Barneveld School

Stock Class

Advisor: Duane Elfering

Participants:

- **Cory Oimoen ***
- **Josh Bollinger ***
- **Charlie Humphrey ***
- **Jackson Hetue ***
- **Aaron Ripp ***
- **Jeff Wright**

Log Book

This year's supermileage car is the same one used last year, but with some modifications. Since our car was very successful last year, there were no changes mechanically. With this in mind, there was not near as much problem solving as last year when creating this car. One main change from last year is that we created a cone like front, like a jet's nose, in order to reduce air resistance significantly. Another body change was placing on new plexi glass with no seams, to also reduce air resistance. Other problem solving changes included mounting the exhaust and kill switches better to prevent bolts from vibrating loose. Another change consisted of fixing the break cables so that they remained firm. Final changes included painting the frame and chassis and placing trim on the cut edges of sheet metal and plexi glass.

- Total time estimates of labor last year= about 250 hours
- Total time estimates of labor this year= about 50 hours

~ Equaling a total of about 300 hours

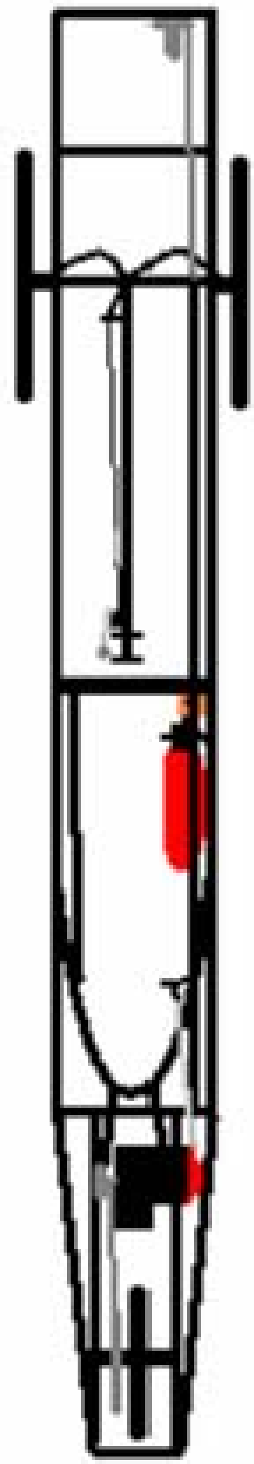
Costs

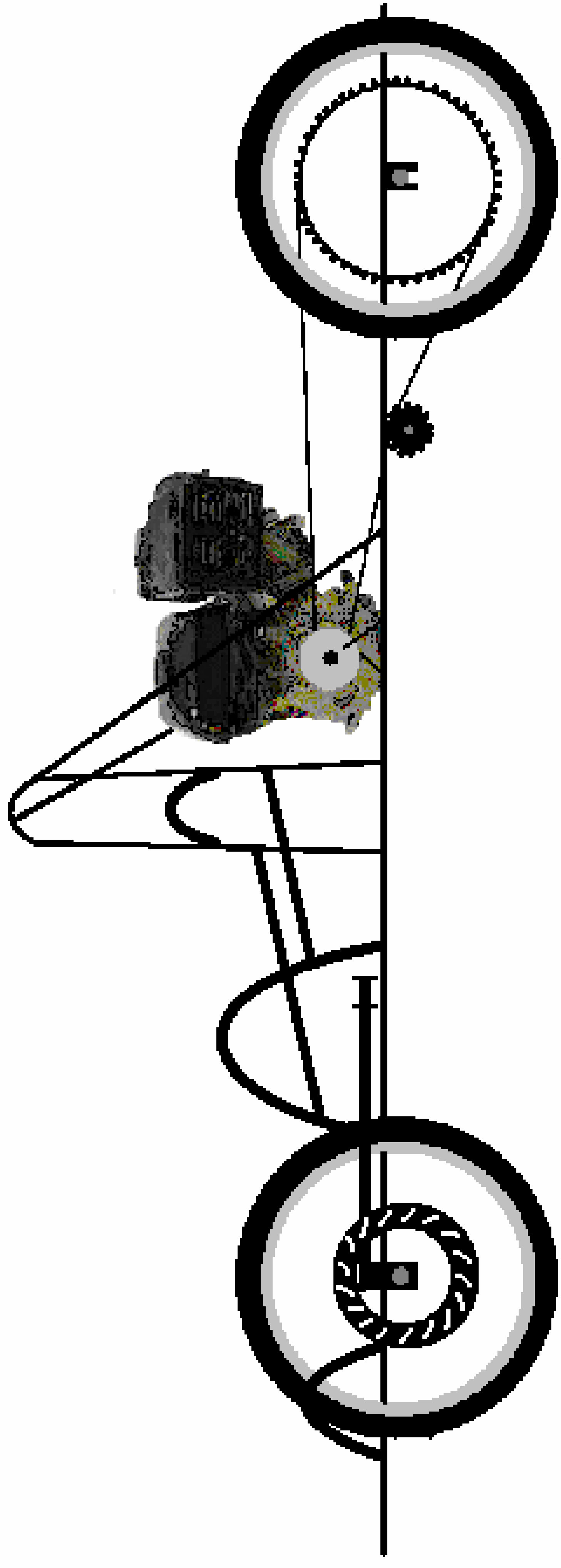
(2) Wheels w/ disc brakes......................$390.00
4 Honda Engine $400.00
Centrifugal Clutch..................................$30.00
Sprockets/Chain......................................$20.00
Steel/Frame..$45.00
Body material (Aluminum sheet metal)...$80.00
Body material (Clear plexi glass)...........Donated
Seatbelt..Donated
Fire Extinguisher.....................................$18.00
Gas line/Fuel bottle.................................$52.00
Electrical wire..$10.00
2 toggle switches.....................................$12.00
Miscellaneous
(nuts/bolts/washers/rivets/screws).........$25.00
Rubber hose (body trim)..........................$20.00
Decorative gold trim..............................Donated
Graphics...Donated

