Problem Statement:
• Achieving an affordable and reliable means of transportation can be a challenging task and a necessity in many parts of the under-developed world.
• The BUV is a durable, cost-effective all-terrain utility vehicle that is intended to be designed and built in rural Africa.
• The Purdue ABE Department has partnered with the African Center for Renewable Energy and Sustainable Technology (ACREST) to provide a Basic Utility Vehicle (BUV) that meets the needs of villages such as Bangang, Cameroon.
• The goal is to design and build a BUV prototype for testing and analysis. The team will then take the design to Cameroon and build a fully-functioning vehicle for the rural village.

Impacts on Society:
• Since some members are afforded the opportunity to go to Cameroon and complete a BUV construction there, the village of Bangang, Cameroon will have a common-use BUV that they can rent to farmers at a cheap cost.
• The finished BUV will allow villagers to carry large amounts of goods to/from the village and allow mass transport of water to the village for washing, cooking, etc.
• The BUV will give ACREST a vehicle to bring to neighboring villages for training exercises and education on building their own BUV.

Primary Design Criteria
• Durable: Traverse varied terrain with a considerable payload on a regular basis
• Inexpensive: Cost no more than $2000 U.S. dollars, less engine
• Manufacturable: Build with basic tools, little specialty equipment, and readily available components
• Adaptable: Utilize a wide variety of new and used automotive components

Vehicle Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelbase</td>
<td>55 in</td>
</tr>
<tr>
<td>Length</td>
<td>82 in</td>
</tr>
<tr>
<td>Height</td>
<td>82 in</td>
</tr>
<tr>
<td>Height of roll bar</td>
<td>45 in</td>
</tr>
<tr>
<td>Bed Height (Moment)</td>
<td>9 in</td>
</tr>
<tr>
<td>Cargo Bed Volume</td>
<td>12.5 ft^3</td>
</tr>
<tr>
<td>Unladen Weight</td>
<td>179 lbs</td>
</tr>
<tr>
<td>Loaded Capacity</td>
<td>1200 lbs</td>
</tr>
<tr>
<td>Engine</td>
<td>Honda GX 340, 11 hp w/ electric start</td>
</tr>
<tr>
<td>Transmission</td>
<td>5 speed w/reverse, foreign car</td>
</tr>
<tr>
<td>Water Pump</td>
<td>1 Northstar Freshwater Pump</td>
</tr>
<tr>
<td>Driveline</td>
<td>clutching is accomplished by way of a pivoting, spring-loaded idle pulley connected to a foot pedal</td>
</tr>
</tbody>
</table>

Alternative Solutions:
• Four-wheeled vehicle - Allows for added stability but complicates the steering and increases the number of parts.
• Dump bed - Allows for ease in unloading various materials, but takes more parts and has a more complicated frame design.

Frame:
A three-piece frame is used utilizing angle iron of a common size, which provides superior strength and minimal weight. The frame sides are integrated into the frame structure along with the seat and floorboards in order to reduce the number of angle iron pieces. Original frame pieces used during the assembly of the longitudinals members in order to eliminate as many welded pieces as possible and provide improved ease of assembly. The front suspension attachment members are designed to be fully adaptable to various styles of automatic steering. The frame was designed to withstand a maximum load of 4000 lbs, which is the vehicle’s rated capacity.

Front Suspension:
An automatic style MacPherson strut suspends the front of the vehicle. This component, while readily available, provides disk braking, steering, ample suspension travel, and shock absorption in an integrated package.

Rear Suspension:
The rear of the vehicle is supported by two inverted car struts. These extend up through the bed of the vehicle in order to lower its profile. Much like a rear wheel drive automobile, the primary drivetrain components are assembled about the centerline of the vehicle. The rear of the vehicle is supported by two inverted car struts. These extend up through the bed of the vehicle in order to lower its profile. Much like a rear wheel drive automobile, the primary drivetrain components are assembled about the centerline of the vehicle. The rear suspension is used as an accessory drive for various uses.

Transmission:
The transmission transmits power to the rear differential through a single belt-reduction. The pulleys on the accessible torque and decreases the vehicle’s top speed. Clutching is accomplished by way of a pivoting, spring-loaded idle pulley connected to a foot pedal. The transmission transmits power to the rear differential through an automotive driveshaft.

Water Pump:
An additional need that was incorporated into the BUV design was the ability to pump water for transportation. The vehicle was designed to allow for a water pump to be mounted next to the engine and powered through a belt drive connecting the pump to a second drive pulley on the engine. The second pulley on the engine was designed to allow for a water pump to be mounted next to the engine and powered through a belt drive connecting the pump to a second drive pulley on the engine.

Summary:
• A BUV prototype has been designed and built to meet the criteria of being low-cost, durable, adaptable, and easily manufactured.
• The vehicle has been tested using 3D modeling software as well as undergoing extensive field tests.
• Additional testing will take place during an upcoming endurance competition where the vehicle will be driven through a rigorous course for 9 continuous hours.
• The team is currently preparing for the build in Cameroon through creating an assembly manual and collecting supplies needed for constructing the vehicle there.

Sponsors: Purdue ABE Department
Vincent Kito, ACREST
Technical Advisor: Dr. John Lumkes