Module 9 — Category 1 Aerial: Drone Spray Technique, Droplet Size & Drift

Category 1 (Aerial) exam · 10 practice questions · What Category 1 (Aerial) actually tests, how rotor downwash changes deposition, droplet-size classes, swath and overlap, and the aerial-specific label language.

Key numbers & facts to memorise

Droplet classes	Fine 106–235 µm · Medium 236–340 · Coarse 341–403 · Very Coarse 404–502 µm
Rule of thumb	Coarsest droplet that still achieves efficacy, within label limits
Downwash	Drives droplets into the canopy — enables low carrier volumes
Effective swath	Narrower than the boom; determine it empirically, plan overlap on it
Verify with	Water-sensitive paper across the swath at canopy height

What Category 1 (Aerial) covers, and where uncrewed aircraft fit

Ohio's **Category 1** is agricultural pest control, and it is subdivided — **1a** is field crops, **1b** fruit and vegetable crops, **1c** ornamentals and turf grown for sale, and so on, with **Category 1 Aerial** covering pesticide application from aircraft. ODA has treated uncrewed aerial spray application as falling within the aerial category, which means a drone spray business needs the aerial credential alongside CORE, not merely a ground-application category. Confirm your exact category set with ODA for the crops and sites you intend to serve, because a mixed operation (field crops plus horticultural crops plus turf) can require several category exams.

The aerial exam content differs from ground categories in emphasis rather than in kind. You are still tested on identifying agricultural pests, selecting products, reading labels and calculating rates — but with added weight on **aerial application equipment, droplet-size control, swath determination, drift management, buffer zones, and the interaction between aircraft operation and pesticide law**. If you have already passed CORE, the aerial exam feels like CORE's drift and calibration sections expanded into a full paper.

A practical note that catches new operators: passing the pesticide exam does not authorise you to fly the aircraft, and holding an FAA certificate does not authorise you to apply pesticide. The two systems are independent and both are mandatory. Module 9 covers the aviation side; the important framing here is that the ODA exam will test the pesticide half and will assume you have handled the aviation half separately.

Rotor downwash: the physics that makes drone spraying different

A multirotor drone does not simply carry nozzles over a crop — it generates a column of downward-moving air that actively pushes droplets into the canopy. This **downwash** is the reason drones frequently achieve better canopy penetration and underleaf coverage than a ground boom at comparable volumes, and it is why drone application can work at very low carrier volumes (often 1–3 gallons per acre) that would give poor coverage from a ground rig.

Downwash also creates hazards that do not exist for ground equipment. Flying too low compresses the vortex and can blast droplets laterally out of the swath or bounce them off the ground; flying too high lets the downwash dissipate before it reaches the canopy, leaving fine droplets exposed to ambient wind. There is a practical height window — commonly around 6 to 12 feet above the canopy for typical agricultural multirotors, with the manufacturer's guidance controlling — and both edges of that window degrade the application in different ways.

Speed interacts with all of it. Faster flight narrows the effective time each point spends under the rotor column, thins deposition and can leave streaking; slower flight increases deposit but reduces acres per hour and can over-apply at turns if the flow controller does not compensate. Modern flight controllers with flow-rate/speed linkage handle most of this, but you should still verify with **water-sensitive paper** laid across the swath at canopy height, because paper shows streaking, gaps and droplet density that no telemetry screen reports.

Droplet size classes, and the trade-off you manage on every job

Droplet size is measured in **microns** and classified by ASABE S572 categories: **Extremely Fine, Very Fine, Fine (roughly 106–235 µm), Medium (236–340 µm), Coarse (341–403 µm), Very Coarse (404–502 µm), Extremely Coarse (503–665 µm)** and Ultra Coarse. Labels increasingly specify a minimum droplet class — "apply as Medium or Coarser" — and that instruction is enforceable, so it constrains your atomiser or nozzle selection before anything else does.

The trade-off is unavoidable and it is the heart of the aerial exam. **Smaller droplets give better coverage and better contact-product efficacy but drift far more**; larger droplets resist drift but reduce the number of impact points per leaf and can run off waxy surfaces. Fine droplets suit contact fungicides and insecticides where coverage drives performance; coarse droplets suit systemic herbicides and any application near a sensitive downwind neighbour. The correct answer to "what droplet size should I use" is always "the coarsest size that still achieves biological efficacy, within what the label allows."

Control levers on a rotary-atomiser drone are the atomiser RPM (higher RPM produces finer droplets), the flow rate, and on nozzle-equipped systems the nozzle type and pressure. Adding a **drift-reduction adjuvant (DRA)** shifts the spectrum coarser by increasing viscosity — useful, but not a substitute for correct settings, and only where the label permits. Verify the actual spectrum with water-sensitive paper rather than trusting the setting alone.

