Drone Fieldwork Procedures

Adapted from fieldwork protocols developed by the WildDrone team for the 2025 Hackathon at Mpala.

Emergency Procedures

1. Aircraft dangerously close: Activate kill switch. RPIC shouts 'Kill Kill Kill' and activates the kill switch.

2. Threatening Wildlife: Get in the car and RTH.

3. Loss of control/fly-away: Try regaining control, otherwise activate kill switch. Try switching flight modes and regaining control. If unsuccessful, activate the kill switch

4. Crew unfit for flight: RTH and provide first aid.

Contingency Procedures

Low battery/high drain: RTH if possible, otherwise land. Check if there is sufficient battery to RTH. If yes, RTH. If no, perform a slow landing. If the drone is close to home, perform a manual landing.

High-wind carries UAS: RTH if possible, otherwise land. If the drone has exited the flight geometry, follow Emergency Protocol 3. If able to RTH, RTH. If not, perform a slow landing.

Aircraft approaching: Lower the drone to a safe altitude (below 30m AGL).

Wildlife approaching: RTH and get in the car. Control the drone and move away.

UAV warnings or errors: RTH if possible, otherwise perform a slow landing.

C2 link warnings or errors: Orient antenna and RTH. Orient the antenna towards the UAS and RTH. Consider driving towards the UAS.

Poor Weather: RTH in case of rain, wind, or poor visibility.

Crew feeling unwell: RTH if any crew member feels unwell.

3rd party approaching: Communicate and avoid distraction. Assistant communicates with the third party and avoids distracting the RPIC.

Flight geography breached: RTH if possible, otherwise follow emergency procedure. If the UAV is under control, RTH. If not, follow Emergency Protocol 3.

Glossary

- RPIC: Remote Pilot in Command

- UAS: Unmanned Aerial System
- NOTAM: Notice to Airmen

OPERATION PLANNING

Operational Environment

Check area. Ensure no-fly zones and NOTAMs are checked. Assess topography for ground obstacles and airspace visibility.

Notify third parties. Inform conservation park of planned locations, heights, and times.

Check weather forecast (droneweather.xyz). Check weather forecast on droneweather.xyz, temperature (-10° to 40° C), wind (< 10 m/s), rain (up to light drizzle), visibility (more than 5km), and Kp-index (max 5).

Crew

Assign crew roles. Ensure the crew is aware of their roles, including pilot, assistant pilot, and ground crew. #### Roles: 1. **Remote Pilot in Command (RPIC):** Responsible for the safe operation of the drone. 2. **Pilot Assistant:** Assists the RPIC with situational awareness, including monitoring airspace, ground conditions, and wildlife. Handles communication between the RPIC and third parties. 3. **Airspace Observer:** Monitors the airspace for other aircraft and ensures the drone remains within the flight geography. Provides situational awareness to the RPIC. 4. **Ground Crew:** Assists with equipment setup, packing, and other logistical tasks, and ensures the safety of the operational area by monitoring for ground obstacles and wildlife.

Agree on mission plan with team, including the flight path, waypoints, and areas of interest.

Regulations

Ensure operational limit. Ensure operations are within 2 km from the pilot and within flight geography.

Equipment

Check drone and equipment. Perform visual inspection of the drone (cracked propellers, smooth motors) and transmitter. Ensure SD-cards are empty and ready for logging. Check batteries for drone and transmitter.

Pack equipment: Ensure all items on the equipment list are packed.

PACKING LIST

UAS

- UAS & UAS controller: Ensure the UAS and its controller are packed.
- UAS batteries (charged): Ensure the UAS batteries are charged and packed.
- SD Cards for UAS (empty sd cards): Ensure empty SD cards for the UAS are packed. ### Personal
- Water: Ensure water is packed.
- Hat + Sunglasses: Ensure a hat and sunglasses are packed.
- Sunscreen + mosquito repellent: Ensure sunscreen and mosquito repellent are packed.
- Charged phone + power bank: Ensure a charged phone and power bank are packed.
- Binoculars

FIRST FLIGHT

Operational Environment

Check area: Ensure no-fly zones and NOTAMs are checked. Assess topography for ground obstacles and airspace visibility.

Safety Briefing

1. **IMSAFE check:** Ensure that everyone on the team is not suffering from Illness, Medication, Stress, Alcohol, Fatigue, or Emotion
2. **Check on crew roles, and ensure team is behind the pilot:** ensure the crew is aware of their roles, is standing at a safe distance behind the pilot.
3. **Assign evacuation car seats:** Ensure assigned evacuation car seats are free of clutter.
4. **Review contingency and emergency procedures:** Make sure that the pilot and assistant pilot are confident with the contingency and emergency procedures.

Equipment

1. **Place landing mat away from pilot:** Place the landing pad at a reasonably safe distance from the pilot.
2. **Check flight controller mode.** Check if your controller mode (mode 2 or mode 1) is set correctly. This dictates the control stick layout.
3. **Power on the UAS to check failsafes.** Power on the UAS and ensure failsafes are set correctly. Failsafe set to RTH, RTH altitude set to be at least 10m above heighest ground obstacle, max flight distance set up to 500m, max altitude set equal to or less than 120m.

4. **Ensure vertical separation.** Pilots to agree on vertical seperation, and set maximum altitude accordingly.

PRE-FLIGHT CHECKLIST

Equipment

UAS inspection: Check for cracks and damage, ensure propellers are spinning smoothly.

Insert new SD card: Insert a new SD card into the drone.

Check battery remaining: Check the remaining battery for both the UAS and the controller.

Final checks

Agree on mission plan, and brief team, including the flight path, waypoints, and areas of interest.

Weather assessment (wind, visibility, rain, low clouds). Pilot assesses if the weather is safe. No high winds, good visibility, no rain incoming, no low clouds.

Power on UAS, check for any errors, GPS fix and RSSI strength. Check for any errors (i.e. drone calibration), and check GPS fix (at least 6 satellites), and strong RSSI.

Team go/no-go (ground, air, IMSAFE). Whole team agrees to proceed, no ground risks (wildlife, uninvolved people), air risks (drones, aircraft), and the team is IMSAFE.

Inform nearby pilots about take-off. Pilot makes sure they have no objections.

Shout 'TAKE-OFF', then take off and move away from pilot, ideally maintaining a 1:1 height-distance ratio.

Check flight performance away from pilot. Make sure UAS is at a safe distance from the pilot, then fly UAS forward, backward, left, right, ensure it behaves as expected.

IN-FLIGHT

Check flight performance. Monitor the drone's flight performance, especially in windy conditions.

Upload waypoint mission. Upload the waypoint mission to the drone.

Start recording. Start recording the flight.

Monitor flight. Continuously monitor weather, drone (battery, RSSI, GPS, altitude, speed, distance), transmitter (battery)/

Advise before landing. Advise everyone in the operational volume before landing.

POST-FLIGHT

Stop on-board recording. Stop the on-board recording after landing.

Remove batteries. Remove the batteries from the drone.

Visual inspection of drone and equipment. Perform a visual inspection of the drone and equipment after landing.

POST-OPERATION

1. **Inform conservation park** after the operation is completed.
2. **Empty SD cards.** Empty the SD cards after the operation and back up to OSC.
3. **Recharge/Storage charge batteries.** Recharge or storage charge the batteries after the operation.
4. **Document the flight.** Document the flight logs and backup to OSC.
5. **Record and report incidents/accidents**

This protocol should be reviewed and updated based on site-specific conditions and research objectives at The Wilds.