Aqua Scooter

Progress Report

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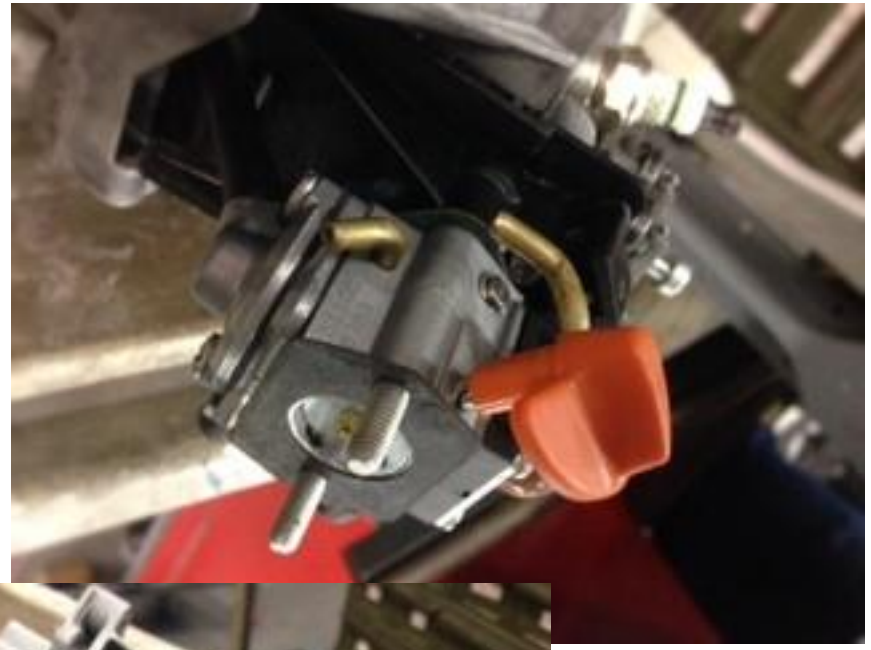


Project Summary

Aqua Scooter is a portable, gasoline powered personal water craft that can propel the user up to 5mph.

Design a hydrodynamic, inexpensive, aesthetically pleasing Aqua Scooter, with a marine engine that complies with EPA regulations.

www.cnet.com

Objectives

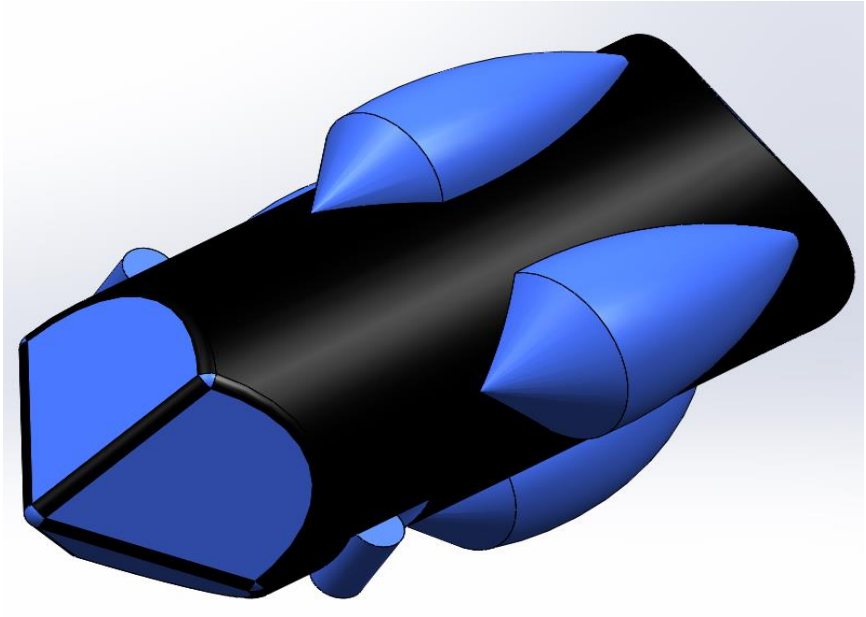
- The new design should be lightweight
- The new design must be buoyant
- To construct an experiment that measures engine horsepower output
- Estimate cost to manufacture device to not exceed $450.00
- Must be safe for a child to use

