

Unmanned Aerial Vehicle (UAV)

UAV usage in the Coppermine River Transect Activity

Technical specification

The drones that will be used are a [DJI Inspire 1](#) (figure 1) and as a backup, a [DJI Phantom 4 pro](#) (figure 2). Both are small drones, 3060 g and 1388 g respectively¹. The sensors attached will be cameras. The usage will respect the rules of Transport Canada and not the technical limitations.



Figure 1 DJI Inspire 1



Figure 2. DJI Phantom 4 pro

Rules

Using a drone in the Coppermine project will follow all the rules by Transport Canada: rules for UAV (Unmanned Aerial Vehicle), for pilot and specific to this area. The only region that is not possible for us to fly is 9 kilometer around the Kugluktuk airport². If we need to fly in this zone, we will ask for a SFOC (Special Flight Operations Certificate)

Table 1 Synthesis of rules from Transport Canada that we will follow.

Where	To do	Rules
Airport (9 km around)	Ask for a SFOC in April if need	SI no.623-001
Kugluk Territorial Park	Ask permission from the park	Defined by the park
ADIZ region(all the study area)	Ask permission for every flight (fly and landing)	section 602.145
Class G aerial space		AC 600-004

The knowledge of the pilot is defined by the [Staff Instruction \(SI\) No. 623-001](#). The pilot of the project holds a certificate from a drone school. (see certificate Annexe 2). This is mandatory since restructuring of the rules in December 2016.

¹ You can read all specification by clicking on the name of the drones.

² Source: http://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/civuas/uav_site_selection_tool.html

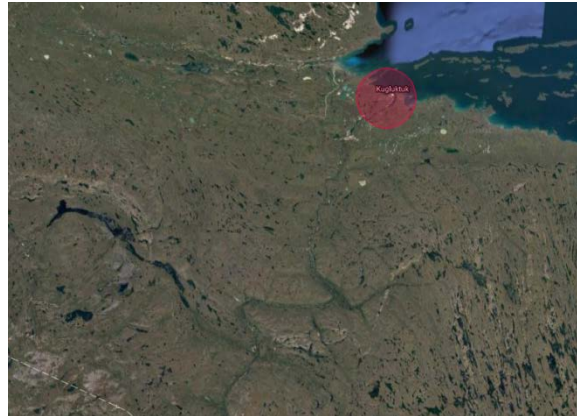


Figure 3: Study area in Class G except the Kuglugtuk airport

Normally to fly a drone you need a **SFOC** as defined in [Staff Instruction \(SI\) No. 623-001](#). However, as long as the project is all in airspace defined as class G and the drone weighs between 1kg and 25 kg, we can fly under an **exemption**. On Dec. 22 2016, Transport Canada released updated Guidance Material for Operating Unmanned Air Vehicle Systems under an **Exemption** in Advisory Circular AC 600-004, see – <https://www.tc.gc.ca/media/documents/ca-opssvs/AC-600-004.pdf>.⁴

The following provides a summary overview of the key elements of the new exemptions. For full details always reference the Transport Canada document noted above⁵.

- Maximum take-off weight of 25 kilogram or less
- Operated within **visual line-of-sight**.
- Not operate the UAV further than **one-half (½) nautical mile (926 m.) from the location from which the pilot is operating the UAV**.
- Minimum of 18 years of age, or be at least 16 years of age and conducting research under the supervision of an academic institution.
- Have no less than **\$100,000 in liability insurance** coverage pertaining to the operation of the UAV system.
- Not use a first person view device.
- Operate no more than one UAV at any one time.
- **Below 300 feet above ground level (AGL) (91 m.)**.
- **Only operate a UAV in Class G airspace**.
- **During daylight hours**.
- Not operate a UAV within or over a forest fire area, or over any area that is located within five nautical miles of a forest fire area.
- At least **five (5) nautical miles (9260 m.) away from the centre of any aerodrome**.
- At least **three (3) nautical miles (5556 m.) away from the centre of any heliport**.
- Operate a UAV at least **three (3) nautical miles (5556 m.) away from a built-up area**.

