

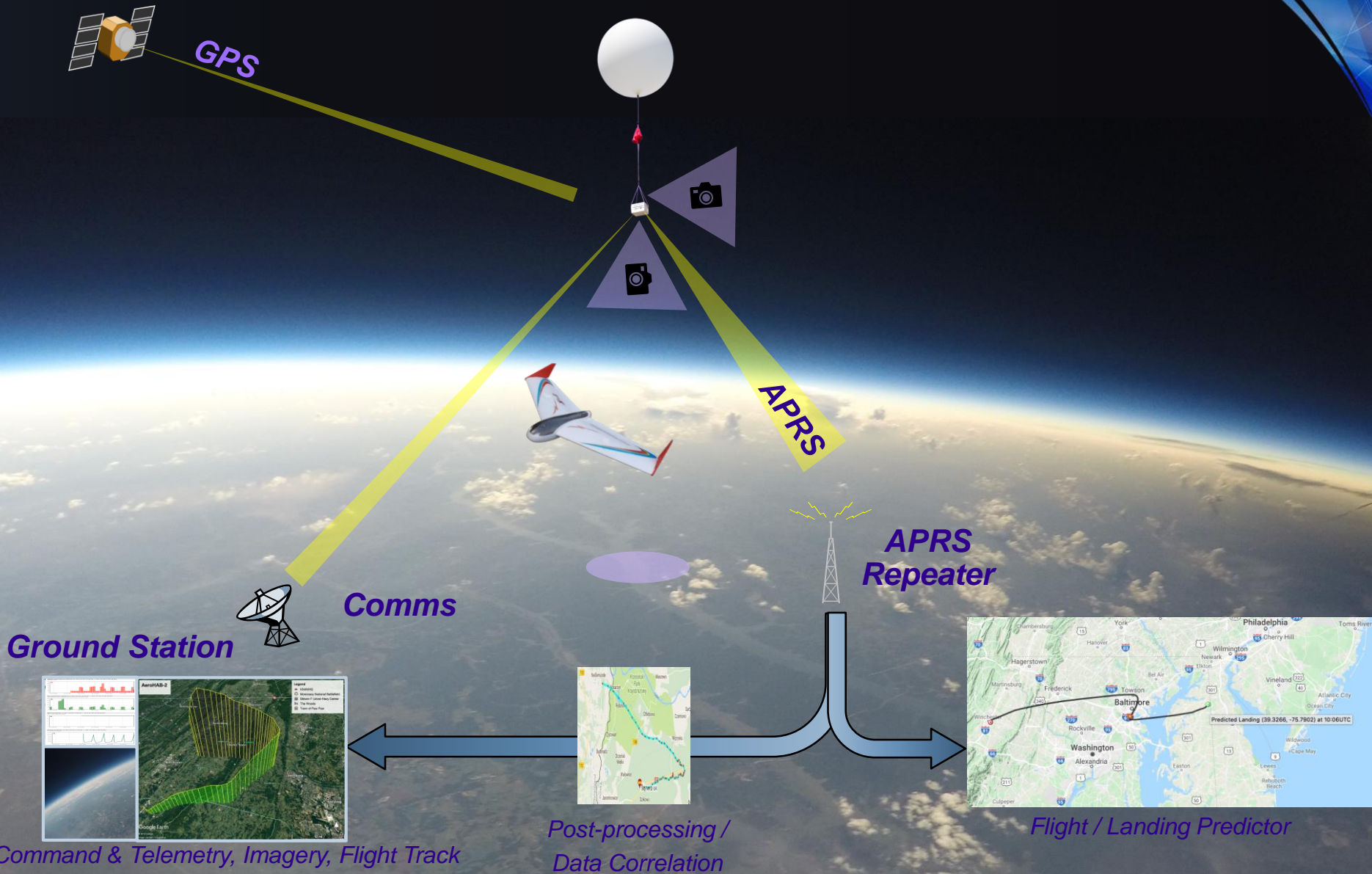


AeroHAB-6 Overview

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***Term Project for GMU CS 321
Spring 2020***

OV-1: AeroHAB-6



AeroHAB-6 Subsystem Overview – Flight Segment



- Payload A
(Primary Collection Segment)
 - *Sensor Collection (3)*
 - Position
 - Temperature / Humidity (internal / external)
 - Gyro (roll / pitch / yaw)
 - Additional team-selected sensor
 - *Command & Telemetry (4)*
 - Telemetry feed to ground
 - Target updates for imagery
 - Photo / video to ground
 - Interface with Comms
 - Fault management
 - Payload release
 - *On Command*
 - *Autonomous via geo fence*
 - *Imagery (4)*
 - Video / photo collection
 - Camera pointing
 - *Target areas of interest*
 - Nadir (ground pointing) camera orientation towards lines of flight
 - *When not capturing specific target*
- Payload B (Glider) (3)
 - *Autopilot*
 - Flight initialization
 - Flight control
 - Waypoint navigation