Tasks

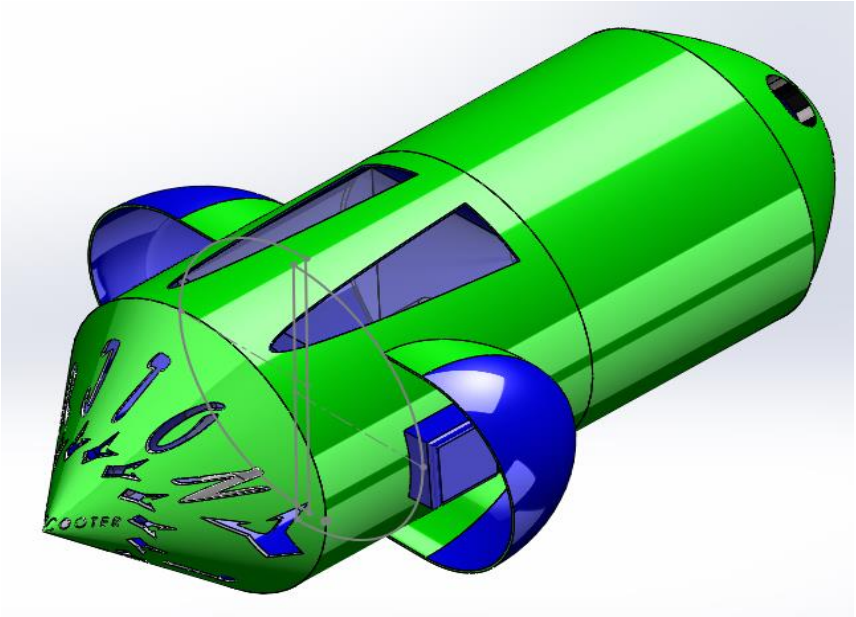
- Analyze and compare gasoline and propane 4-stroke engine concepts
- Quantify the ability for each fuel source to meet EPA regulations
- Calculate the drag coefficients for the two final outer shell designs
- Convert engine to run on propane
- Construct an experiment that measures engine output in horsepower

