**Objective:**

- Modify the design of the 2008 BUV to remedy problems that were a part of the vehicle’s original form.
- Build and test the BUV to prepare it for possible field deployment to a 3rd world country.

**2009 Contest Review:**

- Endurance Run
- Acceleration Test
- Agility Test
- Obstacle Course
- Oral Reports
- Mogul Field
- Mud Pit

- Sheared Axle on the 1st day.
- Slipped Axle on the 2nd day.
- Throttle cable snapped on the 2nd day.
- Earned 3rd place in the Open Class Competition.

**Skills Learned:**

- Pro Engineer Software
- ANSYS 3D Analysis Package
- Machining and vehicle building skills

**Special Thanks:**

- Advisor - Dr. John Lumkes
- Shop Head – Scott Brand
- Shop Staff – Gary Williams
- Pro E Teacher - Jacob Oswalt
- Grad Students from the Hydraulics Lab
- 2009 Design Team
- 485 Professor - Dr. Joseph Irudayaraj
**Front End Design Work**

**Original Design:**

- Front plate
  - Flexed to stretch.
  - Deformed in multiple locations.
- Could not withstand a combination of vertical and lateral forces.
- The 1/4” plate was not strong enough.

**Finite Element Analysis on Design Iterations:**

- Prototype front frame in computer testing proved it could not withstand its designed purpose.
  - 1.5g vertical impact
- Single gusset with box was not long enough to provide support to the plate when tested at 1/4”.
  - 3g 45° impact
- Pipe reinforcement was not long enough to provide proper support. This was also tested with a 3/8” plate.
  - 3g 45° impact

**Final Solution:**

- Increase plate thickness to 3/8”.
- Add angled gussets from neck of the front frame to the plate.
- Remove 3 inches from the neck to increase clearance and reduce moment.
Transmission Mount Design

Original Design:

• Empty space shown used to hold the transmission.
• Transmission hung 4 inches below frame rails.
• Created clearance problems for the vehicle on uneven terrain.

Final Solution:

• Transmission was raised to level with the engine.
• Center pulley spacing was kept constant.
• Deformation shown was corrected with a 1 inch square tube welded to the bottom of the plate.

Unforeseen Problems:

• Angle on the drive shaft became too steep. Thus the rear differential had to be rotated to reduce the angle.
• Brake pedal had to be removed and only one pedal for both rear brakes.
• Emergency brake lever and cable were moved around the transmission.
• Battery holder had to be moved to clear the lift in the drive shaft.
• Bed had to be cut and patched to make room for the battery and the parking brake cables.