

Mission Statement and Project Description

- The purpose of the VIP UHDT is to effectively create an autonomous UAS that successfully performs all expected obligations of the 2016 AUVSI Seafarer Student UAS competition
- Provide students an opportunity to design, fabricate, and fly unmanned drones in a vertically integrated project



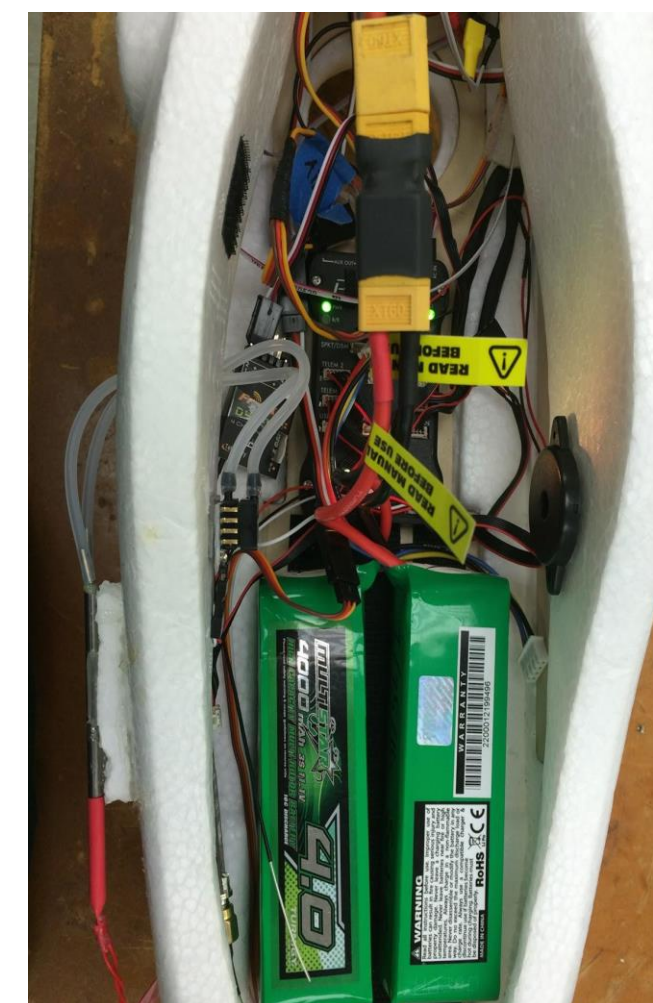
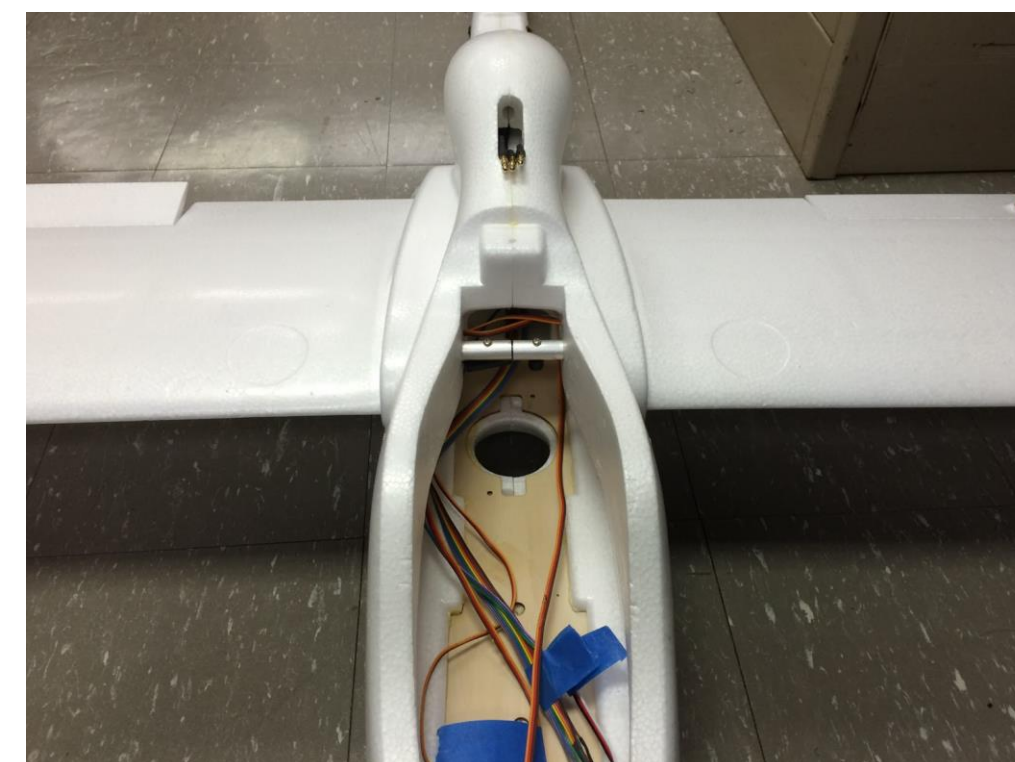
Mission Operations

