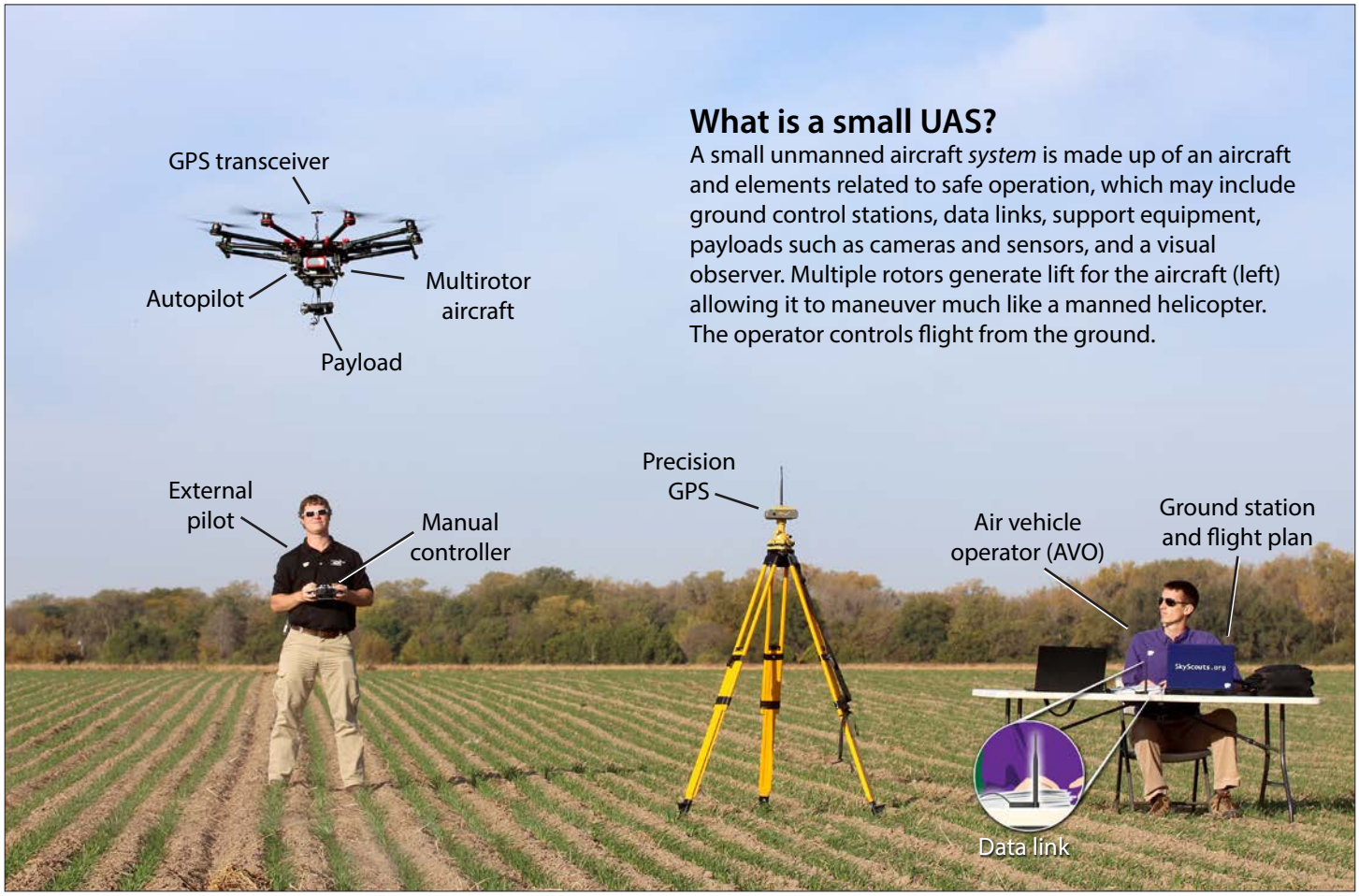
K-STATE Research and Extension

What You Should Know About Small Unmanned Aircraft Systems (UAS)



What is a small UAS?

A small unmanned aircraft *system* is made up of an aircraft and elements related to safe operation, which may include ground control stations, data links, support equipment, payloads such as cameras and sensors, and a visual observer. Multiple rotors generate lift for the aircraft (left) allowing it to maneuver much like a manned helicopter. The operator controls flight from the ground.

Small unmanned aircraft systems (UAS), also known as drones, are fixed-wing or rotary-winged vehicles that do not carry humans. A small UAS consists of a small unmanned aircraft — defined by statute as an unmanned aircraft weighing less than 55 pounds — and equipment necessary for safe and efficient operation. The smallest unmanned aircraft weigh less than a pound and fit into the palm of your hand. Small UAS like the one shown above are powered by electricity and fly for about 15 to 25 minutes. Larger, gas-powered models fly for almost 24 hours.

