FORTFRANCES
BOUNDLESS

REPORT

TO: Mayor Avis and Council

FROM: Jason Kabel, Manager of Community Services

DATE: June 8, 2016

RE: **Unmanned Aerial Vehicle Operations Land Use Request – Rainy Lake Tribal Resource Management Inc.**

Attached is a request from Peter Kline, GIS Technician – Rainy Lake Tribal Resource Management Inc. (RLTRM) for permission to operate an unmanned aerial vehicle (UAV), also known as a 'drone', on June 25, 2016 during the Dragon Boat Festival.

Mr. Kline has provided the following documentation in his due diligence to prepare for his proposed UAV operations:

- DRAFT Transport Canada SFOC application - I am pursuing your land-use permissions in order to complete this SFOC. I have not submitted to transport Canada and will wait for your land-use permission to be granted until I do so. The DRAFT SFOC describes the Pilot and related crew as well as flight plan details.
- RLTRMI UAV Operations Manual - RLTRM is committed to maintaining a safe atmosphere during operations and are willing to work the details of the request to be able to operate.

In addition, Mr. Kline has discussed the proposed UAV operations with Tom Batiuk, Fort Frances Airport Manager. The Community Services Division discussed the proposal with Mr. Batiuk and he does not have any concerns with the application. Further, Mr. Batiuk conveyed that there will not be a problem issuing the necessary Notice To Airmen (NOTAM) for the UAV operation. Please see the proposed take-off and landing location on the attached aerial map.

Recommendation
The Community Services Executive Committee recommends to Mayor & Council to approve the request of Rainy Lake Tribal Resource Management to operate an unmanned aerial vehicle (UAV) on the proposed Town land during the Dragon Boat Festival on June 25, 2016.

Respectfully Submitted,

Jason Kabel

Council approval of this report will agree with the recommendation of the Community Services Executive Committee to approve the request of Rainy Lake Tribal Resource Management to operate an unmanned aerial vehicle (UAV) on the proposed Town land during the Dragon Boat Festival on June 25, 2016.

Rainy Lake Tribal Resource Management Inc.

Ganawenjigaade-Aki ~ Protectors of the Land

Special Flight Operations Certificate (SFOC) Application

Aerial Video and Photography Capture for the Boundary Waters Dragon Boat Race

Prepared by: Peter Klyne

Date Submitted:

Submitted by:

REVISIONS

Date	By	Version	Changes
May 20, 2016	Peter Klyne	Draft	Operation plan amendments

ATTACHEMENTS

Name	Type	Purpose
Insurance – Lloyds	Liability Insurance	Liability Insurance - $500,000

Table of Contents

Revisions

Attachements

Mission Overview

Mission Team

CAR 8.1 623.65(D)(3)(a)

Applicant

CAR 8.2 623.65(D)(3)(b)

Operation Manager

CAR 8.3 623.65(D)(3)(c)

Contact During Mission

CAR 8.4 623.65(D)(3)(d)

CAR 8.5 623.65(D)(3)(e)

Proposed Dates and Times

CAR 8.6 623.65(D)(3)(f)

Aircraft

CAR 8.7 623.65(D)(3)(g)

Security Plan

CAR 8.8 623.65(D)(3)(h)

Emergency Procedures

CAR 8.9 623.65(D)(3)(i)

Ground Supervisor

CAR 8.10 623.65(D)(3)(j)

Operational Plan

CAR 8.11 623.65(D)(3)(k)

Mission Overview

Rainy Lake Tribal Resource Management has been contacted to capture aerial video and photo for the Boundary Waters Dragon Boat Festival located on Rainy River in Fort Frances, Ontario. The river sits on the border between Canada and the USA. The Dragon Boat festival is a public competition that attracts observers from across the entire area. The festival operates as a non-profit organization

The competition is expected to run from 10:00 am until 4pm on June 25th, 2016, with consideration made for extension beyond that time.

The operation will be carried out within visual line of sight (VLOS) between the pilot/groundcrew and the UAV.

Multiple flights will be made with a length of 5-8 minutes for each one depending on actual race events.

During normal operations the following personnel will be present and in constant communication using verbal communication.

- 1 Operations Manager
- 1 Ground Supervisor
- 1 Co-pilot/Camera Operator

Any other person(s) present will be considered a spectator.

Permission to access the waterfront property has been granted by the Town of Fort Frances.

