COMMERCIAL DRONE APPLICATIONS

Leveraging the technology for the good of the industry

BY KIRK MCCLURKIN

Over the past few years, drone usage has gained in popluarity, especially in the area of surveying and aerial mapping. And despite the controversy over airspace rights, the commercial applications of this technology continue to expand.

In 2014, Woolpert became the first surveying and aerial mapping company to be approved to fly an unmanned aircraft system (UAS), or drone, commercially in designated airspace, earning a Federal Aviation Administration (FAA) Section 333 Exemption. As an architecture, engineering and geospatial firm, we secured this exemption believing it would enable us to use drones in multiple industries. As one might expect,

it took a few years for these plans to come to fruition—and for the commercial applications of this technology to benefit the firm and its clients.

Regulatory Compliance

We began our foray into the UAS field by conducting research, testing vehicles and educating our staff. While refining industry applications, we recognized the importance of building partnerships with educational institutions and state agencies, as well as working within the burgeoning rules of the FAA specific to commercial drone use.

"Because of our history and expertise in aviation design and planning, we're able to safely and appropriately integrate our use of UAS into sites that are often restricted," said Thomas Mackie, Woolpert Vice President and Aviation Practice Leader. "We're also able to help our airport clients learn to use UAS to improve their operations—from

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wildlife management to perimeter security surveillance to emergency response to facility inspections."

Our teams are currently working on multiple UAS projects, such as creating high-resolution structural representations of locks and dams, performing pipeline inspections, digitally preserving historic bridges and monitoring construction design for airport runways. In addition to design and planning work, we have provided geospatial services for nearly 2,000 airports. This has helped our team to fully understand the regulations and constraints specific to that environment.

Applications for Natural Disasters

For one UAS project, the Michigan Tech Research Institute (MTRI) hired us to evaluate imagery of haul roads throughout the Midwest. The data collected for the project, sponsored by the U.S. Department of Transportation's Office of the Assistant Secretary for Research and Technology, was being used to test a set of algorithms developed by MTRI. To help commercialize computerized analysis and assessment of unpaved roads, Michigan Tech uses algorithms to detect potholes, rutting and other damage through high-resolution imagery and 3D point clouds. Once it's all combined, this data is intended to be used to assess and address unstable roads.

When northern West Virginia began experiencing historic rains, we dispatched crews to monitor landslides and potential landslide areas. There is value in collecting imagery before, during and after a landslide because we can better

UAS pilots use an unmanned aircraft system to monitor the construction phase of a 500-foot runway extension at the Paoli Municipal Airport in Indiana.

understand the mechanics of these natural disasters from the resulting data. Then this information can be used to predict and prevent landslides, and we can better protect the public, our industries and our resources. UAS is ideally suited for smaller, more rural sites. It's safer and more cost-effective than flying individual manned missions, and in many cases, we can turn around the imagery in 24 hours or less.

Access to this terrain can be challenging, especially during an active weather time, and viewsheds from ground level can be blocked due to overgrown vegetation. UAS gives us a tool to get as close as possible to these remote and often unstable areas in a quick and safe manner. As part of this project, our team collected high-resolution aerial imagery via UAS and quickly generated 3D data after a slope failure on a recently developed parcel of land.

Pilot Certification

When the UAS pilot certification was first made public by the FAA in 2016, Aaron Lawrence, Woolpert's GIS Expert and UAS Technology Manager, was one of the first to earn the UAS license. Seeing the long-term benefits, in early 2017, seven more employees were certified as UAS pilots. The UAS pilots have really extended the firm's versatility in collection methods and enable us to use a lone unmanned pilot or employ manned pilots in concert per FAA mandates.

According to Lawrence, what is beneficial about this group of UAS pilots is that they represent a wide swath of industries and capabilities. "All of our UAS pilots are subject matter experts in a variety of capacities. Looking at UAS from different points of view helps us identify new applications for this medium," he said. "For example, having a lidar technician flying a UAS offers a different perspective than someone with a design background. We're leveraging our extensive, diverse industry experience to adopt alternative methodologies for UAS collection."

Well-suited to small collection areas and those that need to be regularly flown, UAS makes it possible to collect detailed spatial data over locations that are dangerous or inaccessible.

On the Horizon

Dr. Qassim Abdullah, a Senior Geospatial Scientist and Associate at Woolpert, said Woolpert's research has focused—and will continue to focus—on the best practices for achieving and validating survey-grade accuracy from UAS-derived products. Abdullah helped develop the most recent Positional Accuracy Standards for Digital Geospatial Data for the American Society for Photogrammetry and Remote Sensing.

"We're leading the industry in investigating and setting this UAS accuracy standard, and continue to educate others through workshops, presentations and publications," Abdullah said.

Looking ahead, the firm plans to incorporate this data into virtual reality and add first-person view into its UAS capabilities, allowing an operator or an engineer to direct the movement of the cameras by simply turning their head. Lawrence said the firm is continuing to evolve what it can achieve with this and a variety of mapping methods. "We are known worldwide for our mapping capabilities. By increasing our fleet of UAS pilots, we can more expansively apply this expertise," said Lawrence. "It's all about what tool in the toolbox to use to meet the project specifications, and do it in the most cost-effective manner." ✪

Kirk McClurkin is Geospatial Technology Director for Woolpert, where he specializes in delivering GIS and IT solutions for public and private sectors. With 25 years of experience, he has led projects in municipal planning, transportation, engineering, public utilities/public works, photogrammetry and surveying/GPS.