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<b>Title:</b>	<b>Remotely Piloted Aircraft System (RPAS) Directive</b>
<b>Program Name:</b>	<b>RPAS Governance Committee</b>
<b>Effective Date:</b>	<b>September 1, 2018</b>
<b>This document was updated on:</b>	<b>August 13, 2018</b>



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## 1.0 Document History

First Draft	Don Page	August 23, 2017
1 <sup>st</sup> edit	Dan Juhlin	August 24, 2017
2 <sup>nd</sup> edit	Dan Juhlin	February 15, 2018
3 <sup>rd</sup> edit	Nicole Pysh	February 23, 2018
4 <sup>th</sup> edit	Nicole Pysh	March 1, 2018
5 <sup>th</sup> edit	Nicole Pysh	May 14, 2018
6 <sup>th</sup> edit	Nicole Pysh	May 28, 2018
7 <sup>th</sup> edit	Nicole Pysh	June 26, 2018
8 <sup>th</sup> edit	Nicole Pysh	July 31, 2018
9 <sup>th</sup> edit	Nicole Pysh	August 10, 2018
10 <sup>th</sup> edit	Nicole Pysh	August 13, 2018

## 2.0 Acronyms & Glossary

Aeronautics Act	The <a href="#">Aeronautics Act (R.S.C, 1985, c. A-2)</a> governs civil aviation in Canada.
ACC	Area Control Centre of Navigation Canada.
AEP	Alberta Environment and Parks
Authorized Staff	Person to whom a Flight Readiness Certificate (FRC) has been issued.
CARs	<a href="#">Canadian Aviation Regulations (SOR/96-433)</a> of the Aeronautics Act.
CFS	<a href="#">Canadian Flight Supplement</a>
Drone	Synonym for Remotely Piloted Aircraft (RPA).
Emergency Medical Facility map	Map can be found on the <a href="#">RPAS SharePoint</a> site and forms part of the Flight Crew Package (FLP).
FC	Flight Crew
FCP	Flight Crew Package
Fleet Tracker	Tracks GoA RPAs on the <a href="#">RPAS Share Point</a> site.
Flight Log	Personal log of all flights conducted by a Pilot.
FPV	First-person view; method used to control a radio-controlled vehicle from the Pilot's point of view.
FRC	Flight Readiness Certificate issued by the GoA RPASGC.
GoA	Government of Alberta
Ground Supervisor	Person on-site who is in charge of a RPA flight.
NM	Nautical miles
NOTAM	Notice to Airmen

OHS	Occupational Health and Safety
OM	Operations Manager
ROC-A	Restricted Operator Certificate - Aeronautical
SFOC	Special Flight Operations Certificate
TC	Transport Canada
TP 15263	Transport Canada. (2014). <a href="#"><i>TP 15263 – Knowledge Requirements for Pilots of Unmanned Air Vehicle Systems (RPA) 25 kg or Less, Operating within Visual Line of Sight</i></a>
RPAS	Remotely Piloted Aircraft System
RPA	Remotely Piloted Aircraft
RPASGC	RPAS Governance Committee, GoA
VFR	Visual Flight Reference
Visual Observer	Assists the pilot and monitors the local air space for aircraft and hazards.
VLOS	Visual Line of Sight
VNC	VFR Navigation Chart
VTA	VFR Terminal Area

### 3.0 Introduction

Remotely Piloted Aircrafts (RPAs) are power-driven aircraft, other than model aircraft, that are designed to fly without a human operator onboard. RPAs are small, often battery powered, fixed-wing, or rotor-wing craft deployed to acquire aerial photography and video. Remotely Piloted Aircraft Systems (RPASs) are the RPA as well as the software, communication, control and data links, launch and recovery elements, support and maintenance equipment, operating personnel, handling, storage and transport equipment, and all documentation required for successful RPA flights. These aircraft have grown significantly in popularity with both the general public and within the public service. RPASs have been used within the Government of Alberta (GoA) for a wide variety of purposes such as crop monitoring, forest health evaluation, sand and gravel monitoring, bridge inspections, and wellsite and pipeline monitoring, to name a few applications. All GoA staff are required to operate RPASs in a safe and professional manner in accordance with all applicable laws (both federal and provincial) and GoA policies. Transport Canada (TC) regulates the use of all aircraft, manned or unmanned, to keep the aviation community, public, and Canadian airspace safe. RPAS operators are considered Pilots and legitimate airspace users. The *Aeronautics Act*, R.S.C. 1985, c. A-2 and the *Canadian Aviation Regulations* (CARs) establish the framework in which RPASs are to operate. Staff require special training and federal authorization in order to operate a RPAS.

This Directive is a companion document to the GoA Policy on RPASs. The purpose of this Directive is to identify federal regulations and provincial policies to help ensure a safe flight and compliance. It is also important to communicate flight intentions with people, organizations, and government agencies around the project area in which you plan to fly so that they are not alarmed or surprised by the flight. This includes reassuring them that you have the appropriate authorizations and procedures to perform your work as RPAS operators. Any conflict between this Directive and federal requirements shall be resolved in favour of TC's requirements.

## 4.0 Prerequisites to Fly a RPAS

Within the GoA, RPA flights are restricted to authorized staff only. Staff are considered “authorized” once they have successfully completed Ground School training that conforms to the current knowledge requirements for RPA Pilots set out in Transport Canada’s TP 15263 standard document, have met the requirements of the GoA RPAS Governance Committee (RPASGC), and have been issued a Flight Readiness Certificate (FRC). The RPASGC is accountable for maintaining a list of authorized RPAS Pilots.