Current Design Status: Triton

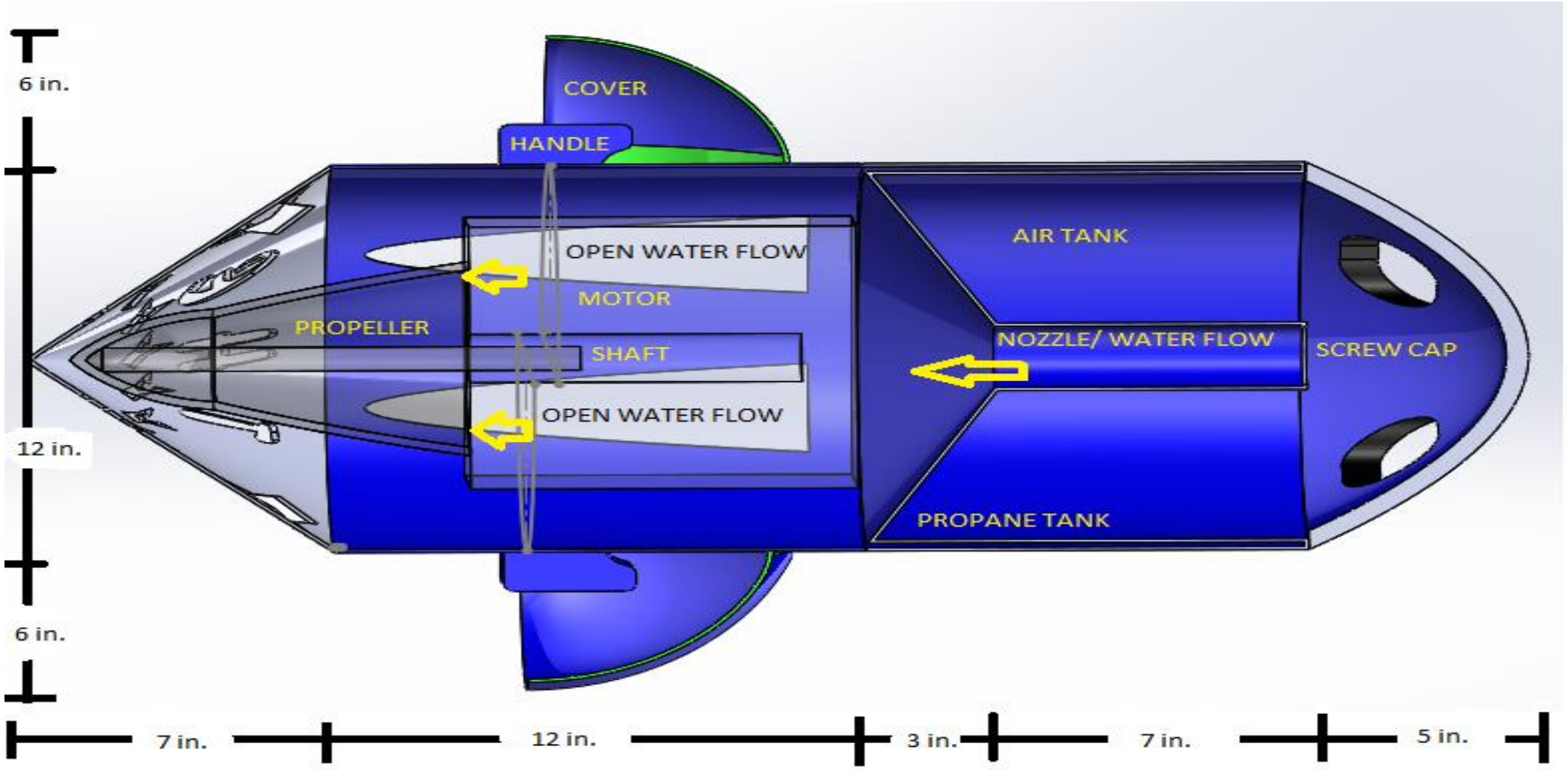
Original Design



Final Design

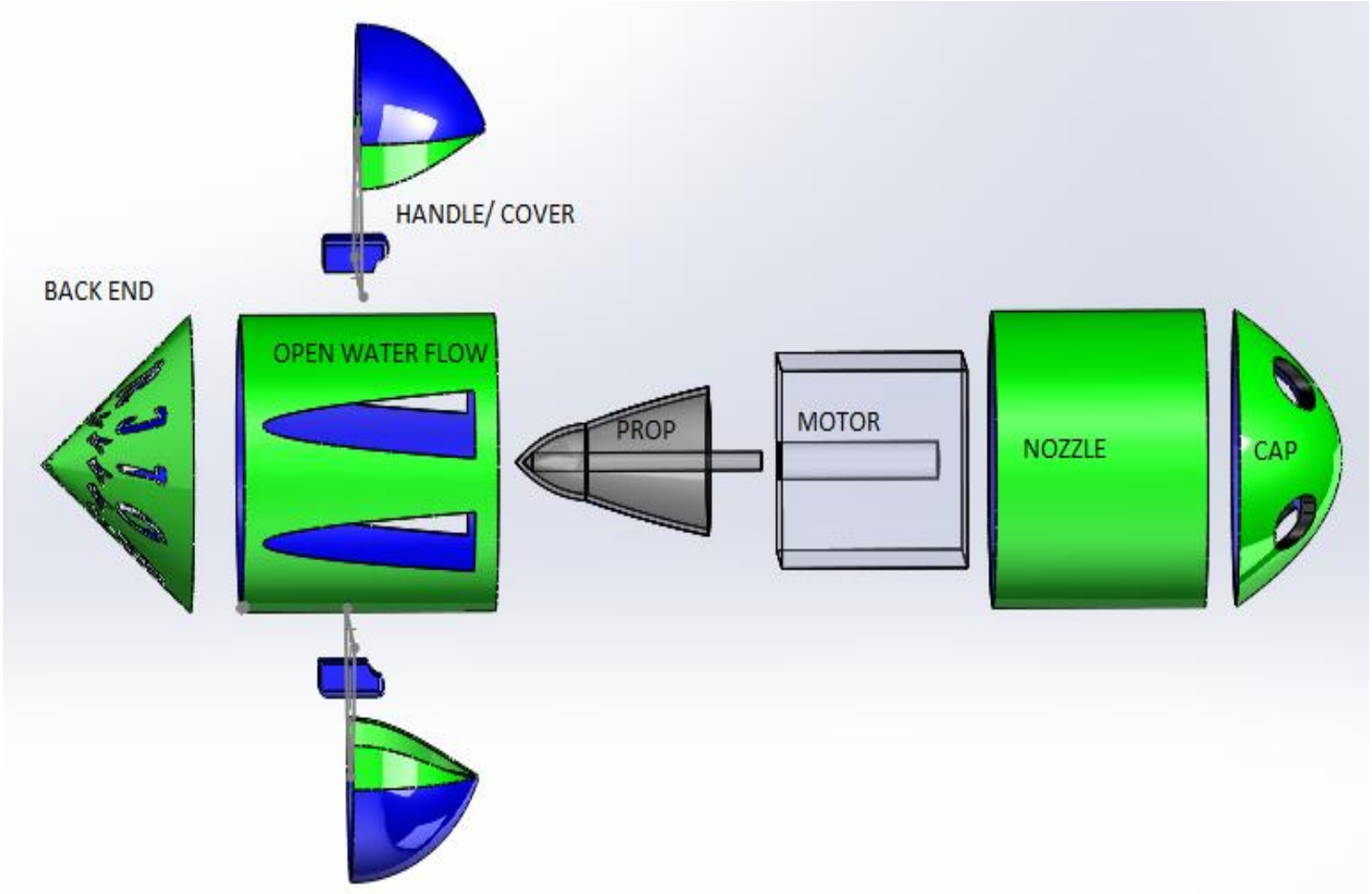


Triton Internal Side View



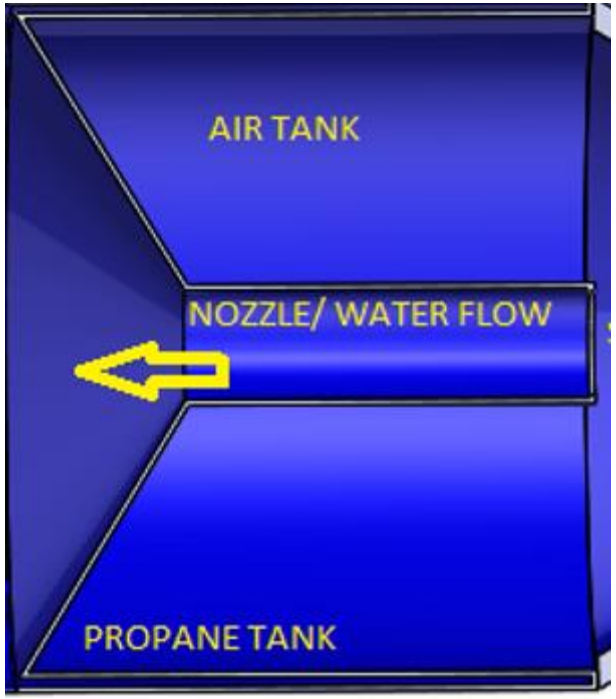
Triton Assembly

- Fiberglass & Molding
- 3-D Printing
  - ½ Scale → (+/-) $450
  - Add Fasteners/ Lips for Assembly
  - Spoke with Dr. Tester
  - Submission after spring break



Buoyancy Calculations

- $V = \frac{\pi(360 - 36h_0 - 2.78^2(10 - h_0) + \frac{-10.37}{3}h_0 + \frac{38.64}{2}h_0^2)}{12^3}$
- $V_2 = \int_0^{h_0} \pi * 6^2 - \pi\left(\frac{-3.22}{h_0}y + 6\right)^2 dy$
- $V_{cyl} = \pi r^2 h = 0.654498\ ft^3$
- $V_{nozzle} = 0.323186\ ft^3$
- $V_p = 0.0795 ft^3$
- $V_{cyl} - V_{nozzle} - V_{propane} = 0.2517725\ ft^3$



Current Engine Status

- Exhaust system modified to fit emission testing probe
- Shaft and flange machined in order to test engine on dynamometer
- Multiple iterations attempted to compensate for shaft vibration

