacturing production world, requiring a break from how things have been done in the past. As the industry sheds jobs, it also hires, but looks for different skills than in the past. And just as this has affected the professional ranks for the past decade, it is now being felt among hourly manufacturing workers.

Digitization of the factory is creating new levels of productivity, but is also changing the technical skills required. As this study was being developed, we interviewed hiring managers and human resource professionals throughout the Southeast to identify core competencies required today in a manufacturing system that takes three-dimensional design files and tugs that thread into the hardened world of a real product, created by a variety of techniques that include additive manufacturing. Key changes in the worker skills needed include:

- Proficiency in the handling of composites
- The ability to set up, monitor and adjust highly complex machinery and automation tools
- Use of precise measuring devices/tools
- Trouble-shooting and resolution of problems with computerized machinery
- Understanding digital “drawings” and translating them into work processes and tasks

More important, today’s manufacturing workers need to be a community of learners. Technology is developing ever faster, and workers are turning to the devices they use outside of work to assist in the workplace. Tablets and smartphones run applications that read, correlate and inform about the terabytes of data that are being pumped out by sensors monitoring every thread of the production process. And while these jobs were evolving, the education system was also changing. The vocational education programs of a generation ago no longer exist, with few individuals able to translate what the DECA and VICA programs meant to prepare young people for work—the much-sought work readiness employers are demanding.
Study Results
The SE Business Composite
The 2016 Southeast Region Manufacturing Study invited more than 400 companies to participate; 13% did so across the five states. Notable in this survey is that it is reflective of the nationwide study Aviation Week conducts—the vast majority of respondents (80%) are companies with fewer than 500 employees.

- 28% of respondents are engaged in production of components
- 37% are engaged in some type of machining and/or production of composite materials or structures
- 28% are engaged in electronics—avionics, displays, navigation, radar, and sensors

On average, these companies outsource 11% of their product content, with the majority of this involving platings and coatings, heat-treating and machining. The outsourced “buy” for the responding companies totals just over $301 million, or an average of $11.2 million per company.

South Carolina Opportunities
Respondents to the South Carolina study indicate steady increases in manufacturing jobs across the board. However, the highest areas of growth are engineering technicians and aircraft painters, followed by production technicians.

On average, SC aerospace companies outsource 11% of their value with that work consisting primarily of platings and coatings, followed evenly by heat treating, machining and materials. The average buy is in excess of $2 million for the responding companies, which on average have 100 employees.

Respondents also indicated that just over half their outsource “buy” is made out of state, particularly for sub-components.

This study incorporated elements of an economic impact study undertaken in South Carolina. For instance, we assessed the total population of SC aerospace and defense manufacturing workers by taking the economic impact model total headcount of 16,619 workers (non-military) and deducted Boeing. This was done as the sheer size of Boeing served to distort the calculations. In addition Boeing has reached a steady state with no stated desire to add more workers beyond to replace those leaving the organization.
Market Environment: The Context

Nationwide, A&D companies reported they would hire 50,000 people in 2015. However, corporate executives viewed the data relative to the manufacturing workforce as incomplete. As one engineering executive indicated, the total number of engineering technicians reported, as a requirement nationwide was equal to what he needed within one business sector.

The reasons for this situation vary, but mostly are related to competitive issues—numbers involving workforce tend to reflect a cost structure. We also found, in conducting the study, that the largest of employers tended to distort the data by their sheer size—the vast majority of A&D businesses throughout the region have fewer than 500 employees.

Regardless, there are some highlights that reflect the level of activity in the region, requiring a highly skilled workforce.

Pratt & Whitney is rolling production work back to Florida after a decades-long shift to Connecticut. General Electric has built three separate manufacturing facilities in the South in the last four years. Spirit AeroSystems is no longer an operation only with ties to Boeing; its operations in Kinston, North Carolina are dedicated to Airbus production and the current ramp up for production.

Northrop Grumman has won the U.S. Air Force Long-Range Strike Bomber program, designated the B-21, and has made it clear that Florida will play a major role in the development and production of the aircraft—a major shift from Northrop’s traditional stronghold in Southern California. However, other than an artist’s concept of the aircraft, few other details have been released.

