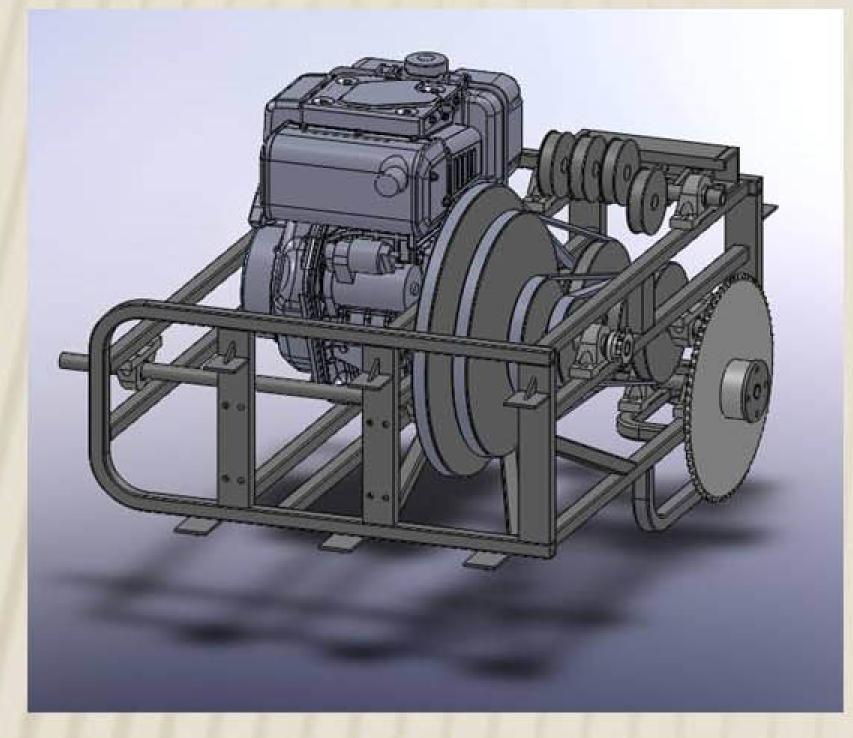
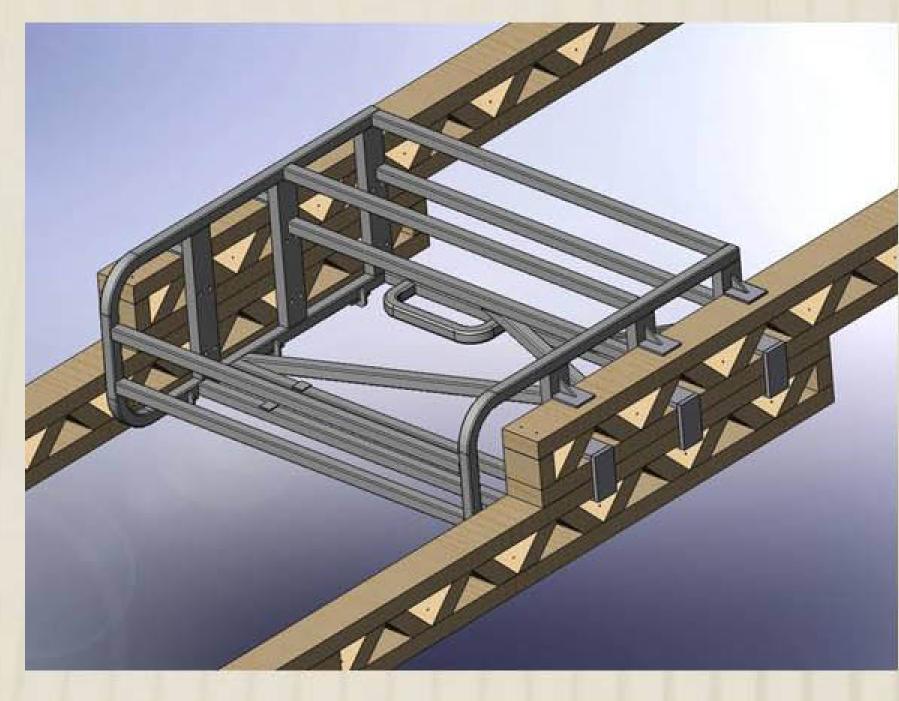
Drivetrain Design & Modeling