Emissions Testing

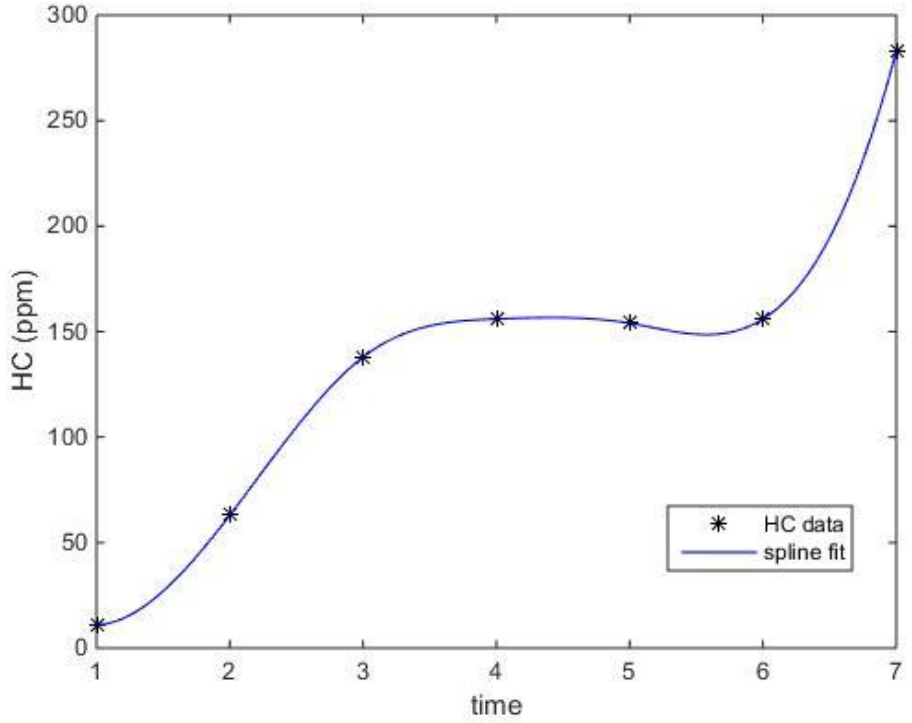
- 87 Octane Gasoline Used
- Device: 4 Gas Analyzer
  - Hydrocarbon
  - Carbon Monoxide
  - Carbon Dioxide
- Exhaust system Machined

Emissions Testing

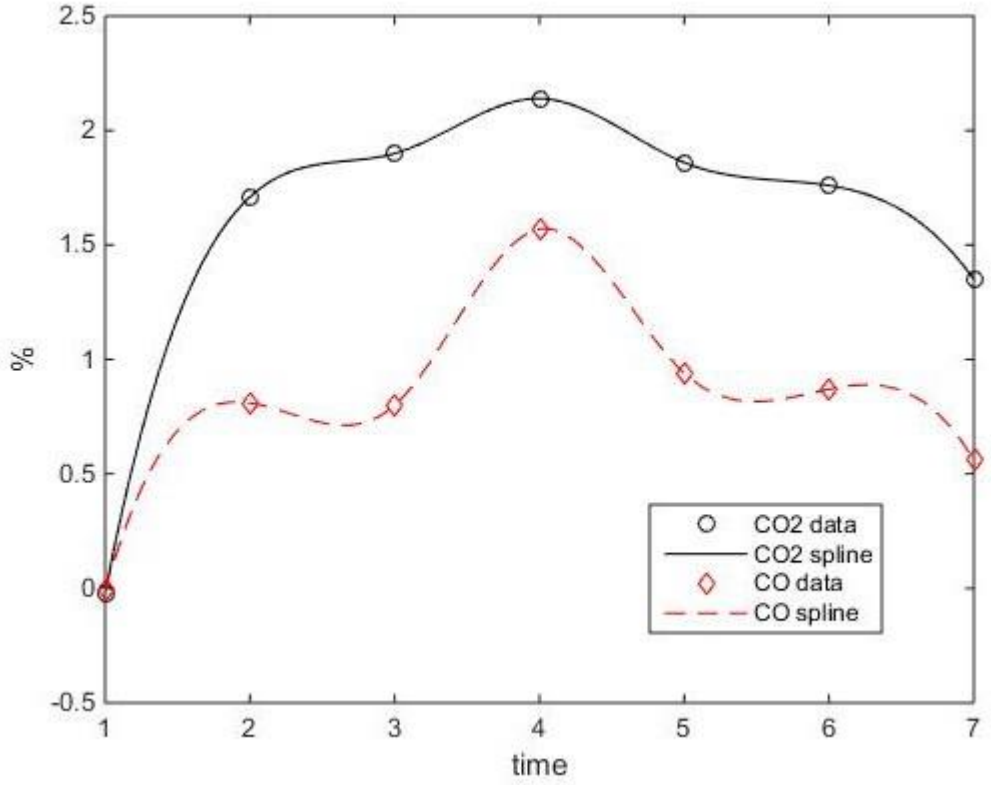
- Probe Insert Into Exhaust
- Single Test Conducted
- Several Data Points were Collected
- Goal to compare with Propane