Based on the size, it is likely that scaled-up technologies and components could be drawn from the still-classified RQ-180 intelligence, surveillance and reconnaissance unmanned air vehicle. But unlike other recent Northrop designs, the B-21 does not appear to be a cranked kite design. Rather, it resembles the original B-2 design and appears to be a twin.

The initial contract is for $80 billion, but the production cost of the first 21 aircraft remains classified—and therein is the demand number for workers. The General Accounting Office says the fixed-price production award supports an average per-unit cost of $511 million.

Those numbers do translate into jobs, initially to complete development, but also for engineering technicians and manufacturing expertise. Northrop, at the direction of the government customer, declined to provide a number of projected hires in Florida, but indicates there will be a ramp up in hiring demand.

In addition, the South could prove the winner should Lockheed Martin be chosen to produce the next fighter-jet trainer. The company rejected a clean-sheet design and will submit a proposal with Korea Aerospace Industries’ T-50. The modernized T-50 would meet the operational capability date, and Lockheed has indicated it would be built at the company’s plant in Greenville, South Carolina, where a “warm” final assembly line will be in place by the end of 2016. Two production-standard aircraft, built in Korea, will be delivered to Greenville by December and available for flight evaluation by the Air Force.
Lockheed Martin, which also did not provide hiring projections due to the current competition, said the budget for the T-X program is $1.37 billion, with the first aircraft to be purchased in 2018. The proposed aircraft is a block upgrade to the South Korean supersonic trainer and will introduce in-flight refueling, large-area cockpit displays, embedded training, and open systems architecture.

South Carolina enjoys the bounty known as Boeing, which went from zero to 7,500 employees between 2010 and 2016, a significant pace that has slowed to a trickle as the facility settles into steady operations. With an average attrition rate in the state of 13.2% for hourly workers and estimating that 25% or more of Boeing’s North Charleston workforce is in hourly production, the company will need to replace about 250 workers in 2016.

South Carolina’s supply chain is also evolving with the new opportunities. GKN and Toray Composites are among the tier 2 suppliers that are stepping up their local operations to take advantage of the growth opportunities. Tokyo-based Toray Composites was land-locked at its Washington state site, prompting the $1.4 billion investment in building a new plant in Spartanburg County. Initially the plant will employ 500 people when it opens mid-year 2017. And despite Boeing’s dominance as the state’s leading A&D employer, Toray is making the largest-ever initial investment in a manufacturing facility. The plant will produce prepreg carbon fiber, which it will supply for Boeing’s 787 aircraft and the new 777X.

Toray is not the only composites business to makes its way to South Carolina. The U.K.’s Sigmatex High Technology Fabrics landed on 20 acres in Orangeburg County, opening in 2015 with a base facility of more than 75,000-ft.² with options to nearly double that size. However, the number of jobs is not huge and reflects the reality of today’s manufacturing world—highly advanced automation and approximately 50 employees to start. Toray and Sigmatex join Cytec Industries and others in providing a solid base to supply aircraft and defense primes with high-demand carbon-based composite materials.

Another big boost to the South Carolina aerospace community is GKN Aerospace, which is producing inlet lip skins for Boeing 737 Max and the 777X from its Orangeburg manufacturing facility. The plant will also assemble the Section 47 floor grid for the 787. The 126,000-ft.² site employs about 75 people and is directly tied to GKN’s acquisition of Sheets Manufacturing Inc. in 2015 to add a metallic spin forming capability. Sheets produced the same parts for the Boeing 747-8 and also had the contract for Boeing Defense Security’s KC-46 tanker aircraft.