### 4.1 Federal Regulations

1. Successful completion (60% or better) of a written examination created and administered by a Ground School training provider that conforms to TP 15263 and teaches air law, navigation, meteorology, aeronautics and general knowledge, and radiotelephony.
2. Any RPA flown by the department for any purpose **other than for training** will require Transport Canada authorization, which may include a Special Flight Operations Certificate (SFOC).
3. A two-way radio able to communicate on frequency of 126.7mHz
  - a. Restricted Operator Certificate - Aeronautical (ROC-A) is required.
4. Meet any liability insurance requirements (as required by the SFOC). Liability insurance will be provided through Risk Management and Insurance (RMI), GoA.
5. Have a Canadian Flight Supplement as per TP 15263.
6. Have applicable flight charts for the area as per TP 15263.
7. All RPAs are required to be registered under an SFOC and clearly marked according to TC guidelines.

### 4.2 Government of Alberta Policies

1. Complete GoA Flight School training.
2. Maintain a personal flight log.
3. Record flights weekly on network flight list.
4. Have a current First Aid certificate.
5. RPAs will be marked with GoA stickers with contact information.

## 5.0 RPAS Hardware Requirements

All RPAs used within the GoA will meet the following standards:

1. The model type must be approved by the RPASGC.
2. Labeled clearly and in accordance with TC regulations and GoA policy.
3. Must be maintained in good flying condition.
4. Must be stored and transported in a container that minimizes the chance of damage.
5. All batteries are stored in a safe manner.
6. Follow all manufacturers’ maintenance requirements.

## 6.0 Flight Crew Roles and Responsibilities

Flying RPAs in a safe and legally compliant manner requires coordination between multiple people and often organizations and departments. Each Flight Crew (FC) is comprised of four roles: Operations Manager, Pilot, Ground Supervisor, and Visual Observer. Often the Pilot or Visual Observer will act as the Ground Supervisor depending on the specific case. To comply with federal requirements, the minimum number of people on-site to fly a RPA is two for flights within class ‘C’ or ‘F’ airspace; therefore, the Ground Supervisor will be a unique person.

### 6.1 Operations Manager

The GoA Operations Manager (GoAOM) is the person tasked with overall accountability for the operational control of the RPA flight and GoA RPAS program, including planning and communications, and is responsible for making safety related decisions about the operation. The OM has the responsibility to use their discretion and may waive any requirements in this Directive based on operational necessity without contravening federal requirements. The OM or the SFOC applicant will submit the SFOC application and

other required documentation to Transport Canada, ensure all persons connected with the operation are familiar with their responsibilities, and will liaise with airport management and local agencies. The OM may be the SFOC holder, or the SFOC holder may be a unique person identified on the SFOC application.

Specifically, the OM has the following responsibilities:

1. Ensure all Pilots are qualified to fly under the SFOC and GoA policy:
  - a. Manage Ground School Certificates.
  - b. Manage ROC-A Certificates.
  - c. Issue and manage Flight Readiness Certificates.
2. Communicate all TC regulatory changes to ministry or departmental RPAS coordinators and to Pilots flying under the SFOC.
3. Ground RPASs for regulatory, operational, or environmental risk factors.
4. Review the proposed flight plan if the flight is to occur outside of class 'G' airspace.
5. Approve flight plans outside of class "G" airspace, communicate clearance and conditions to the FC, and confirm that SFOC conditions are being followed.
6. Notify the appropriate agencies required for the flight and if necessary gain clearance from:
  - a. Local wildfire centers.
  - b. Local airspace authorities if flying in class 'C', 'D', or 'F' airspace.
7. Provide appropriate agencies with the following information regarding each flight:
  - a. A general purpose statement or a summary of the business reasons for the flight, e.g. "inspection of bridges under Program X".
  - b. The OM's contact information and include instructions that the OM's contact information may be provided to any individuals calling in, in order to direct their questions to the OM about their images potentially being collected by a RPAS or to address any privacy concerns being raised.
8. Be available via email, phone, or radio during the operation.
9. Ensure ongoing communication is maintained between all necessary agencies during flights.
10. Advise any callers with privacy concerns that provincial collection authority primarily falls under section 33(c) of the *Freedom of Information and Protection of Privacy Act*, unless the business purpose is for law enforcement (s 33(b)) or authorized by legislation (s 33(a)).
11. Report incidents to TC as required.

## 6.2 Ground Supervisor

The Ground Supervisor (GS) is the person responsible for on-site supervision of the operation. The Ground Supervisor may be the same person as the Operations Manager and/or the SFOC holder if they will be on-site for all operations. In other cases, the Pilot or the Visual Observer may also be the Ground Supervisor depending on the specific situation for the flight. For flights within class C or F airspace, this will be a unique position.

## 6.3 Pilot

The Pilot is the person in physical control of the craft while it is in the air. Often the Pilot will also serve as the payload (camera or video) operator and will have demonstrated competency in both flying the RPA and operating the payload simultaneously. The Pilot is responsible for the following:

1. Recording their location and TC contact information, as detailed in the Emergency Contingency Plan described in section 10.0, so they can quickly report incidents, such as a fly-away RPA.
2. Mission Planning:
  - a. Complete a flight plan detailing the particulars of the operation using the flight plan template or requesting a flight plan through the Regional Informatics Unit (RIU).
  - b. File a flight plan with and obtain approval from the OM, as required outside of class G airspace, in accordance with section 8.1.1.
  - c. Within class G airspace, the Pilot will notify the OM according to section 8.1.2.

