

Basic Utility Vehicle

Mechanical and Aerospace Engineering

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Abstract

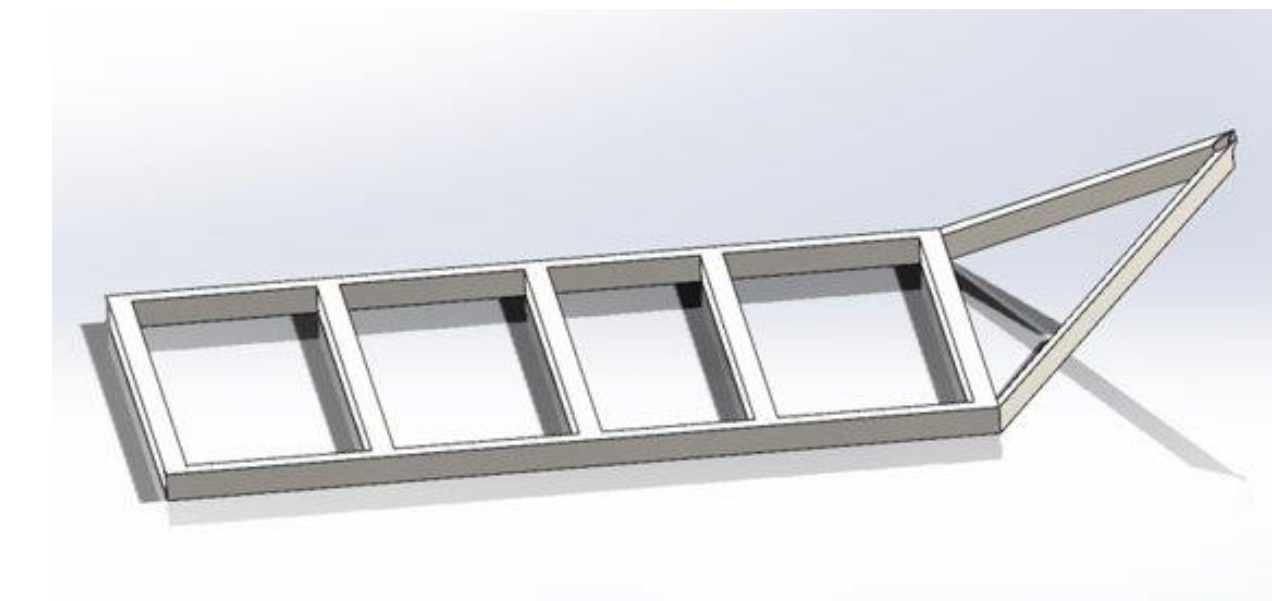
The BUV project consists of building a Basic Utility Vehicle that can be used in third world countries for loading purposes. This vehicle has been designed from scratch within a six-month time frame and will be tested in the 2022 BUV Design Competition held by the BUV Bearcats in Batavia, Ohio. During the past six months, the team designed and built the frame, roll cage, water system, front end, front wheel assist, wheel/tire type, hydraulic system, electrical system, pedal linkage, adjustable steering and removable hydraulic motor mounts. Another major accomplishment of the BUV team this past year has been the successful integration of virtual reality "VR" into the design stage of the vehicle. This was done by taking the CAD design and importing it into VR software. The team wanted to integrate VR because of the many benefits that it has for confirming dimensions, scale, and comfort for the BUV.

Customer Needs and Requirements

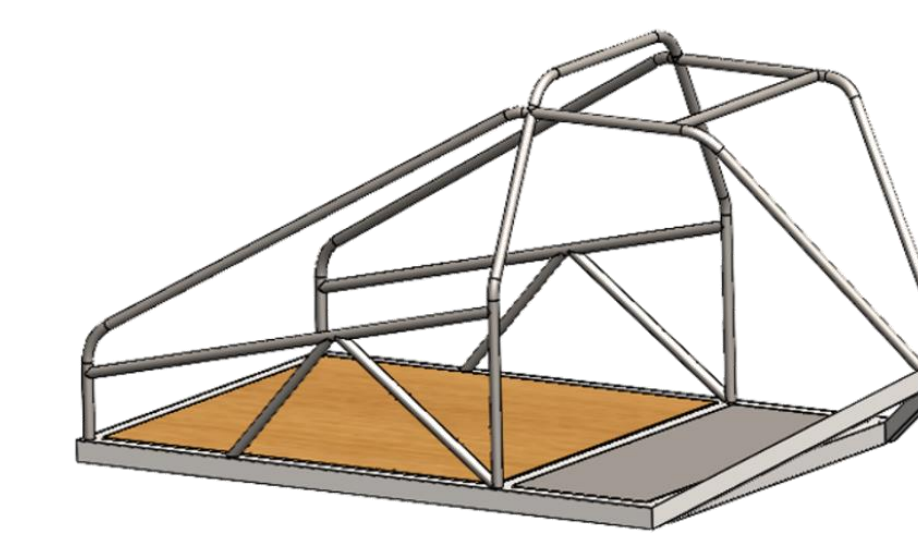
- Customer Needs
 - Defend our title in the competition
 - Handle rugged terrain such as knee-deep mud
 - Transport two or three 55-gallon drums of water or other supplies for a long duration of time
 - BUV must be roughly 1400 lbs.
 - Must be done within the \$2000 budget
- Customer Requirements
 - Engine must not exceed 11 HP and be unmodified
 - Pump water into 3 55-gallon drums
 - Roll bar (36 in above seating surface)
 - Cargo Bed
 - Max Speed 20 MPH