Joining with South Carolina’s state agencies is the business-driven nonprofit Council on Competitiveness (sponsor of this study) and the University of South Carolina and its McNair Center for aerospace research. The center will invest up to $5 million in the center’s efforts to identify new ways to use carbon fiber composite materials, techniques to fuse aircraft part, and use of automated manufacturing to improve structures operations. The University is also home to the Center for Predictive Maintenance.
North Carolina is watching Honda Aircraft take off with its production scale-up, as well as the operation of the state’s Kinston-based Spirit AeroSystems shifting into high gear to support Airbus’s manufacturing plans. Honda has had the luxury of sustaining development of the HondaJet while waiting for the business jet market to begin a climb out of the aftermath from the 2008 recession. The company’s $120 million, 680,000-ft.$^2$ campus is clearly sized to accommodate future HondaJet models. The hangar doors are nearly twice the height of the HA-420’s 15-ft.-high T-tail and open more than twice as wide as its 40-ft. wingspan. And there is ample open land available for future expansion on the 130-acre parcel at the east side of Piedmont Triad International Airport.

In addition to the aircraft assembly factory, Honda partnered with General Electric in 2004 to form joint venture GE Honda AeroEngines to produce the HF120 engine, with an 86,000-ft.$^2$ facility in Burlington. In addition to the HondaJet, the engine has been selected for the Citation Jet engine retrofit program.

While North Carolina lost out in General Electric’s relocation of its headquarters to Massachusetts, GE Aviation maintains a strong presence in the state with more than 1,300 employees. The Durham location has transformed to encompass some of GE’s top innovations as part of its strategy to establish the “brilliant factory”—a digital and advanced technology application that is taking root across the Southeast but that began in North Carolina.

GE produces engines for Boeing’s 777 and 787 aircraft in North Carolina, along with regional jet engines for Bombardier and Embraer. As part of the CFM International partnership, GE produces its parts on the CFM56 engine in Durham. The latest GE engine, the LEAP, will enter service this year on board the Airbus A320 and also will power the Boeing 737 MAX.

GE Aviation broke ground in 2013 for a 125,000-ft.$^2$ site in Asheville to meet demand for composite components—an upgrade from the company’s previous machining operation in Asheville. Along with an increase in employment, the facility uses GE’s advanced manufacturing techniques for silicon carbide ceramic fibers and ceramic resins. The Asheville facility produces the shroud for the high-pressure turbine LEAP engine, which currently has orders for 4,500 units.

A third GE site, in West Jefferson, machines rotables and was expanded to perform additional machining. The 80,000-ft.$^2$ expansion is scheduled to come online in 2017, and will bring an additional 105 jobs.

While GE and HondaJet have been big stories for North Carolina, so too have been suppliers such as Spirit AeroSystems, Curtiss-Wright Controls, and LORD Corp. In addition, Keerfoot, a subsidiary of Astronautics Corp. of America, is located in Asheville and part of a family of business units that provides electronics for the commercial air transport industry and is now serving as a partner in developing onboard aircraft cyber security systems for the commercial market. Lord is extending its reach into Europe and has gained significant traction for its aerospace business via developments on the Lockheed Martin/Sikorsky coaxial rotorcraft.

Spirit opened its 500,000-ft.$^2$ facility in Kinston in 2010 to produce composite center fuselage and wing spars for the Airbus A350. The program, globally, has had problems over the years and Spirit’s new executive team has put into place a number of fixes—including a new leader for Airbus programs, a turnaround CEO in Larry Lawson, and now a new CEO being called upon to stabilize the “fixes” put in place. It is important to hit stride now as Airbus plans to nearly triple aircraft production by year-end 2016. The dramatic increase is a result of substantial delays over
the last 24 months, attributed primarily to another supplier—Zodiac Aerospace in the United Kingdom.

In addition, North Carolina State University is home to a federally funded Manufacturing Innovation Institute, with the NC State site focused on next-generation energy-efficient high-power electronic chips and devices. While more connected to the traditional high-tech industry, the chips are the backbone of electronics found in military and commercial systems developed by the aerospace industry. More recently, the university was tapped to lead the Southeast hub for a new Smart Manufacturing Innovation Institute to improve the efficiency of advanced manufacturing. Specifically, the institute will work in the areas of advanced sensors and controls, data analytics, advanced predictive modeling and simulation software, and advancements to reduce energy use in advanced manufacturing.

