

Taking the Man out of the Aircraft

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As the Federal Aviation Administration makes plans to open up the National Airspace System to unmanned aircraft systems, members of the higher education community are preparing the UAS workers of the future, as well as creating an environment that is ripe for innovation in this burgeoning field. From degree programs to research projects, these schools are poised to create a cutting-edge aviation workforce—which will benefit the military and private industry alike.

Embry-Riddle Aeronautical University

Contribution: Embry-Riddle’s Department of Aeronautical Science has, for the last year, offered a minor to students who are interested in learning about unmanned aircraft systems. This coming fall, the school will begin its full bachelor’s degree program in UAS studies.

To be admitted into the program, students must meet the standard admissions requirements of the school in terms of grade point average and test scores. In addition, Embry-Riddle is eager to admit students who want to learn about this new field and grow along with it.

“The target audience for this program includes those students interested in becoming part of this nascent and exciting technology,” said Ted Beneigh, a professor of aeronautical science and the creator and coordinator of the Unmanned Aircraft Systems Science Program. “That includes pilots, sensor operators, and those desiring to fill various support positions required by the industry. This degree is not intended for engineers or designers.”

Benefits to the Department of Defense: The program will benefit DoD, as well as private industry, by creating the caliber of employees that they want to hire. To that end, Embry-Riddle has worked with companies, DoD and

the Department of Homeland Security to create a curriculum that encompasses the information that future UAS employees will need to be successful in their jobs.

Benefits to Students: Embry-Riddle gives students the option of pursuing a pilot track and non-pilot track within its degree program. Students in the pilot track take courses to learn how to fly unmanned aircraft systems of various sizes and, in order to graduate, they must be able to meet the FAA's requirements for flying in restricted airspaces, as well as the National Airspace System.

In the non-pilot track, students prepare for the non-pilot UAS positions and learn about topics like payload management and sensor operation. The program offers classes and simulation training that covers all aspects of operating an unmanned aircraft.

Kansas State University

Contribution: In the fall of 2007, Kansas State University began teaching unmanned aircraft systems to students in a single class. About two years ago, that one class evolved into a certificate program and this coming year, KSU will offer a full, four-year degree for students interested in studying UAS.

Students who have enrolled in the certificate program, as well as those who are being recruited for the upcoming degree program, have a strong interest in electronics and must not be opposed to flying, because the program requires about 120 hours of flight time.

Benefits to the Department of Defense: KSU's certificate and degree programs are designed to provide a conduit for servicemembers to transfer the flight skills that they developed in the military for use in the civilian world. In order to do this, KSU has worked with DoD to create a curriculum that develops the skill sets necessary for students to succeed in the UAS field.

Benefits to Students: Students in KSU's unmanned aircraft systems programs take courses where they learn the basics of UAS flying, as well as classes in critical thinking, electronics and supervision. The program is designed to create a well-rounded UAS professional because, according to Kurt Barnhart, the executive director of the Applied Aviation Research Center, success in the field requires a holistic approach to learning.

"The UAS specialist of the future is ironically going to have to be somewhat of a generalist," he said. "The skill set borrows from a lot of different areas—electronics, aviation maintenance, flying, engineering, business—so there's a lot of different areas that go into our degree program to develop this very unique set of skills."

In order to further develop these unique skills, KSU offers students the opportunity to deploy UAV simulators, as well as the real aircraft. As a result, students are able to practice and become accustomed to the aircraft before they go out and get their hands dirty with the real thing.

New Mexico State University

Contribution: New Mexico State University's Physical Science Laboratory, acts as a training ground to supplement students' classroom learning. The lab, which has been flying unmanned aircraft since 1998, and drones/targets since the 1950s, gives students from the school's aeronautical engineering program the opportunity to get

hands-on experience with UAS, as well as the mentorship and guidance that they need to complete projects being worked on in the lab. There are 315 students in the aeronautical engineering program and more than 40 students participate in Air Force ROTC.

In order to participate in NMSU/PSL, students must demonstrate that they are willing to work hard and successfully juggle the requirements of the position while earning good grades in their courses. Although many students who work in the PSL study aeronautical engineering, the lab also accepts students studying mechanical and electrical engineering. The PSL even accepts psychology and liberal arts students, as the lab conducts human factor studies that require these students' skills. PSL has funded a small UAS lab for the College of Engineering.

Benefits to the Department of Defense: The NMSU/PSL works on projects with DoD, as well as the Department of the Interior, the Department of Homeland Security, and the U.S. Department of Agriculture. The services that are performed by the lab include design, testing, demonstrations and procedural development.

The PSL is also working with the FAA to gain unmanned aircraft systems access into the National Airspace System so that they can safely coexist with manned aircraft.

"Where a lot of research and development institutions, especially in the academic world, focus on the really technical things—how to build a better aircraft, how to make something smaller so that it takes up less weight and space—we're more focused on the actual procedures on how to fly safely in the National Airspace System, because that's the biggest issue in getting these unmanned aircraft there," said Dennis Zaklan, the lab's deputy director.

Benefits to Students: In addition to earning more money than they would most likely get by working most part-time jobs, the PSL gives students the opportunity to supplement what they learn from their textbooks by working on UAS projects that interest them. Students can begin working for the lab as freshmen and as they progress in school, they can work on more challenging projects with increasing leadership responsibility. As a result of this hands-on training, students that work in the PSL are ahead of the pack when it comes time to look for a job.

"We have found that every one of our engineering students that has come through our program is hired quickly and not at entry level salaries," said Zaklan. Students get a wide variety of UAS experience from engine test cells, integration control documents, RDT&E, UAS operations, and some even become qualified as UAS pilots on specific UAS.

