Professional Aerial Applicators' Support System (PAASS)
Industry Leading Continuing Education for Aerial Applicators

Background

The Aerial Application industry is a small group of professionals who are widely spread across the country. Consequently, there is a great deal of unfamiliarity with the unique educational needs of these individuals, even amongst experts in the pesticide application industry generally. This document is intended to explain PAASS as a continuing education (CE) training for aerial pesticide applicators.

As described in the National Aerial Applicator's Manual[1]:

> *"A pesticide drift mitigation and education project initiated in 1996 by the National Agricultural Aviation Association (NAAA). PAASS is an industry-based collaborative educational effort that focuses on outreach to pilots and operators of aerial applicator businesses. The program's primary goals are to reduce the number of pesticide agricultural aviation accidents, improve pilot safety, and reduce pesticide drift incidents by fostering professionally-sound decision-making.*
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> *The PAASS interactive program improves critical decision-making skills sensitive to environmental factors. The agricultural aviation industry regards the PAASS program as the single relevant recurring training source for modern agricultural aviation pilots. Many companies providing insurance to agricultural aviators require pilots to participate in this training as a condition of insurability.*
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> *Statistics show that aerial application accidents and drift incidents have notably declined since the PAASS program first began."*

PAASS is broadly split amongst three educational areas: (1) Aerial Application Human Factors, (2) Environmental Professionalism and (3) Pesticide Storage & Security.

Aerial Application Human Factors – Education for Spill Prevention

A major educational component of the PAASS Program is a deep dive into aerial application industry-specific aviation human factors[2]. This includes an analysis of recent accidents, which enables attendees to learn from other pilots' experiences and increase flying safety. Because of the unique nature of aerial application, any accident can also be a spill. Accident prevention is also spill prevention, which is nationally recognized as a core competency for all pesticide applicators[3][4]. It is critical that aerial-specific training on this topic is provided to aerial applicators.

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[1] National Aerial Applicator's Manual, 2014
[2] Federal Aviation Administration's Airplane Flying Handbook (Chapter 5), FAA-H-8083-3C, 2021
[3] National Pesticide Applicator Certification Core Manual, Second Edition, 2014
[4] Final Rule, Pesticides; Certification of Pesticide Applicators (EPA-HQ-OPP-2011-0183)

Modern agricultural aircraft can carry up to 800 gallons of spray material. When an accident occurs, there is the potential for the contents of hopper to contaminate the accident site. This can result in a large quantity of pesticide being released into a single spot in the environment, in addition to posing a risk to first responders who arrive at the accident. While modern agricultural aircraft hoppers are designed specifically to not rupture or leak during an accident, the chance still exists. At the very least, the contents of the hopper will need to be removed from the accident site during clean up. This transfer itself presents a risk of leakage, especially since it would not occur over an approved mixing and loading pad, where most pesticide transfers occur.

An example of the potential for this occurred on August 8, 2019 in Sumner Iowa (NTSB accident investigation number CEN19FA259). An agricultural pilot was fatally injured when his aircraft crashed. Nearly all agricultural aircraft accidents occur in rural areas – this accident occurred in the middle of town. Luckily no one on the ground was injured during the accident. Also lucky was that there were no pesticides, fertilizers or any other agricultural chemicals in the aircraft's hopper when it crashed. The concern for public exposure to pesticides was clearly on the minds of local residents and government officials. The Sumner Police Department released a statement to the public specifically addressing this concern: "We also want to address a concern, that has ALWAYS been on first responders mind from the onset, this plane was NOT loaded with any pesticides, fertilizer or herbicides at the time of this tragic event."

Another example that highlights this concern was an accident that occurred in Tappen, North Dakota (NTSB accident investigation number CEN18LA249) on June 27, 2018. The pilot experienced partial power loss on takeoff and subsequently crashed upside down in a marsh off the end of the runway. This obviously had the potential to result in serious environmental contamination, and the North Dakota Department of Agriculture was involved in the investigation and cleanup to determine the extent of damage to the aquatic environment. Fortunately, the pilot, upon realizing he was having difficulty getting airborne, dumped his load which ended up on the runway. The aircraft's hopper was completely empty by the time it ended up upside down in the march. Had the pilot not successfully been able to dump the load, the marsh could have been contaminated with the hopper contents.