Notable to the North Carolina dynamic is the range of use of outsourcing. While the average company responding to the survey outsources 15% of its finished product, which ranges up to 95% for some companies. The outsourcing spans the full gamut of supply chain requirements—materials, test, platings and coatings, as well as heat treat.

Alabama, too, is scheduled for more attention during the coming five years as the U.S. mounts a significant effort to upgrade its missile and anti-missile operations. In addition, the strong haven for space-based security assets will also play a pivotal role as the Air Force analyzes the best approaches for combining capabilities from private industry with what previously was operated entirely by the service. Launch requirements also are shifting, and currently four new engines are competing for future work. With so many questions remaining, the hiring situation has yet to be defined.

Alabama has long enjoyed a healthy environment for the space and defense industry, from Raytheon (which did participate in this study) to much smaller operations, such as Ball Aerospace. There is some rebalancing—the addition of a new Airbus plant, but the loss of Bell Helicopter Textron to Louisiana.

GE Aviation has broken ground on two factories in Alabama to support what the company calls “brilliant factories.” The two factories won’t be fully operational until 2020, but are designed to produce silicon-carbide ceramic fiber, a first-of-its-kind in the U.S. The material is used for the ceramic matrix composite components in jet engines. (The technology is also used in gas turbines used to produce electric power.)

Georgia has an extensive network of suppliers to the aerospace and defense industry, but the state’s largest employer, Delta Air Lines, drives new jobs. Delta Tech Ops, the maintenance unit for the airline, is among the employers who indicate double-digit rates of job growth for the coming year. Currently the maintenance/repair/overhaul service unit has 9,600 employees worldwide. The business plays an important role in the world’s largest aerospace maintenance/repair/overhaul conference, attracting up to 10,000 attendees who provide everything from hand tools to full-scale manufacturing robots, to Atlanta every four years.

In addition to Delta TechOps, most of the defense industry’s aircraft and engine manufacturers have operations in Georgia—based at Warner Robins and, Dobbins and Moody Air Force Base.

Georgia is also home to Lockheed Martin Aeronautics Co.’s Marietta facility. More recently known as the home of the F-22 Raptor, the business has since sold much of this square footage to
Georgia Tech for its research center in Cobb County. About 1,800 of the Marietta plant’s population qualifies for a buy-out program being offered to mid-level leaders—not manufacturing employees.

But make no mistake, Lockheed Martin remains a powerhouse in the dynamics of Georgia’s aerospace and defense operations with 5,400 employees who support production of the C-130J military transport, modifications and upgrades to the P-3 Naval surveillance plane and the C-5 Galaxy cargo jet.

General Dynamics’ Gulfstream in Savannah also streams work into the supply chain throughout Georgia. Gulfstream currently lists a host of jobs, from product engineering to FAA and EASA certification specialists to planners and schedulers. In addition to the engineering center and manufacturing operations in Savannah, Gulfstream also has service centers at Brunswick and Savannah. And despite a long history in the state, Gulfstream continues to break ground on new technologies and production processes. Most recently the Completions Center incorporated 3-D projection technology into the design and production of aircraft paint schemes, eliminating a time-consuming step in the process.

In addition, in June the jet aircraft company opened its Product Support Distribution Center, a 405,868-ft.² in Savannah. The new facility has 300 employees, handling an inventory valued at more than $1.6 billion.

Supporting these major operations are a host of smaller businesses providing a range of services and products.

Back in Florida, the New Space market is bringing opportunity back to Brevard County, from the new factory being built by OneWeb LLC, to SpaceX. And while building aircraft requires pulse lines and automation that “feeds the beast,” the world of building spacecraft tends to be more similar to a custom auto shop, methodically creating cars designed to meet individual tastes. That’s about to change, according to global business advisory consultants AlixPartners, which says satellite builders must become more “industrial-like.”

