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.

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.

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.

Mission Operations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Threshold</th>
<th>Objective</th>
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<tbody>
<tr>
<td>Takeoff</td>
<td>Achieve controlled landing. Property transition to autonomous flight.</td>
<td></td>
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<tr>
<td>Flight</td>
<td>Minimum of 3 manual transitions from autonomous flight.</td>
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<tr>
<td>Landing</td>
<td>Achieve controlled autonomous landing. Property transition from autonomous flight.</td>
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<tr>
<td>Waypoint navigation (waypoints)</td>
<td>Digital wireless communication with on-board autonomy. cottage, accuracy, and minimizes navigation (position, pitch, and roll) along the planned flight path. Specific experiments based on Section 7.5.</td>
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<tr>
<td>GCS display items</td>
<td>Accurately display &quot;sea-free zone boundaries,&quot; and flight transition display current aircraft position with respect to the &quot;sea-free zone&quot; boundary. Display hill-shaded terrain (MTM) and on-board autonomy status, operational status, and sensor data to the flight operator and pilots.</td>
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<tr>
<td>Autonomous search</td>
<td>n/a</td>
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<tr>
<td>Secret message</td>
<td>n/a</td>
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</tbody>
</table>

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.

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.

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