Mission Team

Peter Klyne – Operations Manager

Jason Krikke– Ground Supervisor

TBD – Camera Operator

CAR 8.1 623.65(D)(3)(a)

Certificate Holder:

- Peter Klyne
- UAV Operations Manager
- Rainy Lake Tribal Resource Management Inc.
- Box 522, Fort Frances, ON P9A 3M8
- pklyne@advisoryservices.ca
- 807-274-9877 ext. 213
- 807-276-7438

CAR 8.2 623.65(D)(3)(b)

Operations Manager

The Operations Manager has full control over the operation and is responsible for supervision of the operation area, and is designated to assume responsibility for the operational control of the UAV flight operation. Duties and responsibilities are as follows;

- Coordinate initial site review and communication with client as to specifics of the operation
- Prepare SFOC for Transport Canada
- Establish communication and permissions with property/land owners, airports/air traffic control/NAV Canada, and related agencies that may be required for the operation based on the actual location.
- Ensure all personnel are properly trained and aware of their duties for the operation and that enough personnel are in place to safely manage the operation.
- Make final decision on the cancellation/rescheduling/termination of the operation where conditions fall outside of those defined in operating procedures or as defined within associated SFOC

Peter Klyne is the UAV Operations Manager as well as the Primary Pilot for Rainy Lake Tribal Resource Management

Peter Klyne
GIS Technician
Rainy Lake Tribal Resource Management Inc.
Box 522, Fort Frances, ON P9A 3M8
pklyne@advisoryservices.ca
Office: 807-274-9877 ext. 213
Cell: 807-276-7438

Mr. Peter Klyne has been involved in recreational aircraft since September 2014. Mr. Klyne has an Environmental Technician Diploma from Confederation College in Thunder Bay, Ontario. He is currently a student of Lakehead University and expects to graduate in May 2017. Included in his study is 8 months of Remote sensing training from Lakehead University, Faculty of Natural Resources. Mr. Klyne has also completed the Inspire 1 Online flight school provided by DJI, as well as Mark Richardsons' Flight Video and Photography Course on Udemy.

Pilot (Peter Klyne)

The pilot will have full command and control of the UAV during operation. Duties and responsibilities will include;

- Familiarization with the UAV being used prior to actual operation and sufficient flight time on the aircraft.
- Familiarization with the flight location and associated airspace and surrounding obstacles prior to any flight operations.
- Be in good health and rested prior to any operation.
- Not have consumed alcohol or altering substances at least eight hours prior to operation.
- Verify weather conditions are within the parameters defined for this operation.
- Ensure the UAV airframe as well as command and control system are safe to fly prior to each operation.
- Ensure the take-off and landing area is clear of any obstacles and any foreign object debris.
- Ensure the UAV remains within all flight boundaries (ceiling and range) defined and approved of in the SFOC.
- Ensure all phases of the flight are performed in a safe and responsible manner.
- Terminate any flight when they feel the safety of the operation is at risk.
- With the assistance of ground crew, monitor the airspace of the operation and give way to any aircraft in the area.
- Inspection of the aircraft when flight is terminated. Inspect for any damage or malfunctions that may have occurred in-flight.

Ground Supervisor (Peter Klyne non-flight, TBD during flight)

The duties of the ground supervisor are often carried out by the Operations Manager. However, bystanders, observers, and invited guests present for the operation will require additional personnel to be managed safety. A ground supervisor will be assigned to ensure the safety of these guests. Their duties will include the following;

- Establish safe takeoff/landing zones for each flight, and cordon off these areas if and where required.
- Not have consumed alcohol or altering substances at least eight hours prior to operation.

- Ensure field kit is on site, accessible, and fully stocked.

- Ensure spectators remain within the designated spectator area and that their actions do not pose an additional risk to themselves or the operation and maintain general security of the site.
- Ensure safe distances to surrounding building, vehicles, and spectators are maintained during the flight operations.
- Communicate with other operation personnel during the operations
- Coordinate spectators in the area surrounding the landing/launch area in the event of an emergency.

Camera Operator (TBD)

The duties of the camera operator are often carried out by the Pilot. However, public operations require an additional degree of aircraft and situational awareness. For this reason a camera operator will be utilized to allow the pilot to focus on matters of safe operation.