Spaceframe



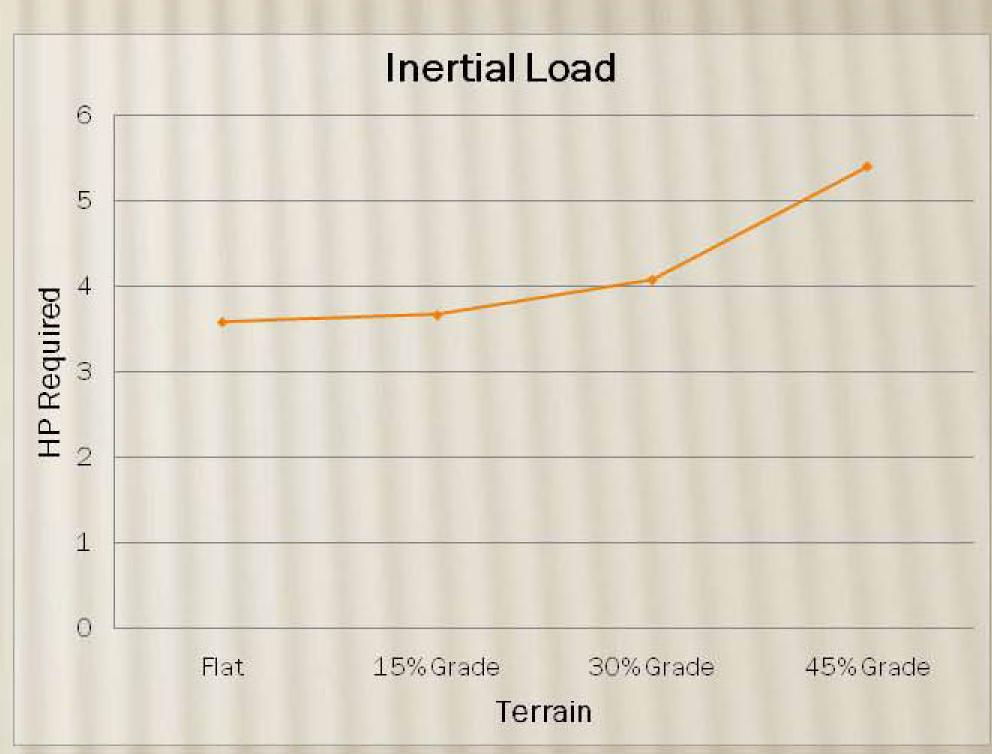


Engine (Yanmar L100V, 4-stroke, 10 hp Diesel Engine)						
No. of Cylinders	1					
Bore x Stroke	3.39	X 2.95	in ³			
Displacement	26.5	in ³				
rpm	3600	3200	2500			
hp SAE	9.1	8.7	7.4			
Torque (ft-lb, theoretical)	13.3	14.3	15.5			
Rear Axle (from 1989 Toyot	a Pickup)					
	a Pickup) 2.73	:1				
Gear Reduction	2.73	:1				
Gear Reduction 4-Speed Belt Driven Transi	2.73	:1				
Gear Reduction 4-Speed Belt Driven Transi Wheel Dimensions	2.73	in				
Rear Axle (from 1989 Toyot Gear Reduction 4-Speed Belt Driven Transi Wheel Dimensions Outside Diameter Width	2.73 mission					

Engine Load

The engine load was calculated based on rolling resistance given soft sand or packed dirt as might be seen in Cameroon as well as the inertial load of accelerating from 0-20mph in 8 seconds.