- d. Review and comply with the SFOC, applicable TC Regulations and *Advisory Circular* material, GoA policies, and all other applicable laws (i.e. *Freedom of Information and Protection of Privacy Act* (Alberta), *Criminal Code of Canada* (Canada), etc.), including:
    - i. Assessing relevant aeronautical information prior to commencing operation including airspace, aerodromes, air traffic services unit contact and radio frequencies to ensure there is no breach of regulated airspace, and
    - ii. Consulting the OM regarding updates to the *Aeronautics Act* and *CARs* prior to operation as guidelines continue to evolve.
  - e. Prepare pre-programmed flights.
  - f. Ensure the RPA and control system have current firmware and software installed.
  - g. Verify control software is set-up properly.
    - i. The altitude limitation set out in the flight authorization must be set with the control software to ensure TC compliance.
    - ii. Establish a radial working area based on the size class of the RPA. If the flight software does not provide constraints, it is the responsibility of the Pilot to ensure compliance with these radiuses:
      - a. <1kg – radius set to ¼ Nm (450m).
      - b. 1kg – 25kg – radius set to ½ Nm (900m).
      - c. Under OM guidance or emergency conditions, these radiuses may be extended.
  - h. Notify appropriate internal agencies prior to flight.
  - i. Obtain the appropriate permissions from landowner(s), lease holders, and land managers, or notify as required according to legislative authorities.
  - j. Identify hazards; this is followed up in the field on the day of the flight.
    - i. Reference any ministry or department safety documents.
    - ii. Identify any built-up areas.
    - iii. Identify additional flight and safety hazards including, but not limited to, power lines, towers, random camping, and raptor nesting.
  - k. Assess and record weather conditions as detailed in section 9.0 prior to and during the flight to determine if the weather will be favourable and ensure winds and temperatures do not exceed the operating limits of the RPA.
3. Pre-flight checks prior to departure to the field:
    - a. Ensure NOTAMs were filed by the OM with TC no less than 24 hours prior to the flight, if flying in C, D, E, or F airspace.
      - i. Flight plans requiring NOTAM shall be sent to the OM no less than 72 hours before the flight, unless an emergency situation exists. If the flight request is non-emergency in nature, flight plans requiring NOTAM will be denied if filed within 72 hours of the flight.
    - b. Weather is monitored on the morning of the flight.
    - c. The Flight Crew Package (FCP) is up-to-date; ensure all necessary paper work such as insurance, SFOCs, etc., is readily accessible on site.
    - d. The RPA and control station software are up-to-date.
    - e. Batteries are charged.
    - f. Cell phone is charged and charger is in the flight kit.
    - g. 2-way radios are programmed to the appropriate air traffic frequency (126.7mHz) or other frequency for the project area if other than 126.7 MHz.
  4. Pre-Flight checks on the day of the flight at the project site:
    - a. Assess the project area from the ground within a 1 km radius (if accessible) for any hazards or unexpected restrictions such as airstrips, buildings, people, animals, or facilities not identified in the initial mission planning that may restrict or prevent flight operations.
    - b. Ensure that a Site Specific Hazard Assessment (SSHA) has been filled out.



- c. Pre-flight hardware checks (rotors, batteries, motors, RPA shell, navigation systems, control systems and camera mounting). Defective system components, controls and software issues will compromise air-worthiness or RPAS control and the operator must not operate the RPAS.
  - d. Report any pre-flight damage or malfunctions immediately to the OM via email.
  - e. Mitigate control signal loss and GPS loss that may result in loss of control of the RPAS by:
    - i. Ensuring the battery is fully charged prior to takeoff.
    - ii. Ensuring GPS lock and home point are acquired prior to takeoff.
    - iii. Ensuring the operation is within the operating specifications as outlined by the manufacturer.
    - iv. Boosters/signal-extenders may be used if there is concern for control signal loss.
    - v. Ensuring that flights are completed with no less than 30% battery life.
5. Flight Operations:
- a. Wear reflective vest (including any observers).
  - b. Block off with signs, cones, or ribbons an area at least 100' (30 metres) to prevent spectators from distracting the Pilot and to keep the landing area clear and safe.
  - c. Operate the RPA only within its operating range in regards to altitude, temperature, wind speed, etc.
  - d. Operate the RPA safely and cease operation immediately if safety is jeopardized, or if exemptions or terms of the SFOC are breached.
  - e. Operate the RPA in VLOS at all times. If a FPV is used, there must be a Visual Observer to keep primary VLOS. If line of sight is lost, Pilot shall initiate return-to-home function.
  - f. RPAs under 1kg shall not exceed a ¼ nautical mile flight radius.
  - g. RPAs over 1kg and under 25kg shall not exceed ½ nautical mile flight radius.
  - h. Always give right-of-way to all other aircraft (i.e. Hot air balloons, gliders, ultra-light aeroplanes, aeroplanes, and helicopters).
  - i. Operate RPAs during daylight hours unless stated otherwise in the SFOC.
    - i. Daylight Hours are ½ hour before sunrise to ½ hour after sunset, as long as VLOS is maintained.
  - j. Only operate the RPA in airspace classes approved under the SFOC.
  - k. Do not fly where interference could occur with first responders (fire department, police, etc.) not involved in GoA Emergency Response activities. Respect the privacy of others.
  - l. Do not operate within 5 NM of a forest fire unless under coordination with the Wildfire Branch of Alberta Agriculture and Forestry.
  - m. Do not operate within 1 NM of a Department of National Defence property or controlled airspace without specific authorization.
  - n. Do not operate within 1 NM of any active emergency scene or emergency response personnel without specific authorization.
  - o. Do not operate more than 100 feet above ground when closer than 5 NM from any aerodrome or heliport.
  - p. Maintain a safe horizontal distance (100 feet) from people, animals, structures, buildings, or vehicles not involved in the mission.
  - q. Do not fly in populated areas or near large groups of people (e.g. long weekend random camp gatherings, etc.) unless the SFOC specifically allows.
  - r. Ensure that the appropriate Air Traffic Service Unit(s) is advised immediately anytime the flight of the RPA inadvertently enters into controlled airspace. The Pilot must also notify the OM and their supervisor once incident is over.
  - s. Ensure that TC and the OM are notified immediately if personal injury or property damage occurs during operation. In the event of personal injury, first aid procedures shall be immediately initiated as required.
  - t. Ensure that TC, the OM, and the ministry or departmental RPAS Coordinator are notified immediately if there is a fly away or lost link resulting in loss of the RPA.
  - u. Emergency procedures shall be initiated if an unsafe situation develops.
  - v. The Pilot shall notify the OM of an incident via email. The incident must also be filed on the incident reporting system of the RPAS SharePoint.

