

A young child with brown hair and blue eyes is lying in bed, looking up at a night sky. The sky is dark blue with several white stars, a planet with a ring, and a rocket ship with a blue trail. The child is wearing a blue and white striped shirt. The overall scene is illuminated with a soft blue light.

Commercial Growth

Fueling U.S. Satellite Industry

Employment

BY ANNE WAINSCOTT-SARGENT

Finding its next generation of engineers has long been a critical issue for the aerospace industry. *Via Satellite* investigates efforts to expand aerospace employment opportunities in the United States, and whether or not the satellite industry is getting access to the talent it needs.

With nearly 1,600 satellites

forecasted to launch in the next 15 years, satellite industry watchers say employment prospects for engineering and other technical employees will remain strong at least in the near-term.

As the industry rebounds from the Great Recession, several challenges remain — among them, an increasing shortage of science, technology, engineering and mathematics (STEM) students to fill needs in the professional world, and an aging technical workforce. Nearly 60 percent of current aerospace engineers are 45 years or older, notes Joshua Wright, an editor with the Economic Modeling Specialists Inc. (EMSI), an economic data and analyst firm.

“Depending on retirement plans and whether or not engineers will continue to hold off given economic uncertainties, this could have a major impact in the next five to 10 years on companies that depend on a skilled and viable engineering workforce,” says Wright.

Wright cites a statistic from Georgetown University’s Center on Education and the Workforce that shows wages for engineers and engineering technicians increasing 18 percent since 1980. EMSI sees rising wages for these technical jobs as a sign of unmet demand.

Industry watchers such as NSR analyst Stéphane Gounari caution that even with the upswing of engineering hires and the fact that an average of 106 satellites will be launched per year between 2012 and 2026, the influx of workers may not be needed once satellites are built and launched. Gounari characterizes the cycle into three phases: the next five years marked by a period of strong satellite manufacturing; followed by a period of low activity; and then a restart of satellite launches.

“If the space sector is hiring in the next two years to address the current needs, down-sizing may quickly become necessary assuming a constant retirement level,” Gounari predicts.

Help Wanted

Not surprisingly, several prime contractors and satellite manufacturing firms say they are hiring this year. Coming off the heels of the successful launch of its Ka-band satellite, ViaSat plans to increase its employee base of more than 2,200 staff by 10 percent this year just as it did last year, says Steve Estes, the company’s vice president of human resources for the Carlsbad, Calif.-based satellite maker.

“We’ve never stopped growing. The recessionary impacts of 2008 temporarily slowed down our growth a bit but we never stopped hiring or had to deal with a large surplus of employees,” he says.

With ViaSat-1’s launch in January, the company continues to see a need for a wide variety of engineers, from manufacturing to electronic design specialists. The satellite builder’s customer base includes both government and commercial entities.

“The success of ViaSat-1 is propelling some of our hiring needs as it opens up new applications for customers. The largest need we have is for software and network systems people. So much of the capability that you can get out of technology is driven by programmability and flexibility and much of this capability is in the software arena,” Estes says.

To attract engineering talent, Estes says a major focus is on growing the company’s intern and new graduate programs. Estes acknowledges that while ViaSat competes for engineering talent with the likes of Google and other Internet firms, the competition isn’t a huge concern since there’s still a breed of young people who want to work on space-related technology. “Being an engineering design company, we are after the best and the brightest,” he says.

Boeing also finds that being a leading satellite and aerospace employer serves as a draw when recruiting on college campuses. “The work we do in satellites can be a driver to attract

and keep people who might otherwise think they want to go to another industry,” says Liz Huldin, director of human resources for Washington, D.C.-based Boeing Network and Space Systems, part of Boeing’s Defense Systems business. “We understand we need to move with speed and give our more senior executives the ability to give on-the-spot job offers. We’re using the Internet ourselves with a number of different tools, including Facebook.”

Huldin says her business unit also is hiring technical talent to support new business on the commercial side. The unit currently has 17,000 employees in four operating divisions — Electronic and Missile Systems, Information Solutions, Space and Intelligence Systems and Space Exploration.

“We have a very positive outlook in terms of employment,” says Huldin, who adds that hiring is increasing as Boeing Commercial Airplanes ramps up its 787 and other airplane programs. “The level of sophistication we need in terms of talent, particularly around the software and materials and even in the people who help manufacture and build these satellites is key,” she adds.