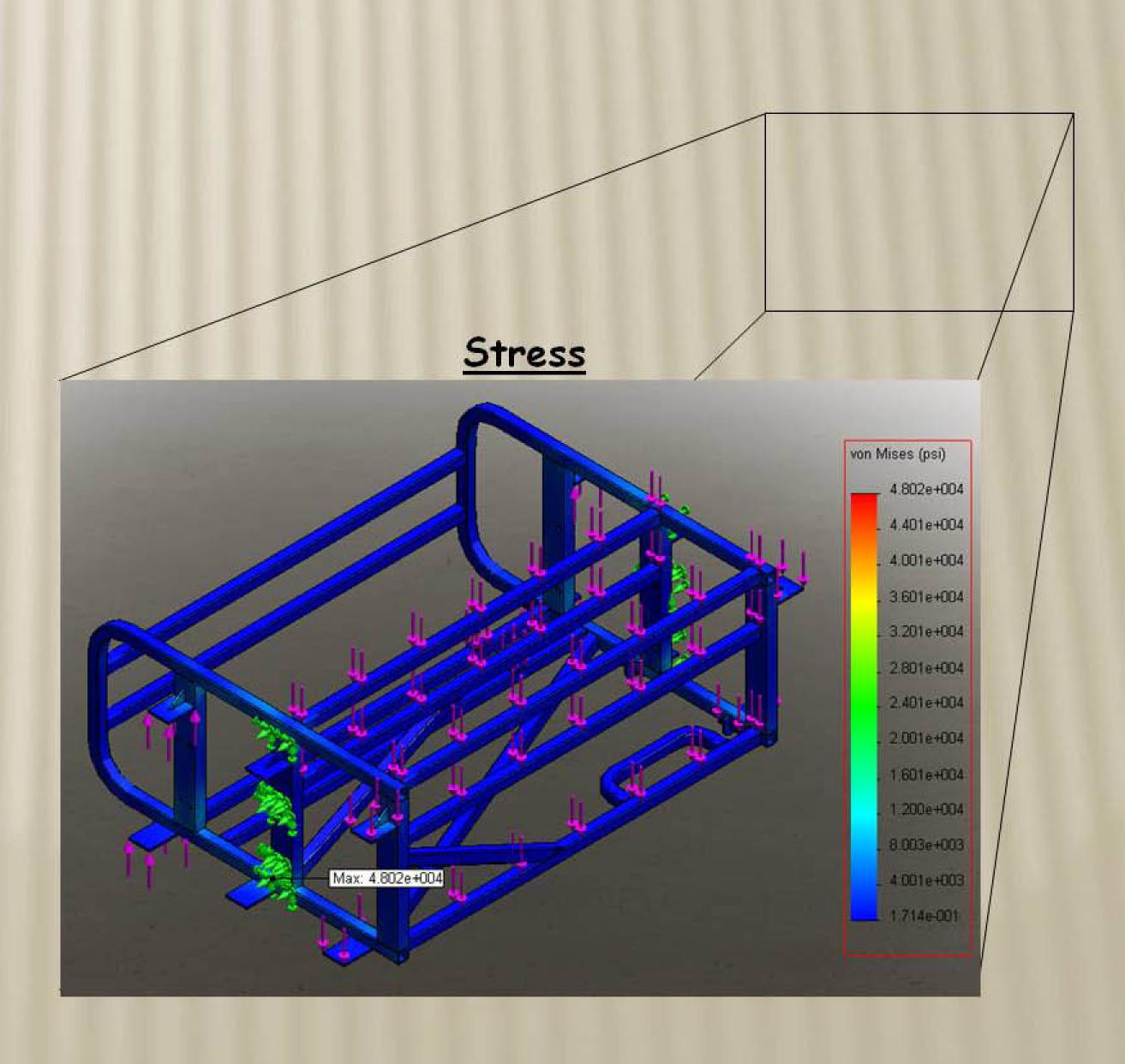




Displacement URES (n) 1.587 e 002 1.159 e 002 1.159 e 002 1.159 e 003 7.7 933 e 003 6 6 111 e 003 5 209 e 003 3 866 e 003 2.644 e 003 1.122 e 003 3.837 e 032

FEA

- •60lbs on each motor support, bottom pulley supports, and 72t sprocket support
- 20lbs on each transmission support
- •1,200lbs on rear frame mounts
- •1,500lbs on front frame mounts