6. Post Flight checks:
  - a. Post-flight hardware check (rotors, batteries, motors, and control system). Any defective parts or control issues must be reported to the OM via the online maintenance log.
  - b. Charge batteries, controller, and peripheral devices for next operation.
  - c. Record flight log, aerial imagery, and incident reporting.
  - d. Complete flight logbook entry including Pilot/co-Pilot, RPA serial number, weather, date, time, duration, and location.
  - e. To avoid fire, serious injury, and property damage, observe the Battery Safety Guidelines outlined by the manufacturer.
  - f. Maintain the Pilot log.
  - g. Record flights in the online Flight Tracker.
  - h. Inform the OM of flight completion and of any incidents related to the flight.
  - i. Report any post flight damage or malfunctions immediately to the OM via email.

#### 6.4 Visual Observer

Visual Observers are required as per the SFOC and their main role is to assist the Pilot and monitor the local air space for aircraft and hazards. The Observer must be briefed as to their responsibilities. The Observer is not the same as a payload operator who may be operating a camera on a RPA. In some cases, the Observer will also act as the Ground Supervisor. The Observer has the following responsibilities:

1. Ensure the Pilot is not distracted by any spectators or other activities during the pre-flight, flight and post flight operations by:
  - a. Ensuring spectators respect the 100' boundary.
  - b. Answering any questions from the spectators.
  - c. Ensuring any other activities in the area do not affect the Pilot.
2. Assist the Pilot with the pre-flight site hazard assessment.
3. Help monitor radio communication.
4. Monitor the weather and notify the Pilot of any changes that may affect the flight.
5. Assist the Pilot in maintaining VLOS.
  - a. The observer may NOT use binoculars to aid in maintaining VLOS; however, polarized sunglasses are encouraged.
6. Watch and listen for any approaching aircraft.
7. Assist the Pilot in identify potential hazards during the flight, such as birds.
8. Assist the Pilot in any emergency situations, which may include helping track a fly-way RPA and assisting with documentation.

#### 7.0 Flight School/Training Flights

It is departmental policy that every RPAS Pilot must successfully complete both Ground School and Flight School in order to fly a RPA. Ground School training is provided through external trainers whereas Flight School and flight qualifications are certified internally by the RPAS Coordinator(s). RPAS Coordinators are ministry or department specific experienced RPAS Pilots. The RPAS Coordinators are responsible for the following, subject to the direction of the OM:

1. Delivering GoA Flight School training and ensuring operators meet all training requirements.
2. Ensuring communications from the OM are disseminated to Pilots.
3. Ensuring training records are retained and submitted to the OM in accordance with the RPAS Directive, GoA policies and standards, and ministry or departmental business rules.

The training standard to be met to demonstrate proficiency is specified in a GoA RPAS Training Manual (to be issued). Once the training is completed, the RPASGC will register the new Pilot and the OM will issue a FRC. Training flights will be performed pursuant to an exemption filed with TC. However, there are still restrictions on when and where the training can occur. As well, the training flights must follow the operating procedures identified in this document, excluding obtaining an SFOC, provided the flights follow the TC exemption restrictions.

## 7.1 TC Restrictions for RPAS Training

Training flights require an exemption notification<sup>1</sup> and shall adhere to all of Transport Canada's exemption conditions<sup>2</sup>.

## 7.2 GoA Policy

1. You must develop a flight plan as per section 8.0 and notify the OM as per section 8.1.2.
2. You must be supervised by an experienced RPAS operator.
3. You must follow any applicable laws and GoA policies.
4. You must follow the operating procedures identified in this document, excluding obtaining the SFOC, provided you follow the TC exemption requirements.

