Mission Statement

Nā Koa Kekona O Ka Alahe, “The Second Warriors of the Road”, at the University of Hawai‘i at Mānoa proposes to use traditional and innovative problem-solving solutions to design and construct a highly competitive Human Powered Vehicle that exceeds the speed, endurance, and innovation requirements and is eligible to compete in the 2016 American Society of Mechanical Engineers Human Powered Vehicle Competition.

Background

“Human-powered transport is often the only type available in underdeveloped or inaccessible parts of the world, and if well designed, can be an increasingly viable form of sustainable transportation.” – ASME HPVC Homepage

The American Society of Mechanical Engineers (ASME) holds an annual Human Powered Vehicle Challenge (HPVC) to promote innovations and sustainability to alternative forms of transportation. Team Nā Koa Kekona O Ka Alahe at the University of Hawai‘i has engineered a Human-Powered Vehicle that is compliant with the HPVC Rules and is safe and reliable which can be used for both the HPVC and as an everyday form of transportation.

Competition Events

- **Design** – Written Report, Technical Presentation, Safety Inspection, Static Judging
- **Innovation** – Design and Demonstration of Innovation
- **Sprint** – Men & Women’s High Speed Drag Race
- **Endurance** – Speed, Practicability, Performance, and Reliability race on a closed Course

<table>
<thead>
<tr>
<th>Competition Event</th>
<th>Maximum Points</th>
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<tbody>
<tr>
<td>Design Event</td>
<td>15</td>
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<tr>
<td>Male Speed Event</td>
<td>12.5</td>
</tr>
<tr>
<td>Female Speed Event</td>
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</tr>
<tr>
<td>Innovation Event</td>
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<tr>
<td>Overall Score</td>
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<tr>
<td>Total Score</td>
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Importance & Impact

- Creating a practical vehicle that is Safe, Fast, and Functional
- Providing an Alternative Form of Transportation, which is very much needed due to the rapid increase in Hawai‘i's urbanization, which creates traffic.
- Environmentally Friendly Alternative Form of Transportation
- Reduces Traffic Congestion
- Hawaii has an increasing population as well as rapid urbanization
- 2.3% of Honolulu’s population uses a bicycle as the primary form of transportation.
- Promotes Healthy Lifestyle
- Minimal Maintenance

Team

- Wilfred J. Holmes Hall
- College of Engineering
- Advisors: Dr. A Trimble, Brennan Yamamoto
- Institution: University of Hawai‘i at Mānoa

Global Design

- One Wheel Design
- Stability while riding
- Ease of usability for inexperienced riders
- Quick in and out for rider exchange and item delivery during competition.
- "Tadpole" Configuration (Two Front Wheels)
- Dynamically Stable
- Ideal teardrop shape for aerodynamics
- More points of contact to surface that benefit steering & braking
- Single Operator
- Ease of design
- Less overall weight
- Recumbent Position
- Increased efficiency and speed
- Rider comfort over long distances
- Low center of gravity, providing stability

Key Features

- 4130 Chromoly Steel Frame
- RPS Doubles as Surf Rack
- Lightweight Carbon Fiber Seat
- Adjustable Seat Position for Various Rider Heights
- Shimano Alfine 11-Speed Internal Geared Hub

Functional Requirements

- Competition has Safety requirements that all teams must satisfy to be eligible to compete
- Load
- Turning
- Braking
- Inversion

Importance & Impact

- Ensure Safety of Rider
- HPV is a lot lower when compared to a regular Car
- Low Visibility between driver and HPV Rider
- According to a 10-year study done by the national Highway Traffic Safety Administration (NHTSA)
- Average of 711 bicyclists died in motor vehicle related accidents
- 46,000 injuries occurred in motor vehicle traffic collisions with bicyclists
- 40% of accidents occurred after 6 pm
- 30% of fatalities occurred in intersections
- 68% of bicycle accidents occurred in urban areas
- Developing a system where both rider and Driver are aware of one another

Table 1: Steel ALOHA Safety Requirement Checklist

<table>
<thead>
<tr>
<th>Design Specification</th>
<th>Units</th>
<th>Goal</th>
<th>Testing</th>
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<tbody>
<tr>
<td>RPS Top Load</td>
<td>lbs</td>
<td>600</td>
<td>675</td>
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<td>RPS Top Load Deflection</td>
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<tr>
<td>RPS Side Load</td>
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<tr>
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