Basic Utility Vehicle

Agricultural Biological

April 22, 2010



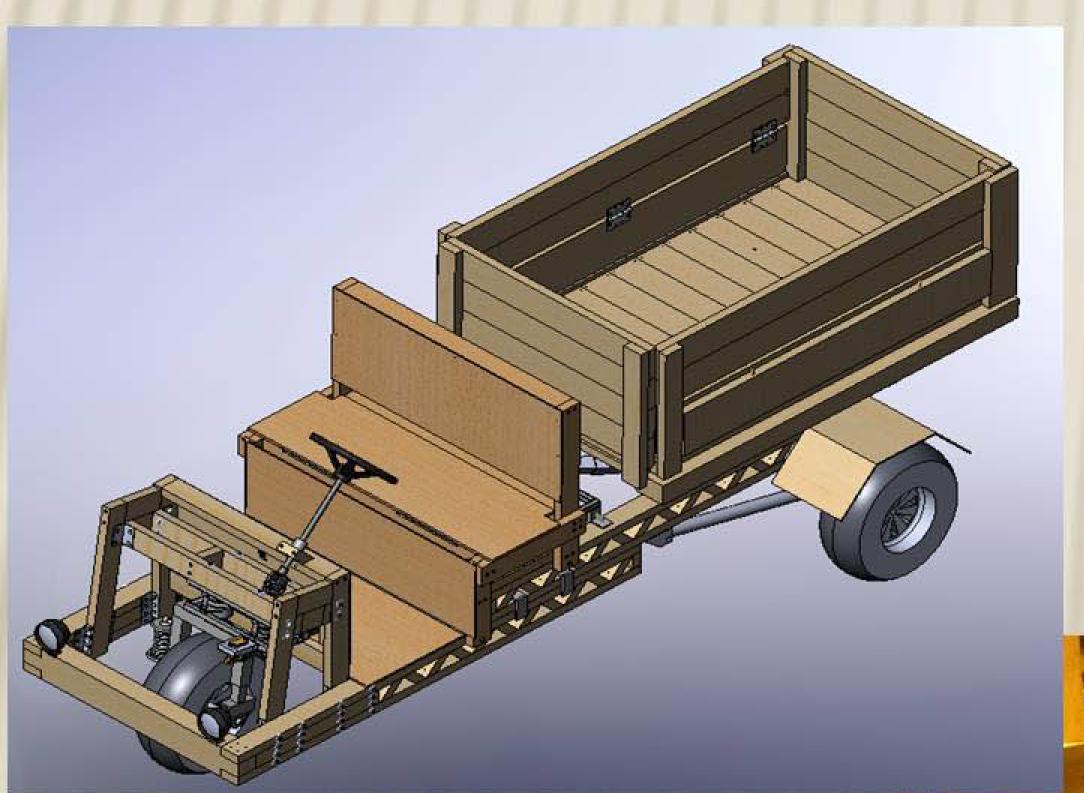
Designed for Cameroon



Common BUV Applications

- School bus for children and orphanages
- Farm commodities and delivery vehicle
- Ambulance medical vehicle
- Material carrier to and from construction projects
- ·Water distribution (drip irrigation) / water purification
- Water pump or generator





Key Features

- Wooden Truss Frame
- Rear and front suspension using recycled car and truck tires
- Transmission design composed of belts and pulleys
- Dumping bed with fold out seats for passengers
- Steering wheel for easy use
- Bench seat gives room for two

Acknowledgements

Agricultural & Biological Engineering Support

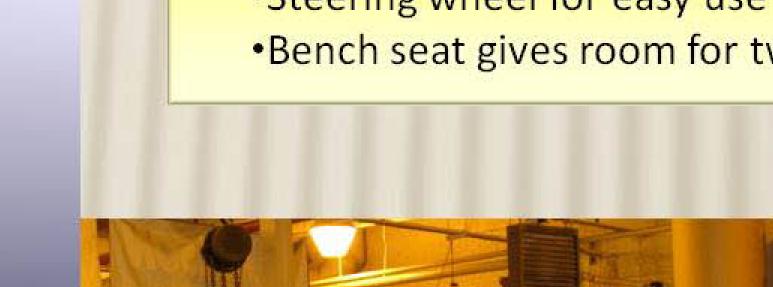
- •Dr. Bernie Engel, Department Head
- •Dr. John Lumkes, Technical Advisor

Organizational Support

- •Institute for Affordable Transportation (Will Austin)
- •ACREST African Center for Renewable Energy and
- Sustainable Technology
- **Industry Support** Yanmar
 - Von Tobel Lumber

Others

- ABE Shop: Scott Brand & Gary Williams
- •Vincent Kitio Contact in Cameroon
- Purdue University Student Grant Program