It’s a challenge OneWeb plans to tackle from its clean-sheet production facility that will crank out dozens of small broadband internet service satellites each month. Backed with co-financing from the state of Florida, the joint venture of OneWeb LLC and Airbus Defense and Space says it will invest $85 million in the new factory—the first ever to mass-produce spacecraft—as part of the company’s plan to deploy a constellation of hundreds of high-speed, low-latency internet satellites. Slated to open in 2017, the new facility will comprise more than 100,000 ft.² and employ 250 people in an effort to turn out 15 satellites per week at full capacity, each weighing 150 kg and boasting electric propulsion that will be used to raise the spacecraft to their operating orbit.
Translating Market Environment to Jobs

Job growth in the Southeast region varies to some degree by state. However, the job categories with the highest growth forecast across all five states for the coming two years are:

- Engineering technicians: 53%
- Molding technicians: 44%
- Production technician: 26%
- Maintenance technicians: 25%
- Coatings applicator/machinist: 21%

Respondents to the SE regional survey indicate that overall there will be approximately 700 new jobs created in 2016—keeping in mind that this sample represents just 13% of the total industry in the Southeast. From this sample, job growth for the 2015-2017 period is forecast at 11%. As is indicated later in this report, this does not include replacement of retiring employees or those that voluntarily leave their jobs. There is no data available to indicate what the churn rate is—whether the individuals who leave their jobs do so to go to another aerospace and defense company.

South Carolina Job Data

Companies in South Carolina plan to grow their workforce by 31% by year-end 2017. And this is no surprise based on the growth of the supply chain throughout the state, even if these jobs come in relatively small numbers by facility.

The respondents to this study were companies of fewer than 500 employees. However, by looking at the hiring plans for the current manufacturing community (not inclusive of Boeing), there will be 140 people hired in 2016 and another 158 in 2017. The entry-level position of operator makes up the majority of this hiring in both years, followed by machinists and engineering technicians. However, it is notable that there is a near-doubling of aircraft painters positions in 2017.

Sample of South Carolina A&D Employment Plans

<table>
<thead>
<tr>
<th>Manufacturing Labor</th>
<th>Projected Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp;P Mechanic</td>
<td>23.4</td>
</tr>
<tr>
<td>Aircraft Painter</td>
<td>7.65</td>
</tr>
<tr>
<td>Assembler</td>
<td>1.95</td>
</tr>
<tr>
<td>Coatings Applicator</td>
<td>5.85</td>
</tr>
<tr>
<td>Engineering Technician</td>
<td>13.65</td>
</tr>
<tr>
<td>Inspector</td>
<td>11.7</td>
</tr>
<tr>
<td>Inventory/Shipping</td>
<td>5.85</td>
</tr>
<tr>
<td>Machinist</td>
<td>19.5</td>
</tr>
<tr>
<td>Maintenance Technician</td>
<td>5.85</td>
</tr>
<tr>
<td>Manufacturing Mechanic</td>
<td>1.95</td>
</tr>
<tr>
<td>Molding Technician</td>
<td>0</td>
</tr>
<tr>
<td>Operator</td>
<td>53.15</td>
</tr>
<tr>
<td>Production Technician</td>
<td>9.75</td>
</tr>
<tr>
<td>Technician</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>140.4</td>
</tr>
</tbody>
</table>
More than half the employees at these companies currently are either operators or assemblers. However, there is an increasing need evidenced by these plans to hire engineering technicians, machinists and A&P mechanics—all jobs involving more education or training.

South Carolina’s employers indicate they will rely heavily upon the high school education system to prepare these workers, but companies stress that post-secondary education is desirable for the high-demand job categories. In the maintenance technician category, 27% of the employers will turn to baccalaureate-awarding universities for new hires. This data differs significantly from that of other states, where production technicians and engineering technicians are the most likely to have BS degrees.
In addition, South Carolina officials queried survey respondents about a possible solution to improving worker preparation. In all, 91% of the respondents said they would consider hiring an individual with no prior aerospace experience but who completed 120 hours of aerospace-specific manufacturing training through a technical institute and resulting in certification.

Finally, it’s important to note the role of contract workers in the aerospace manufacturing workforce. Of the companies providing detailed data to the survey, respondents said they would supplement their full-time employee base 23% with contract workers, primarily in the role of coatings application and operators. The companies anticipate they will increase their reliance on this workforce to provide some flexibility in dealing with program delays or surges—an increase of 100% between December 2015 and year-end 2017. The largest increase in contract labor will come in A&P mechanics, followed by maintenance and engineering technicians.