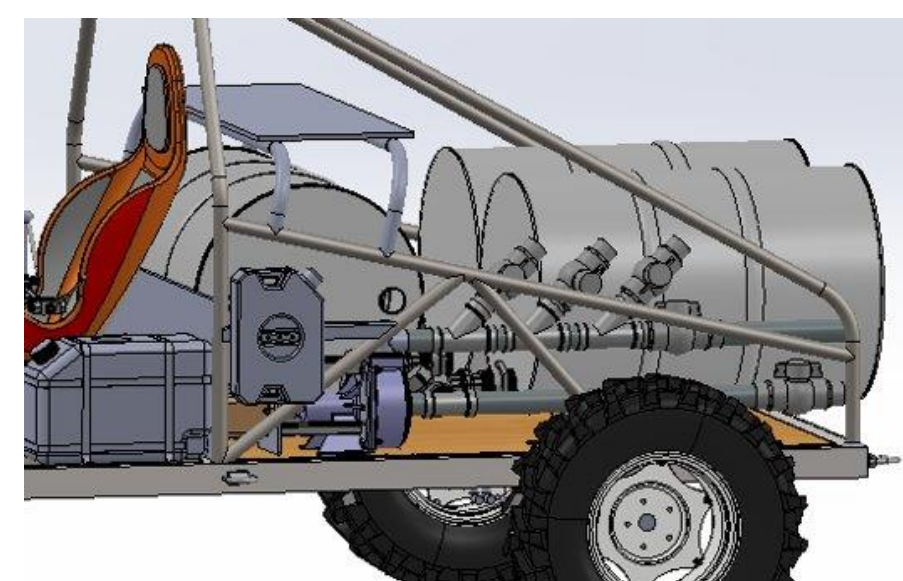
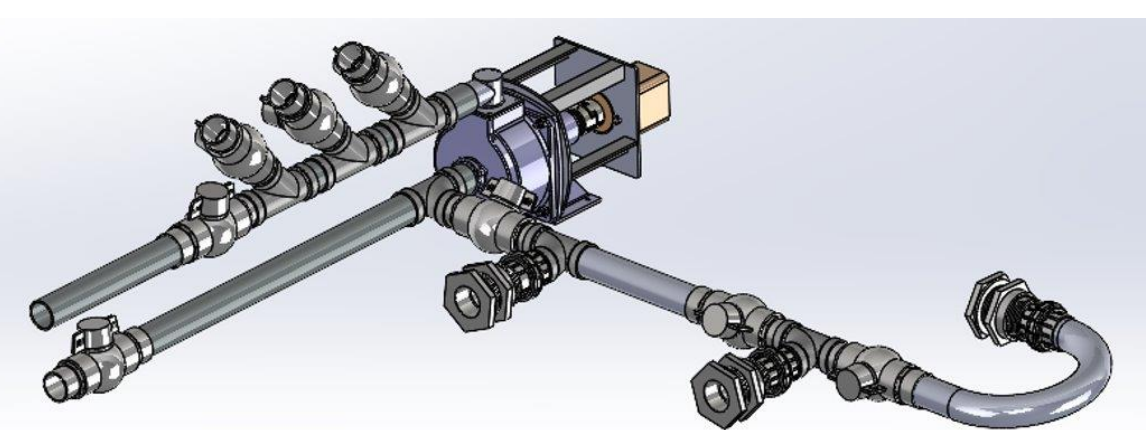
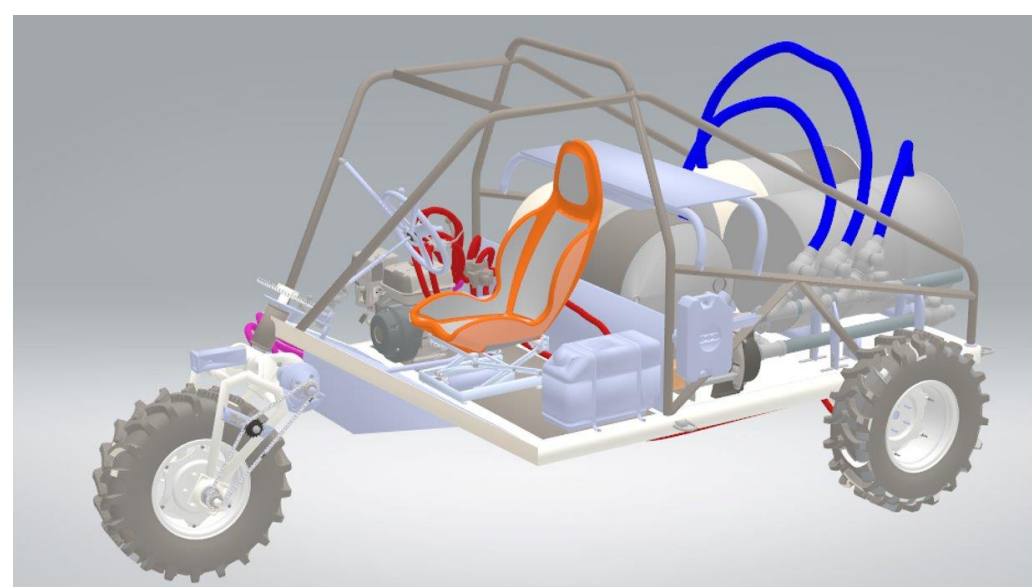
Concept Selection