ACREST

www.drivebuv.org







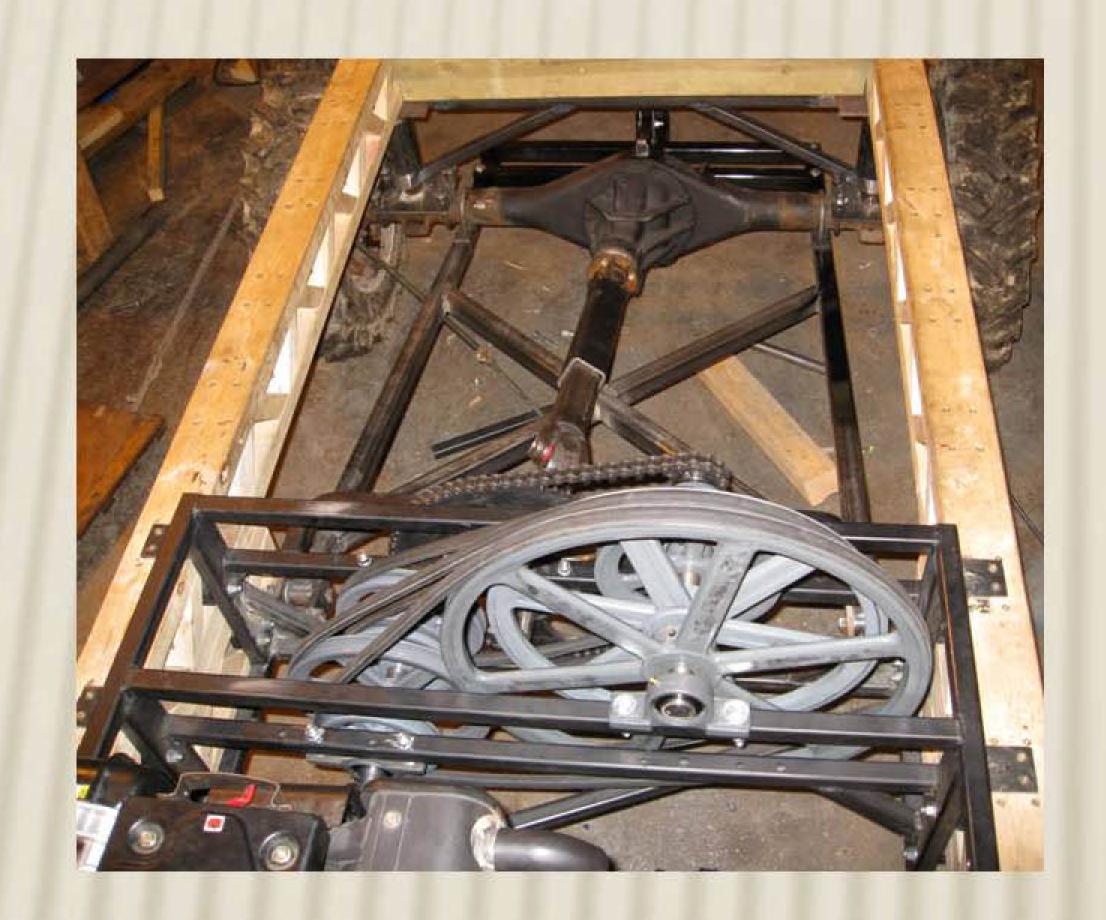


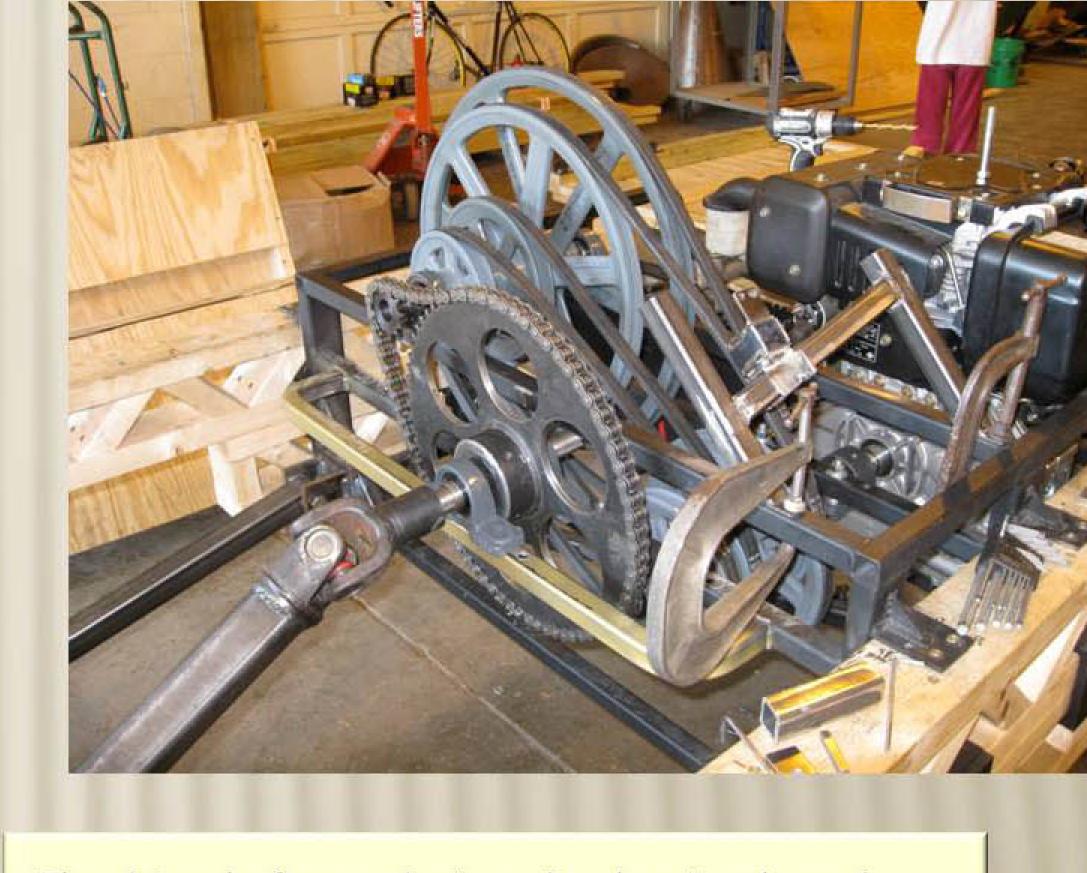
Drivetrain Build



The spaceframe was designed to maintain the tight tolerances in shafts between the engine and transmission and to the driveshaft given the high deflection in the wood frame. In order to minimize the amount of steel needed, the space frame houses the engine and transmission as well as connects the rest of the vehicle together. Clamps hold the front and rear sections of the frame together and supports on the top and bottom keep the spaceframe from moving along the frame.







The driveshaft was designed to be simple and strong, and is made from two concentric square steel tubes which can slide inside each other and have yokes attached at either end. This is suitable for low speed applications as well