LIDAR Workflow SOP

Texas Drone Company · DJI M300 RTK · Mavic 3E · Emlid · v1.0 *Revised 04/08/2026*

Section 1 — Equipment checklist

Case / Bag	Contents
Laptop bag	Laptop, Charger, SD Cards, SD Card Reader
Mavic 3E case	Drone, Batteries, Controller, Portable charger
M300 case	Drone, Batteries, Controller, Charger, Cord
LiDAR case	LiDAR Unit, Antenna, Antenna Mount, LAN Cable, LiDAR Base, Base Collector (Silver Box), Base-to-collector cable, Mavic 2 Battery, Mavic 2 battery-to-collector cable, USB-A Cable, Twist tie
Survey equipment	Emlid base and rover, Three sets of survey poles, Reflective GCPs, Nails, Hammer, Marking paint / ribbon
Vehicle + PPE	Ranger and keys, Hard hat, Hi-vis vest, Boots

Section 2 — Office preparation

Complete before leaving the office.

1. Charge all batteries the day before: M300, two Mavic 2 batteries, Emlid base and rover, M3E batteries and controller, and laptop.
2. Plan GCP placement across the mapping area. Ensure enough reflective tape targets and nails.
3. Verify licenses are activated on your laptop: UGCS and LiGeoreference.
4. Build the LiDAR mission in UGCS. Import the client-provided .KML boundary: linear segments as Waypoint, polygons as Lidar area.
5. Select drone: DJI Matrice 300 RTK. Configure all mapping settings per Section 3.
6. Export route to DJI Pilot 2 (.KMZ). Transfer via micro SD or email the file to yourself for download via Firefox on the M300 controller.
7. Create the survey on Emlid Flow app. Confirm correct state plane datum before saving.
8. Pack all equipment from the checklist into the Ranger.
9. Deactivate the UGCS license when done — this allows other users to access the account.

Section 3 — UGCS mission settings

Basic mapping settings

Parameter	Value	Notes
FOV	38.4°	
Flight height	50–70m	Wind + foliage dependent
Flight speed	5–7 m/s	Wind + foliage dependent
Side overlap	50%	
Forward overlap	80%	
Corner radius	6m	

Parameter	Value	Notes
Turn type	Adaptive Bank Turn	
Altitude mode	Smart AGL	
Action execution	Every Point	

Advanced mapping settings

Parameter	Value	Notes
AGL tolerance	1.5–2m	Determines number of waypoints
Direction angle	Parallel to wind	
Straight flight after turn	10m	
Avoid obstacles	Enabled	

Export settings

- Export format: DJI Pilot 2 (.KMZ)
- Export parameters — Altitude: "Relative to the ground under 1st waypoint"
- Save with the correct flight route name. Transfer to controller via micro SD or Firefox / Gmail download.

Section 4 — DJI Pilot 2 route configuration

1. Open flight route in library. Verify accuracy: dropdown arrow → edit (pencil) → Add Point on Map.
2. Home Menu: confirm correct aircraft selected and altitude mode.
3. Route Menu: Safe Takeoff Altitude — 150 ft minimum, or enough to clear all surrounding obstacles.
4. Enable "Climb to Start Point."
5. Verify speed in mph is equivalent to speed set in UGCS (m/s).

> **IMPORTANT:** Relative Altitude must match the UGCS mission altitude exactly (e.g. 60m = 200 ft). This setting is used as a failsafe. Never set it to 0.

6. Aircraft Yaw: Along the Route.
7. Gimbal Control: Manual.
8. Waypoint Type (all middle waypoints): Coordinated Turn, Skips Waypoint.
9. Waypoint 1: Straight Route, Aircraft Stops.
10. Final waypoint: Straight Route, Aircraft Stops.
11. Upon Completion: Exit Route Mode.
12. Cycle through all waypoints — verify speeds match and relative altitudes are close in value.
13. Save the mission (disc icon).

Section 5 — On-site arrival & base station setup

Site arrival

1. Find a central location to unload the Ranger — ideally where you will set up both bases and fly from.
2. Set up the Emlid rover. Connect your iPad. Enable RTK corrections.
3. Place reflective GCPs in the preplanned locations across the mapping area.

Base station setup

1. Tie marking ribbon around two separate nails.
2. Hammer nails approximately 5 feet apart. Shoot one as "LiDAR base" and the other as "Emlid base" in the Emlid software.
3. Mark with spray paint: **triangle = LiDAR base, square = Emlid base.**
4. Set up LiDAR base and Emlid base over their respective nail points. Turn both on.
5. Wait for the blinking yellow satellite light on the LiDAR base collector to turn **solid yellow.**
6. Hold the LiDAR base collector power button for approximately 1 second — record button turns **solid blue.**

> **START 15-MINUTE BASE COLLECTION TIMER.** The LiDAR base must collect data for a minimum of 15 minutes before flight. Use this time to set up the M300 and LiDAR unit.

Section 6 — M300 & LiDAR unit setup

1. Attach legs and arms to M300. Ensure all arm and leg sleeves are in the locked position.
2. Attach LiDAR unit to M300. Ensure the connection port is threaded and seated correctly.
3. Connect antenna mount to M300. Screw antenna onto the mount.
4. Thread antenna cables through the inside of the payload housing. Use the twist-tie to secure cables — they must not be able to reach the props.
5. Connect the right cable to the right hole on the LiDAR unit, left cable to the left hole.
6. Insert batteries and lock in place. Power on the drone. Wait for full boot. Place over landing pad.
7. Power on the LiDAR unit. Wait for IMU light to turn **solid blue.**

> If IMU light turns solid red — power the LiDAR unit off and back on. Do not proceed until IMU light is solid blue.