Emissions Testing

Hydro Carbons Emissions vs. Time



Carbon Monoxide and Dioxide vs Time



Prony Brake Experiment

- $P = \frac{(F_A - F_B) * D}{t}$

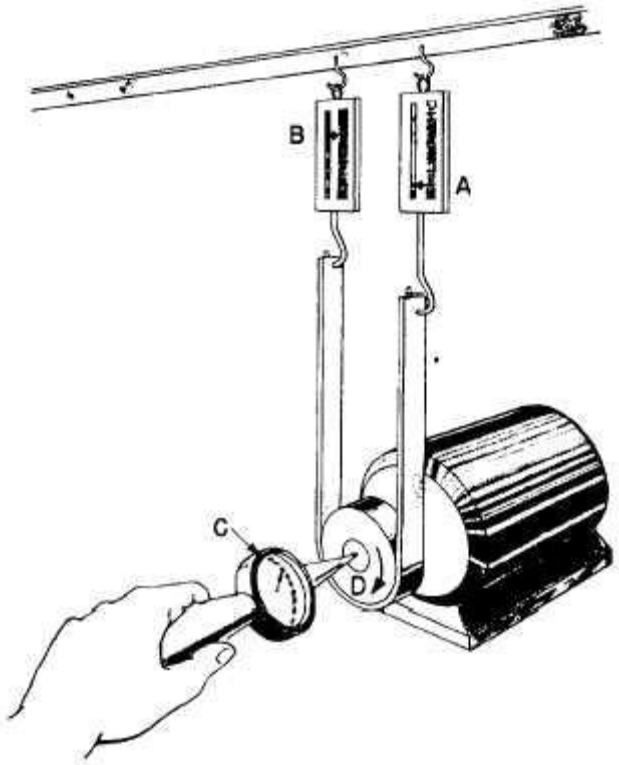
  $P = Power$

  $F_i = Force\ measured\ from\ spring$