This is partially because by the time students are ready to graduate, their work in the PSL has exposed them to many of the types of projects that employers need to complete—and the hands-on experience has created a level of expertise that those with only an academic background don't possess.

Northland Community and Technical College

Contribution: Northland Community and Technical College has an aviation maintenance technician program and will begin an unmanned aircraft systems program in the fall for students who have completed the maintenance program and want to continue their studies.

In addition to completing the maintenance technician degree program, Northland wants its UAS students to have a

high level of motivation and integrity. Students must care enough about what they're studying to complete a project correctly the first time, no matter what.

"The type of person that is successful in this industry is self-motivated, and more importantly, has a strong sense of personal integrity. Obviously, with an aircraft, you can't just pull over on the side of the road when something breaks. What that means is, the standards that are in place are on everybody— from the guy that's changing the bolts and tires on the bottom of the aircraft to the person that's troubleshooting the complex electronics. At the end of the day, they have to make sure that they do it right and that they do it right the first time," said Curtis Zoller, the UAS program manager. "You have to do that when no one is looking, regardless of what's going on in your personal life, whether you're trying to get out of work early— whatever the different external factors might be."

Benefits to the Department of Defense: Northland has recognized the paradigm shift that has taken place in the aviation industry and is preparing a workforce that will be ready to fill the positions that will open as UASs become more common. The school is working with DoD and manufacturers so that when this shift comes to fruition, they are prepared to capture the market that will exist.

Benefits to Students: In addition to learning the mechanics of unmanned aircraft systems, students at Northland learn about the human factors that makes someone successful in the field—which is important because workers need to be able to separate their work from their personal lives and leave their problems at the door when they show up to work.

The skills that Northland students acquire are easily transferred to jobs outside of the aviation industry, so students have numerous options available to them when they're done with these programs.

"With the concepts that we teach here, there is a lot of crossover into other industries. Whether we're talking about hydraulics, electronics, or basic aerodynamics, there are countless industries out there—amusement parks to wind power generators—that will hire a standard aviation maintenance mechanic." Zoller said. "These guys are literally going to be able to write their own check."

Northwestern Michigan College

Contribution: Northwestern Michigan College offers a UAS program that utilizes a building-block approach to teaching students. In the program, students learn about the electronics, construction, structures and flight controls of unmanned aircraft. In addition, students also learn about FAA regulations and get hands-on experience with the operating procedures and techniques of UAS. Students who enter the program should have taken college-level math and English.

Benefits to the Department of Defense: Aaron Cook, the school's director of aviation, said that the school is accelerating the training needs of the military, so that the services get workers who are battlefield ready.

"We're a resource that can help support some of the needs right now in training, so that people can be an asset to the Department of Defense—whether it's in initial training with instruments or basic UAV training. When they go into the military, they're prepared," he said.

Benefits to Students: Because Northwestern Michigan College is a smaller school, it appeals to students who crave hands-on learning. In addition, the program is great for students who have an interest in aviation, but don't necessarily want to become pilots. As a result, pilots and non-pilots alike can find jobs with military contractors after they graduate.

Oklahoma State University

Contribution: Oklahoma State University has offered a bachelor's level degree in aerospace engineering for those interested in studying unmanned aircraft for several years. Last year, the school also added a graduate-level option to their mechanical and aerospace engineering M.S. and PhD degrees. The program is for students who are interested in applied UAV research and development, as well as good hands-on learning. Two fully operational, modern UAS airfields are available for student learning.

Benefits to the Department of Defense: OSU students work on research projects that are funded by DoD, as well as industry. As a result, students in the program have the opportunity to help shape the next generation of UAV platforms that will be used by the military— or its industry and academic partners.

Benefits to Students: Students who are interested in doing applied research and development on unmanned aircraft systems will find OSU's graduate program rewarding. This will also give them an edge when they look for a job after graduation.

"We think that because this field is growing fast, that graduates can expect to get advanced engineering jobs in any area—primarily in defense. Once the civil airspace opens up, there will be lots of opportunities with companies as well," said Larry Hoberock, the head of OSU's School of Mechanical and Aerospace Engineering.

University of Dayton Research Institute

Contribution: The University of Dayton Research Institute is the home of the Center for UAS Exploitation, or CUE, which is a collaborative enterprise of companies, the military, and academia who work in concert to advance the development of unmanned systems. Those who participate in the CUE share ideas, resources, and, when the right project comes along, the ability to share project work.

Benefits to the Department of Defense: Rick Scudder, the Director of the CUE, says that the work that is done there accelerates the process of innovation—which goes a long way toward meeting the needs of the military and commercial UAS markets.

"The value proposition of the CUE is for universities and businesses to have closer insight into the types of technology work that the Air Force Research Laboratory (AFRL) is doing or is interested in within the limits of propriety," he said. "Conversely, it allows AFRL to be connected to the innovative thinkers in industry and academia, which gives them a much quicker, shorter path to a bright idea that otherwise might not be available to them."

Benefits to Industry: Companies that participate in the CUE have the opportunity to show off their own expertise and learn from the expertise of their colleagues. There is no room for petty rivalry here: Members of the CUE are expected to work as a team and, in return, will reap all of the benefits of the collaborative atmosphere.

“There’s no company that has all of the answers. There’s no know-it-all. There’s a great deal of teamwork here and it’s a very close-knit community of universities, private businesses, and government researchers,” said Scudder. “Having thirty or forty sets of eyes on a technical challenge is better than having just one set of eyes, so it’s through collaboration and recognizing each collaborator’s field of expertise that we can create a better amalgamated team approach to everything—rather than everybody going off into their own corner and attacking it by themselves.” ♦

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