California-based firm Space Systems/Loral (SS/L) plans to bring on 500 regular employees and at least 50 interns and co-ops to support the company’s workload this year, according to Shirley Olerich, vice president of human resources.

“The majority of our openings are in spacecraft systems engineering, communications systems, the satellite mission systems and the bus subsystem operations, and then in spacecraft test and operation, the repeater subsystem group and the antenna subsystem area,” she says.

“Our hiring is focused on how many satellite design wins we have. Our expectation is that this will be a very good year for us so we are ramping up. Right now we have 24 satellites in our backlog,” Olerich adds.

Robotic Competition Inspires Future STEM Generation

The annual FIRST Robotics Competition remains one of the most successful educational programs to leverage engineering mentors from the satellite and aerospace industry. The brainchild of inventor Dean Kamen, the FIRST competition began in 1992 with 28 teams in a New Hampshire high-school gym. Today, it reaches close to 350,000 young people and receives support from three out of every five Fortune 500 companies.

FIRST Robotics aims not only to teach students technical skills and abilities, but also teamwork skills and the ability to set priorities and execute on a plan.

"Of the 40 top sponsors of FIRST, more than one dozen are directly involved in manufacturing or using advanced aerospace systems," says Cheryl Walsh, senior director for marketing/media/alliances at U.S. FIRST. These organizations include BAE, Rockwell Collins, Rockwell Automation, Boeing, NASA, SAIC, the U.S. Air Force and United Technologies, which provide support through mentoring and/or funding of high school robotics teams nationally.

For the last four years, Boeing has provided \$1 million a year to FIRST. This year, the company supported 146 Boeing-mentored teams nationally and funded 77 teams in under-served areas. Twenty-seven teams qualified for the competition's championships held in April in St. Louis.

ViaSat also sponsors teams in addition to being one of the lead region sponsors for the San Diego Region. "It's a fantastic program, and generates such high-energy and excitement amongst the kids," says Estes. "We hear year-over-year stories about what the kids are doing. We're hearing from some of the parents. We're absolutely having an impact," he says.

Brandeis University's Center for Youth and Communities recently conducted an independent, retrospective survey of FIRST Robotics Competition participants and compared results to a group of non-FIRST students with similar backgrounds and academic experiences. When compared with the group, FIRST students are more than three times as likely to major specifically in engineering, nearly four times as likely to expect to pursue a career specifically in engineering and more than twice as likely to expect to pursue a career in science and technology, the analysis found.

company currently employs 1,700 people, which is more than triple the number of employees it had four years ago. The company's careers page had close to 200 open positions at the time this article was written, with the majority of positions in avionics hardware and software development and launch, production and systems engineering.

Even with these positive hiring trends, there will continue to be a STEM graduate shortage to fill the talent funnel both in the satellite and other tech sectors. The shortage perhaps will be most felt in the government sector whose hiring options are more limited than their commercial counterparts because of U.S. citizenship and security clearance requirements.

During his keynote address at the 28th Annual National Space Symposium in Colorado Springs, Gen. William L. Shelton, commander of the Air Force Space Command, said the lack of STEM graduates is, "a national security issue in the broadest sense of those words, and it doesn't seem to be on a path toward improvement."

Attracting Future Workers

In 2010, there were 7.6 million STEM workers in the United States, representing about 1 in 198 employees in the overall domestic workforce, according to the U.S. Department of Commerce's Economics and Statistics Administration. STEM occupations are projected to grow 17 percent from 2008 to 2018 compared with 9.8 percent growth for non-STEM occupations.

"There continues to be a need for STEM-educated personnel," says Lt. Gen. Ellen M. Pawlikowski, Commander, Space and Missile Systems Center, Air Force Space Command.

Of the command's 13,000 Air Force officers, enlisted specialists and civilian employees who support the nation's satellite constellation, more than 2,000 work in space-based engineering jobs. Those numbers don't include contractors who work alongside Air Force staff to develop, launch and operate the

SS/L has been hiring progressively — more than doubling its headcount from 1,500 to 3,200 during the last six years. Olerich says nearly 50 percent of the employee base has 25 years of industry experience or more, and that the current annual attrition rate remains low at 2.5 percent. The Palo Alto, Calif.-based manufacturer recruits talent from nearby top engineering schools such as Stanford, the No. 2 ranked engineering school in the country according to U.S. News and World Report.

Olerich says that the most difficult positions to fill include antenna

sub-system specialists with strong radio frequency (RF) backgrounds and high-level systems engineering professionals.

