Transnational Criminal Organizations (TCOs) are using unmanned, autonomous surface vessels to transport contraband undetected across the Maritime Boundary Line. Such vessels are difficult to detect, so they pose a threat to national security, law enforcement, and public health. This project is focused on the design and manufacture of an autonomous surface vessel capable of transporting a payload across ocean waters. The end goal of the project is to provide useful ideas and information to the United States Coast Guard, who have intercepted a few vessels of this nature. Rather than improve upon or remaster one of the vessels confiscated by the USCG, the team shall design and build a device of their own concept. With a budget of $4500, the team is expected to manufacture a model that meets or surpasses the abilities of the existing vessels. The team's final design shall not exceed a material budget of $700, which correlates to the estimated cost of the previously intercepted vessels.

**Materials Used**

<table>
<thead>
<tr>
<th>Electronics</th>
<th>Mechanical</th>
<th>Mounts &amp; Fasteners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batteries (6x)</td>
<td>Sealed Hatch (1x)</td>
<td>4-40 Heat set inserts &amp; Screws</td>
</tr>
<tr>
<td>Arduino Due (1x)</td>
<td>Propellor Shaft (1x)</td>
<td>10-32 Fasteners &amp; Lock nuts</td>
</tr>
<tr>
<td>GPS (1x)</td>
<td>Universal Joint (1x)</td>
<td>Servo Mount (1x)</td>
</tr>
<tr>
<td>Bluetooth (1x)</td>
<td>Pushrod (1x)</td>
<td>Motor Mount (1x)</td>
</tr>
<tr>
<td>Servo (1x)</td>
<td>2 lb EPS foam</td>
<td>Rudder Mount (1x)</td>
</tr>
<tr>
<td>DC Motor (1x)</td>
<td>Fiberglass (~5 yds)</td>
<td>Electronics Enclosure (1x)</td>
</tr>
</tbody>
</table>

**Key Requirements**

- Material Cost < $700
- 90 lb Minimum Payload Capacity
- 2 to 4 knot Operating Speed
- 66 Nautical Mile Range at 2.5 knots
- < 7” Freeboard, < 48” Waterline
- Autonomous Navigation
- Stealth against Radar, Visual, and Auditory Detection
- UV and Salt Water Resistant

**Budget**

Total Project Budget: $4,300.00

Breakdown of MKII Vessel - $700

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics</td>
<td>43.6%</td>
</tr>
<tr>
<td>Hull</td>
<td>52.1%</td>
</tr>
<tr>
<td>Fasteners</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

**Team**

- ME: Shane Cooke, Jorge Martinez, Kyle McCoy, Andrew Preece, Juan Rojas
- ECE: Ahren Kimo Aguinaldo, Frank Aosman, Abdulaziz Bandar, Jason Lin, Ivan Orozco

**Photos**

- Exploded Views & Renders
- Photos of team members working on the project

**Diagram of the PID Controller**

- Reference value for heading deviation [in MR the value is N, out of 360° [double]
- [PI] + Actual orientation is degrees [type double]
- [P] + Target orientation is degrees [type double]

**Team Members**

- Jason Lin
- Ahren Kimo Aguinaldo
- Kyle McCoy
- Frank Aosman
- Jorge Martinez
- Abdulaziz Bandar
- Dean Cook
- Ivan Orozco
- Andrew Preece