Parameter	Threshold	Objective
Takeoff	Achieve controlled takeoff. Properly transition to autonomous flight.	Achieve controlled autonomous takeoff. Properly transition to autonomous flight.
Flight	Maximum of 3 minutes manual flight. Maximum of 3 manual takeovers from autonomous flight.	Achieve controlled autonomous flight with no manual flight, except for transition from manual takeoff.
Waypoint navigation (every waypoint)	Capture waypoint in sequence with ± 50 ft. accuracy, and maintain navigation ± 100 ft. along the planned flight path.	Capture waypoint in sequence while in autopilot control with ± 50 ft. accuracy, and maintain navigation ± 100 ft. along the planned flight path.
GCS display items	Accurately display "no-fly-zone boundaries" and shall accurately display current aircraft position with respect to the "no-fly-zone" boundary, display indicated airspeed (KIAS) and altitude (feet-MSL) to the operators and judges.	Specific requirements listed in Section 7.1.5.
Landing	Achieve controlled landing. Properly transition from autonomous flight.	Achieve controlled autonomous landing. Properly transition from autonomous flight.

Parameter	Threshold	Objective
Localization (each standard and QRC target)	Determine target location within 150 ft. Must be paired with at least a threshold classification.	Determine target location within 75 ft. Must be paired with at least a threshold classification.
Classification (each standard target)	Provide any two target characteristics, electronically.	Provide all five target characteristics, electronically.
Classification (QRC target)	Detection.	Decode the message.
Imagery (each target)	n/a	Provide cropped target image ($\geq 25\%$ of image frame).
Autonomous Search	n/a	Aircraft in autopilot control during search.
Secret message	n/a	Decipher the message anagram collected from the targets in the search area.

Aircraft

- With maximum flight weight of 5.3 lb the calculated operational flight weight at 4.85 lb and a payload of 1.42 lb will allow for a 8.40% buffer.
- Penguin will complete the search area task in 7.3 minutes at 147,000 ft/h
- Motor thrust from the two multistar 3S 6000mAh batteries is 3.5 lbf at 100% throttle.
- Drag force calculated at 100% throttle will have a drag coefficient of 0.06 and will have a maximum flight speed of 205920 ft/h.



Electrical Power System

- FrSky 2.4GHz D4R-II Manual control/override Pixhawk flight system Range tested to 1300+ feet
- 3DR Telemetry 915MHz 100mW Telemetry data transmission, waypoint navigation Pixhawk flight system
- 1.3 GHz 400mW Video Transmitter Live video feed for manual control FPV system