  $D = Distance\ Pulley\ Traveled$

  $t = time$
- $\tau = LF \quad (ft * lb)$

- $P = \tau * rpm\ (ft * lb/min)$



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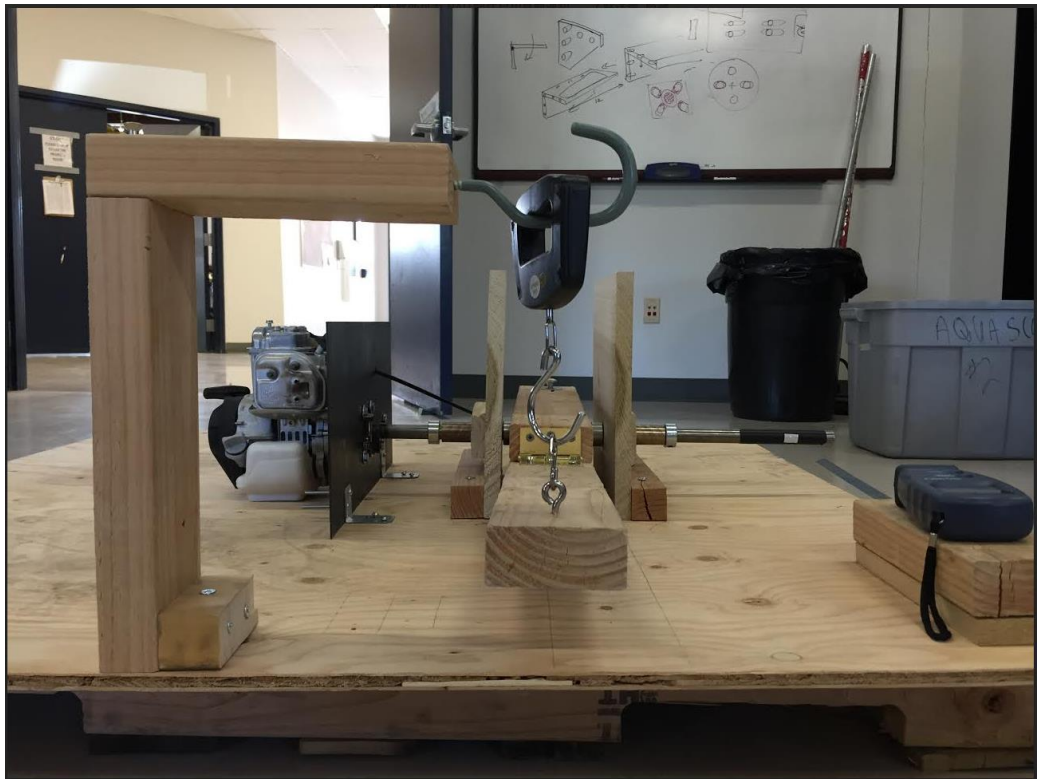
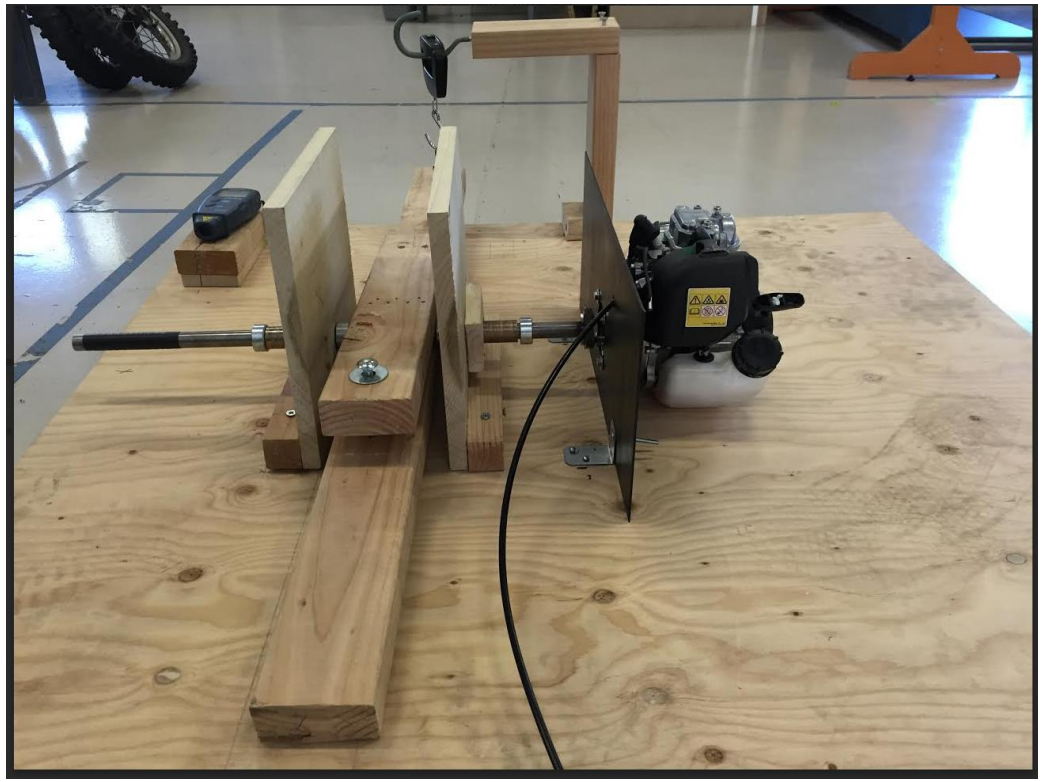
Prony Brake Experiment