Launch provider SpaceX also reports rapid employment growth. With the end of the space shuttle mission, NASA is looking to the commercial sector and specifically SpaceX to transport supplies to the International Space Station (ISS). In May, its unmanned Dragon capsule flying aboard the Falcon 9 became the first private spacecraft to dock with the ISS.

SpaceX's biggest areas of demand are for engineers and technicians. The

nation's satellite constellation.

"Our Air Force and satellite industries should remain a steady source of employment opportunities, but like other parts of the Defense industrial base, the space industry will respond to changes in the Defense budget. I expect there will be opportunities presented by retirement of veteran workers and recruitment and training of new workers," Pawlikowski says.

The industry's positive hiring outlook also is reflected in strong graduation rates inside the nation's engineering schools. The American Society of Engineering Education (ASEE)'s Profiles of Engineering and Engineering Technology Colleges Survey, an annual report that benchmarks U.S. engineering schools, finds that the number of degrees awarded last year grew at all levels. The amount of engineering bachelor's degrees issued to students grew 5.6 percent from 2010, reaching 83,001 degrees awarded in 2011. Master's degrees increased by 8 percent to 46,940 awarded, while doctoral degrees grew by more than 6 percent to 9,582 degrees awarded.

"More students are choosing engineering," says Brian Yoder, director of Assessment, Evaluation and Institutional Research at ASEE.

Yoder adds that manufacturing engineering is one area that is proving challenging to fill as workers retire because it is not typically appealing to graduates. "With so many manufacturing jobs going overseas in the last couple of decades, it's not seen as providing job and career security even though now manufacturing jobs are coming back to the United States," he says.

Paul Steffes, professor and associate chair for research at the School of Electrical and Computer Engineering at Georgia Institute of Technology, saw the number of electrical and computer engineering majors peak in the 1980s and 1990s before slowing down in the first decade of the 21st century.

"We're seeing a rebound as students are again having more interest

in electrical and computer engineering," he says. "That specialty of engineering is most significant since most satcom hires studied those fields."

Drawing More from Non-U.S. Engineers

Georgia Tech's program is ranked fifth in the United States and graduated 750 electrical and computing engineers in the 2010-2011 academic year. Georgia Tech overall has more than 12,000 undergraduate and graduate engineering majors as of 2011, says Doug Williams, professor and interim school chair. "Here at Georgia Tech, we are drawing from students overseas."

EMSI reports that the proportion of non-resident aliens completing engineering degrees is greatest in electrical, electronics and communications engineering. This segment of graduates jumped from 28 percent in 2003 to 35 percent in 2010.

Ohio State University's ElectroScience Laboratory in the Department of Electrical and Computer Engineering, one of the largest RF programs in the country, has a large number of U.S. and non-U.S. students in its graduate program. "We have close to 80 graduate students and produce about 15 to 20 RF graduates a year; we just don't produce enough. "If I had twice as many RF engineers, they would be employed," says Ohio State University Professor John Volakis, director of the laboratory.

He's seeing significant demand for his students by traditional satellite and aerospace employers as well as the wireless, medical, automotive/transportation and even the financial sectors.

"Satellite companies are in competition with the commercial industry big time," he says. Volakis says some of these commercial firms can lure students with larger paychecks and, in the case of government industry, aren't restricted in recruiting international students.

Volakis would like to see more

industry support in terms of fellowships and additional support that would enable the school to hire more faculty members to increase their students specializing in wireless. "The RF area appears to have a significant shortage of engineers. These are wireless and wireless communication engineers who focus not only on the components in systems, but also on delivering information and how people see and use the information."

Many satellite employers *Via Satellite* spoke with say they are keeping their tech workers once they bring them into the company. "We touch people early in their lives through our STEM programs and they remember that touch when they are looking at potential employers," says Huldin.

In 2011, Boeing invested about \$27 million in STEM programs like the annual FIRST Robotics Competition (see sidebar). "We also do a lot within the community and have rotational programs that we offer to people early in their careers that give them exposure to decision making that they might not get anywhere else."

SS/L supports STEM education through an organization called "Change the Equation." Olerich attributes her company's low annual attrition rate of 2.5 percent for technical staff to the excitement of working in the satellite industry and the type of engineer SS/L recruits. "At SS/L, employees see satellites going from concept to launch in less than three years. We take pride in what we do here and the satellites we build help improve the human experience around the globe." ▮



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