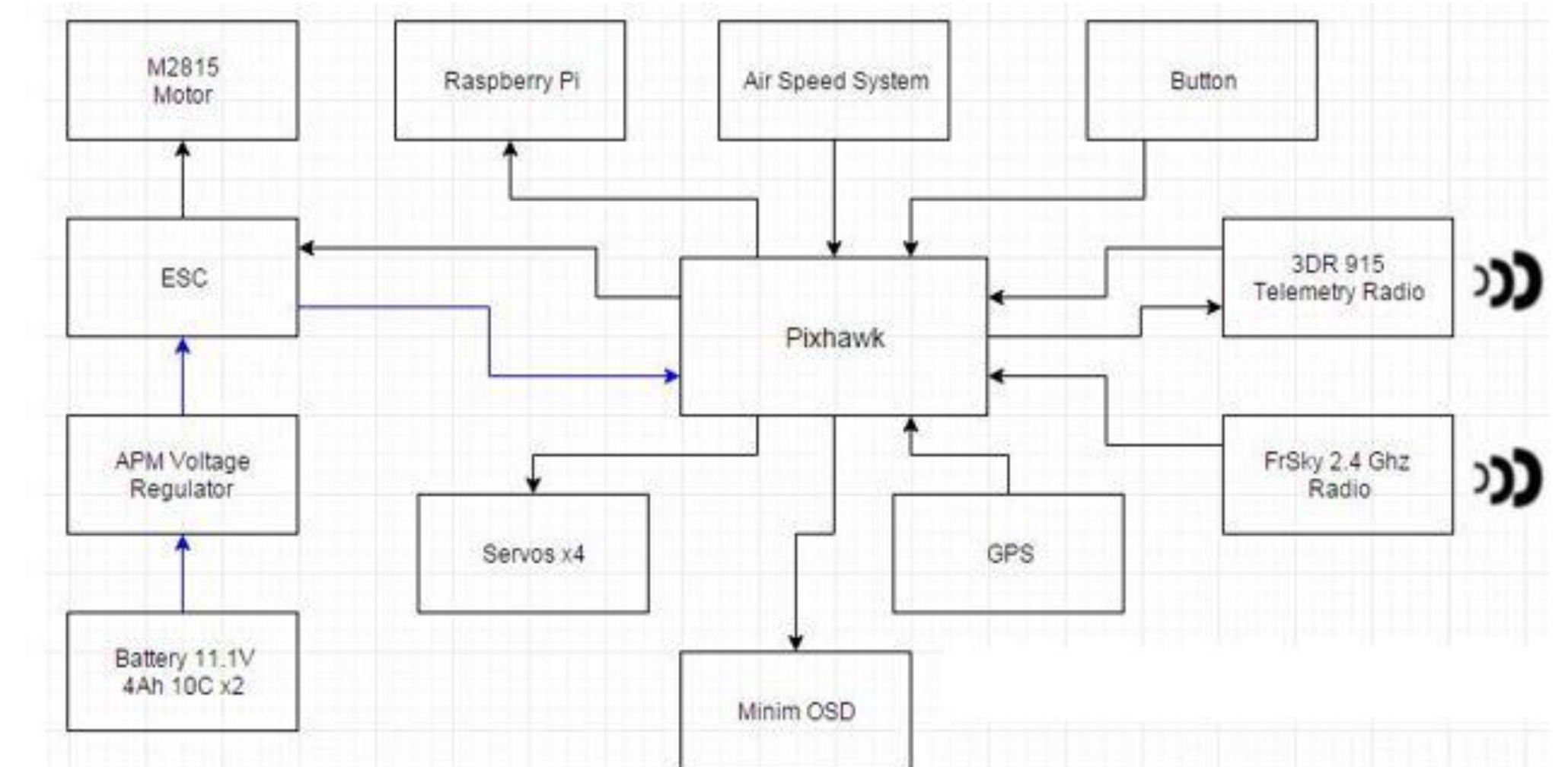
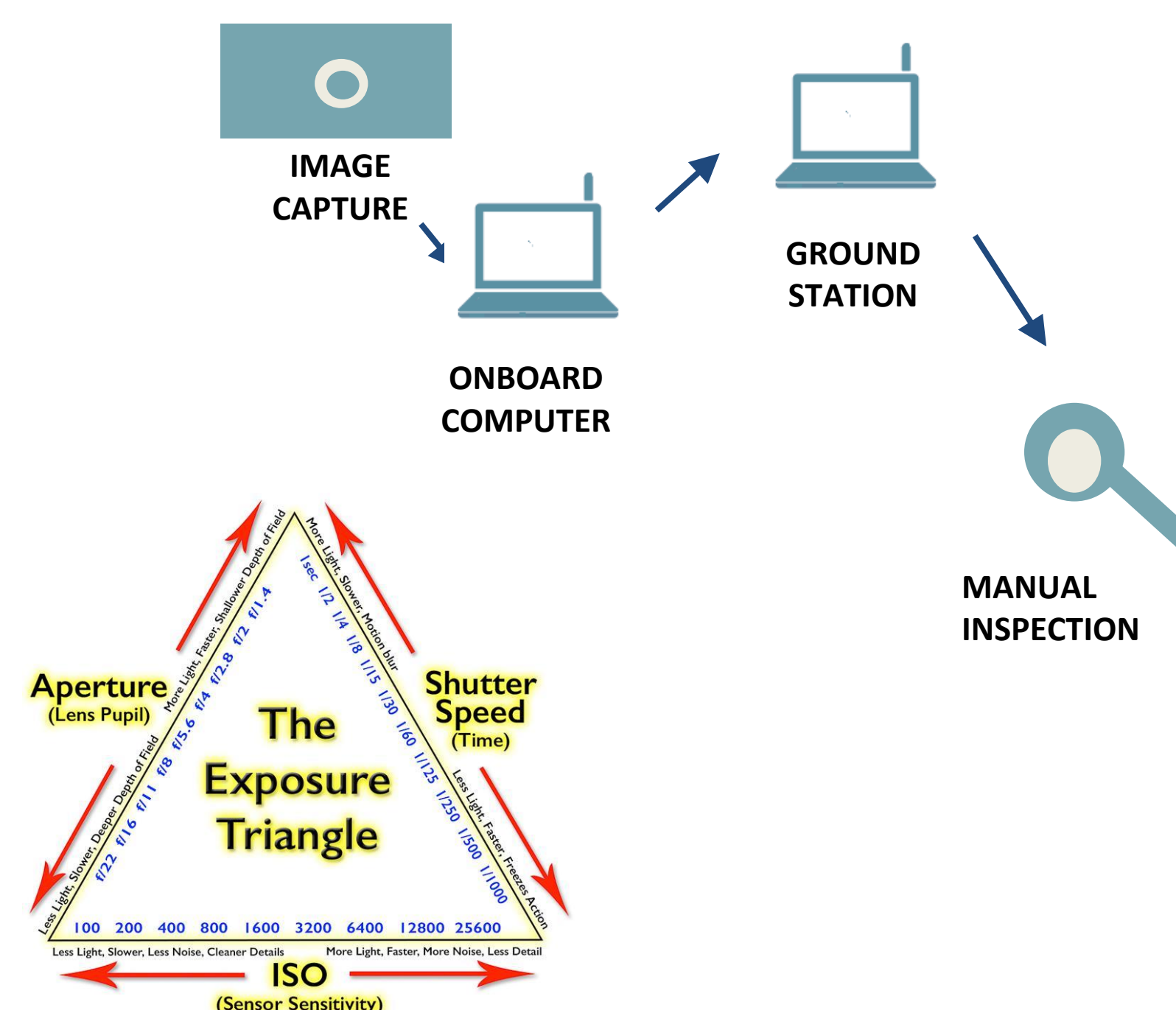