## 8.0 Mission Planning

Mission planning is the responsibility of the Flight Crew (FC). The FC is responsible for determining what TC regulations are applicable in the project area. Once the location of the operation is known, conduct an airspace assessment using the CFS and VNC to determine the class or classes of airspace you will be operating in. Assess the relevant aeronautical information prior to commencing a flight (airspace, aerodromes, air traffic services unit contact, radio frequencies etc.) Also review the Natural Resources Canada RPAS Site Selection Tool: [https://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/civRPAS/RPAS\\_site\\_selection\\_tool.html](https://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/civRPAS/RPAS_site_selection_tool.html). The RPAS software and hardware is also prepared at this stage.

The flight plan and initial hazard assessment can be based on a desktop review and/or a site visit and is completed based on all available information at the time. The flight plan is a document that details the particulars of a single flight or group of flights and consists of the following:

1. Map and date of the proposed operation.
2. The business purpose of the flight.
3. Phone number and name of the nearest medical facility.
4. List all aerodromes within 30km or, the nearest aerodrome when the closest aerodrome is more than 30km away with:
  - a. Local radio frequency and phone number.
  - b. Distance in nautical miles from the operation to the aerodrome.
  - c. Direction of the aerodrome using standard cardinal directions (NW, SE, etc.).
5. The centroid of the map in the format of latitude/longitude to four decimal places.
6. Detail of the airspace class in which the flight will occur.
7. The phone numbers of the FC including the OM.
8. An empty space for the sign off of the flight plan.
9. Contact numbers as detailed in the Emergency Contingency Plan.

## 8.1 Flight Planning

### 8.1.1 Flying in airspace other than class G

To obtain authorization for a flight outside of class G airspace, the FC shall file a flight plan with the OM for approval. Once approved, the flight plan becomes part of the FCP and must be on hand during operations. This is a specific condition of the SFOC.

Once the flight plan is completed and filed, the OM will review on a case-by-case basis, sign off, and return. The OM reserves the right to:

1. Delegate to the pilot, coordination with all other agencies including filing the Notice to Airmen (NOTAM) and/or,

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<sup>1</sup> [Exemption Notification Form](#)

<sup>2</sup> [Exemption Conditions](#)

- Depending on the specifics of the flight, serve as the Ground Supervisor for the duration of the operation.

During emergency response situations, Pilots may submit the NOTAM directly to TC and ensure the OM and RPAS Coordinators are notified as soon as possible. Flight plans must be retained on hand and filed with the OM, but do not require pre-approval by the OM.

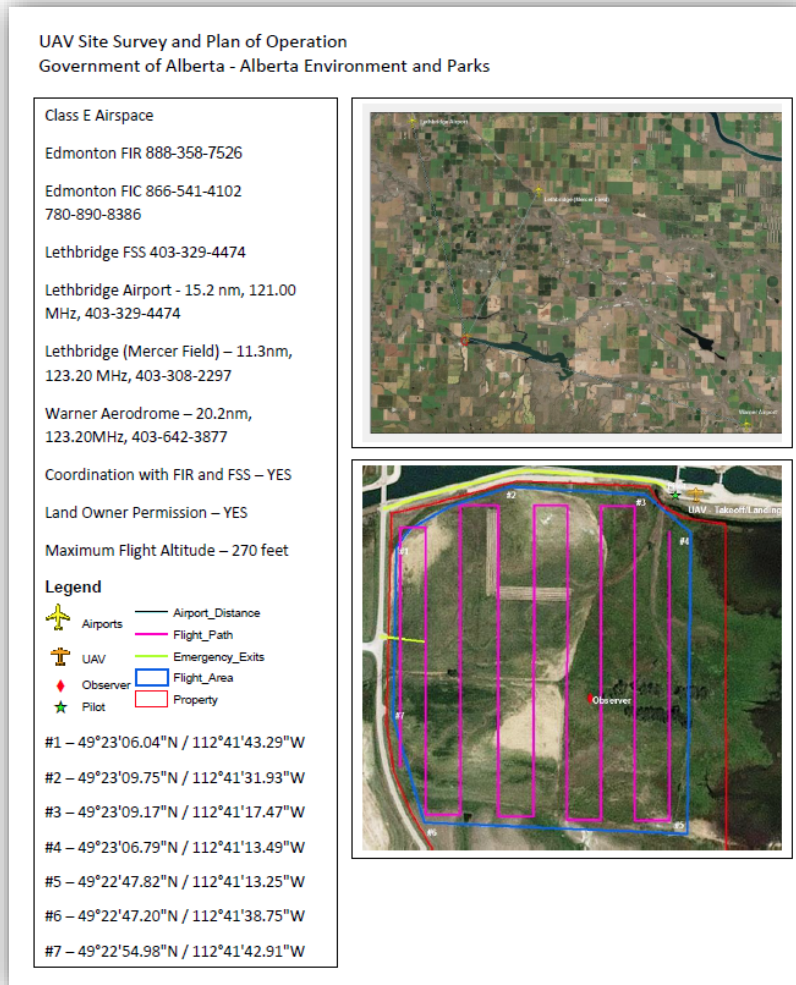


Figure 1: Sample Flight Plan

### 8.1.2 Flying in Class G airspace

Much of the time, Pilots will be operating in class G airspace, which is uncontrolled airspace. Typically, if no specific class of airspace is noted on the Visual Navigation Chart (VNC), the operator is in class G airspace. To fly in class G airspace, it is sufficient to notify the OM via email that a RPAS is being deployed. The following information should be included in the email:

- Name of Pilot and Visual Observer.
- Location of the flight in latitude/longitude or legal land description.
- Business purpose of the flight.
- Description of feature (i.e. gravel pit, cut block vegetation buffer, etc.).