**Adding to the Job Forecast Equation**

Projecting workforce requirements is not just a report of new jobs. It must include the underlying voluntary attrition of personnel and retirements. The study requested data concerning total attrition—the combination of involuntary, voluntary and retirement data.

The basic calculation is the current headcount multiplied by both the retirement rate and voluntary attrition rate plus all-new jobs. In looking just at the sample group reflected in the chart above and the state’s voluntary attrition and retirement ratios, the calculation would be:

\[ 499 \times 13.2\% + 499 \times 1.1\% + 153 = 224 \]

Note the factor in that equation—13.2%. This voluntary attrition rate is an anomaly in the statistics for the region and nationwide. While the rate for the SE runs high, the new companies opening in South Carolina have created significant churn as the increased hiring pace for new factories tends to encourage mobility of experienced workers from one level of the supply chain upward..

Another factor is competition that arises from South Carolina’s strong automotive manufacturing community. However, this study did not cover the outflow of A&D workers to a different...
industry sector. Anyone who has taken to the roads in this summer holiday season can relate to the increasing popularity of the Mercedes-Benz vans built in Charleston; the Charleston plant added an assembly van for the midsize Metris in 2015, the period covered by this study. If the reason for this employee churn is the presence of factories in other industries, it would be worthwhile to examine what the specific issues are that make other sectors more attractive than A&D—whether it is pay, benefits, or other factors.

In contrast, the voluntary attrition rate among salaried manufacturing personnel is lower in South Carolina than for the region and the nation.

**Voluntary Attrition**

<table>
<thead>
<tr>
<th></th>
<th>South Carolina</th>
<th>SE Region</th>
<th>Nationwide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly Mfg Workforce</td>
<td>13.2%</td>
<td>8.3%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Salaried Mfg Workforce</td>
<td>1.4%</td>
<td>8.7%</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

Projecting retirements is not a science, either. It is based on the economy, to some degree, but it also relates to the type of work undertaken. As one NASA worker told Aviation Week, it is difficult to think about drinking coffee at the local McDonald’s after working on lunar colonization.

That said, the industry has displayed it is taking action at managing what a decade ago was described as a “gray tsunami.” The storm never hit, in part because companies continued to hire new workers, and to focus on correcting an age distribution curve that was made up primarily of workers over age 50.

The rate of retirement as a percent of the total workforce has increased to 3.2% nationwide, from a low of 1.1% in 2009. In the Southeast region, the retirement rate is lower among hourly workers; however, it is more than two times the rate for salaried manufacturing workers.

In South Carolina, hourly manufacturing employees retired at a rate significantly lower than the nationwide average, at less than 1%. However, the rate of retirement among salaried manufacturing workers is higher than the national average.

**Rate of Retirement for Current Workforce**

<table>
<thead>
<tr>
<th></th>
<th>South Carolina</th>
<th>SE Region</th>
<th>Nationwide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly Mfg Workforce</td>
<td>0.7%</td>
<td>2.2%</td>
<td>3%</td>
</tr>
<tr>
<td>Salaried Mfg Workforce</td>
<td>1.8%</td>
<td>2.9%</td>
<td>1%</td>
</tr>
</tbody>
</table>

The aging of the workforce relates directly to establishing strategies to deal with the flow of retirements and the exchange of knowledge and expertise. As the chart below indicates, the percentage of workers who are older than age 55 is 22% while the percentage under age 35 is 17%. Ideally these two percentages would be equal, and this data illustrates the point that few individuals under age 25 are currently in the Southeast’s A&D manufacturing workforce.

