The Potential of Drones

University Communications
November 2019

Drones are making headlines as the delivery vehicles of the future, airborne invaders of privacy or the perfect gift for teens who want to annoy their parents. But the buzzing quad-rotor helicopters can do so much more than that, and they are finding their way into more and more applications.

At the University of Arizona, drones are being embraced in areas as multifaceted as agriculture, geological field research, wildlife monitoring, photographic and video documentation, construction surveys and journalistic reporting.

Drones can go where helicopters can't go — or could go only at high risk or cost. They inspect towers and bridges, map remote areas and study volcanoes up close. They stealthily fly above whale pods in the open ocean and document behavior that the animals would never show if humans were present.

Oblivious to many of the hazards that prohibit humans from accessing certain working environments, drones happily dive into smokestacks at power plants, allowing their operators to conduct inspections from a safe location. Closer to home, drones are whirring around campus, where they assist members of Planning, Design & Construction[1] in documenting construction projects and campus mapping efforts.

Autonomous aircraft hold great potential for scientific applications as well, according to Michael McKisson, associate professor of practice in the School of Journalism[2], who uses drones for videography and visual reporting.

"Let's say a researcher is interested in studying heat island effect in urban areas," he says. "They could use a drone to do thermal imaging and then use that data to create heat maps of the landscape. Basically, anything you could imagine using a helicopter for, you can do with drones."

Drones can be programmed to "do anything you want," he added. "You can stick whatever sensor you want onto the underside and have your drone follow a programmed route and take images along that path."

Although flying drones obviously involves much less demanding piloting skills than helicopters, the Federal Aviation Administration does require drone pilots to hold a valid license for any operation that is commercial. While it may be tempting to believe that applications such as field research or journalistic reporting don't fall under the commercial realm, they actually do, McKisson points out.

"I think many people probably are flying drones without realizing they need a license," he said.

Any activity in which value is exchanged is deemed commercial, McKisson explains, adding
that it's irrelevant whether actual monetary value is involved.

"The best way to think of it is in terms of work versus hobby," he says. "If you're flying a drone purely for recreational purposes, you don't need a license. For all other uses, you do."

This means that anyone who wants to fly drones as part of their work at the University needs to obtain the FAA's Small Unmanned Aircraft Pilot Certification.

Gaining the Training

Some faculty members already offer instruction to would-be drone pilots as part of their curricula, including McKisson. His course, to be offered for the first time this coming spring, is open to degree-seeking and non-degree seeking students and aims to cover everything from how drones work to legal and ethical issues — from safety considerations to possible applications. It will also tackle the bigger picture — how drones will impact journalism and other fields. The course will offer hands-on flight experience, too, as students will learn how to actually fly a drone and capture imagery. The course also prepares students to take the test required to become a licensed drone pilot.

McKisson says earning a license would allow students to fly a drone on their own at an internship or job, making them more marketable when they graduate.

The test, McKisson says, is not easy, contrary to common misconceptions.

"Many aspiring drone operators think they can just show up and wing it," he says. "They think it's easy, but it's not. It's actually quite complicated."

One of his favorite moments, McKisson says, is presenting the students with an aeronautical map for the first time and "watching their jaws drop."

"We rarely think about what is going on in the space above our heads, so we don't tend to know much about it," he says. "Much of it is weather related; that is the most complicated part. You may be interacting in controlled airspace. It's important for drone pilots to understand what is important to pilots of crewed aircraft."

McKisson hopes to get people outside of journalism interested in his course, such as researchers who are curious about how they can benefit from drone technology.

A Camera in The Sky

Jeffrey Gillan, a senior research specialist in the School of Natural Resources and the Environment [3], is one of a growing number of researchers who are taking advantage of drones. His group flies drones over vast swaths of remote rangeland in Arizona and California to help managers assess and maintain the health of grazing lands.

"Out here in the West, we have large expanses of land that are valued for cattle grazing, wildlife habitat and other ecosystem services," Gillan says. "We want to make sure this land isn't being used to death and becomes less productive for us."

Aerial photography is essential to researchers like Gillan who want to measure the health of soil and vegetation.

"We use drones to mimic and expand traditional field measurements, because they can look
"The drone takes lots and lots of overlapping images, so the same piece of ground is imaged many times."

From the drone-generated images, Gillan creates two- and even three-dimensional images, renderings and maps that allow experts like him to assess what type of vegetation is on the ground, what its height is, and how much soil might be eroding.

"Drones represent a new scale of ecological monitoring that is somewhere between field measurements and satellite imagery," he says. "I always tell people that the most important question is, 'What is your application?' That is more important than just the desire to get into drones. A drone is a tool to put a camera in the sky."

And just in case you were looking forward to trying out that drone you asked for this holiday season by exploring campus from above: Sorry, that's a negative, according to Herbert Wagner with Risk Management Services [4], who adds that the University of Arizona Police Department has become involved several times when wannabe drone pilots attempted to do just that.

"Any drone that is to fly on campus outside of a building has to be registered with the FAA," he said. "If someone is bringing a personally owned drone, for example to take video, they need to go through a process of approval, and they need proof of insurance."

More information

- "The Drone Zone [5]," a website hosted by the FAA, has lots of information for those interested in drones and regulations.
- Risk Management Services offers information for those interested in operating drones on campus [6].
- McKisson's course, JOUR 482/582, is open to degree-seeking and nondegree-seeking students.
- Kamel Didan, associate professor in agricultural and biosystems engineering, teaches BE 385, a course on drone building and flying for engineers and scientists. Like McKisson's course, Didan's class covers pilot licensing requirements, FAA regulations, what it takes to get licensed, and the science aspects of the technology.