There is no requirement to wait for clearance from the OM to fly in class G airspace but the flight plan shall be on-hand at all times as part of the FCP.

### 8.1.3 Flying in the Forest Protection Area

As the RPA flying season coincides with the fire season, all flights within the Forest Protection Area (FPA) of Alberta will require coordination with the local wildfire centre. An updated contact list for the wildfire centre is part of the FCP and must be updated annually. When flying within the FPA, you must ensure that the local fire center is copied on the email notification to the OM. During a wildfire event, there is an automatic 5 NM buffer around the fire, which is class F airspace. As such, refer to section 8.1.1 for the process to fly in class F airspace.

## 8.2 Flight Crew Package

The FCP is the field manual that must be present while conducting flights. The FCP is tailored to the specific unit that is being flown and shall include, but is not limited to:

1. Flight plan (and OM approval if required).
2. This RPAS Directive.
3. Copy of the Emergency Medical Facility map.
4. Copy of the SFOC and completed SFOC application.
5. Copy of the Emergency Contingency Plan referenced in section 10.0.
6. Proof of liability insurance.
7. Canadian Flight Supplement (hard or soft copy).
8. Air Chart(s) for the area (hard or soft copy).
9. RPAS Operator contact information and RPAS system limitation (user manual).
10. Flight Readiness Certificate.
11. Pilot Ground School Certificate and ROC-A.
12. Government issued personal identification.
13. Evidence of permission from the owner of the property from which the UAV operator intends to take-off and/or land (legislatively delegated authorities may supercede this requirement).

## 9.0 Weather

Having a basic understanding of the weather and monitoring it prior and during the flight is critical to safe operation of the RPAS. The RPAS Pilot will not operate their aircraft in any weather conditions that exceed the operating capability of the aircraft (including the batteries and the controller). Weather observations will be recorded before the flight and will include:

1. Wind speed and direction.
2. Topographic influences.
3. Cloud cover (8<sup>th</sup> scale).
4. Temperature.
5. Visibility.
6. Fronts speed and direction.
7. Solar and geomagnetic anomalies.

Temperature will affect the operating capacity of batteries and temperature extremes will affect the battery length. In addition, colder temperatures and humidity may result in icing of the rotors and/or wings of the RPAS and can severely affect its ability to fly. If conditions are favorable for icing to occur, the Pilot will suspend the flight until conditions improve.

The Pilot and Observer will also monitor any fronts passing through the area and anticipate changes in wind speed and direction. If thunder storms are passing through or by the project area, the Pilot will suspend the flight until it has passed.

## 10.0 Emergency Contingency Plan

The following procedures must be followed in case of a fly-away, crash, close encounter with another aircraft, or hard landing. To expedite notifications to TC, the Pilot will know the location of their project in decimal degrees

to five decimal places and will have the contact numbers for the Area Control Centre (ACC) Shift Manager of TC in Edmonton and the nearest controlled aerodrome.

## 10.1 Fly-away

A fly-away occurs when the Pilot loses control of the RPAS and the RPA exits the project area in either a vertical or horizontal direction. The procedures to recover control will vary depending on the RPAS; however, in general the Pilot will attempt the following:

1. Press the “Home” button on the controller to try and command the RPA to return to the site.
2. If the home button does not work, the Pilot will attempt to take manual control of the RPA and fly it back to the site.

If these are successful, the Pilot will immediately land the RPA and cease all flying until the issue is resolved. If the Pilot cannot regain control of the RPA, the Pilot will activate emergency procedures as follows:

### 10.1.1 Vertical Fly-away

1. Call the ACC Shift Manager in Edmonton at 780 890 8397.
2. Contact the nearest local controlled aerodrome using the Canadian Flight Supplement.
3. Notify the OM.

### 10.1.2 Horizontal Fly-away

1. Make note of the following:
  - a. The direction the RPA was heading.
  - b. Estimated battery life and potential range.
  - c. RPA model, weight, and color.
2. Contact the nearest local controlled aerodrome using the Canadian Flight Supplement.
3. Call the ACC Shift Manager in Edmonton at 780 890 8397.
4. Notify the OM.

## 10.2 Crash

If the RPA is involved in a crash the following steps are followed:

1. Turn off the controller and ensure the RPAS is deactivated to avoid further damage or injury.
2. Determine if there are any injuries and if so follow standard first aid procedures.
  - a. Ensure the area is safe and secure.
  - b. Call 911 if required.
3. Assess if the RPA has caused damage to vehicles, buildings, or infrastructure.
  - a. Ensure there is no further risk of damage or danger.
4. Call the ACC Shift Manager in Edmonton at 780 890 8397 and follow their instructions.
5. Notify the OM.
6. Once safe to do so, record the following:
  - a. Time of incident.
  - b. Weather conditions.
  - c. Events leading to the crash.
  - d. Pictures of any damage.
7. Record the incident on the incident tracker. Attach all applicable documentation to the incident report including:
  - a. Pilot record of incident.
  - b. OHS report.
  - c. Pictures of damage if applicable.

