



Application for a Special Flight Operations Certificate

for a Large Unmanned High Altitude Balloon

by

Shaftesbury High School

Shaftesbury High Altitude Robotics Project
SHARP

Date: November 1, 2013
Prepared by: Robert Striemer

Table of Contents

TABLE OF CONTENTS	2
TABLE OF FIGURES.....	3
APPLICANT & CONTACT INFORMATION	4
OPERATION MANAGER AND CONTACT INFORMATION	5
EXECUTIVE SUMMARY: TYPE/PURPOSE OF OPERATION	6
DATES AND TIMES.....	7
DESCRIPTION OF SHARP HAB SYSTEM.....	8
PERSONNEL.....	9
AREA USED FOR OPERATION	9
SECURITY PLAN.....	10
EMERGENCY CONTINGENCY PLAN	11

Table of Figures

FIGURE 1: PARTIAL PAYLOAD ASSEMBLY SHOWS TWO OF THREE PAYLOAD MODULES.8

FIGURE 2: APRS BEACON, TEMPERATURE SENSORS, ARDUINO AND BATTERY PACKS9

FIGURE 3: NOVEMBER 6TH, 2013 FLIGHT PATH PREDICTION 10

Applicant & Contact Information:

Shaftesbury High School

2240 Grant Avenue

Winnipeg, Manitoba

Canada, R3P 0P7

<http://www.pembinatrails.ca/shaftesbury/>

The high altitude balloon (HAB) will be operated by the Shaftesbury High Altitude Robotics Project (SHARP) which is part of Shaftesbury High School.

The following Shaftesbury High School staff members have read and agreed to this application.

Robert Striemer (VE4SHS)

Teacher

Shaftesbury High School

Phone: (204) 888-5898

Fax: (204) 896-5492

Commercial Pilot Licence: 243418

rstriemer@pembinatrails.ca

Adrian Deakin (VA4AMD)

Teacher

Shaftesbury High School

Phone: (204) 888-5898

Cell Phone: (204) 801-6120

Fax: (204) 896-5492

adeakin@pembinatrails.ca

Operation Manager and Contact Information:

Bruce Feaver (VE4BDF)

Military Instructor Pilot for RCAF at Portage Southport, Manitoba.

Employed by Canada Wings Aviation Training Center for 20 years.

Certificate Number: C360660 since 1984, 9000 hours in VFR and IFR environments.

Phone: (204) 428-2491

bfeaver@shaw.ca

Bruce Feaver has been involved with SHARP since 2010. He has filed NOTAMs on previous SHARP HAB flights. Mr. Feaver also designed and fabricated the 24 inch parachute recovery system.

Type/Purpose of Operation

Shaftesbury staff teach high school students how to design and build high altitude balloon payloads which includes microcontrollers, precision sensors, servos, amateur radio tracking systems, GPS receivers and imaging systems. SHARP HABs have been successfully flown to altitudes in excess of 38 km on data collection and flight operations exercises. The HABs were designed and built by the students under the close supervision of teachers and with the assistance of a support network that includes pilots, engineers, amateur radio specialists and scientists, including a meteorologist.

Through SHARP activities, students develop competency in assembling electronic circuits, programming microcontrollers, integrating and testing sensors, data logging, amateur radio communications, gps navigation, remote sensing, data analysis and systems design and integration.

Future applications for SHARP HAB flights will be submitted to cover any significant additional functionality, possibly including more advanced telemetry and the dropping of radio controlled aircraft.

Flight path predictions are made for HABs launched from rural areas. The launch point is carefully chosen so that the payload can be precisely tracked using the Automatic Packet Reporting System (APRS) in southern Manitoba and to avoid interference with air traffic. The ideal landing zone for payloads is on the flood plain of the Red and Assiniboine rivers south and west of Winnipeg to the US border. This is also the area with the best coverage by the APRS-IS repeater system.

