

# How Does Spraying Pesticides with a UAS Work?

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## PROGRAM GOAL

The increased use of Unmanned Aerial Systems (UAS) in the application of pesticides has dramatically increased in the Midwest including Ohio. Spraying with UAS has different challenges compared to traditional spraying. The need to connect farmers and UAS sprayer operators to the information they need has been the focus of this program.

## LEARNING OBJECTIVES

- Understand what the F.A.A. requirements are to obtain licenses and waivers for UAS spraying
- Assist operators on obtaining the required ODA Pesticide Applicator License for UAS spraying
- Explain how to read a pesticide label to determine aerial application requirements
- Educate UAS sprayer operators about the flight planning software through field demonstration
- Demonstrate the management of the drone, batteries, and pesticide handling in the field
- Conduct on-farm research to determine the best practice in applying pesticides with a UAS



## PROGRAM ACTIVITIES

### Teaching Events

- West Central Agronomy Day 2022
- Northwest Ohio Corn & Soybean Day 2023
- East Ohio Agronomy Day 2023
- Conservation Tillage Conference 2023
- Farm Science Review 2022 / 2023
- Northwest Ohio Agronomy Day 2024
- Putnam County Farmer Breakfast 2024
- Hardin County CTC Breakfast 2024
- Pesticide Applicator Recertification Meetings

### Field Day Demonstrations

- Brown County Extension / Farm Bureau Day 2022
- Defiance County Field Day 2022
- OSU Agronomy College 2022
- Northwest Ohio Agriculture Technology Day 2023
- Shelby County Farm Bureau Meeting 2023



## Spray Drone Applicator Credentials

### Federal Aviation Administration (FAA)

- Part 107 Pilot license to fly commercial drone flights
- Part 137 Aerial application of pesticides



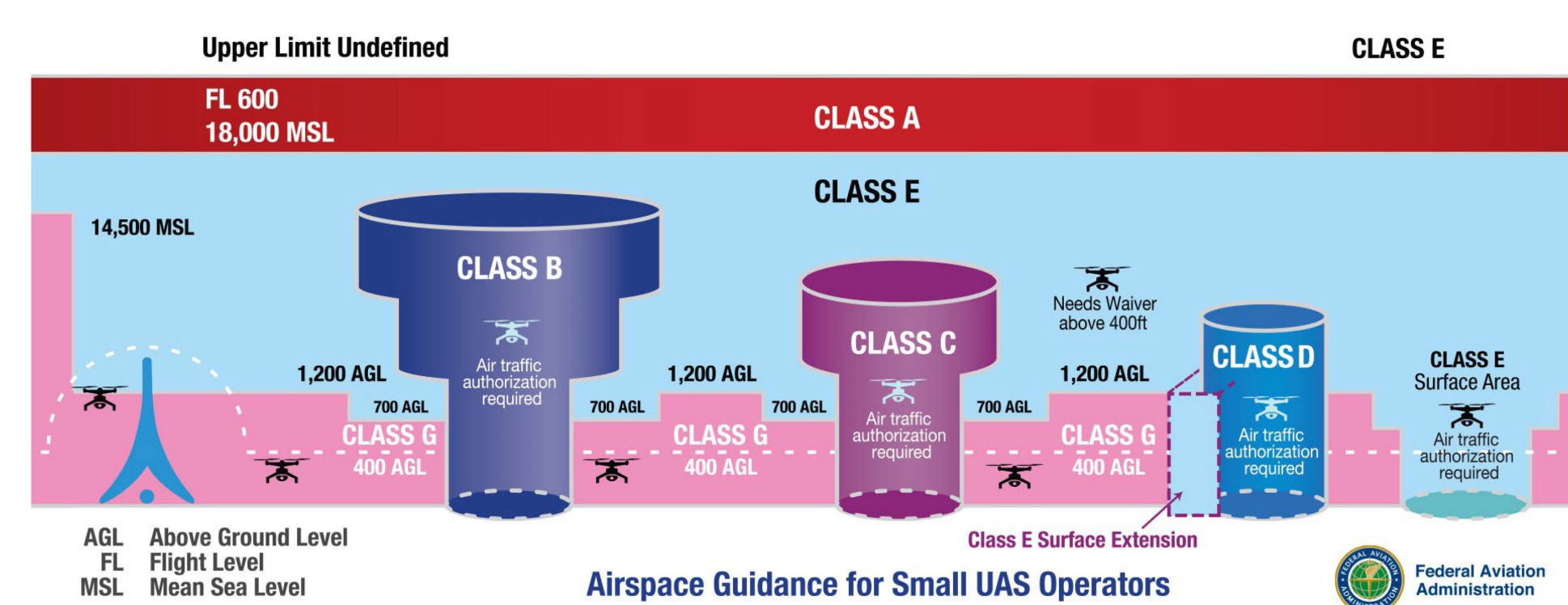
### Ohio Department of Agriculture (ODA)