- Familiarization with camera controls and limitations of camera performance.
- Not have consumed alcohol or altering substances at least eight hours prior to operation.
- Capture appropriate video of the Dragon Boat races during competition
- Communicate with other operational personnel during the operations.
- Communicate directly with the pilot during operations.

Contact During Mission

Primary

Peter Klyne
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Box 522, Fort Frances, ON P9A 3M8
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Office: 807-274-9877 ext. 213
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Secondary

Gary Both
General Manager
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gboth@advisoryservices.ca
Office: 807-274-9877 Ext 206
Cell: 807-276-2709

CAR 8.4 623.65(D)(3)(d)

Mission Type

- **Day, VLOS,** flight operations in pursuit of Aerial video and photography capture. Aerial video service for the Boundary Waters Dragon Boat Festival has been requested. Large boats with 18-22 occupants will compete in timed races along the riverfront. Cinematic video of the competition will be captured by UAV. Boundary Waters operates the festival as a non-profit organization.

Mission Purpose

- The purpose of flight operations are to gather photos and video for the clients within uncontrolled class G airspace up to 300ft AGL inclusively for daylight operations within the extent of the Boundary Waters Dragon Boat Festival in Fort Frances, Ontario on the Rainy River.

Mission Details

- Operations will be carried out with VLOS (visual line of sight) between the operator and the aircraft at all times.
- Operations will be performed in multiple flights, each covering a strip or pattern associated with the linear race of the dragon boat. Multiple passes will be made to cover each participant boat in each heat (two boats per heat), as well as to capture video appropriate for media use later.
- The following minimum personnel will be present and in constant communication with each other: Operations Manager, Pilot/Co-pilot. Any additional person(s) present will be considered to be spectators.
- Additional personnel may be added to maintain launch/landing zones, or crowd control when necessary.
- Permission from the property owners will be received prior to any operations, and proper authorities will be contacted when necessary.
- Air Traffic Service Providers will be contacted in advance of all operations and comply with the ATC authority requirements where required.
- Each location will be assessed via a site survey prior to any flight operations to assess the ability to carry out safe flights, and proper authorities will be contacted when necessary.

CAR 8.5 623.65(D)(3)(e)

Proposed Dates and Times

- The competition portion of the Festival will occur on June 25th, 2016 from 10:00am to ~4:00pm, with consideration for the competition running later than intended.
- Multiple flights will be performed with each flight lasting from 5 to 8 minutes based on the actual competition progression.
- Flights will be performed in the daylight hours under visual flight rules (VFR) conditions within visual line of sight (VLOS)
- Flights will only occur when the following criteria is met:
    - Visibility greater than 1km
    - Winds below 30 km/h
    - Cloud ceiling greater than 1000 feet AGL
    - No precipitation
    - Temperatures above -5°C
- Local weather forecasts will be used to assess and verify weather conditions for the proposed period immediately prior to actual mission flight.
- Only one aircraft will be used at any one time.

Operation Location

- Operation will be performed near the Marina in Fort Frances Ontario:
    - 1011 Front Street
    - Fort Frances, ON P9A 1A3
    - (807)-274-0488
    - N 48.607004, W -93.378445
- The races will extend from the Marina, 300m East upriver to the finish line.

Aircraft

DJI Inspire 1, Model T600

DJI Inspire 1 Description

- Rotary Wing Quadcopter
- Carbon Fiber Composite Body
- 438x451x301mm Body Dimensions
- 13x4.5inch propeller dimensions
- Gross Maximum Takeoff Weight: 3400g
- Airframe Empty Weight: 2143g
- Camera+Gimble Weight: 222g
- Battery: 570g and 670g
- Payload Capacity: 465g
- Four DJI 3510H Electric Motors
- Lithium Batteries: TB47 – 4500mAh, TB48 – 5700mAh
- Powered takeoff/landing, VTOL
- GPS Positioning, Visual Positioning
- Two sonar sensors equipped in the underbelly
- One monocular camera equipped in the underbelly
- No transponder installed
- Equipped to begin a stabilized hover upon loss of RC signal
- Hover accuracy: 0.5m vertical, 2.5m horizontal
- 2 Forward (red) and 2 (green) Rear running LED's. A system status LED is positioned on the tail of the aircraft. A system status LED is positioned on the Camera gimble. The forward, rear and tail LED's allow for orientation of the aircraft to be determined at a glance.
- The white paint scheme is highly reflective in daylight conditions.

