AgriDrone CFD – SolidWorks Flow Simulation Checklist

This checklist guides setup and validation of the representative CFD case for the AgriDrone nozzle spray model.

Parameter	Value
Number of nozzles	4 (single modeled, duplicated ×4)
Mounting height	4 m above ground
Spray pressure	2 bar
Flow rate per nozzle	0.15 L/min ($\approx$ 0.0025 kg/s)
Mean droplet size	80 µm
Crosswind velocity	2.5 m/s
Domain size	12 × 12 × 6 m
Ground area of interest	15 m²
Analysis type	External flow + particle tracking
Gravity direction	–Z
Output metrics	Deposition flux, uniformity (CV %), drift (%)

1. Pre-model Preparation

- Ensure nozzle, Y/T joints, tubing stub, and ground plane are included.
- Domain box: 12×12×6 m; rename parts logically (Nozzle_1, GroundPlane, DomainBox).

2. Project Setup (Wizard)

- Type: External flow | Units: SI | Enable gravity.
- Fluids: Air (primary), Water (particle).
- Initial velocity: 2.5 m/s (X-axis), 25°C ambient.

3. Boundary Conditions

- Inlet: Mass flow 0.0025 kg/s per nozzle at 2 bar.
- Outlet: Environmental pressure 101325 Pa on sides and top.

4. Particle Study

- Water droplets, mean diameter 80 µm (±20%).
- Injection from nozzle inlets, 2000–5000 particles.
- Gravity ON, drag model spherical.

5. Mesh Settings

- Global level 4–5; refine spray cone (level 7–8).
- Target total cells $\approx$ 1–1.5 million.

6. Goals & Outputs

- Surface goals on ground: deposition flux (kg/m²·s), uniformity CV, drift %.

- Global goal: total injected vs. escaped mass.

7. Run & Convergence

- Steady-state first; residuals < 1e-4 or stable goals.
- If stable, run transient: $\Delta t = 0.01$ s, total time 1 s.

8. Visualization

- Cut plots: air velocity, trajectories, deposition heatmap.
- Export images and CSV data for GitHub documentation.

9. Validation

- Compare CFD deposition map with bench test photo.
- Document all parameters in README and include exported visuals.

✔ *Use this as a tick-off sheet while setting up the SolidWorks Flow Simulation.*