## 10.3 Close Encounter with another Aircraft

If the RPAS has an unexpected close encounter with another aircraft that is within 150 meters (500ft), do the following:

1. Immediately land the RPA and shut it down.
2. Cease all flights.

3. Call the ACC Shift manager in Edmonton at 780 890 8397 for further instructions.
4. Report incident to OM.

#### 10.4 Hard Landing

If, while the RPA is landing in an otherwise controlled manner (i.e. it was a normal landing sequence), it flips or lands hard, do the following:

1. Turn off the RPA and controller.
2. If the RPA damages private or public property treat it as a crash.
3. If only the RPA is damaged then:
  - a. Shut the RPA down.
  - b. Assess the RPA for damage.
    - i. If there are only broken rotors then replace and do a test flight to ensure the RPA is still stable and there was no motor damage.
    - ii. If other components such as the landing gear, airframe, gimbal or camera are damaged, any further flights will cease and the RPA will be sent in for repairs or replacement.
  - c. Document the events leading to the hard landing in the same manner as a crash but there is no need to report it to TC.
4. In all cases, inform the OM for further advice.
5. If the RPA appears to be undamaged, perform low-level test flights and slowly extend the flight time until you are confident it is flying correctly.
6. Once flying is completed, attach a note to the RPA indicating the unit had a hard landing and that when the next flight occurs the Pilot should do a low-level test flight to ensure the unit is still working correctly.

#### 11.0 Security Plan

All Pilots and Ground Supervisors listed on the SFOC will have a good understanding of airspace classification and structure, weather, notice to airmen (NOTAM) reporting services, VTA and VNC, the Canadian Flight Supplement (located in an emergency backpack with First Aid kit and Fire extinguisher), and relevant sections of the *Canadian Aviation Regulations*, particularly sections 602.01, 602.07, 602.11, 602.21 and 602.4.

NOTAMs should always be filed for any RPAS operation within 5 NM of any aerodrome or within class C, D, E or F airspace. NOTAMs should be filed by the OM at least 24 hours in advance of mission and the flight plan should be sent to the OM 72 hours prior to the flight; however exemptions exist for emergency situations as detailed in section 8.0. The following information is pertinent to air navigation services and users:

1. Dimensions of RPAS Operations area (within 1 NM is considered standard) with reference to the:
  - a. Area of operation, expressed as latitude/longitude, and
  - b. Planned operational altitudes, in feet above ground level.
  - c. RPA size.
  - d. RPA weight.
  - e. RPA colour.
  - f. Date and time of operation.
  - g. User contact information.

All RPAS operations will be conducted so that the safety of persons and property on the ground and other air space users is not jeopardized. The procedures listed below will be reviewed prior to each RPAS activity:

1. The RPAS users are responsible for compliance with TC rules and guidelines at all times. As RPAS technology and the rules for operations are evolving frequently, it is mandatory to refer to the TC website for current rules prior to operation.
2. Alberta Parks Division has developed a *Use of Remote Cameras and Unmanned Air Vehicles (RPAS) Directive*. This document will be referenced by all Pilots when applicable.
3. RPAS users are responsible for complying with all other Canadian laws that might apply (e.g. Privacy Act, Criminal Code of Canada etc.) during operation. All provincial, territorial, and municipal laws and regulations must also be followed.

4. RPAS use is restricted to authorized staff only. The SFOC Certificate Holder/Operations Manager is accountable for maintaining the authorized RPAS Pilot list. Only Pilots who have received a GoA Flight Readiness Certificate (FRC) are permitted to fly.
5. Always have on hand the RPAS Directive, SFOC, proof of liability insurance, VHF air band transceiver, RPAS user contact info, maps/charts, aircraft system limitation (user manual), means of communication (cell phone, satellite radio), and fire extinguisher.
6. RPAS Lithium Polymer batteries will be transported according to the [\*Dangerous Goods Transportation and Handling Act \(Alberta\)\*](#). Each battery must be separated from metal objects and battery terminals insulated with electrical tape or other non-conductive material as this will prevent short circuits.
7. RPAS users shall adhere to all responsibilities outlined in section 6.0.
8. Remote control signal loss and/or GPS loss may result in loss of control of the RPA and will be mitigated by:
  - a. Calibrating the RPAS compass before each flight.
  - b. Ensuring battery is above 90% prior to takeoff.
  - c. Ensuring GPS lock and home point are acquired.
  - d. Ensuring the mission is within the RPAS operating specifications.
  - e. Planning flight to complete with 30% battery power remaining.
9. RPAs not being operated shall be stored in a secure way (i.e. pelican case inside a flammable cabinet).

## 12.0 RPAS Maintenance

The type of maintenance performed on a RPAS will depend on the RPAS type and the recommendations from the manufacturer of the RPAS. The Pilot and/or owner of the RPAS will follow these guidelines:

1. Never open the body of a RPAS or attempt to perform any maintenance on a RPAS that is not prescribed in the RPAS's user manual.
2. Follow the manufacturer's recommended maintenance cycles and storage recommendations.
3. Before and after each flight, inspect the RPA for visible signs of damage to any of the components paying close attention to the rotors.
4. Replace damaged rotors immediately and discard them.
5. Firmware upgrades must be performed regularly. Ensure that:
  - a. The craft is up to date before operational flights.
  - b. The controller and batteries are updated at the same time.
  - c. After all updates, a test flight must be performed to ensure that the update was successful and that there are no conflicts between the RPA, batteries, and the controller.

## 13.0 Grounding of RPAS

Due to the rapid advancement of RPAS technology, updates are frequent with the classes of RPAS deployed by the GoA. There is the potential for these updates to cause conflicts with the software/firmware of the units and as such, it may be required to ground specific units if problems are encountered. Grounding of RPAS can occur for several other reasons including:

- Unsafe environmental conditions.
- Regulatory or policy changes.
- Physical damage to units.
- Emergencies.
- Software/firmware bugs discovered.
- Failed software/firmware updates.