8. Hold the LiDAR power button for approximately 1 second to start recording — the record light will turn on after you release the button.

> **START 3-MINUTE STABILIZATION TIMER.** Let the drone and LiDAR unit sit completely undisturbed. This timer should end after the 15-minute base collection timer. Do not touch or move the drone or LiDAR unit during this period.

Section 7 — Flying the mission

Pre-launch checks

- □ 15-minute base collection timer has expired
- □ 3-minute stabilization timer has expired
- □ IMU light: solid blue
- □ Record light: solid blue
- □ Flight speed and altitude confirmed appropriate for site foliage conditions

Takeoff

1. Take off. Fly **two figure-8 patterns** over the site before beginning the mission.
2. Upload mission in DJI Pilot 2 and begin mapping.

Battery swap procedure

1. Fly two figure-8 patterns before returning to land.
2. Land. Do not touch the drone or LiDAR unit.
3. Let sit untouched for **3 minutes.**
4. Perform hot battery swap.
5. Let sit untouched for **3 more minutes.**
6. Take off, fly two figure-8 patterns, then resume mission.

> □ **3 minutes before swap + 3 minutes after.** Both rest periods are required. Skipping either will corrupt the IMU trajectory data.

Mission completion

1. Fly two figure-8 patterns before final landing.

2. Land. Let drone sit completely untouched for 3 minutes.
3. Hold LiDAR power button for approximately 1 second to stop recording.

> ⚠ **Figure-8 patterns are required before every takeoff and before every landing — including battery swaps.** Never skip them.

Section 8 — Orthomosaic (Mavic 3E)

- Using the Mavic 3E, fly a photogrammetry map of the entire site.
- Altitude: **400 ft AGL.**
- Follow the standard Photogrammetry Mapping SOP for all other parameters.
- The orthomosaic provides visual context for the LiDAR point cloud and is part of the final deliverable.

> The Mavic 3E orthomosaic flight can be flown while M300 LiDAR data is being collected, or after mission completion.

Section 9 — Data retrieval

LiDAR data must be retrieved while the drone and LiDAR unit are still powered on.

1. Connect LiDAR unit to laptop using the LAN cable.
2. In File Explorer, type: `\\192.168.1.88` to access the LiDAR data.
3. Open the Tfcard folder.
4. Copy the LiDAR data from the folder named with today's date. Make a backup copy. You will have two folders: **LiDAR** and **LiDAR Copy.**
5. End the record on the silver LiDAR base collector box.
6. Connect the LiDAR base collector to your laptop via USB-A to A cable.
7. Retrieve the base log via connected device "D."
8. Copy the base log into the folder named "base" inside both the LiDAR and LiDAR Copy folders.
9. Download photogrammetry photos from the Mavic 3E to the desktop.

Section 10 — Field data processing (LiGeoreference)

> ⚠ Confirm you have enough storage on your laptop before starting. Insufficient storage will prevent the trajectory file from loading.

LiGeoreference license key

```
USUKTXNB5HCE4LEXSU
```

Activate in Ligeo License Manager before opening LiGeoreference.

Processing steps

1. Open LiGeoreference. Select "Browse" to choose your project.
2. Open the LiDAR folder copied to the desktop. **Do NOT open or use the LiDAR Copy folder.**
3. Open the "live" file. Flight lines may look incorrect initially — this is normal and will be corrected in the next step.
4. Open Settings (top left). Enter base coordinates from the Emlid software: Northing, Easting, and ellipsoidal height.
5. Height conversion: **Height (ft) ÷ 3.28084 = Height (m).** Antenna height: **2.05m.** Select OK.
6. Check "Pos Process" and "Georeference." Press Start.
7. Wait — even when processing appears finished. Complete when a visible point cloud appears beneath the flight trajectory.
8. Use the profile tool to check ground surface density under high tree and foliage areas.

If data looks good

- Reopen Ligeo License Manager and deactivate the LiGeoreference license on your laptop.
- Return to UGCS and deactivate the UGCS license.

If data looks wrong

- Flight trajectory not fixing in Pos Process or point cloud not appearing: most likely a storage issue. Verify sufficient storage.
- Confirm the base log from the LiDAR base collector is placed inside the LiDAR base folder.

Section 11 — Deliverables & file naming

File naming convention

```
YYYY_MM_DD - Client Name - Job Site
```

e.g. `2025_09_18 - Trinity Land Survey - Lake Dallas`

Deliverable summary

Deliverable	Notes
Unprocessed imagery (Mavic 3E)	Photogrammetry photos
LiDAR data files	From LiDAR unit
Base log	From base collector
LiGeoreference point cloud	Processed on site

Pre-handoff checklist

- ☐ 15-minute base collection completed before flight.
- ☐ Figure-8 patterns flown before every takeoff and before every landing (including battery swaps).
- ☐ 3-minute rest periods observed before and after every battery swap.
- ☐ LiDAR data retrieved while drone and LiDAR unit were still powered on.
- ☐ Base log copied into both LiDAR and LiDAR Copy folders.
- ☐ LiGeoreference point cloud processed and verified on site.
- ☐ UGCS and LiGeoreference licenses deactivated.
- ☐ Files named: YYYY_MM_DD - Client Name - Job Site.
- ☐ Data backed up before leaving site.
- ☐ Do not pack up before verifying point cloud quality in LiGeoreference.

> “ Questions on site? Call your lead pilot before improvising.

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