Side View of Setup



Isometric View of Setup



Prony Brake Experiment: Shaft Vibration Modification

High Density Polyethylene

Springs on the Screws

Prony Brake Experiment:Progress

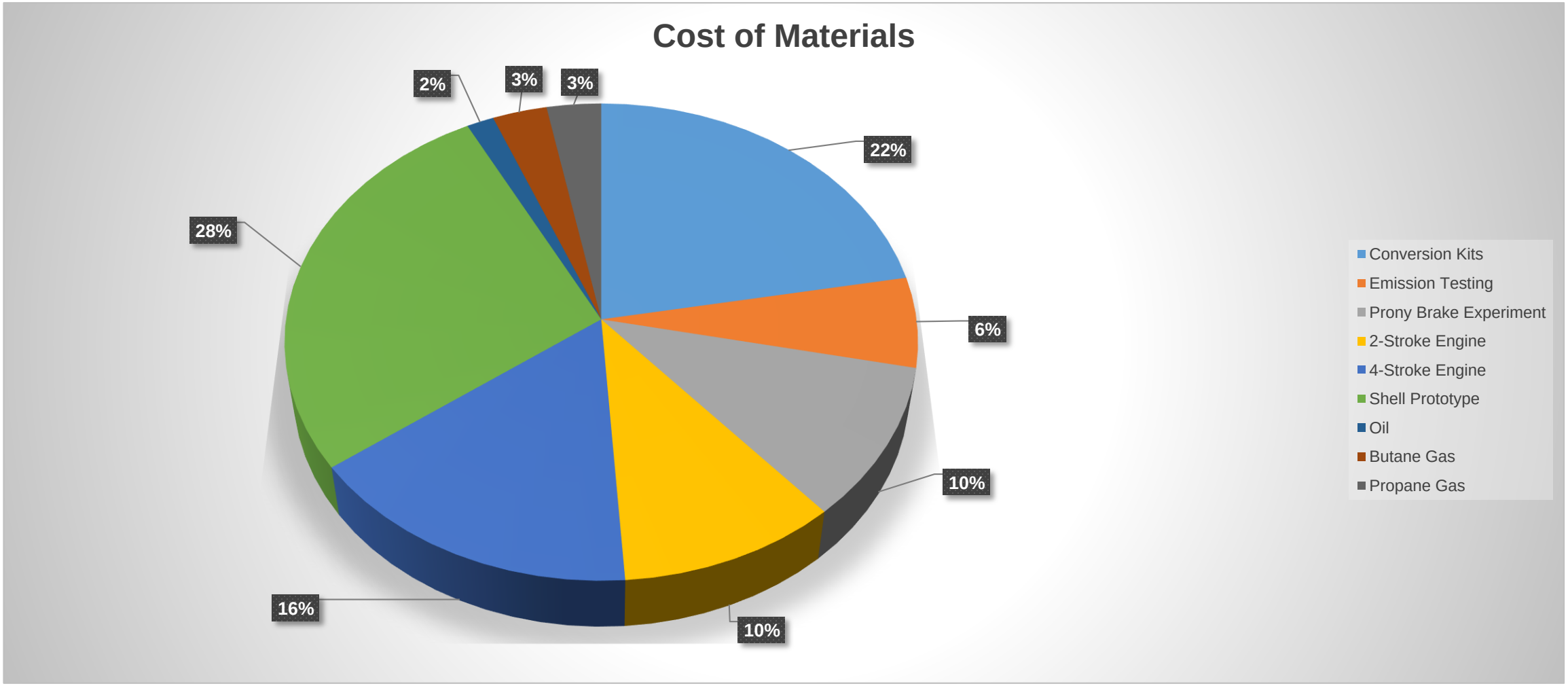
Original Test

- Engine did not start
- Shaft eccentricity significant
- Too much friction

Recent Test

- Engine did start with shaft in bushings
- When brake was applied engine stalled
- Vibration moved bolts out of flywheel

Cost of Materials



Conclusion

- Complete engine efficiency and power test with gasoline and propane
- 3-D Print prototype of shell within two weeks
- Install conversion kit and compare power and efficiencies of the alternate fuels
- Test emissions test after propane conversion

propanepowerkits.com

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Any Questions?