- Commercial pesticide license including Cat 1
- Other categories may be required depending on the crop



### FAA Rules That Influence Spray Drone Operation

- Cannot fly any drone above 400 feet
  - "Most spray drones fly less than 20ft above the crop canopy"
- Must weigh less than 55lbs at take-off
- Can weigh more than 55lbs with a filed exemption from the FAA
- Must maintain a line of sight during flight
- Must have Air Traffic authorization to fly in Class B, C, D or within the lateral boundaries of the surface area of class E airspace



## PROGRAM MATERIALS

- Poster developed for pesticide label requirements for UAS spraying
- Poster developed for FAA & ODA requirements for UAS spraying
- Presentations on PowerPoint for teaching events
- Hyllo 110 UAS sprayer for teaching, field days and on-farm research
- Tender trailer for UAS in field servicing
- Multiple sprayer nozzles for teaching and research

## ON-FARM RESEARCH

On-farm research is an invaluable tool to teach the concepts of a UAS spraying system. A combination of in season applications in a corn crop and static tests were conducted to determine the best operation practices of the UAS.



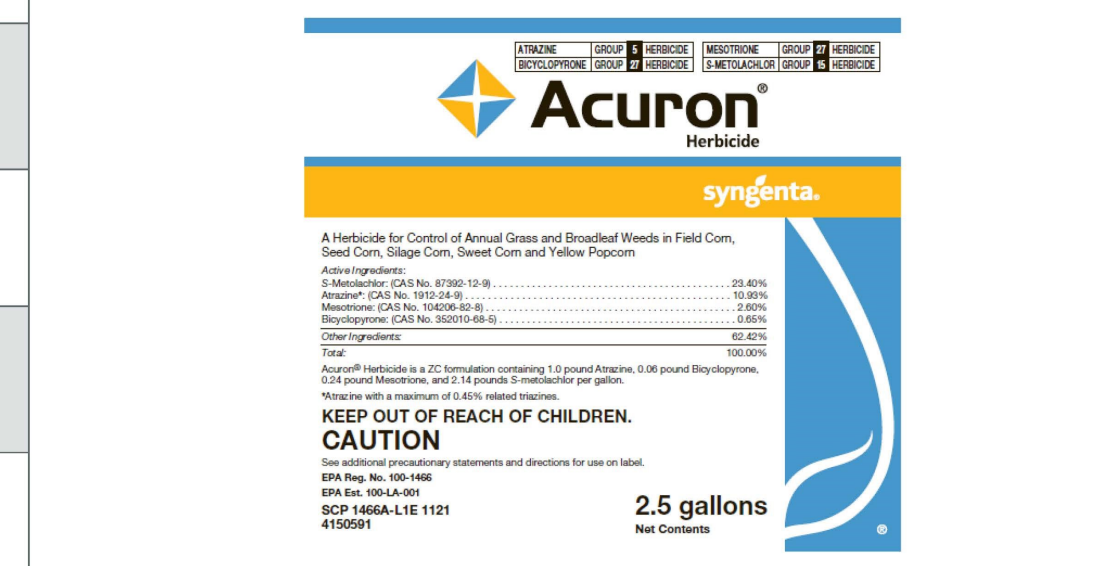
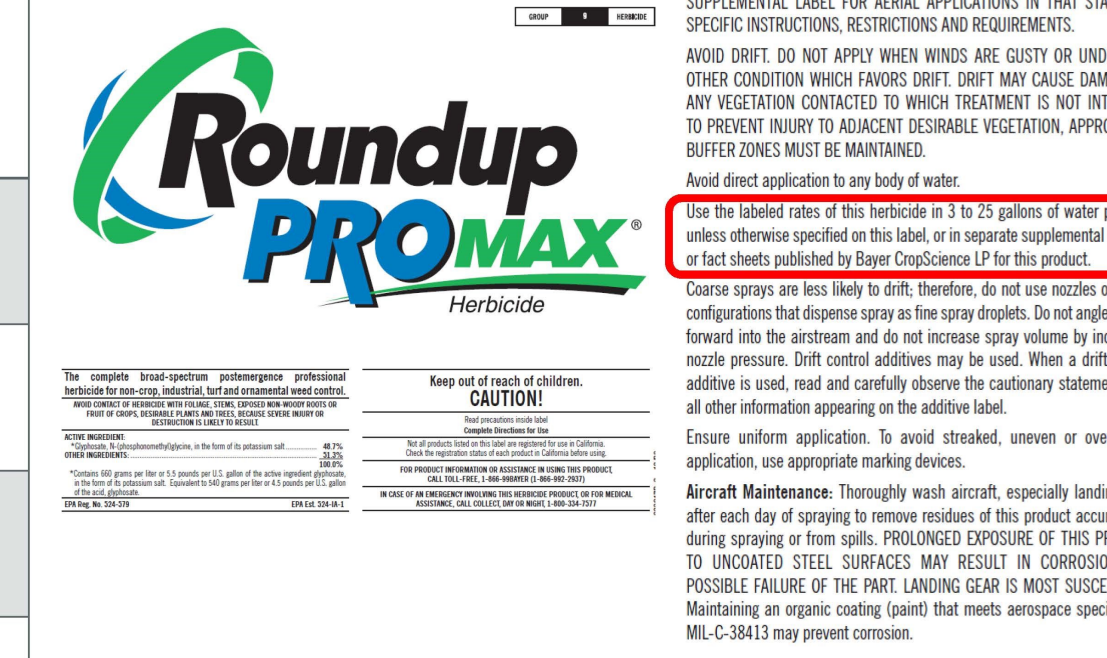
Layout of an on-farm research UAS sprayer project. Spraying water sensitive cards with the UAS for an altitude and swath width study. Water sensitive card placement for in fields fungicide treatments.

