

Standard Operating Procedures Form (Pre-flight) 2023

General information

Pilot in Command? *

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Visual Observer? *

[REDACTED]

Aircraft(s) used? *

- ☐ DJI Phantom 4 RTK
- ☐ DJI Mavic 2 Professional
- ☐ DJI FPV
- ☐ DJI Mavic Pro
- ☒ DJI Matrice 300 Pro
- ☐ DJI M210 RTK V2

Provide three-view drawings or photographs of the RPA to be used. *

 DJIMatrice_imag...

Provide a description of the RPA to be used, including performance, operating limitations, and equipment.

6.3 kg with batteries, +/- 0.1m hovering accuracy, 1cm horizontal and 1m5 cm vertical RTK positioning accuracy. Max speed 23 m/s S mode, 55 min maximum flight time. -20 C to 50 C operating temperature range. GPS + GLONASS + BeiDou + Galileo GNSS. Equipment includes remote controller and DJI L1 sensor. Maximum takeoff weight is 9 kg.

Provide details of the instructions regarding maintenance of the system and a description of how that maintenance and serviceability will be performed before flight.

RPAS will be stored and transported to site of operations in a Pelican 1450 Equipment case. Routine maintenance inspections will be performed the day prior to the flight operation as well as before flight commences the day of. Components to be checked for damage include, but are not limited to: cooling fan intake vents, motors, propellers (installed correctly), battery ports, antennas, gimbal, radar, remote controller, and damping plate. All components will be checked for cracks or other damage, cleared of debris, and stored in the Pelican case with specific sections for each component after disassembling the RPAS unit.

Describe the purpose of the operation. *

Doctoral research data collection including thermal imagery and LiDAR for riparian forest structure project.

Proposed flight altitude? *

Variable (60m, 100m)

Start date of operations? *

MM DD YYYY

End date of operations? *

MM DD YYYY

Site survey

Tips and resources:

Use Google Earth to create a simple map showing the boundaries of the area of operation and take-off and landing locations.

Use <https://nrc.canada.ca/en/drone-tool/> for info on the type of airspace and applicable regulatory requirements (perhaps you need an advanced type license or SFOC). It also includes locations of aerodromes and a measuring tool. You can get special permissions through:

<https://www.navcanada.ca/en/flight-planning/drone-flight-planning.aspx>

You need to be aware of proximity of manned aircrafts. You can find flight routes on so-called VTA charts, which you can view through <https://fltplan.com>. Go to "digital charts" -> "sectionals" -> "sectionals-canada" and make sure "TAC Charts" is checked (which is the American name for VTA charts).

Use recent high res satellite imagery or LiDAR to work out the height and location of obstacles such as wires, masts, buildings, cell phone towers, wind turbines, lakes or trees.

Watch weather forecasts!

Be aware of maximum flying height (basic = 122m) and minimal horizontal distances from bystanders (basic = 30.). More information can be found here: <https://tc.canada.ca/en/aviation/drone-safety/where-fly-your-drone>

Coordinates of site? (Lat-Lon) *

Airspace Class? *

- ☒ Class G (Uncontrolled airspace)
- ☐ Class F (Special-use airspace. May be controlled or uncontrolled. May be a restricted or advisory area)
- ☐ Class E (Controlled airspace)
- ☐ Class D (Controlled airspace)
- ☐ Class C (Controlled airspace)

Permission? *

- ☐ Yes, I have permission to fly and the required certificates
- ☒ I am currently applying for a SFOC
- ☐ Other:

Nearby aerodomes and distances (in km)? *

Port McNeill Airport, YMP, CAT5 (approximately 61.0 km from site)

Obstacles and descriptions of locations? These can also be included in the map instead (e.g. wires, tall trees, etc) *

Trees in and around the site can reach 40 - 50 m tall.