Total: $1102.00

Basic Vehicle Configuration

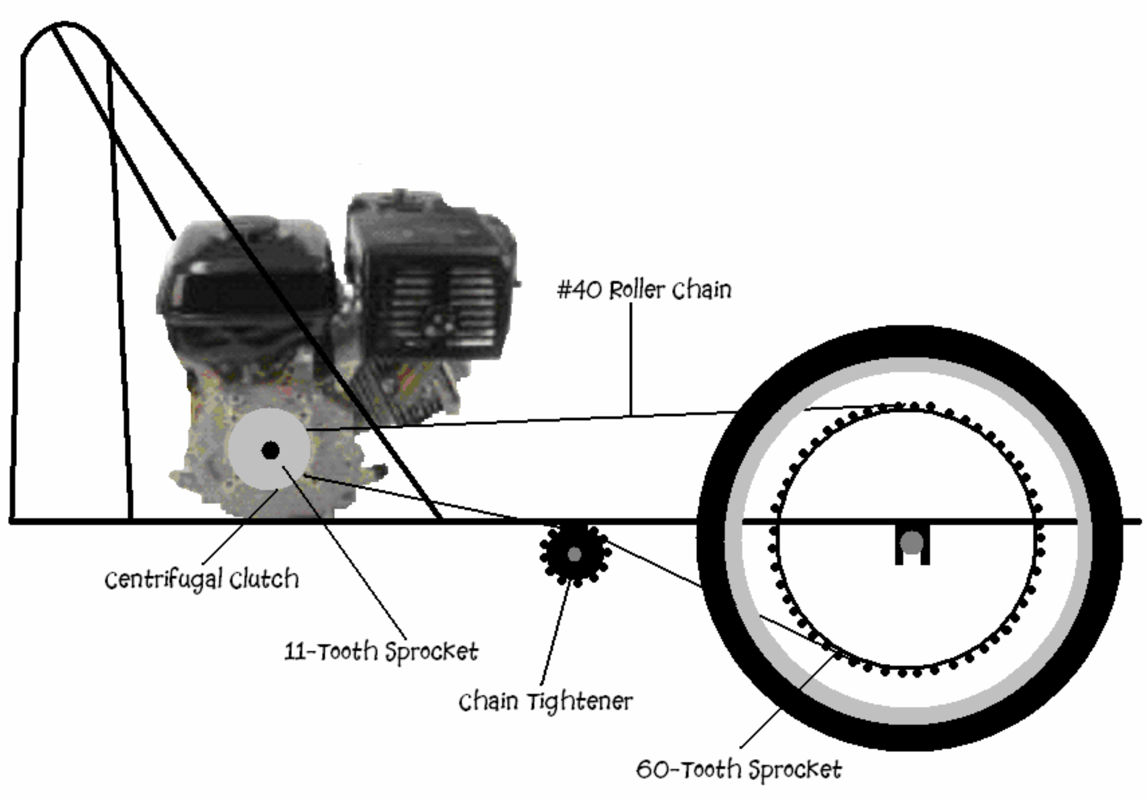
When we designed our car, we wanted a rounded body that had very little air resistance, kind of like an airplane or jet. In this case, we had a narrow wheel base and longer chassis. Once we welded the chassis, frame supports, and roll bar in, we wrapped the car with aluminum sheet metal to act light-weight, fire-resistant body. From the roll bar forward, the car's circumference got smaller, in order to reach a point in the front. Then put clear plexi-glass on the top, front-half of the car to allow the driver to see out. Components consist of: our steering consists of a straight, pivoting handle with two pivoting tie rods connected to the wheels. On the steering handle, we put a brake handle and ran a cable down to a splitter, which teed into two brake lines. Each of these lines then ran to two disc brakes on each front tire. Next, we used a Honda, 3.5 horsepower motor with a centrifugal clutch. To accelerate, we put a foot pedal near the front of the car to act as the accelerator. Next, there is one kill switch inside the car for the driver and one on the top, exterior of the car for others to kill the engine when necessary.





