Intuitive Stop and Safety Sign Module
Meet the Team

Sponsor
Michael W. Smith
SunCoast Concepts

Advisor
Daren Otten
Assistant Professor in Sustainable Manufacturing, B.S. Industrial Technology w/ option in Manufacturing Management, CSU Chico. M.S. Interdisciplinary Studies in Manufacturing Engineering, CSU Chico. Ed.D. Education, California State University, Sacramento 2014

Sponsor
Michael W. Smith
SunCoast Concepts

Advisor
Daren Otten
Assistant Professor in Sustainable Manufacturing, B.S. Industrial Technology w/ option in Manufacturing Management, CSU Chico. M.S. Interdisciplinary Studies in Manufacturing Engineering, CSU Chico. Ed.D. Education, California State University, Sacramento 2014

Amar Alali
Mechanical

Charlotte Conley
Mechatronic

Carl De Witt
Mechanical

Emilio Martinez
Mechatronic/Electrical

Weston Skillicorn
Mechatronic
Background

- Why are people running stop signs?
- What is our sponsors reason for solving the problem?
- What is the current situation?
Current Problem

Need
- A cheaper, alternative option to putting in traffic lights at high risk, rural intersections

Goal
- Design the first phase of a continuing project to modernize and increase visibility of rural STOP signs for inattentive drivers

Problem Definition
- This project attempts to assist the Department of Transportation (DOT). By reducing the number of accidents and increasing the time to react to a Stop sign, while abiding by DOT regulations
Driving Requirements

- Fits on traditional stop sign without obstruction
- Lighting modes for day and night
- Detects vehicles in approaching lanes at a minimum of 80 feet
- Installation in < 120 minutes (changed from 60 minutes)
- Weather resistant and vandal deterrent
- Sustainable for 24 hrs without charging source
- Operates within DOT and Caltrans standards
Design Solution
Device in Action
Method of Operation

Standby mode

Sensor detect vehicle

Yes

Solar output > .5 Amp

Yes

Turn red LED ON (Day Mode)

Yes

Sensor detect vehicle

No

Keep LED’s on for additional 10 seconds then turn OFF

No

Turn white and red LED ON (Night Mode)
Analysis

- Total Power Consumption – 3.45 W-hour
  - Blinking red LED
    - 2.625W/6LED
  - 2 White LEDs
    - .72W/LED
  - Doppler Radar
    - .1W
- Need greater than 108 W-hour battery to last more than 24 hours
  - Will be operating at 12 Volts
  - 10 Amp–hour battery selected
Analysis

- Northern California
  - 6 hours peak sunlight (Summer)
  - 4 hours peak sunlight (Winter)
- Time needed to charge 10 Amp-hour battery depends on season
  - 2.50 Amps solar panel (Winter)
  - 1.67 Amps solar panel (Summer)
- On average the Solar panel needs to output 2.27 Amps
  - Selected solar panel will provide 2.35 Amps at peak sunlight
Labor = (1820 total hours) \times \text{(engineering rate*)} = $138,398.00

TOTAL PROJECT COST = $141,655.00

* Hours, benefits, and overhead based on 2013 Bureau of Labor statistics
Purchased Parts Breakdown

Purchase Parts Total = $1,612.00

* Miscellaneous includes sales tax and shipping costs
Project Cost Breakdown

Total amount needed

Projected Cost: $3,257

- Purchase Parts: $1,600.00
- Material: $200.00
- Tooling: $400.00
- Testing: $600.00
- Contingency: $800.00
Balance Sheet

Expected Costs
$3,257

Spending Limit
$3,500

Other
Material
Tooling
Purchased Parts

Sponsor
Case to Go Forward

- Justification that project will meet requirements

<table>
<thead>
<tr>
<th>Must do</th>
<th>Requirements met by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather Resistant</td>
<td>NEMA enclosure</td>
</tr>
<tr>
<td>Vandal deterrent</td>
<td>Steel box</td>
</tr>
<tr>
<td>Night and Day mode</td>
<td>Two modes</td>
</tr>
<tr>
<td>&gt;24 hours on a single charge</td>
<td>Accomplished by 26.7 hours constantly blinking</td>
</tr>
<tr>
<td>Detects vehicles &gt; 80 feet</td>
<td>300+ feet</td>
</tr>
<tr>
<td>DOT standards</td>
<td>Yes</td>
</tr>
<tr>
<td>Fits on a traditional stop sign</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Conclusion

- Will solve the issue of low-visibility at stop signs
- Be safe and protected from environmental factors
- Self-sustaining module
- Reducing costs by not having to install traffic signals at rural intersections
Questions?