Flight Data

- Maximum Speed: 22m/s (ATTI mode, no wind)
- Maximum Climb: 5 m/s
- Maximum Descent: 4 m/s
- Maximum Altitude: 4500m above sea level
- Maximum Range: 5km or 3.1 miles unobstructed
- Maximum Wind Speed Resistance: 10 m/s
- Max Tilt Angle: 30°
- Operating Temperature Range: -10°C to 40°C
- Aircraft should not be operated in high precipitation situations. There are no humidity or mist limitations on the hardware. Care and control is recommended.
-

Control Station

- Manual (Human) Flight Capable
- Autopilot Flight Capable
- Combined Control Flight Capable
- Vertical Takeoff and Landing
- Automatic Takeoff (to 1.2m) and Landing Capability
- Software is open for development on the iOS operating system. Automatic flight system capability and performance are being upgraded weekly. Currently utilizing Autopilot by Autoflight Logic.
- DJI GO App is the interface between RC controller and the aircraft. It displays; vertical speed, horizontal speed, horizontal distance from the controller, vertical distance from the controller, GPS signal strength, RC signal strength.
- DJI GO App provides additional flight data that can be found through menu selection on the flight screen such as; magnetic navigation information, distance travelled, etc.
- Altitude sensor can detect the ground at Nadir within ~500cm. No additional sensors are installed.
- Redundant control systems include; RTH (return-to-home), Visual flight.
- The RC controller has an onboard rechargeable battery that is charged with the DJI charger.
- An ABC dry powder fire extinguisher is kept with the aircraft for fire safety consideration.
- Equipment is kept securely inside the office when not in use. Office door is locked in addition to building being locked/deadbolted at night.

Command and Control Links

- C1 RC Controller operating frequency: 5.725~5.825 GHz in dual operator mode. 2.400~2.483 GHz in Master-only mode.
- RC range: up to 5km or 3.1 miles unobstructed
- DHI GO app provides indication for; lost radio linkage from the RC controller to the aircraft, lost video feed from the RC controller to the aircraft, as well as lost GPS signal from the aircraft to available satellites.
- The RC controller is the single point of control with the aircraft. All systems cooperate with this transmitter. No redundant systems are currently in place should the RC controllers' hardware fail during operations. A second RC controller is a future mitigation option.
- CB radio located in the operators' vehicle will provide local communication with loggers and other crewmembers on-site.
- The RC controller has some amount of latency depending on distance from controller to aircraft as well as local weather and geographic conditions. Out of date or unsupported operating systems of the phone or tablet, storage space available, processing speed and local temperature conditions will all cause additional latency between the command input and the aircraft response.
- Ground crewmembers are equipped with CB radios within their operations vehicles to communicate with local loggers, truckers and other services. Handheld radios that are frequently used in the field have been observed to disrupt and interfere with the aircrafts connection with the RC controller. For this reason handheld communication radios are not permitted when UAV is in operation. Crewmembers maintain visual line of sight with each other (high visibility vest, hard-hats, etc.), and are within audible communication range.

Payloads

- Gross Maximum Takeoff Weight: 3400g
- Airframe Empty Weight: 2143g
- Camera+Gimble Weight: 222g
- Battery: 570g and 670g
- Payload Capacity: 465g
- The X3-FC350 Camera and Gimble system are the primary payload.
- The aircraft is capable of being controlled from an FPV perspective from the camera (not permitted in Canada).
- The aircraft is capable of automatic flight patterns based on the image or video limitations set by the user.

- When coupled with third party autopilot software the Inspire 1 is capable of complex automatic flights. Some methods include target setting with the Camera, where the aircraft will maintain its relative position or pattern. Moving targets can be set, with the autopilot making adjustments without user-input confirmation.
- A second RC controller is not available to allow a second operator to connect to the aircraft camera controls.
- The controlling Ipad 2 is used for additional camera control when required.

CAR 8.7 623.65(D)(3)(g)

Security Plan

Accidents involving UAV's will occur no matter how stringent the conditions or oversight prescribed. The premise of this safety plan is to establish a safe condition to fly that details how inherent risks can be mitigated and managed to an acceptable level.

Safe Altitudes and Distances

100 feet will be maintained from the aircraft and any person not involved in the operation of the UAV. Horizontal flight distance of 100 feet will be maintained between any building, non-participant property, or occupied vehicles or vessels that have not given consent from the owner, or any occupants that have voiced objection. Roadways that have not been restricted by the local authority will be treated as occupied vehicles for the purposes of distance evaluations.