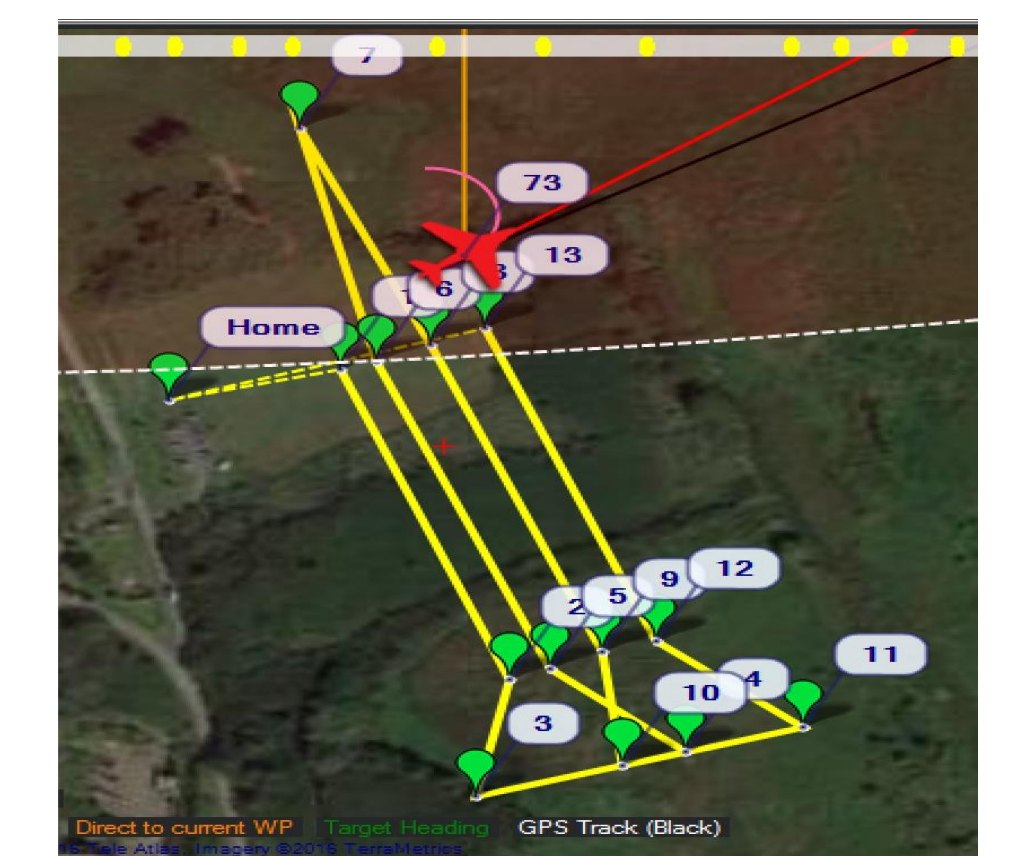
Image Processing

- Use camera images to identify at least two of five target characteristics and GPS location within 150 ft.
- Fly at about 230 feet (no optical zoom).
- Factoring in overlap and search area, approximately 100 pictures needed at 4-5 seconds per picture.
- Chose Canon S100 digital camera based on weight and Canon Hack Development software
- Images are extracted from SD card and manually processed at the ground station



Ground Station

- Mission Planner is a drone software that allows for:
- Interoperability with AUVSI server
 - Waypoint navigation Allows us to preset GPS coordinates
 - Flight planning capabilities to Fly autonomously to waypoints
 - Can record/view/analyze telemetry logs Match up pictures with a timestamp and coordinates



Acknowledgements

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