³ See an introduction to exemption zone in <http://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/civuas/background.html>

⁴ See an introduction to exemption zone in <http://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/civuas/background.html>

⁵ Source of synthesis : <https://blog.flitelab.com/2016/12/22/updated-uav-exemptions-overview/#more-4364>

- Lateral distance of at least **500 feet (152 m.) away from any building, structure, vehicle, vessel, animal or person** unless: (a) The building, structure, vehicle, vessel or animal is the subject of the aerial work; and (b) Only persons inherent to the operation are present.
- Not operate a UAV over or within an open-air assembly of persons.
- Under visual meteorological conditions, clear of cloud with not less than two (2) statute miles (3218 m.) ground visibility.
- The pilot successfully **completed a pilot ground school program**.
- Prior to the commencement of operations, notify the Minister, in writing.

Specificity of the region

The project study area is completely within the ADIZ region (figure 3), which means the UAV Certificate Holder shall not permit operations within the Canadian Air Defence Identification Zone (ADIZ) unless the UAV pilot-in-command is able to comply with [section 602.145](#) of the CARs confirmed in a personal communication with [Jack Kearley](#) of Transport Canada (annex 1). As the rules specify:

“3) The pilot-in-command of an aircraft whose point of departure within the ADIZ or last point of departure before entering the ADIZ has facilities for the transmission of flight plan or flight itinerary information shall

(a) before take-off, file a flight plan or flight itinerary;”⁶

⁶ Extract from the [section 602.145](#)

Air Defence Identification Zone (ADIZ)

