Motivation
One of the most important goals of the United States Armed Forces is to keep personnel safe in hopes of reuniting them with their families. This can be accomplished by providing additional security measures and assurance to the United States Military. There are many times when the current technology for immediate surveillance to ground troops and sailors fails to reveal valuable information critical to mission safety. Aerial surveillance can provide real-time information about potential hostile targets or Improvised Explosive Devices (IED) out of sight from approaching U.S. ground troops traveling in a convoy. This information can be the difference between life and death.

Objectives
- Autonomous Detection of Obstacles
- Autonomous Takeoff, Flight, and Landing
- Autonomous Convoy-UAV Tracking

Research Challenges
- Selecting appropriate parts for UAV construction.
- Balancing flight time, weight, and stability of UAV.
- Determining obstacles using cost-efficient hardware.
- Accurate Convoy-UAV Tracking.
- Allocating processing power for system integration.

Design
Construct an autonomous UAV for military applications. The UAV will follow and maintain a specific altitude above a vehicle completely unassisted with the ability to avoid obstacles.

- APM-Arduino Interface
  Replicate RC transmitter PWM signals using an Arduino Uno. The Uno will send these signals to the APM 2.6 to control the roll, pitch, throttle, and yaw of the UAV.

- Real-Time Obstacle Avoidance

- Flight Controller
  Receives and processes I/O data from distance sensors, altimeter, gyroscope, and GPS to determine correct mode of flight.

- Convoy-UAV Tracking
  2 GPS modules will communicate using wireless transceivers. The information sent will be used to determine the distance and direction of the convoy.

Systems
Overview

Future Work
- Addition of Video Surveillance
- Upgrade to faster and longer range sensors
- Acquire more processing power for integration of devices and systems
- Expand usage to Naval environment (Track life vest of overboard sailor)

Specifications

<table>
<thead>
<tr>
<th></th>
<th>Weight</th>
<th>Flight Time</th>
<th>Lift</th>
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<tbody>
<tr>
<td></td>
<td>2.95kg</td>
<td>30 Minutes</td>
<td>5.52kg</td>
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<tr>
<td></td>
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<td>(920g/motor)</td>
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Communications Range
- Long Distance Detection: 40m
- Short Distance Detection: 1.5m

Acknowledgments
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References