Swath, overlap, buffers and the aerial label language

Your **effective swath** is narrower than the physical boom or the manufacturer's headline figure, because deposition tapers at the pattern edges. Determining effective swath empirically — laying paper or collectors perpendicular to the flight line and finding where deposition falls below an acceptable fraction of the centre — is the single highest-value calibration exercise in aerial application. Overlap is then planned as a percentage of that effective swath, commonly on the order of 10–30% depending on the pattern, so adjacent passes sum to a uniform rate.

Field geometry drives the rest. Fly perpendicular to the wind where possible so drift moves along the swath rather than across it, and always **plan the downwind edge first**: the pass adjacent to a sensitive boundary should be flown with the buffer already respected, not corrected afterwards. Set headland turns outside the treated area, and confirm that the flight controller stops flow during turns and ferry legs — an uncontrolled turn is a double-rate strip and a common source of crop injury complaints.

Read the label's aerial section as a distinct document. Modern agricultural labels contain aerial-specific language on **release height, minimum droplet size, boom length as a fraction of wingspan or rotor span, wind speed limits, temperature-inversion prohibitions, and downwind buffer distances to sensitive sites**. Several also require that spray be released no higher than a stated distance above the crop. These are not best practices; they are the terms under which the application is legal, and they are exactly what an ODA inspector reads alongside your record.

Finally, document the conditions. Record wind speed and direction, temperature, humidity, start and end times, droplet class or atomiser setting, release height, effective swath and the buffer you observed. A drone gives you telemetry logs that most ground applicators cannot produce; using them turns a drift complaint from an argument into a review of data. That evidentiary advantage is a genuine competitive asset and costs nothing but the habit.

Practice questions

Answer these closed-book, then check against the answer key that follows. Ohio requires 70% to pass.

1. Compared with larger droplets, smaller spray droplets:

A) Drift less and cover less
B) Drift more but provide better coverage
C) Drift less and cover more
D) Have no effect on drift

2. Under the ASABE S572 classification, "Medium" droplets are approximately:

A) Under 100 µm
B) 236–340 µm
C) 404–502 µm
D) Over 700 µm

3. Rotor downwash on a spray drone primarily:

A) Increases drift in all cases
B) Drives droplets down into the canopy, improving penetration
C) Cools the pesticide
D) Reduces the need for calibration

4. Flying too high above the canopy tends to:

A) Improve canopy penetration
B) Let downwash dissipate and expose fine droplets to ambient wind
C) Eliminate drift
D) Increase droplet size

5. Effective swath width is:

A) The same as the physical boom width
B) Narrower than the boom, determined by where deposition falls off
C) Always 30 feet
D) Set by the FAA

6. The best tool for verifying droplet density and pattern uniformity in the field is:

A) The flight controller display
B) Water-sensitive paper placed across the swath at canopy height
C) A rain gauge
D) The product label

7. When spraying next to a sensitive downwind neighbour, you should:

A) Fly the downwind edge last and correct as needed
B) Plan and respect the label buffer on the downwind edge before you start
C) Increase atomiser RPM for finer droplets
D) Ignore wind direction

8. A drift-reduction adjuvant works by:

A) Lowering the boom
B) Increasing spray viscosity to shift the droplet spectrum coarser
C) Reducing the label rate
D) Cooling the tank

9. If the label states "apply as Medium or Coarser," that instruction is:

A) A recommendation you may ignore
B) Enforceable label language you must follow
C) Only for fixed-wing aircraft
D) Optional if wind is calm

10. Flow should be shut off during headland turns and ferry legs because:

A) It saves battery only
B) Continuing flow creates double-rate strips and off-target application
C) It is required by the FAA
D) It improves droplet size

Answer key & explanations

1. B) Drift more but provide better coverage — Small droplets stay airborne longer (more drift) but give more impact points per leaf (better coverage). Use the coarsest size that still works.

2. B) 236–340 µm — Fine ≈106–235 µm, Medium ≈236–340 µm, Coarse ≈341–403 µm, Very Coarse ≈404–502 µm.

3. B) Drives droplets down into the canopy, improving penetration — Downwash actively pushes droplets into the canopy, which is why drones can work at low carrier volumes.

4. B) Let downwash dissipate and expose fine droplets to ambient wind — Above the effective downwash window, droplets are released into ambient air and drift risk rises sharply.

5. B) Narrower than the boom, determined by where deposition falls off — Deposition tapers at pattern edges, so effective swath is narrower and must be determined empirically.

6. B) Water-sensitive paper placed across the swath at canopy height — Water-sensitive paper shows actual droplet density, streaking and gaps that telemetry cannot report.

7. B) Plan and respect the label buffer on the downwind edge before you start — Buffers are planned into the flight, not corrected afterwards. Fly perpendicular to wind and respect the downwind buffer first.

8. B) Increasing spray viscosity to shift the droplet spectrum coarser — DRAs coarsen the spectrum. They supplement — never replace — correct droplet-size settings, and only where the label allows.

9. B) Enforceable label language you must follow — Droplet-size directions in the label's aerial section are enforceable use directions.

10. B) Continuing flow creates double-rate strips and off-target application — Uncontrolled flow during turns over-applies and is a common source of crop-injury complaints.