

## Aerial Ignition Tracking System – Second Generation Requirements

*Jim Thomasson*

### Introduction

---

Alberta currently has an aerial ignition logging system that they use with their helitorch. The system is large, has multiple pieces, and is somewhat complicated to use. As a result, the system does not provide consistent results. Alberta desires a next-generation logging system that is smaller, less complicated, and can be used with their helitorch, the Premo Plastic Sphere Dispenser (PSD), and any other future aerial ignition device.

### Objectives

---

1. Specify the basic requirements for the second-generation logging unit.
2. Design and construct a prototype.
3. Test the prototype for usability and functionality.

### Methods

---

#### Logging Unit Requirements

1. The unit shall use the existing ignition device harnesses with no modifications, where possible.
2. The logging unit shall have a minimum of the following three inputs:
  - a. Power (from existing ignition device)
  - b. Sensor (optical sensor for PSD and switch position for the helitorch)
  - c. GPS antenna
3. Any new cables or sensors required (e.g., for the PSD) shall be affixed to the unit in such a way as to not interfere with operations and can be removed for storage.
4. PSD sensors shall be protected from liquids and contamination in the dispensing chute.
5. The logging unit shall count the number of plastic spheres dropped, and record whether the helitorch trigger is activated.
6. The sphere count from the PSD shall be accumulated for each run and reset. A stoppage of spheres of more than 5 seconds while in flight shall be considered the end of a run and the counter will set to zero. The total for the run shall be written to the file.

7. The logging unit shall be contained in a single waterproof storage box with the smallest possible footprint, and shall be easily transportable (hard case) and securable in the helicopter.
8. The logging unit internals shall be secured against shock and vibration during operation and transport.
9. The logging unit shall have external indicators for the following functions (as a minimum):
  - a. Unit power applied
  - b. GPS valid position
  - c. Ignition device operation (ON when dropping fire or when PSD spheres are being dispensed)
10. The unit shall operate on voltages between 10–30 VDC with circuit breaker and polarity protection.
11. The logging unit may detect the type of device attached (helitorch or PSD) without user inputs.
12. The unit shall log at a minimum of 1 Hz during flight and at 5+ Hz during ignition.
13. The unit shall start logging with power application, but only record at 1 Hz when movement is detected and stop logging when the movement stops. When stopped there should be a single entry for position.
14. The outputs of the system shall be:
  - a. The following data fields (as a minimum) in .xlsx, .csv, or .txt formats:
    - i. Date and time
    - ii. Logger unit ID
    - iii. Ignition device type
    - iv. Position (ddd mm.mmm)
    - v. Movement (STOPPED, FLIGHT)
    - vi. Ignition ON/OFF
    - vii. Sphere counter
  - b. Track files in GoogleEarth compatible formats (.kmz, .kml). Tracks shall be RED when ignition is occurring and BLUE for the flight track, and the display of each will be selectable (ON/OFF).
  - c. ESRI shape files (.shp, .shx, .prj, .dbf) for each flight in both point and line formats.
15. Data shall be stored internally and on a USB stick in date-named folders.
16. Network GUI (as a minimum) shall display the tabular data and a track representation.
17. All files from a single date shall be contained in a single file folder.
18. Individual flight files (from power ON to power OFF) shall be named with the date and time.
19. Unit must record as data is gathered so a small battery backup may be employed to complete the data write if power is removed.
20. A test harness to simulate sensor inputs for ground-based testing shall be provided.
21. An acceptance test showing compliance with the above requirements shall be performed and the results shall be provided.

## System Evaluation

Researchers will develop an evaluation process to provide ESRD Ignition Specialists with confidence that the new logging unit functions correctly prior to flight-testing. Tests will be done on the ground with a moving vehicle to simulate the helicopter, and a test harness will be used to simulate sphere dropping or helitorch trigger engagement. The test setup can become a training aid for the ignition specialists after the testing. The field evaluation plan will be developed separately from this document.

## Current Logging Unit

The current logging unit is shown in Figure 1. The desired size of the new logging unit is shown in Figure 2.



Figure 1. Current ESRD aerial helitorch logging unit.



Figure 2. The current system (blue) and the approximate desired final size (red).

## Ignition Devices

The plastic sphere dispenser (PSD) has only a power input. The connector is a two-prong power plug (Figure 3).



**Figure 3. Power plug on the plastic sphere dispenser (PSD).**

The PSD chute where the sensors may be attached is shown in Figure 4. There is another chute inside which must be avoided. Sensors should be removable to avoid damage during storage and transport.



**Figure 4. Possible sensor location on the PSD unit.**

The Alberta helitorch has a single three-prong power connection (Figure 5). Only the two power pins are used; the ground is not connected. The existing logging unit has a locking three-prong power connection (Figure 6). This provides the switch signal for activating the helitorch. 24 VDC power is provided by the two-pin connector on the left.



**Figure 5. Power connection on the Alberta helitorch.**



**Figure 6. Alberta helitorch interface cable and connection to existing logging unit.**

## **Timeline**

---

The system will be assembled and tested prior to the 2014 fire season (March 2014).

## **Deliverables**

---

A final report with images will be produced upon delivery and acceptance testing. The report will document the design, installation, and performance of the system.

## **Participating Members/Collaborators**

---

Alberta Environment and Sustainable Resource Development (Mike May)