A 2020 fatal accident in Colorado was the direct result of the spray mixture itself. The combination of products used in the hopper created an excessive amount of foam that was able to penetrate the hopper seal. The resulting foam covered the windshield, which obstructed the pilot's view causing him to crash.

These accident examples highlight the concern that agricultural aircraft accident present in terms of pesticide spills and the hazard to both the environment and the public. Studying accidents leads to greater awareness of the causes and can teach other aerial applicators how to avoid similar types of accidents. Since its inception, PAASS has reduced the agricultural aviation accident rate by almost 26 percent, proving the program is working to reduce accidents and potential pesticide spills.

Environmental Professionalism

Mitigating drift potential and increasing application efficacy are covered by a new specific topic each year. This includes utilizing new or improved equipment and/or methods. Specific studies and recent research efforts serve as the basis for discussion. Many technical differences exist between applying pesticides with an aircraft rather than a ground-based sprayer. Training content in this category is often produced in consultation with or reviewed by the USDA-ARS Aerial Application Technology Research Unit[5] to ensure applicators are provided with leading edge, unbiased information. Further explanation here of environmental professionalism as substantive CE will be unnecessary for those generally familiar with the pesticide application industry.

[5] United States Department of Agriculture (USDA) – Agricultural Research Service (ARS) – Aerial Application Technology Research Unit (AATRU)

Pesticide Storage & Security

Knowledge of safe and secure storage of pesticide products is nationally recognized as a core competency for all pesticide applicators[6]. Pesticides are one of the many valuable things stored at an aerial application operation. Protecting those pesticides from theft or tampering is critical to ensuring the safety of both the environment and the public.

Pesticides in the wrong hands can lead to many different negative outcomes. Take paraquat for instance. If an unauthorized person were allowed to remove paraquat from an aerial operation, it could inadvertently be transferred to a non-approved container and potentially poison someone The EPA provides the following true stories of the results involving paraquat when this occurs:

- In 2013, a 70-year-old female ingested some contents of a re-used iced tea bottle that contained paraquat, unknown to her. She went to the hospital awake and alert with persistent vomiting. Over the course of a 16-day admission, she evolved the classic picture of paraquat ingestion: corrosive gastrointestinal injury plus kidney and respiratory failure leading to death.
- In 2010, a 44-year-old male mistakenly drank paraquat, which he thought was fruit juice. He developed difficulty breathing and vomited blood. He was admitted to the hospital intensive care unit where he died after 20 days of aggressive treatment.
- In 2008, an 8-year-old boy drank paraquat that had been put in a Dr. Pepper bottle, which he found on a windowsill in the garage. He died in the hospital 16 days later. His older brother had used the product on weeds around the house and put it in the bottle in the garage. The older brother obtained the product from a family friend who is a certified Restricted Use Pesticide applicator.
- In 2003, a 49-year-old male took a sip from his coffee cup in which he had poured paraquat because the product's bottle was deteriorating. He realized his mistake and went to the Emergency Department. At that time, he was vomiting, cold and sweating profusely. Doses of activated charcoal were administered, and his stomach was pumped; morphine was provided for esophageal pain; and he was intubated to support breathing function on the fourth day. Aggressive supportive care continued until he died on the tenth day.
- In 2000, a 15-month-old boy ingested paraquat that had been transferred into a Gatorade container and stored inappropriately. The boy survived in the hospital for 13 days after the ingestion and received aggressive treatment but died after suffering acute kidney and liver failure.
- In 2000, an 18-month-old boy ingested an unknown amount of paraquat solution from a bottle found in his father's landscaping truck. He received multiple-dose activated charcoal treatment two hours after the ingestion. He suffered from lack of oxygen during the first 24 hours followed by progressive liver, kidney, and cardio-pulmonary dysfunction. The boy died 11 days after the ingestion.
- In another case that occurred in 2014 in South Carolina, two men illegally sold paraquat in soda bottles to local residents. One of those residents accidently ingested the paraquat and subsequently died. Authorities believe the two men obtained the paraquat by stealing it, which highlights the need to protect aerial application operations from theft.

[6] National Pesticide Applicator Certification Core Manual, Second Edition, 2014