Unmanned Aircraft Systems for Aerial Applications
Yamaha unmanned helicopters have been used commercially for spraying since 1991.

Yamaha has released 3 separate platforms:
- R-50 (1991)

Yamaha has produced over 5,000 helicopters and have over 2 million flight hours.

Yamaha unmanned helicopters spray over 2.5 million acres annually.
Currently over 40% of all rice paddies in Japan are sprayed by a Yamaha unmanned helicopter.

Currently authorized to be used in Japan, Korea, Thailand, Australia, New Zealand and the United States.
• 2017 was the first season offering commercial services

• Conducted active spray studies with UC Davis since 2015

• RMAX unmanned helicopter

• Viking VI that serves as our loading platform

• Roles

• Pilot (per current California laws the pilot must be commercially rated)

• Visual Observer (no requirement other than Yamaha training)
SETUP (45 mins)
• Unload equipment
• Prepare units
• Preflight checklist
• Morning briefing (huddle)

SPRAY
• 1 – 3 acres per hour
• 10 gallons per acre
• Includes time for mixing & loading
• Backpack areas not accessible by helicopter
• 10-12 mph
• 10’ above canopy
CLEANUP (30 – 45 mins)

- Triple rinse
- Clean in field
Autopilot

- Exact terrain following allows for automated flight
- Reduce operator fatigue
- Allows for spot applications
- Will integrate into operations in 2018

FAZER R

- Type Certify FAZER R with FAA
- Lease FAZER R to qualified organizations
- Carries 8.5 gallons (double the RMAX)
- Plan to begin offering lease in 2019-2020
• Multi-Rotor
• Yamaha introduced a multi-rotor unit in Japan (October)
• Under 55 pounds
• Battery powered with 2 gallon payload
MG-1 and MG-1S Unmanned Aircraft System (UAS)

- 1 to 4 Teejet nozzles
- 22 pound payload
- 10 liter spray tank
- Gross weight 54 lbs.
- Flow rates 12 – 128 ounces / minute
- Variable rate flow control
- Autonomous or manual flight plan
- RTK – Real Time Kinematic GPS
- Absolute RTK correction
- Flight time duration 12-15 minutes
- Treat .5 - .8 acres per minute
- Fully integrated with real time tracking and positioning
- Variable rate flow control
If you are going to perform aerial applications, you better know your droplet spectrum, effective swath width and cross wind swath.
Pacific Northwest

- Custom Forestry application for site prep
- Removes plant competition
- Seeding performed by Drones also
- Reforestation without extensive labor as in the past
- Operator can operate multiple drones at once
THE FIRST FAA APPROVED SWARMS FOR SPRAYING

We're working with commercial foresters to make reforestation more efficient. Offering a one-stop solution, our team of drones plants tree seeds and sprays fertilizer and herbicides to keep trees healthy.

Millions of acres of forestland are currently under-utilized. The availability of dependable workers, and the safety concerns of rough terrain, prevent trees from being planted and cared for. DroneSeed is a scalable solution to addressing this problem. This is the future of forestry - faster, safer, and more efficient.
UAS FAA Laws & Requirements

It’s Complicated
14 CFR Part 107

- FAA promulgated rules in 2016 due to increase of Drone use

- sUAS Small Unmanned Aircraft System < 55 pounds for commercial purposes

- Can’t carry or dispense hazardous materials “Economic poisons”

- Can get waivers by FAA but can take along time to get. Public entity COA faster
14 CFR Part 137

- Agricultural Aircraft Operations
- UAV > 55 pounds
- Same as traditional aerial applicators
- Can apply economic poisons
- Exemptions from wearing harness and certain maneuvers
• The FAA grants relief from certain sections of 14 CFR part 137 that are not applicable to small UAS

• Section 107.36 states that; a small unmanned aircraft may not carry hazardous material. For purposes of this section, the term hazardous material is defined in 49 CFR 171.8

• Knowledge and skill tests - Chief pilot supervisor of agricultural aircraft operations knowledge and skill regarding agricultural aircraft operations

• The test of skill consists of: Approaches to the working area, flare pullups and turnarounds.
Established comprehensive pilot and visual observer (VO) training
- A pilot proficiency demonstration;
- Supervised flight training including agricultural spraying;
- Droplet assessment
- Completion of the training program requirements including examination;
- Continued periodic training even after certification.
• One person who holds a current U.S. commercial or airline transport pilot certificate and rating for the aircraft to be used.

• The remote PIC must hold a remote pilot in command certificate (RPIC) with a small UAS rating in accordance with 14 CFR part 107. However, when conducting commercial agricultural aircraft operations, 14 CFR part 137 requires the PIC to hold at least a commercial pilot certificate, and meet all requirements of 14 CFR part 137 unless exempted.

• When a person manipulating the controls of the small UAS is not the remote pilot in command, as permitted in accordance with § 107.12(a) (2), he or she must be supervised by a remote pilot in command who meets the applicable knowledge and skills requirement for agricultural aircraft operations.
Recommendations for State Agricultural Policies:

Private applicators:
- Adopt Federal FAA requirements
- Require FAA Part 137 Certificate
- Pilot, sport, recreational pilot license
- Chief pilot with Part 137 Credentials
- FAA Part 107 sSUS pilot license

Public Agencies:
- FAA Part 107 sSUS pilot license
- Applicators license (ground)
- Operate as public use aircraft
North Carolina Issues

- Must have Aerial Applicator license and Contractors license
- Specialty category (Forestry, Ag Pest  Plant)
- Apprenticeship of 125 hours under licensed pilot
- No deposit zones (25 feet from road edge, 100 feet from residence and 300 feet from occupied business.
- Drones can be a precision application method, not practical for our regs
Other considerations

- Is a Drone a Helicopter?
- Does Aerial Application on the label cover it?
- Labels will need to specify
- Droplet size documentation
- Is a Drone safer thus minimizing risk. Less stringent no deposit areas.
Questions