# Fact Sheet on Unmanned Aircraft Systems (UAS)

## Importance of the Aerial Application Industry

- Aerial applicators treat 127 million acres of cropland per year; 28% of the treated commercial cropland nationwide. In addition to the cropland acres, aerial applicators annually apply to 5.1 million acres of forest land, 7.9 million acres of pasture and rangeland, and 4.8 million acres for mosquito control and other public health concerns. Aerial applicators also fight fires and protect the environment from invasive species.
- Aerial application is often the only application method available to farmers to eradicate a pest before it destroys their crop. Aerial application is also the only method to treat crops that ground applicators can't get to, such as crops on rolling hills or crops after a rain, when the ground is too wet for ground applications. Furthermore, aerial application does not damage a standing crop and reduce yield like ground application does[1].
- The aerial application industry is directly responsible for the production of 1.69 billion bushels of corn, 199 million bushels of wheat, 548 million pounds of cotton, 295 million bushels of soybean, and 3.33 billion pounds of rice annually that would be lost every year without the aerial application of pesticides. The value of the aerial application industry to farmers, input suppliers, processors, and agricultural transportation and storage industries for corn, wheat, cotton, soybean, and rice production in the U.S. is estimated to be about $37 billion[2,3].
- The aerial application of crop protection products results in greater harvest yields of crops. This in turn results in less land being used for agricultural production, preserving more wetlands for natural water filtration, forest ecosystems for carbon sequestration and habitat for threatened and endangered species. The total area of cropland needed to replace the yield lost if aerial application was not available for corn, wheat, soybean, cotton, and rice production is 27.4 million acres, an area roughly the size of Tennessee[2].
- Aerial applicators seed 3.8 million acres of cover crops annually[2], helping to sequester 1.9 million metric tons of CO2 equivalent every year. According to the EPA this would be the equivalent of removing approximately 412,000 cars with carbon-combustion engines from the roads each year.
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## Obstacles to Ag Aviation

The agricultural aviation industry is concerned about UAVs hitting ag aircraft. Bird strikes have shown our industry how dangerous low-altitude objects can be, and unmarked towers have taught us that UAS operators will likely be liable in the event of a UAV-manned aircraft accident.

Ag aviators commonly fly between 10- and 500-feet above ground level (AGL) while monitoring many gages in the cockpit and avoiding trees, telephone poles, towers, wires, and birds. According to a joint report by the FAA and the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA-APHIS), between 1990 and 2012 over 131,000 wildlife strikes occurred with civil aircraft, 97 percent of which were the result of collisions with birds, with 25 producing fatalities. Accident records maintained by NAAA, as taken from NTSB accident reports, show there were seven collisions between aircraft, in which at least one of the aircraft was an ag aircraft during the last 10 years (2008-2018).

Small UAS are generally like birds in their difficulty to be seen by manned aircraft pilots, but a recent FAA study shows they are much more deadly. [4] A duck, made of hollow bones, feathers and sinew, weighing less than two pounds can crash through an ag aircraft windshield. A UAV of a similar weight causes far more damage to an aircraft due to dense battery packs, engines and cameras made of metal, glass and plastic.

Research conducted by the University of Dayton Research Institute showed what can happen should a UAS collide with a manned aircraft. The research team mimicked in a laboratory a collision between a small quadcopter and a Mooney M20

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[1] Hanna, S., S. Conley, J. Santini, and G. Shaner. 2007. "Managing Fungicide Applications in Soybean." Purdue University Extension Soybean Production Systems SPS-103-W. https://www.extension.purdue.edu/extmedia/sps/sps-103-w.pdf

[2] Dharmasena, S. 2020. "How Much is the Aerial Application Industry Worth in the United States?" Research presented at the 2020 Ag Aviation Expo, Savannah, GA. https://www.agaviation.org/2020aatresearchpapers

[3] National Agricultural Aviation Association. May 2019. "2019 NAAA Aerial Application Industry Survey: Operators." https://www.agaviation.org//Files/Comments/NAAA%202019%20Operator%20Survey.pdf

[4] http://www.assureuas.org/projects/deliverables/sUASAirborneCollisionReport.php

aircraft. While the UAS only weighed 2.1 pounds, it did extensive damage to the wing of the Mooney. Should such a collision occur with an agricultural aircraft while it is making a pass in a field at the standard application height of 10 to 15 feet, there would be little opportunity for the pilot to avoid crashing the agricultural aircraft.