Safety Regulations

UAS have been around since the beginning of aviation and were originally used by the military. Technological advances have spurred the recent growing interest in the recreational and commercial use of small UAS as well as safety concerns. To address problems associated with the number of remotely piloted vehicles operating in the national airspace, the Federal Aviation Administration (FAA) developed safety rules, which are outlined here.

Under current FAA rules, a certificate of authorization (COA) is required to operate a small UAS in national airspace. This document defines the block of airspace in which the aircraft is allowed to fly and states provisions unique to the proposed operation. The COA requirement applies to both public and commercial entities, *even when operators are licensed pilots*. Regulations pertaining to specific types of users are presented in Table 1 on the back page. Rules are subject to change. To make sure you are in compliance, visit the FAA at www.faa.gov/uas.

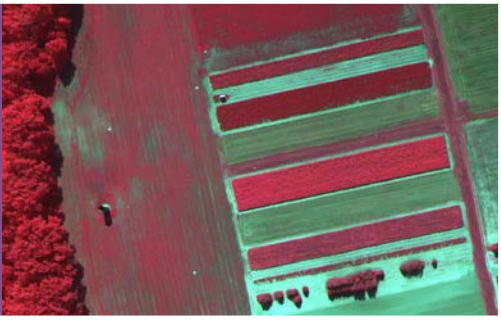
Small UAS at Work

Small UAS offer practical advantages for those working in agriculture, energy, transportation, and safety. Here are a few examples (right).

A fixed-wing aircraft consists of a rigid wing and streamlined shape (airfoil) that generates lift as a result of forward airspeed. Airspeed is generated by forward thrust from a single propeller powered by an internal combustion engine or electric motor to keep the payload aloft.

Food Production

Sensors give farmers and ranchers the ability to monitor plant health at critical growth stages and to detect problems with livestock and rangelands long before they are visible to the unaided eye. The thermal image at left shows animal location. These tools also can be used to estimate crop yield, collect precision agriculture prescription data, and track livestock migration.



Crop Protection and Plant Biosecurity

Early detection of pests and invasive species and implementation of sophisticated pest management strategies are possible with remote-sensing technology. Using small UAS to create vegetation maps, researchers have been able to chart field patterns to quickly identify and manage damaging infestations of crop pests.

Infrastructure Inspection

Small unmanned aircraft systems can be used to evaluate the condition of hard-to-reach structures such as wind turbines, power lines, and smokestacks without endangering inspectors. The ability to relay information in real time and at lower cost increases economic efficiency of the power system.

Transportation

The ability to capture images labeled with time and location increases the utility of small UAS for road and bridge inspection, pothole detection, accident reporting, environmental assessment, and post-disaster surveys.

Public Safety

By enabling responders to cover large areas and locate victims quickly, the aerial view offers an advantage for firefighters doing search and rescue in wilderness or large urban areas. Detailed site information allows rescue teams to make better decisions, which saves lives and protects property.

Water Quality

Small UAS can be used to monitor shorelines, swimming beaches, and farm ponds for algae that may be toxic to humans or livestock. Routine checks enable rapid response to changing environmental conditions.

Table 1. Regulations for operation of small UAS in federal airspace.*

Restrictions / Requirements	Hobbyist	Public entity	Commercial user
Section 333 exemption	No	No	Yes
Certificate of authorization (COA)	No	Yes	Yes
Visual line of sight	Yes	Yes	Yes
Pilot's license	No	COA	COA**
Altitude limitation	400 feet above ground level	COA	COA
Distance from airport	5 nautical miles unless authorized	COA	COA

* FAA rules in effect as of October 2015. Flight restrictions are specified in the COA.

**COA is required for public and commercial users even when operators are licensed pilots.

Key Terms

Section 333 exemption – allows a sUAS operator with an FAA airworthiness certificate and COA to fly in approved airspace. Required for commercial use. Other operators may be granted an exemption for commercial use. To apply, visit the FAA's Section 333 page.

Certificate of authorization (COA) – waiver that allows an operator of a small unmanned aircraft system to fly within federal airspace. Altitude limitations and distance from nearest airport are specified in the authorization certificate.

Visual line of sight – requirement that the aircraft must remain in sight of the operator at all times, with help if needed.

Altitude limitation – maximum height above ground an operator can fly a small unmanned aircraft system in federal airspace.

Hobbyist or recreational user – a person who operates a system for personal enjoyment without compensation. Selling images or videos taken from an unmanned aircraft system is considered commercial use.

Public entity – publicly funded institution or organization such as a university, fire department, or law enforcement agency. The FAA requires a certificate of authorization (COA) to engage in public aircraft operations or research.

Commercial user – anyone who operates a small unmanned aerial system for compensation or hire — to capture and sell images or videos or to provide industrial inspection, security, or telecommunication services, for example.

The average time to process a COA is less than 60 days, but the application can be expedited in an emergency. Laws and regulations pertaining to public aircraft operations are referenced in 49 U.S.C. §§ 40102(a)(41), 40125, and FAA Advisory Circular 00-1.1A, Public Aircraft Operations (Feb. 12, 2014).

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