Power Train Configuration

Our engine is connected to the drive wheel by a #40 roller chain. We chose to use a centrifugal clutch and then tested different sized sprockets to determine what would be the best gear ratio for our car. During the tests, we used our school's parking lot and drove it both up and down hills and on flat pavement. We did this to figure out what gearing was needed when starting off or when going up hills. In conclusion, we determined that an 11-tooth and 60-tooth steel sprocket would be the best for our car. To calculate the gear ratio, we took 60/11, which equaled to about a 5:5 gear ratio.



Performance

This year's supermileage car is the same one used last year, but with some modifications. Testing was unnecessary this year, since we were successful last year. Since last year's competitions, there were no mechanical failures, so mechanically, our car remained the same. Since we were using the same car, designing was necessary, so we decided to modify the front body of the car for less air resistance. We did this by cutting the slanted, front end of our car off and created a cone like front, like a jet's nose, to reduce air resistance significantly. We also took off the plexi glass and replaced it with more flexible, lighter plexi glass that had no seams. Compared to last year's car, it had many seams in the plexi glass, creating much wind resistance.

Brake System

The brake system that was used is a Hayes MX1 disc brake system that is a fluidless system that uses a standard lever, cable, and housing. It has an adjuster barrel for easy pad adjustment, so you don't need tools to make adjustments. This is a ball bearing system with all rolling elements and semi metallic brake pads. The caliper has an open back which allows easier set-up and a cooler running system. Each brake kit included a MX1 mechanical caliper, a rotor, and mounting hardware. On our car, these disc brakes are located on both front, sealed-bearing wheels. Brake cables run from each brake caliper to a tee and then one cable runs up the steering handle to a bicycle brake handle, which acts as the lever that tightens the brakes.

Safety Items

Two kill switches: Allow the driver inside the car and others outside of the car to disengage the engine for emergencies.

Guards and shields: Protects the driver from broken drive train components and any moving wheels within the cockpit of the car.

Fuel and lubrication: We use hose clamps to secure our fuel lines and fuel bottle.

A breaking system: We have two Hayes disk breaks on the front wheels that can be activated by the driver at any time.

Fire extinguisher: Our car contains one multi-purpose ABC dry chemical fire extinguisher that is two pounds and is located near the driver to be used when necessary.

Exhaust system: We have an exhaust system in which a pipe runs from the muffler and exit s the body of the car.

Fire wall: We have an aluminum fire wall that is 0.032 inches thick and separates the driver from the engine compartment without any openings.