A recent study[5] conducted by the FAA through the Alliance for System Safety of UAS through Research Excellence (ASSURE), shows UAS collisions with aircraft would cause more damage than would a bird strike of similar size, due partially to UAVs' dense motors and batteries. Using simulations, researchers replicated collisions of UAVs weighing 2.7 to 8 pounds with common mid-sized commercial and business jets. The "stiffer" parts of a UAV, such as motors, batteries, and cameras, caused the worst damage to engine fans. In some cases, UAVs in the simulations also punctured the skin of the aircraft. Birds, already a risk to manned aviation, cause less damage in comparison because they are softer and made mostly of water. A collision between one of these unmanned aircraft and a manned aircraft could be catastrophic.

In 2015, the Colorado Agricultural Aviation Association teamed up with aviation and UAS organizations in the state to conduct a visibility test to determine if pilots can see UAVs mid-flight. The results showed not a single pilot could visually track a six-pound, 28-inch-wide Enduro quadcopter when flying at regular speeds, and only one of six pilots were able to even briefly spot a UAV while flying. Small UAVs are essentially not visible to pilots, a dangerous reality that greatly increases the chance of fatal crashes. The result of this test leads NAAA to believe that UAVs must be marked/lighted and equipped with an ADS-B Out-like system, and/or that UAVs and manned aircraft should not be in close proximity to one another while flying to ensure pilot safety.

**Issues Related to Aerial Applications Made by UAS**

UAS are used for application of crop inputs in the U.S. but it is less than 1% of the industry. UAV applications are more common in countries like Japan, due to the average farm size in Japan being about 5 acres[6] compared to the 441 acre average in the U.S.[7] UAVs simply cannot carry enough pesticide, fertilizer, or seeds to make them feasible on a large scale effectively or economically.

In January 2020, NAAA sent a letter to EPA Administrator Andrew Wheeler outlining the lack of testing data on UAVs used for application, such as a lack of data regarding their application efficacy and drift potential. The letter urged the EPA to begin testing UAS to evaluate application accuracy and drift potential so such data could be incorporated into an atmospheric model known as AgDRIFT used for the risk assessment process for pesticide registration and re-registrations to ensure aerial applications can be made safe environmentally. Manned agricultural aircraft are currently evaluated using the AgDRIFT model.

The AgDRIFT model is used by EPA to predict spray drift for manned fixed wing and single rotor applications. Other inputs into the model include weather conditions and boom length. These models do not necessarily apply to UAVs with two, four, six or more rotors or which weigh far less than manned aircraft. Without a similar model for unmanned aircraft, a proper spray drift risk assessment cannot be performed. Therefore, pesticide products with an aerial label that are dispersed by UAVs are not necessarily done in the spirit of the law.

In December of 2020, North Carolina State University's Center of Excellence for Regulatory Science in Agriculture (CERSA) organized a conference titled "Advances in Regulatory Risk Assessment of Pesticide Drift from Unmanned Application Systems (UAS) and Manned Aerial Application." The CERSA final report stated that "Reliable data on drift profiles of UAS are not currently available." There are current efforts underway to develop a better accounting of how different UAV types' applied material moves in the atmosphere. These include the OECD, EPA's PPDC Emerging Technology Working Group, CLA, and the Unmanned Aerial Pesticide Application Systems Task Force

The Pest Management Regulatory Agency (PMRA), Canada's counterpart to the EPA, has established policy that requires a pesticide to be specifically registered to be applied by a UAV, must have drift modeling showing its safety. As such, UAS applications in Canada are not allowed presently. NAAA has been urging the EPA to develop UAS spray modeling indicating how the product moves in the atmosphere and to label its use according to the results, just like it does for manned applications.

[5] http://www.assureuas.org/projects/deliverables/sUASAirborneCollisionReport.php
[6] http://www.ers.usda.gov/topics/international-markets-trade/countries-regions/japan/basic-information.aspx
[7] http://usda.mannlib.cornell.edu/usda/current/FarmLandIn/FarmLandIn-02-18-2016.pdf

## UAS Federal Policy Background

As of April of 2023, there are over 871,000 drones registered with the FAA, and over 307,000 certified Remote Pilots. The FAA mandates registration of drone that weighs about 0.55 pounds or more (more than 250 grams) with the authorities. This is compared to the 320,000 manned aircraft registered with the agency.

In June of 2016, FAA finalized its small UAS (sUAS) rule which went into effect in August of the same year. The rule applies only to commercial UAS under 55 pounds and allows UAS operators to fly without a Sec. 333 exemption. Instead, sUAS may be operated commercially by someone with a remote pilot airman certificate, which requires having a pilot's license and completing an online course, or by taking an in-person remote pilot knowledge exam at an FAA approved test center. In part thanks to NAAA, comments on the notice of the proposed rule, the ceiling for UAS flights was lowered from 500 to 400 feet.