AeroHAB-6 Subsystem Overview – Communication Segment

- Flight / Ground Communications (4)
 - *Radio transmission between payload and ground station*
 - *Protocol modulation / demodulation*
 - *Provide interfaces for:*
 - Flight telemetry
 - Photo / video imagery
 - Ground commanding
- Think of this as the network layer of the project
- **BONUS:**
 - *20% grade bonus to anyone in this team that passes the Amateur Radio Technician License Exam by the end of February*
 - Start here and I can give you more info on test prep
<http://www.arrl.org/find-an-amateur-radio-license-exam-session>

AeroHAB-6 Subsystem Overview – Ground Segment



- Ground Station App (7)
 - *Command & Telemetry*
 - Live telemetry display
 - Payload commanding
 - Interface with radio
 - *Flight Tracker*
 - Live path updates
 - *Payload A & B*
 - *Google Earth or similar display*
 - *Primary track from telemetry feed*
 - *Secondary from APRS*
 - Camera field of view (FOV) overlay for nadir camera
 - *Imagery Display*
 - Live feed or selected snapshot
- Post Processing App (3)
 - Data correlation post flight
 - Image / track correlation
 - Video overlay
 - *Telemetry added to video*
- Antenna Pointing (3)
 - *Azimuth and Elevation pointing*
 - *On command, track Payload A or Payload B*
 - **BONUS:** *Get a mechanical engineer to help you*
- Flight Predictor (4)
 - *Improved flight / landing predictor based on current weather data*
 - *Live landing prediction updates during flight using payload telemetry and updated weather data*
 - *Post-flight comparison of accuracy vs. existing prediction apps*

AeroHAB-6 Primary Items to Purchase

- Payload A
(Primary Collection Segment)
 - *Sensor Collection*
 - Position
 - Temperature / Humidity (internal / external)
 - Gyro (roll / pitch / yaw)
 - *Command & Telemetry*
 - Telemetry feed to ground
 - Imagery on demand
 - Payload release
 - *Imagery*
 - Video / photo collection
 - Horz / vert camera pointing
 - Nadir (ground pointing) camera orientation towards lines of flight

Single Board Computer (SBC)

- e.g. Pi Zero; GumStix; Pocket Beagle, etc.

Sensors

- Temperature
- Humidity
- Gyro (roll / pitch / yaw)

AdaFruit Ultimate GPS

SBC

**Teams Must Agree on One SBC
And Must Coordinate Pin Usage**

SBC

Cameras x 2 (e.g. Pi Cam)
Horizon / level sensors or use gyro data
Gimbal / Servos ([Example](#))

Enclosure
Power Module (Flight)
Release Mechanism
Radio
APRS tracker

Items to Purchase: **Student** / **Professor**



AeroHAB-6 Primary Items to Purchase

- Payload B
(Glider)

- *Autopilot*

- Flight initialization
 - Flight control
 - Waypoint navigation

Single Board Computer (SBC)

- e.g. Pi Zero; GumStix;
Pocket Beagle, etc.

GPS (Recommend AdaFruit Ultimate GPS)

Gyro sensor(s)

Servos for testing

Glider with servos

Power Module (Flight)

Release Mechanism

Camera

APRS tracker

Items to Purchase: Student / Professor



AeroHAB-6 Primary Items to Purchase

- Ground Station App
 - Post Processing App
 - Flight Predictor App
- Should work on your own laptops
Apps should be compatible with Windows or Mac
Approval required for any non-standard configuration
- Antenna Pointing
- Gimbal / servos (work with professor on requirements)
Microcontroller / SBC unless gimbal can be controlled from laptop
Yagi antenna during mission

Items to Purchase: Student / Professor



AeroHAB-6 Team Assignments

- Flight Segment
 - *Payload A*
 - Sensor Collection (3)
 - Command & Telemetry (4)
 - Imagery (4)
 - *Payload B*
 - Glider Autopilot (3)
- Communications Segment (4)
- Ground Segment
 - *Ground Station App* (7)
 - *Post Processing App* (3)
 - *Antenna Pointing* (3)
 - *Flight Predictor* (4)



Top-level System Requirements

Must develop derived requirements for software

- Requirements maintained on [Google Docs \(Sheets\)](#)