Weather? If forecasts are not available yet, describe the general conditions for that time of year, including weather patterns, temperatures, and potential environmental risks. Include weather minima for the operation and how minimum weather conditions can be ensured during operations. *

Weather in the area of the site rarely deviates below 2 C or above 26 C, both of which are within minimum and maximum temperature operating ranges for the RPAS. Skies are generally clear in July for the sites, with local rainfall possible. Thunderstorms are rare. RPAS operations will not take place should weather conditions exceed minimum and maximum operating temperatures. RPAS operations will be halted if rainfall begins, and will either wait until the weather has cleared to continue, or cease entirely should conditions worsen. RPAS operations will not take place if the threat of electromagnetic interference is reported for the day.

Check Notice to Airmen (NOTAM) for your area of operation with <https://plan.navcanada.ca/wxrecall/> *

☒ I state that I have checked the most recent NOTAM

Upload a map of the area of operation, including take-off and landing locations. *

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Pre-flight checklist

This checklist can only be filled out close to departure to the area of operation.

Aircraft components and accessories

- ☐ Batteries charged (aircraft + RTK station)
- ☐ Control station battery full
- ☐ iPad/Smartphone battery full
- ☐ Propeller secure
- ☐ Battery secure
- ☐ Payload secure
- ☐ Camera lense cap off
- ☐ Sensors clean
- ☐ (If applicable) Calibrated reflectance panel clean
- ☐ (If applicable) Follow protocol non-DJI sensor
- ☐ GPS signal locked
- ☐ Transmission signal and antennas check
- ☐ Calibrate compass and IMU
- ☐ Set appropriate flying height
- ☐ Load digital terrain model (for terrain following)
- ☐ SD cards storage cleared
- ☐ Other:

Site check

☐ Check no unanticipated obstacles on site

☐ Primary landing location secure

☐ Secondary landing location secure

☐ Back-up landing location secure

☐ Other:

Crew

☐ Brief crew: roles, safety guidelines, and emergency procedures

☐ Note time of take-off

☐ Note time of landing

Landing checklist

- ☐ Secure aircraft
- ☐ Shut down aircraft battery
- ☐ Shut down control station
- ☐ Shut down RTK station
- ☐ Check for any damage
- ☐ Report all irregular occurrences using the "Drone Incident Log" form
- ☐ Back up data
- ☐ Note time of take-off
- ☐ Note time of landing
- ☐ Other:

Emergency protocols and safety procedures

Read the User Manual, Disclaimer and Safety Guidelines and Intelligent Flight Battery Safety Guidelines for your drone. The documents of the Matrice M210 V2 can be found here:

<https://www.dji.com/ca/downloads/products/matrice-200-series-v2>.

Be aware and prepared for the following issues and emergency situations:

- Control station failure (e.g. crashed app, unplugged antenna or low battery)
- RPAS failure (crash, impact and LiPo fire)
- Lost link
- Fly away

An emergency might have to be reported to the relevant organization. Organizations include:

Transport Canada – More serious incidents need to be reported. An incident and maintenance log needs to be presented.

Contact and forms: <https://tc.canada.ca/en/aviation/aviation-security/report-aviation-security-incident>

Transportation Safety Board – Report impact with a manned aircraft, seriously injure or killing with the drone.

Contact and forms: <http://www.bst-tsb.gc.ca/eng/incidents-occurrence/aviation/index.html>

NavCanada – Report incidents impacting airspace, e.g. fly-away and when you enter controlled airspace without permission.

Contact and forms: <https://tc.canada.ca/en/aviation/operating-airports-aerodromes/report-incident-affecting-airport-aerodrome-safety#report>

Emergency contact

[REDACTED]

Provide a Safety Plan for the proposed area of operation. Describe how you are going to be proactively safe and not endanger Aviation Flight of other aircrafts or any person.

Pre-flight checklist and RPAS inspection will take place prior to flight operations. Weather conditions for the time of the scheduled operation will be checked the night prior and the day of to ensure flight conditions are good. Visual observer(s) will maintain VLOS and report any other aviation activity and report it to the pilot in command. Fire extinguisher and first aid kits will be available with field crew. All flight operations crew members, including pilot, will be certified in Standard or Remote First Aid.

Provide an emergency contingency plan and emergency response plan.