Bystander/Spectator Isolation

Warning signs will be placed around the launch/landing location. The landing/launch area will be outlined by safety cones as well as high-vis barrier to a minimum radius of 10m from the launch site. Solid barriers with low opacity will be utilized if available (concrete barriers). There will be bystanders and observers present throughout the day.

A ground supervisor will be utilized to control the public presence around the UAV.

A third crewmember (Co-pilot) will be posted for the entirety of operation to ensure the launch/landing area is not breached by spectators.

Closure of roads will be utilized for the launch/landing area. Closure of public sidewalks, most roadways, or other public spaces is not within the scope of the proposed operations. Local authority will close public spaces as requested for the safe operation of the UAV.

Land Use Permissions

The Town of Fort Frances has been contacted for land use permissions throughout the waterfront area of Front St. as well as around the Marina on Rainy River. James Kabel has been in contact with the Operations Manager.

The Fort Frances Airport authority has been notified of operations. No special instructions were recommended by the Fort Frances Airport. Permission to operate in conjunction with the Boundary Waters Festival has been granted. A NOFAM was planned prior to UAV operations being proposed. This NOFAM covers all safety concerns of the UAV with ATC. The airport supervisor, Tom Batiuk (807-274-3930) was reached via email, correspondence occurred over the phone.

CAR 8.8 623.65(D)(3)(h)

Emergency Procedures

Loss of Datalink

- Occurs if the datalink is lost for more than 10 seconds.
    - If combined with a loss of GPS, the mission will terminate.
    - If the RC link fails during manual flight, the UAV must terminate
- The UAV will fly to RTH point (launch/landing) and loiter for 1 minutes.
- If the datalink is not re-established within this time, the mission will terminate.
- A total of three datalink losses will be allowed before the mission is terminated.

Loss of GPS

- If GPS reports a loss of lock, the aircraft will immediately go into ATTI mode.
- The UAV will loiter around the point of GPS lock loss (dead reckoning) for 30 seconds. Loiter radius could be as much as ~100m.
- The UAV will navigate to the RTH point manually
- RC control will be established and the UAV landed.
- A maximum of three GPS signal losses will be allowed before the mission is terminated.

Software Crash

- If no sign or signal is heard from the DJI GO app or related Ipad 2 for more than 3 seconds, the flight will be terminated.
- Flight termination (RTH function) must be immediately activated.

Loss of Engine Power

- If the UAV's airspeed and altitude drop suddenly and does not recover immediately the engine may have stopped.
- Flight termination (RTH) will be initiated immediately.
- Air horn will be sounded to notify any bystanders or participants nearby of the UAV's location and distress.

Flight Termination

- Flights will be terminated with the Return-To-Home (RTH) function on the RC controller.
- Failure of the RTH function will cause pilot intervention from the RC controller and manual flight will be initiated to the RTH point.

CAR 8.9 623.65(D)(3)(i)

Ground Supervisor

- The Operations Manager will be responsible for the duties of the ground supervisor during the planning, pre-flight and post-flight phases of the mission.
- Additional personnel will be used to fill the duties and responsibilities during flight during the proposed operation

CAR 8.10 623.65(D)(3)(j)

Operation Plan

Pre-Operation

The following checklist will be reviewed prior to flight operations.

- Gather operational details from client
- Perform site survey and review onsite planning with client.
- Finalize proposed operation dates and alternate dates, if applicable.
- Create and file SFOC
- Verify SFOC approval and rework as needed.
- Review final operation plans with client
- Prepare equipment and aircraft for operation – full review and check of all gear and complete aircraft check.
- File NOTAM with local ATC if required.
- Check weather conditions leading up to and on the day of operation.

- Arrive on site and secure landing and launch areas.
- Perform aircraft inspection and ensure all systems are configured properly and fully operational

Pre-flight Procedures

- Check that the area is secure and free of animals, persons, and vehicles.
- Check weather conditions are within defined safe parameters.
- Notify bystanders and team of flight plan.
- Notify ATC if required and announce to aircraft flight intentions if required.
- Visually inspect aircraft for any damage or structural issues.
- Verify control transmitter is fully charged and all switches and controls in proper neutral position.
- Place aircraft in clear level safe takeoff defined areas, clear of obstacles and any foreign object debris.
- Verify flight batteries are fully charged and stable.
- Power aircraft and verify flight control connections and battery levels.
- Verify camera control and datalink
- Verify flight controls and failsafes, and GPS lock acquired
- Ensure takeoff and flight area is clear.
- Announce takeoff to team and nearby bystanders
- Arm aircraft and perform takeoff.