as being simple to manufacture. The rear axle was salvaged from a Toyota pickup, similar to what will be available in Cameroon.

Bill of Materials

Part	# of Units	Supplier	Unit Cost	Line Cost
10 hp Yanmar diesel engine	1	Purdue - ABE Dept.	\$300.00	\$300.00
Toyota axle Assembly	1	Pick-A-Part	\$90.00	\$90.00
Drive Shaft	2	Pick-A-Part	\$20.00	\$40.00
Toyota Wheels	3	Pick-A-Part	\$18.99	\$56.97
Transmission	1	Surplus Center.com	\$400.00	\$400.00
				\$0.00
1/4" Plate Steel	2	Metals Depot.com	\$7.13	\$14.25
1" 12ft Square Tubing	25	Metals Depot.com	\$1.29	\$32.25
1"x2" Rectangle Tubing	6	Metals Depot.com	\$3.00	\$18.00
				\$0.00
3/8" -24 UNF-3B 2.5"	32	BoltDepot.com	\$0.24	\$7.68
3/8" -24 UNF-3A	32	BoltDepot.com	\$0.07	\$2.24
3/8" - Spring Washer	32	BoltDepot.com	\$0.06	\$1.92
				\$0.00
			10.12	\$0.00
				\$0.00
			Total Cost:	\$886.97