In the event of an injury or critical situation requiring emergency evacuation from a location, secure safety of all involved, call for search and rescue (SAR) assistance, and administer first aid for injuries requiring immediate attention. Personal First Aid Kit, SpotX, emergency contact information will be carried on person. Call 911 to activate Search and Rescue or other resources, or press SOS on the SpotX device.

In the event of a vehicle accident, secure the safety of all involved. Contact emergency services and administer first aid if needed. Exchange information with the other driver(s), including contact information, license plate number(s), driver's license numbers(s) and insurance information. Document the situation: where and when did the collision occur? What were the road conditions? Once it is safe to do so, contact the project supervisor and the designated check-in person.

If the field crew gets lost and cannot find their way, they will contact SAR via the RCMP using their cell phones (911) or, if out of service range, a SpotX/InReach device. Once they are able to, they will contact the project supervisor and the designated check-in person.

If the field crew gets separated and cannot find one another, the workers should first get themselves to a safe place and try to radio their partner. If their field partner is unreachable, they should attempt to meet at a predetermined meeting spot. If their field partner does not arrive at the meeting spot within a reasonable time frame, the worker should get themselves to safety (ex: road, vehicle) and follow the missed check-in procedure. If the worker cannot get themselves to safety, they will contact SAR via the RCMP using their cell phones or, if out of service range, a SpotX device. Once they are able to, they will also contact the project supervisor and the designated check-in person.

Provide a description of separation and collision avoidance capability and procedures.

The RPAS to be used, DJI Matrice 300 RTK, is equipped with six-direction dual-vision sensors and dual Time of Flight sensors for omnidirectional collision avoidance. Detection ranges reach up to 45 m in any direction. Auxiliary lights for low-visibility conditions will automatically turn on in low-light conditions. The RPAS also includes redundant systems in case of hardware failures, such as dual battery configurations, IMU, compass, and barometer which automatically come online should the primary unit fail. The RPAS main circuit boards contain a backup power supply and communication links.

Provide normal and emergency procedures.

Under normal circumstances, flight operation procedures would be as follows:

1. Transport RPAS to field site carefully in Pelican case
2. Ensure no obstructions, obstacles, or unexpected elements are present at flight operation site
3. Set up RTK station and connect
4. Complete pre-flight checklist and RPAS inspection
5. Ensure terrain map is loaded
6. Connect RPAS to RTK station
7. Commence flight plan
8. Maintain VLOS and watch for obstacles during flight
9. Complete flight and return to home
10. Ensure data has been collected and downloaded, disconnect RTK, disassemble RPAS and store safely in Pelican case

Under emergency circumstances, flight operation procedures would be similar to the above, but in an emergency situation, the Return-to-Home function will immediately be implemented. Radio channels will be checked for information and the emergency contact notified. In the event of an RPAS accident/incident, the appropriate authorities will be contacted (Transport Canada, AVOPS, and/or CADORS). In the event of a failure of the aircraft (such as a crash scenario), press the RTH (Return to Home) Button on the remote controller to initiate the Return to Home process instead of turning off the remote controller.

Make sure to operate the aircraft within the transmission range of the remote controller. Only use the Failsafe and Return to Home functions in case of emergency. Such functions may be affected by the weather, the environment, or any nearby magnetic fields. The aircraft cannot avoid obstacles during the Failsafe RTH when lighting condition is not ideal.

Therefore, it is important to set an appropriate Failsafe altitude before each flight.

The aircraft will land automatically if the current battery level can only support the aircraft long enough to descend from its current altitude. The user cannot cancel the auto landing but can use the remote controller to alter the aircraft's orientation during the landing process.

Procedures:

- Clear landing area
- Be ready to extinguish and/or contaminate a fire
- Be ready to call Transport Canada, AVOPS, CADORS or 911.

Provide RPAS Accident and Incident Reporting procedures.

In case of accident or incident, Transport Canada's Situation Centre will be contacted to report the incident. In the event of an incident which is a threat to aviation or public safety, such as a Fly-Away scenario, the AVOPS emergency number will be contacted through 1-877-992-6853. Incidents potentially affecting an airport or aerodrome will also be notified to CADORS.

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