In-Flight Procedures

- Monitor battery levels during the duration of the flight via telemetry or other visual/audible indicators.
- Monitor flight area for other aircraft, persons, animals, or other obstacles.
- Announce landing procedure is to commence.
- Verify landing area is clear.
- Land aircraft in designated area.

Post-Flight Procedures

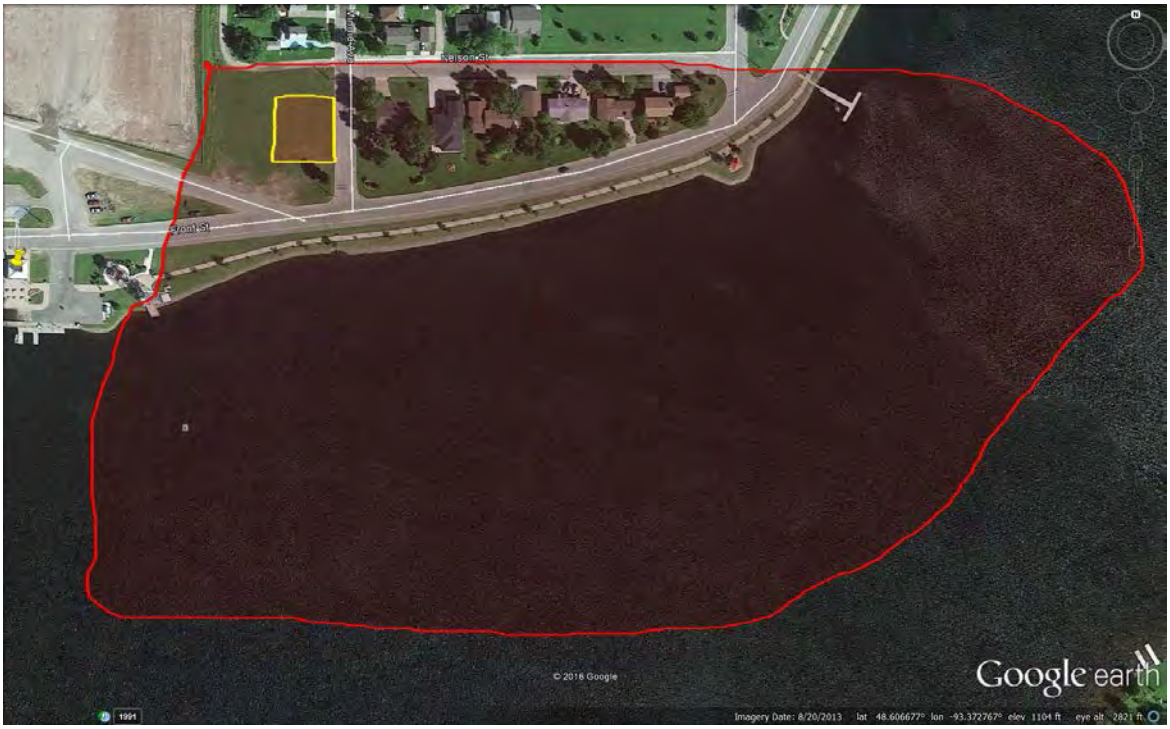
- Power down aircraft.
- Power down control transmitter.
- Return all equipment to staging area.
- Notify team and bystanders that flight is complete.
- Visually inspect aircraft and gear for any damage or wear from flight.