Dates and Times

These operations will occur on November 6th 2013 between 12 PM and 4 PM local time.

Launch may occur if the following criteria are met:

1. Winds below 15 knots
2. Cloud ceiling greater than 700 feet AGL
3. No precipitation

Description of the SHARP HAB System

Kaymont 3000 gram Helium Filled Balloon and 2100 gram Payload:

SHARP 3.1 is a Kaymont 3000 gram helium filled balloon and payload that was designed and built by SHARP members. Available parameters are listed below.

Launch volume at the Earth's surface:	6.48 m ³ / 229 ft ³
Balloon to payload length:	7 m
Total payload mass (includes parachute):	2100 grams
Ascent rate:	4.9 m/s / 1000 ft/min
Burst altitude:	37480 m
Payload release altitude:	36800 m
Time to burst:	127 min
Descent rate near Earth's surface:	5 – 8 m/s (20 – 30 km/h)
Total flight time:	150 min
APRS beacon call sign:	VE4SHS-9
SPOT satellite messenger website:	http://share.findmespot.com/shared/faces/viewspots.jsp?glId=0RtMWO8J65HOCUgcR9vPKguIsOvnJod3P

The payload consists of an octagonal foam board box approximately 12 inches high and 8 inches wide. It's larger components include two digital cameras with plastic bodies, an APRS transmitter consisting of a 5 inch long circuit board and piano wire antenna and a 12 volt lithium battery pack, a SPOT satellite tracker and three 3 inch by 2 inch Arduino microcontroller boards. The HAB is equipped with a GPS controlled payload cutdown circuit. This circuit will be programmed to release the payload from the balloon 500 m below the burst altitude.

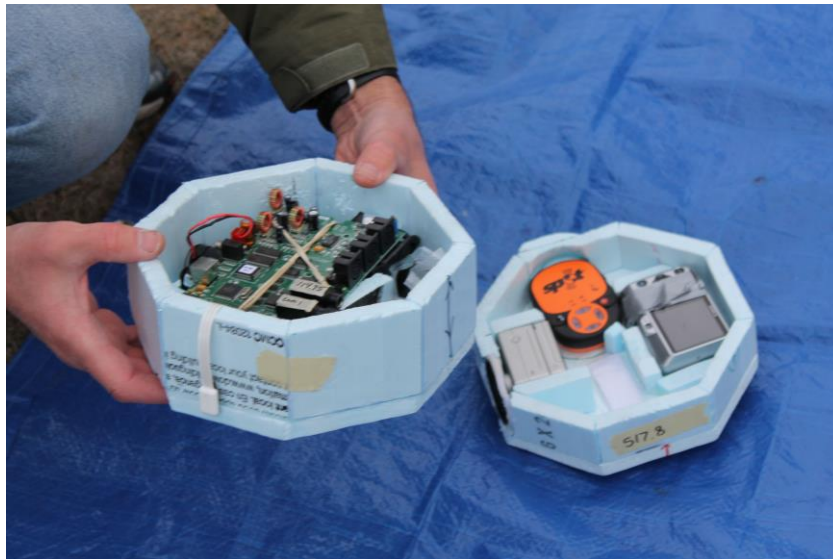


Figure 1: Partial payload assembly shows two of three payload modules.