In the event of a Pilot grounding a specific unit, the unit status on the online Fleet Tracker will be updated with details of the condition of the craft that caused the grounded status.

If, in the event that a systemic issue arises and the entire fleet must be grounded, or a specific make or model must be grounded, a notification will be sent from the OM to all Pilots with details of the situation that is affecting the



ability to fly safely. Once the issue is resolved, Pilots will be notified that the grounding has lifted and normal RPAS operations can continue.

## 14.0 Incident Reporting

Reporting of incidents is imperative to ensuring the operation of a safe and legally compliant RPAS program. Incident reporting serves not only as a way to stay legally compliant, but also serves as a mechanism that will enable the GoA to track issues that may prove to undermine the effectiveness of a specific RPAS. Incident reporting will also enable the GoA to identify gaps in training and provide an avenue to address those gaps.

Additionally, federal law dictates that a Pilot of a RPAS cease operations if any of the following incidents or accidents occurs, until such time as the cause of the occurrence has been determined and corrective actions have been taken to eliminate the risk of reoccurrence:

1. Injuries to any person requiring medical attention.
2. Unintended contact between the unmanned aircraft and persons, animals, vehicles, vessels, buildings or structures.
3. Unanticipated damage incurred to the airframe, control station, payload or command and control links that adversely affects the performance or flight characteristics of the unmanned aircraft.
4. Anytime the unmanned aircraft is not kept within lateral boundaries or altitude limits.
5. Any collision with or loss of separation from another aircraft.
6. Anytime the unmanned aircraft becomes uncontrollable, experiences a fly-away or is missing.
7. Any incident not referred to in paragraphs (a) to (f) for which a Canadian Aviation Daily Occurrence Report (CADORS) has resulted.

In situations where a FC reports interference from any persons that jeopardized the safety of the flight (either direct interference with the crew and/or the aircraft), the crew will notify the OM and cease operations until the issue is resolved.

Section 10.0 of this Directive outlines an order of operations for internal reporting of incidents in the Emergency Contingency Plan. Internal incidents are reported through an online form (Figure 2). This is a live system that immediately notifies the OM that an incident has occurred. If the incident resulted in damage to any personal or public property, or resulted in an injury to the public or the FC, an OHS incident form must also be completed. The RPA involved in the incident is automatically grounded until the internal investigation is completed and if required, permission is obtained from TC. Filing of incident reports with TC is the responsibility of the SFOC

Figure 2: Incident Reporting Form

holder or the OM and shall be done within 24 hours of the incident or by the next business day. Pilots are not to file incidents with TC directly.

## 15.0 Appendices

### 15.1 Flight Checklists

This checklist supplements the RPAS Directive.

#### 15.1.1 Preparation Checklist

- Check NOTAMS
- Complete any notifications as specified in SFOC (if required, and as noted above)
- Current weather and forecast check
- Date/ Time
- Location
- Visibility
- Wind (knots)
- Cloudiness / Fog
- Temp
- Check battery charge level
- Check aircraft link with control unit
- Check aircraft overall integrity
- Check airframe for visible signs of cracks or damage
- Check batteries for visible signs of damage or bulges.
- Check props for signs of nicks, cracks or signs of wear or damage
- Check props are secured ('o'-rings or self locking)
- Check camera operation
- VNC
- VTA
- Canada Flight Supplement

#### 15.1.2 Pack Equipment

- RPAS unit
- Batteries and charger
- Controller
- Tablet or laptop as required
- Anemometer (if available)
- Spare Propellers
- Apple Lightning Cable
- SD cards
- SD Card Reader
- Tablet sun shade
- Hazard Assessment and Safety Emergency Plan
- Documents
- Procedure
- SFOC
- RPAS exemptions,(if applicable)
- Proof of liability insurance,
- Pilot contact information
- CFS

- VNC/VTA
- Aircraft system limitations (user manual)
- Sunglasses
- High-Visibility Vest

### **15.1.3 Mandatory Pre-flight Checklist**

- Perform final aspects of Site Survey
- Copy of Emergency Contingency procedure
- Plan final operations route
- Establish Take Off / Landing Zone – 5m. radius clear zone
- Place aircraft in launch zone with battery indicator facing toward Pilot
- Visual weather check
- Complete Operations Briefing with spotter
- Ready Aircraft
- Power on control unit
- Power on RPAS
- Power on peripheral devices
- Start flight software
- Confirm camera feed
- Confirm Gimbal operation
- Perform compass calibration.
- Maximum altitude programmed to 400ft or less.
- Return to Home (RTH) altitude programmed.
- Confirm GPS lock

### **15.1.4 Take-off/launch & Flight Procedures**

#### **START OF FLIGHT**

- Record Flight Start Time
- Ensure no bystanders are in the area (30m feet from RPAS flight path)
- Clear launch area of FC
- Confirm GPS Lock
- Begin mission

#### **ABORTED TAKE-OFF AND RETURN TO HOME**

- Immediately land manually or engage auto-land/return to home button

#### **END OF FLIGHT**

- Return RPAS to landing zone
- Confirm Landing zone is clear
- Descend until RPAS is on ground
- Shut down motors
- Power off RPAS
- Power off control unit