**FAA Drone Remote Identification Rule Finalized; Operations Over People and at Night Allowed**

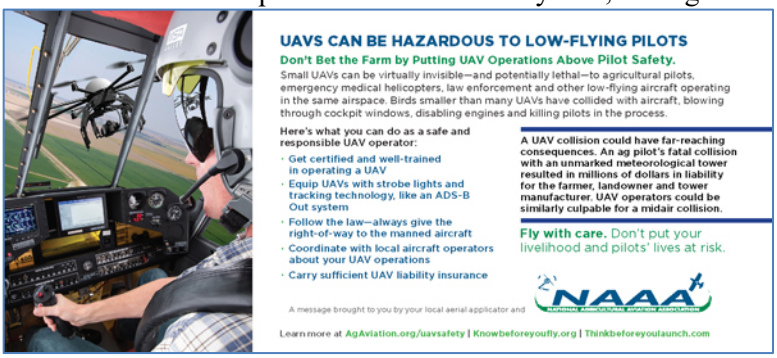
The Federal Aviation Administration (FAA) 14 CFR Part 89 final rule on the remote identification (RID) of unmanned aircraft systems (UAS) requires drones to be equipped with technology that will determine a drone's location and the time it is operating in specific locations. NAAA has been active in advocating drone's half a pound or greater be tracked and identified long before the FAA issued its proposed rule in the spring of 2020. With only a few exceptions, RID is required for all drones over 0.55 pounds operating outside of an enclosed structure. Under this RID rule, drones will be required to broadcast a signal that includes, among other information, the UAS's ID serial number, latitude/longitude, altitude, velocity, emergency status and time mark. The identification of the owner/operator of the serial numbered UAS will only be available to law enforcement and regulatory agencies. The specific frequency band of the broadcast signal is not specified other than it must be compatible with personal wireless devices such as tablets or phones using Wi-Fi or Bluetooth. The signal strength is required to be optimized to allow reception by as many devices as possible. As of December 16, 2022, newly manufactured drones are required to have the ability to transmit RID and all drones must start actively transmitting RID by September 16, 2023.

**FAA UAS Beyond Visual Line of Sight Aviation Rulemaking Committee**: The FAA beyond visual line of sight (BVLOS) aviation rulemaking committee (ARC) issued their final report on March 10, 2022. NAAA believes their recommendations for BVLOS operations are markedly flawed due to the ARC's assumptions that few manned aircraft operate below 500 feet of altitude and that no manned aircraft operate within 100 feet of obstructions. NAAA was not invited to participate in this ARC. The ARC's recommendations of not requiring an unmanned aircraft operating BVLOS to have ADS-B or any sense and avoid technology and not have to give right-of-way to a manned aircraft while the unmanned aircraft is operating within 100 feet of an obstruction is a serious violation of aviation safety.

## NAAA's Actions to Promote Safety

NAAA has sent letters to FAA Administrator Billy Nolen and Transportation Secretary Pete Buttigieg pointing out the serious aviation safety concerns the BVLOS ARC's recommendations would have to manned pilots flying in low-altitude airspace. NAAA is ready to respond with convicted opposition to any of the BVLOS ARC's recommendations that the FAA or Congress intends to codify into law. NAAA is urging to include statutory language in U.S. Code that unmanned aircraft, without exception, must give way to manned aircraft.

NAAA has worked to educate UAS users and the public about how they can use UAVs safely, especially in agricultural areas. NAAA has also created free fliers to include in the bills ag pilots send to farmer customers to remind them of safe UAV practices. The flier includes recommendations to those using UAVs in low-altitude manned airspace to hire certified UAV pilots, only use UAVs with strobe lights and an ADS-B Out-like system, and always give the right-of-way to manned aircraft to help manned aircraft to stay safe, among other suggestions.



**NAAA's Recommendations to Congress**

A fundamental safety principle needed for manned aviators is the ability to see and avoid obstructions and other aircraft in the airspace in which they operate. This principle can only be utilized when other aircraft do their part to avoid collisions by making their whereabouts known. Requiring drones to give right-away to manned aircraft without exception; be identified, and equipped with sense and avoid technology; and to be well-marked for manned aviators will considerably decrease the likelihood that a UAS will collide with a manned aircraft.

National Agricultural Aviation Association (NAAA) represents the interests of the 1,560 aerial application industry owner/operators and 2,028 non-operator agricultural pilots throughout the United States licensed as commercial applicators that use aircraft to enhance food, fiber and bio-energy production, protect forestry, and control health-threatening pests. Furthermore, through its affiliation with the National Agricultural Aviation Research & Education Fund (NAAREF), NAAA contributes to research and education programs aimed at enhancing the efficacy and safety of aerial application.

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