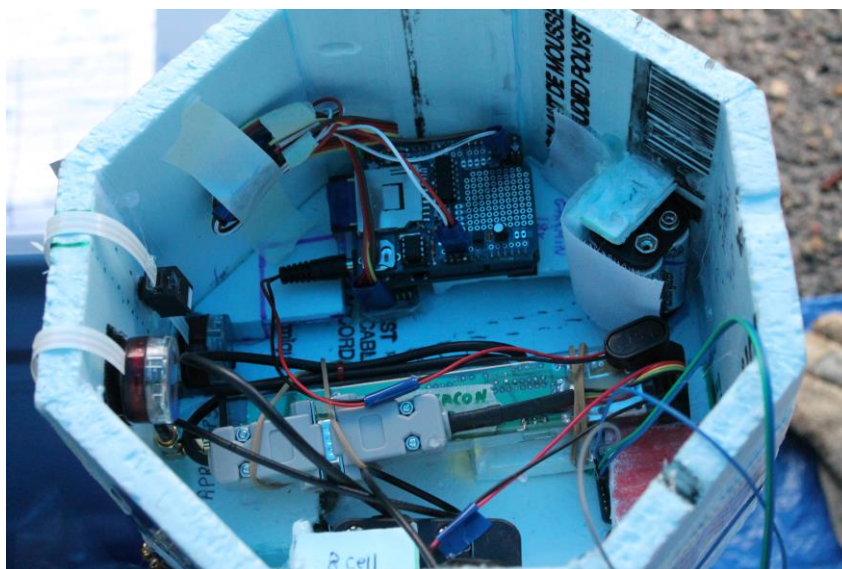


Figure 2: APRS beacon, temperature sensors, Arduino and battery packs

Personnel

During normal operations the following personnel will be present and in constant communication using cell phones and amateur radios.

- 1 Operations manager (Mr. Bruce Feaver)
- Several teachers including the applicants Mr. Robert Striemer and Mr. Adrian Deakin and as many as 25 students on the ground in chase vehicles

The SHARP team prepares the balloon and payload at the launch site. The operations manager will be notified when the launch is ready to proceed. After the launch the team packs up and follows the balloon in the chase vehicles. One chase vehicle will beacon the call sign VE4SHS-10 using the APRS. The chase team is supported by other groups in Winnipeg who are also tracking. The team is usually able to recover the payload less than one hour after landing. The operations manager will then close the NOTAM.

Area Used for HAB Flight Operation

SHARP HABs will always be launched from a rural area or small town northwest or southwest of Portage la Prairie Manitoba, well beyond the Portage la Prairie flight training area (CY407).

The proposed flight is for November 6th, 2013. The proposed launch site is in Treherne, Manitoba. The GPS launch coordinates are:

N 49.623° (49° 37' 25) W 98.699° (-98° 41' 57)

There are two airstrips 2 nm east and 2 nm northeast of Treherne. The closest airport is Southport near Portage la Prairie (CYPG) 43 kilometres northwest of Treherne, see attached flight prediction map.

The proposed launch time is 12 PM central standard time or 18:00 UTC. The predicted landing area is near Brunkild Manitoba at 2:30 PM or 20:30 UTC. The approximate GPS landing coordinates are:

N 49.591° (49° 35') W 97.572° (-97° 34')