## Following Pesticide Labels with Spray Drones

### Aerial Application Minimum Carrier Rates of Common Pesticides

All aerial applications including spray drones must follow the required label rate of carrier "Water" that must be applied per acre. The survey of products below show the different carrier rates required for application.

Product	Pesticide Type	Minimum Carrier Required
Roundup ProMax	Herbicide	3 GPA
Liberty	Herbicide	10 GPA
Miravis Neo	Fungicide	2 GPA
Miravis ACE	Fungicide	N/A
Approach Prima	Fungicide	N/A
Mustang Maxx	Fungicide	2 GPA
Warrior II	Insecticide	2 GPA
Enlist	Herbicide	Do Not Apply
Xtendimax	Herbicide	Do Not Apply
Acuron	Herbicide	Do Not Apply
Harness Xtra	Herbicide	Do Not Apply



**SPRAY EQUIPMENT**  
Ground Application: Spray nozzles should be uniformly spaced, the same size and type, and should provide accurate and uniform application. Ensure that all the nozzles and nozzle covers in the sprayer are 50-cm or closer. Use a spray that can maintain the manufacturer's recommended pressure at the nozzle and provide proper agitation within the tank to keep the product dispersed. Lower pressure may be used with extended spray or drift reduction nozzles as long as adequate coverage is maintained. Always use full rate application in maintenance level spraying in herbicide. When it is required to reduce the volume of the application, the application should be for more than 5 minutes, re-suspend the spray solution by running on full agitation prior to spraying.  
Preemergence: Apply in a spray volume of 10-80 gpa.  
Early Preemergence: Good weed coverage is essential for optimum weed control. Boom height for broadcast over-the-top applications must be based on the height of the crop - at least 15 inches above the crop canopy, but only high enough to give uniform coverage. Apply the spray volume of 10-80 gpa. When used in-row, use a minimum boom height of 20 inches above the crop canopy. The height of the boom is not recommended for optimum pre-emergence coverage. Do not use fogger nozzles or controlled droplet application equipment for pre-emergence applications. Nozzles may be angled forward 45° to enhance penetration of the crop and provide better coverage.  
Aerial Application: Do not apply by air.

## OUTCOMES

- Presented to over 500 farmers, ag retailers, and UAS sprayer operators at Extension events
- Conducted field day demonstrations for over 400 attendees
- Demonstrated UAS spraying on-farm for five practicing farmers
- Conducted five different on-farm research projects applying fungicides in corn and soybeans
- Conducted a UAS spraying deposition study
- Published on-farm research results in the eFields publication