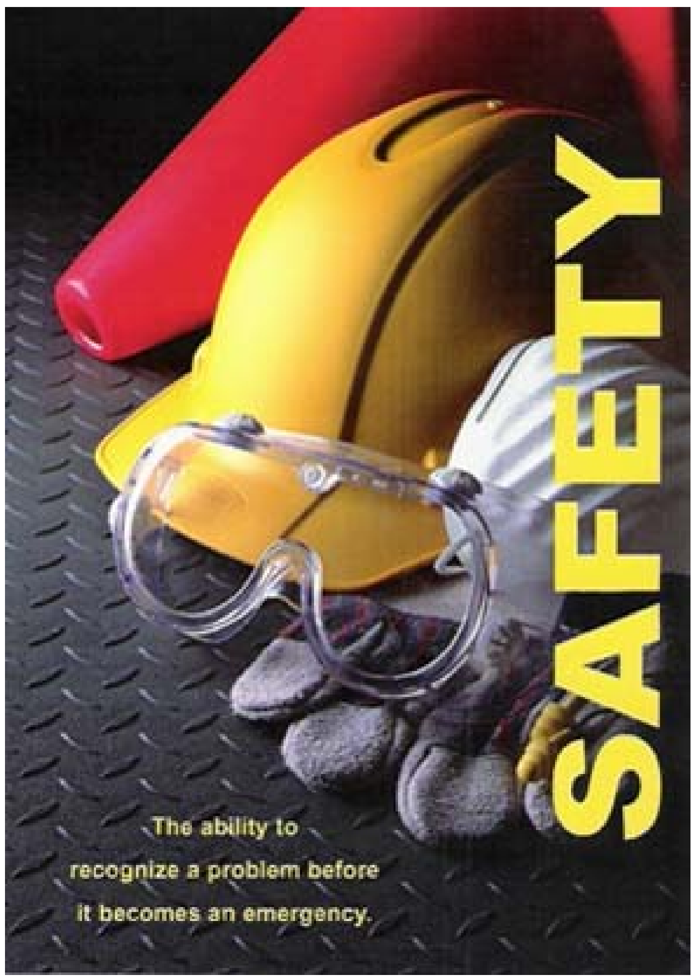
Floor pan: We have an aluminum floor pan that is 0.032 inches thick and runs from the base of the fire wall to the front of the car.

Rear view mirrors: We have to rear view mirrors, one on the right and left side of the vehicle, allowing the driver to have a clear view behind the vehicle. This allows the driver to see where other vehicles are around them.

Seat belts: Our vehicle is equipped with a 3-point seat belt that is securely mounted to the vehicle frame.

Roll bar: Our car is equipped with a 40◦ roll bar that serves to withstand impact and protect the driver. The roll bar is 6" higher than the driver's head and 4" wider than the driver's body and can easily support 350 pounds.

Enclosed vehicle body: Our vehicle's body is created of aluminum sheet metal and plexi glass and completely encloses the driver within the vehicle's body. This way the driver is protected at all times from any surrounding elements.



Problem Solving Essay

The first thing our group did was identified the problem. Our country uses millions of gallons of oil in our motor vehicles each and everyday. Our earth is not able to produce oil as fast as we demand it and eventually we will run out of oil to make gas, if we do not find a solution. Next, our team discussed what we need to do. Our job is to create a car no wider then five feet and no longer than nine feet, which will get outstanding gas mileage. Our car will also have to be safe for the driver and any bystanders. The next thing was to research information and gather ideas. Our group looked up all the factors that we could find that would affect the gas mileage of our car and the stability. Our team found factors, including the following: speed, friction, wind resistance, motor size, and gear ratio. Then our team had to come up with a creative design. We picked shapes that would allow for the least amount of wind resistant. We also decided to use three wheels instead of four wheels, in order to have less friction, and that way we will be able to coast further. Then after we designed our whole car on a computer program, we made a 1/10 scale module of our car out of wood to see how it would work in full scale. After that, we built the full scale car. Then we started to create the speed, control, breaking, and durability test. After performing these tests, we made modifications to prefect these safety aspects. Then we created more tests and trial runs, to test our gas mileage. During this testing procedure we would make one change at a time to the car and analyzed the information to see if it helped the gas mileage or not. If a certain aspect lowered our gas mileage, we made changes to improve it, or vice versa. After testing and changing all the aspects that affected our gas mileage, we went over the safety procedures one more time and, then started getting things ready for the competition.