Post-Operation Procedures

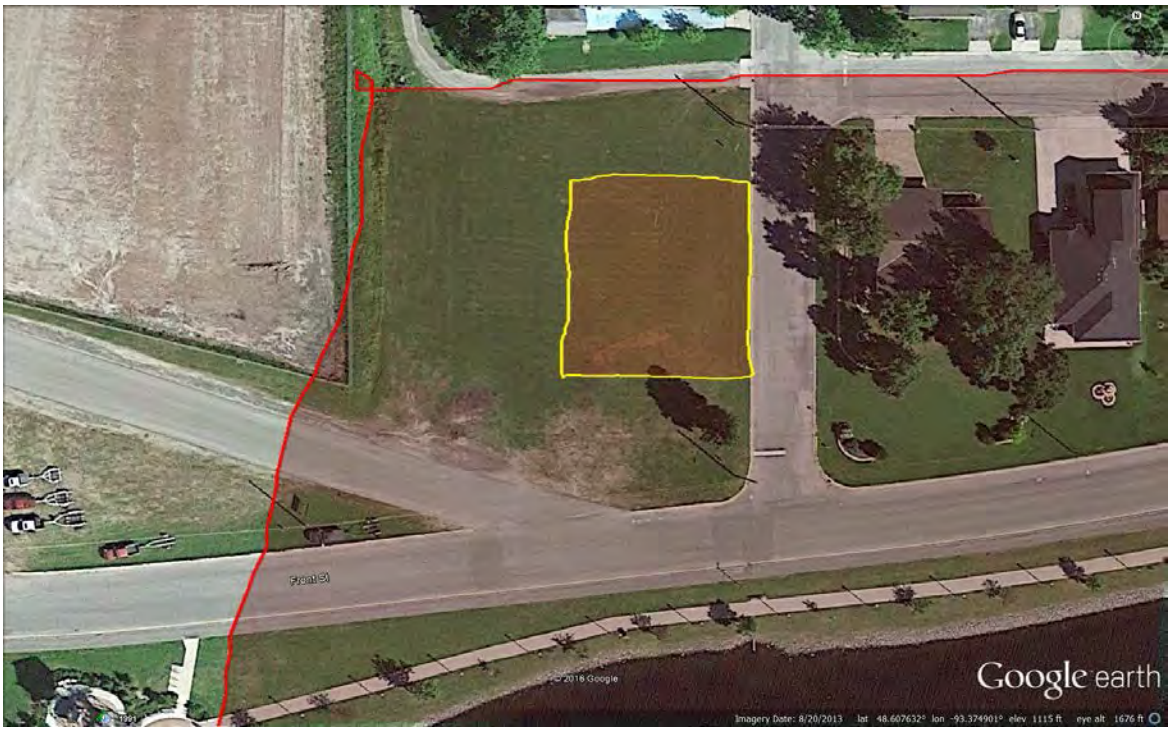
- Remove any notifications, safety equipment, etc from the area.
- Pack and store aircraft and all equipment for departure.
- Notify team and bystanders that operation is complete.
- Report any incidents to proper authorities.

Flight Plan

- Entire flight plan will occur inside
- Takeoff from the staging site.
- Altitude of 50m shall be reached above the staging area to be clear of surrounding obstacles.
- Aircraft will proceed South under manual control until South of the current heat of Dragon Boat racers.
- Careful maneuvering around the Fire lookout tower (33m/100' height) is required until tower is cleared by a minimum of 150 feet on the South side facing Rainy River.
- Aircraft will loiter above Rainy River, to the south of race participants at 50m altitude.
- Camera setting and target confirmation will occur at 50m loiter above the watercraft.
- UAV will proceed to drop altitude to between 10 and 20 meters above the water surface for the duration of the particular heat being recorded.
- 100' distance between race participants and UAV is maintained.
- 100' distance between other watercraft present and the UAV is maintained.
- Camera armed and recording 10 seconds prior to commencement of heat.
- Camera disarmed approx. 10 seconds after the heat is complete.
- Aircraft will be maneuvered manually in a pattern parallel to the subjects.
- Aircraft speed will fluctuate between 0.6 km/hr and 24 km/hr during actual filming of the event.
- Flight plan area is outlined on the .KML file included with this application. A rough estimate of the extent of the flight area can be seen on the following page.
- GPS coordinates of the flight area are enclosed within the following GPS points listed.
    - 48.608030°, -93.375398°
    - 48.607733°, -93.369456°
    - 48.606395°, -93.369558°
    - 48.605566°, -93.376525°



Proposed Extent of Flight in Red. Related Google Earth .KML file is attached.



Proposed staging area in shaded yellow. RTH point is within yellow shaded area. Related Google Earth .KML file is attached.

CAR 8.11 623.65(D)(3)(k)

Attached documentation includes;

- RLTRMI UAV Operations Manual
- Lloyds Liability Insurance
- Sample letter of request sent out to local aerodromes.