Fast Times in Estabrook –
The First Annual 4-Meter Drag Race Nationals!

Your EF 152 instructors have been, frankly, consumed with jealousy at the success of Battle-Bots, Junkyard Wars and the rash of other cable shows where you get other people to make useful stuff out of junk and then make lots of money by organizing a competition. This should have been our idea! Better late than never, we have come up with another scheme. What if we started a scaled down drag race that everyone could afford to participate in? It might be bigger than Junkyard Wars!

Your team has the task of designing, building and testing a rubber band powered drag racer to compete in our 4-Meter Nationals on April 13. This will be a double elimination tournament with section and overall class winners determined. This project utilizes your knowledge of rotational motion and energy. A brief analysis of a similar vehicle will be made available to you to get you started in the analysis of your design. Applicable subjects are free body diagrams, rotational energy, slipping and rolling motion, and work and energy. The stored energy of a rubber band and the characteristics of its release are very relevant topics you should consider.

Added Competition. We all know that marketing our scale drag race league will ultimately depend on attracting fans. Therefore, in addition to performing in the drag race, your vehicle must be designed with a special feature or capability that adds to its entertainment value. Demonstration of this capability will be judged separately. This “surprise” function should be related to the technical material in this course other than that covered by the construction of the drag vehicle itself. This might include oscillatory motion, fluid or heat transfer/thermo considerations. Scoring of the “surprise” competition will be based on a) relevance to EF 152 material, b) integration with performance of vehicle, c) creativity, and d) general “coolness” factor.

A drag racer is defined for this project as a device that moves as a whole and does not damage or attach itself to the surface it moves on except through wheel friction. No part of the vehicle can be attached to the course by any artificial means (gluing, clamping, etc.) Your vehicle will be placed on the starting line with rubber band(s) ready, and then released by you at the start signal.

First assignment:
Your initial efforts should be directed towards developing background material, generating alternative designs, and selecting promising concepts. Materials will not be available until you have documented these steps of the design process. Your first assignment is to find out as much as you can about this type of vehicle, so you can be ready to generate alternative ideas next week. Before you leave today, make a list of areas you feel you need to research, and make team assignments. Each team member should bring research material to class and report to the team next Tuesday, 2/21.
Schedule:
2/14 Project assigned, background
2/21 Idea generation
2/28 Idea generation report due
3/7 Concept selection
3/14 Preliminary reports due
3/28, 4/4, 4/11 Work Periods
4/13 Test Day
4/18 Class discussion, Final reports due, 4 p.m., all sections

Some details:
- Vehicle must operate in a lane 45 cm wide. Physical barriers will define and separate the two lanes. The surface will be rough plywood, and you will race side by side with another team’s vehicle. The object will be to cross the finish line 4 meters away before the other team’s vehicle. Crossing the starting line and finish line will be defined as when the front wheel(s) of vehicle cross the line. Your vehicle cannot be longer than 75 cm, taller than 60 cm, and wider than 44 cm as it sits on the starting line configured for a run.
- Power is provided by a maximum of 2 number 107 rubber bands.
- We will supply limited quantities of basic materials, hand tools, and a workshop that may be used by the teams during construction (Room 13 Estabrook). Materials other than that which we supply are allowed, however the drive train of your vehicle must be completely fabricated by your team from our materials (no commercial gears, parts of toy cars, etc).
- Materials supplied and used by team must pass the “reasonable man” test of costing a total of less than $15 and being in the spirit of the competition.
- We love creativity. Questions about material usage and rule interpretation are encouraged, but are only “official” if submitted in writing (through your TA’s) and ruled upon by the benevolent council of elders (The Dr.’s P, P, and B)
- Only lubricant allowed is WD-40. Up to 300 g of ballast weights can be used. Your team must supply these.

Supplied Material List (and quantity per team, if limited. Subject to some modification):
1/2 sheet of foamcore
4 ft length of 1/2” diameter PVC pipe
2 ft length of 3/8-inch diameter wooden dowel
2 number 107 rubber bands (can be replaced with new ones once during design process)
1 piece sandpaper
1 ft length of 4-inch diameter cylindrical foam
Small nails, paper clips, string
Duct tape, but only1 ft of duct tape can remain on vehicle as tested
Wood glue supplied, other joining compounds can be used if supplied by team

Reports:
This project requires your team to go through the steps of a nominal design cycle and document your progress. There will be a final written report and two intermediate reports. Requirements for each will be discussed in class. Each report will also involve an oral class discussion or demonstration.

Approximate Grading:
Idea generation report and discussion – 10%
Preliminary report and discussion – 10%
Final Report and discussion – 40%
Vehicle performance (including race and surprise) - 40%