- New Frame
 - Roll Cage
- Drive Control
 - 3-wheel Drive

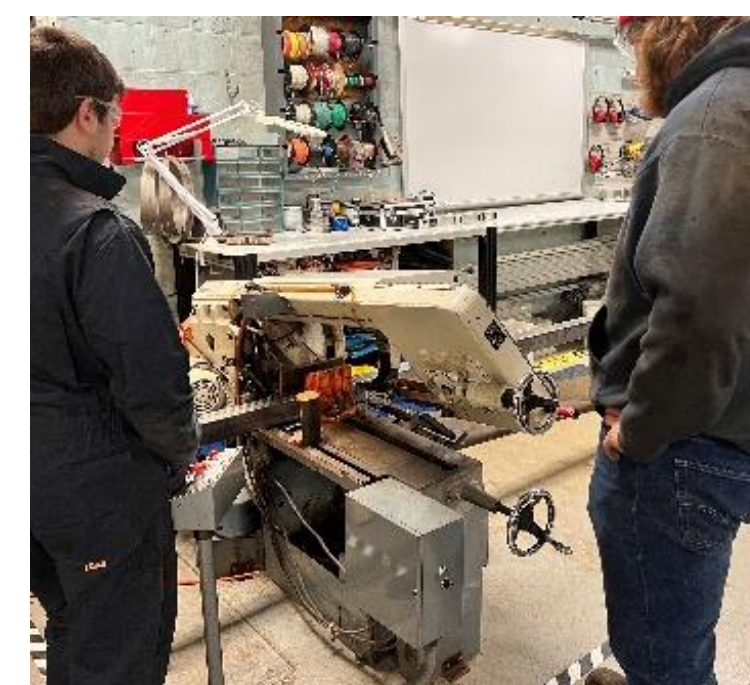


Design Solution



Manufacturing

Cutting Steel Tubing/Bending Steel Tubing



Welding of Frame



Sub System Installation

Front Wheel Assist



Hydraulic Valves



Testing and Validation

Test 1: Drive Testing BUV

- The BUV was testing on a Dry day on Trine Campus
- Was able to climb previously unclimbable terrain



Test 2: Test BUV in Mud Conditions

- The BUV was tested on the same practice track on Trine but in muddy conditions
- Was able to go through some amounts of mud.



Test 3: Stress Testing the Winch

- The BUV was stuck in 1-2 ft of mud on practice track
- Found Battery to not be enough for sustained use of Winch when not moving.



Test 4: Full Stress Test at Boy Scouts campground

- Stressed Test on Rough Conditions
- Tested Water system
 - Slow filling rate



Acknowledgments

The BUV team would like to thank Mr. Joe Thompson II, Dr. Liu, and Dr. Webber for giving us guidance and advice throughout the design and build process. The team would like to thank SOS Hydraulics Inc for their practical design advice, Bills Towing for generous Material Donations, JICI/ProFab for letting us use their fabrication facilities, and DAS for donating hydraulic hoses.