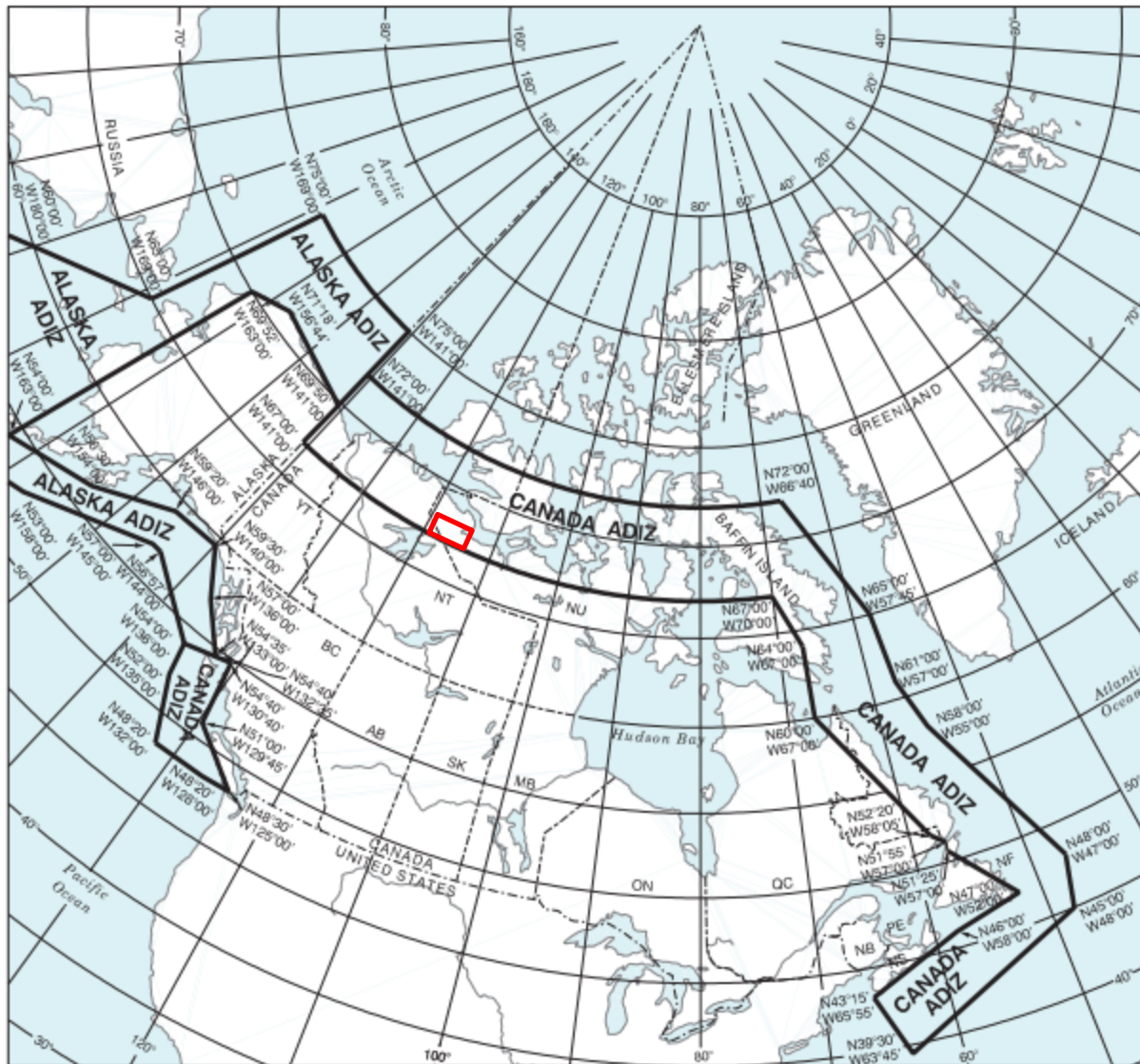


Figure 4: ADIZ region⁷, in red our study area region

Emergency

In case we lose control of the drone we will apply what is specified in [Advisory Circular. No, 600-004](#).

Summary from⁸:

- **Rogue UAV Lateral Fly Away:**

⁷ As define in https://www.navcanada.ca/EN/products-and-services/Documents/DAH_Current_EN.pdf

⁸ Source of resume : <https://flitelab.files.wordpress.com/2015/08/eg-fir-uav-best-practices-eguav-2015a.pdf> and <https://blog.flitelab.com/2015/05/03/sfoc-uav-fly-away-procedure-confusion/>

- In a situation where a UAV loss of control has occurred, or is apparent, and the UAV appears to be travelling horizontally but not climbing, ATC would suggest from an aviation safety perspective that the primary Emergency contact be the nearest Aerodrome,
- Flight Service Station, or Tower. The Secondary in this case should be the EG ACC Shift Manager at 780-890-8397. Prior to UAV operations, understanding the area and classification of airspace in and around your mission area will assist in the proper identification of potentially affected ATC units.
- **Rogue UAV Vertical Fly Away:**
 - In a situation where a UAV loss of control has occurred, or is apparent, and the UAV appears to be climbing with minimal or no horizontal travel, ATC would suggest from an aviation safety perspective that the primary Emergency contact be the EG ACC Shift Manager at 780-890-8397. The Secondary in this case should be the nearest Aerodrome, Flight Service Station, or Tower. Prior to UAV operations, understanding the area and classification of airspace in and around your mission area will assist in the proper identification of potentially affected ATC units.

Conclusion

The objective of using the drone is to obtain very high resolution imagery of the geology of the study region, while respecting all regulations. The potential environmental impact may be to disturb wildlife, primarily birds nesting in cliffs along the Coppermine River Valley. We will do our best to avoid flying close to such areas. We will check with Environment Canada for sites to be avoided. All Transport Canada rules will be followed.

Annex 1

Personnal communication with Transport Canada specialist in Winnipeg about the ADIZ region.

From: **Kearley, Jack** [mailto:Jack.Kearley@tc.gc.ca]

Sent: **November 15, 2016 15:13**

To: **Girard, Étienne (NRCan/RNCan)**

Subject: **RE: ADIZ**

Importance: **High**

It is class G for the most part, but you are required to comply with all of the CARs so yes, you need to do as instructed in the CARs and notify ATC of any flights operating within the ADIZ.

Jack Kearley

From: Girard, Étienne (NRCan/RNCan) [mailto:etienne.girard@canada.ca]

Sent: Tuesday, November 15, 2016 1:10 PM

To: Kearley, Jack <Jack.Kearley@tc.gc.ca>

Subject: RE: ADIZ

Good afternoon

Just to be sure, is that mean it need a SFOC and communication with the air traffic control unit OR it's consider as a Class G where an exemption is enough but it need to communicate with the air traffic control when we flight with the UAV.

Étienne Girard

From: Kearley, Jack [mailto:Jack.Kearley@tc.gc.ca]

Sent: November 15, 2016 09:52

To: Girard, Étienne (NRCan/RNCan)

Subject: ADIZ

Good morning

The Air Defense Identification Zone is described in the Designated airspace handbook (google-its online and free) and the requirements for operating in it are to be found in **CAR 602.145**

Jack Kearley

Civil Aviation Safety Inspector - Flight Operations

Transport Canada

Prairie & Northern Region - Winnipeg

344 Edmonton Street P.O. Box 8550 Winnipeg, Manitoba, R3C 0P6

Government of Canada

Cell [\(204\) 229 2144](tel:2042292144)

Email | Jack.Kearley@tc.gc.ca