**Southeast Region Age Distribution**
The South Carolina Distribution

Clearly the age curve for South Carolina differs from that of the region. In all, 38% of the hourly workforce is under age 40, compared to the high 20s for the region as a whole. In addition, the peak of South Carolina’s curve is at age 56, older than the peak for the region—indicating that the industry is pushing through the aging of the workforce in smart fashion. In addition, the peak occurs at 15% of the workforce vs. 25% as the peak for the region. The data point reflects the surge of growth in A&D manufacturing in South Carolina that came with Boeing’s decision to locate its facility in Charleston—driving a younger workforce well beyond Boeing’s walls.
The Face of A&D in South Carolina

The study also examined demographics. As could be anticipated, the hourly workforce is mostly a white male population, but this situation is less prevalent in South Carolina than in other Southeast Region states and the national industry. In all, 73% of the A&D manufacturing workforce in the state is male—below the statistic for the region and nationally.

The rate of African-American employees as a percentage of the South Carolina A&D community runs lower than that of the SE region and is equal to that of the nationwide industry. This bears further examination, given the demographic breakdown for the state of South Carolina, which is 28% African-American.

The importance of this data, of course, is in the ability to attract workers of all ethnicities and genders to contribute to the industry—for a well-balanced reflection of the populations where the manufacturing facilities are located, but also as a reflection of the customers served by the products built.

South Carolina Demographics

<table>
<thead>
<tr>
<th></th>
<th>South Carolina</th>
<th>SE Region</th>
<th>Nationwide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>73%</td>
<td>81.6%</td>
<td>81%</td>
</tr>
<tr>
<td>Women</td>
<td>27%</td>
<td>18.4%</td>
<td>19%</td>
</tr>
<tr>
<td>African-American</td>
<td>10%</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>17%</td>
<td>9%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Results from Aviation Week Nationwide Manufacturing Study

- Responding companies employed 91,800+ employees in manufacturing
- 20% were female
- 28% were non-white
- 21% were under the age of 35
- 30% were over the age of 55
- 3% of the manufacturing workforce left their employer voluntarily last year
- 3.3% of the hourly workforce retired
- 3.4% of the hourly workforce involuntarily separated
- National data on hiring still lacks validity
  - Just 3,469 new hires forecast for 2016
  - 30% Assemblers, 15% A&P Mechanics
  - Vast majority of jobs require only a high school diploma or GED
  - Associate degree or similar education required for technicians, operators, mechanics
  - Skills identified as “in demand”
    - Assembler
    - Toolmaker
    - Machining
    - A&P Mechanics
Summary
The Southeast has benefitted from green-field construction of factories supporting the aerostructures, propulsion, missiles and space sectors. It is imperative that the infrastructures needed to support this advancement continue to be developed in terms of:

- Making tools available to assist businesses in planning for growth
- Support for efforts to improve manufacturing efficiency
- Capitalizing on the advanced nature of manufacturing capabilities across the region
- Ensuring adequate support for an educational system that stays apace with teaching core competencies in:
  - Handling of composites
  - The ability to set up, monitor and adjust highly complex machinery and automation tools
  - Use of precise measuring devices/tools
  - Trouble-shooting and resolution of problems with computerized machinery
  - Understanding digital “drawings” and translating them into work processes and tasks.

It would be beneficial to compare workforce demographics for A&D with that of the population writ large. As has been found with the nationwide industry community, the health of the industry resides on the ability to attract individuals from a young age to the industry—whether in manufacturing or engineering. Aviation Week’s historical data indicates that students who choose to go into A&D tend to do so because of their existing knowledge of the industry and its careers, most often through the guidance and advice of individuals working in the industry. This kind of mentoring will be critically important in attracting and retaining the A&D workforce of the future.

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Penton’s Aviation Week Network is the largest multimedia information and services provider for the global aviation, aerospace and defense industries, with a database of 1.2 million professionals around the world. Industry professionals rely on Aviation Week for analysis, marketing and intelligence. Customers include the world’s leading manufacturers, suppliers, airlines, business aviation operators, militaries, governments and other organizations that serve this global market. The product portfolio includes Aviation Week & Space Technology, AC-U-KWIK, Aircraft Blue Book, Airportdata.com, Air Charter Guide, Air Transport World, AviationWeek.com, Aviation Week Intelligence Network, Business & Commercial Aviation, ShowNews, SpeedNews, Fleet and MRO forecasts, global maintenance, repair and overhaul (MRO) tradeshows and aerospace & defense conferences.

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