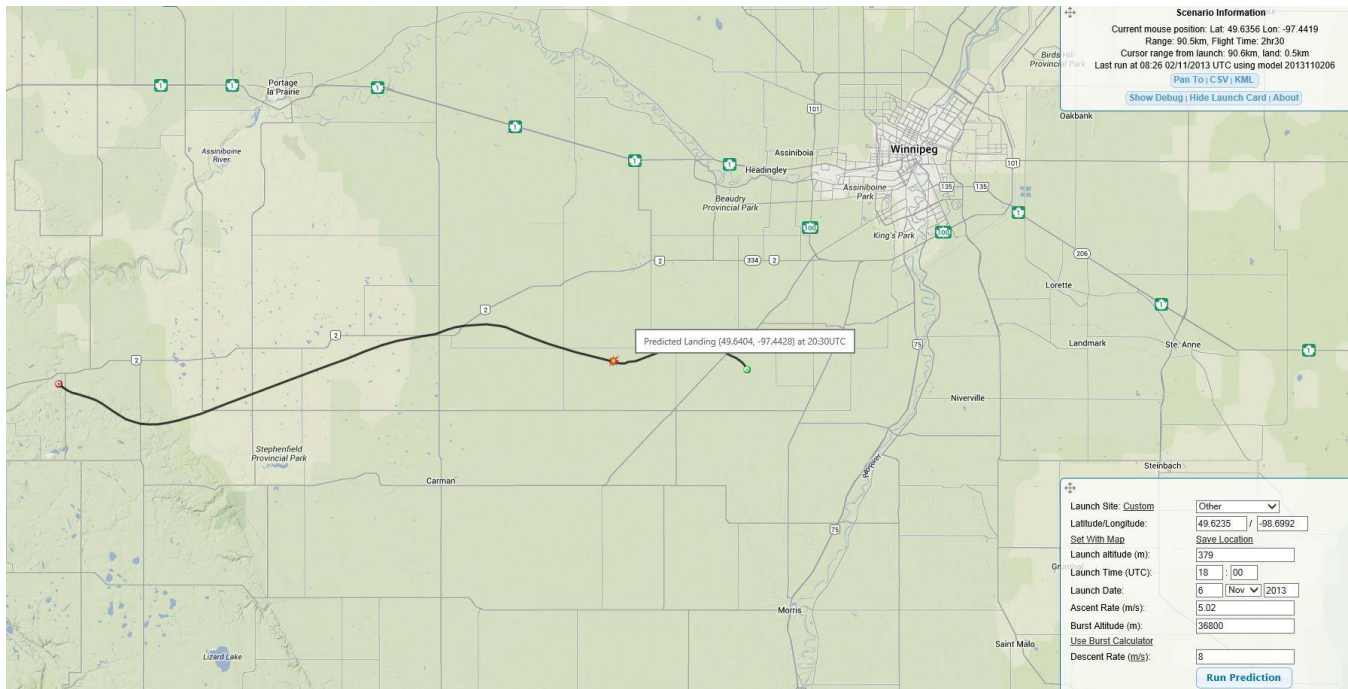


Figure 3: November 6th, 2013 Flight Path Prediction (as of Nov. 2nd, 2013)

Security Plan

A SHARP unmanned balloon will be launched from the playing field behind Treherne Collegite Institute (TCI) in Treherne, Manitoba. This plan has been approved by the principal Jeff Small. The launch site was chosen to avoid heavily populated areas and to avoid undue interference with air operations in the Winnipeg and Portage la Prairie regions. The payload is predicted to land 42 km southwest of Winnipeg (CYWG) in a lightly populated area most likely on a farm field. The property owner will be notified as needed. Because of the time of year (November) it is not expected that the launch or landing will interfere with farm operations. Several responsible teachers will be at the launch site. They will also be at the recovery site during or shortly after the landing. The payload will be continuously tracked using the Automatic Packet Reporting System by the chase team on the ground and by radio amateur groups in Winnipeg and Portage la Prairie. A group of engineering students at the University of Manitoba, Mike Lambeta (VE4PBC) and Erik Johnson (VE4EDJ) will be tracking the balloon from UMARS ([University of Manitoba Amateur Radio Society](#)). They can be reached at 204-899-7978 and 204-960-9404 respectively. In addition, the payload can be tracked using the internet web site [aprs.fi](#) and SHARP's SPOT satellite messenger web site at <http://share.findmespot.com/shared/faces/viewspots.jsp?glId=0RtMWO8J65HOCUgcR9vPKguIsOvnJod3P>

Security will be maintained at the launch and recovery sites by a group of about 25 students and teachers. The Treherne RCMP detachment will be reached by phoning 204-723-2024 (non-urgent).

Emergency Contingency Plan

If an emergency were to develop, the appropriate authorities would be contacted by calling 911, which handles all emergency requests in this area. The emergency phone number for the Treherne RCMP detachment is 204-723-2345.

SHARP members have access to first aid kits in the event of an emergency. The Tiger Hills Health Centre contact information is:

64 Clark St, Treherne, Manitoba
Telephone: (204) 723-2133