

MECH 3200 – 12S – Team Design Project

The class will be divided into four person teams. Class members are free to choose their teammates. Each team will complete the design for a mechanical system up through embodiment design, but short of detail design. A prototype need not be built; however, models (iconic, analog, symbolic) might be appropriate. A manufacturing plan must be developed. FMEA must be applied.

The purpose of this project is to gain practice in working through the design process. The lessons of the course must be applied. Good teaming practice must be followed. The results of the work must be effectively communicated in written form.

The subject of the project is the following design problem:

Figure [1] shows a Baja SAE car.



Fig.1 – Baja SAE car in race

These are off-road racecars intended for intercollegiate competition. They typically weigh about 400 lb. (w/o driver), have a wheelbase of about 60 in., and a track width of about 48 in.

The cars are new-design, hand-built prototypes, running over purposefully demanding race courses. In consequence, the cars sometimes break down during race and have to be towed back to their paddocks for repair, as shown in Fig.[2].



Fig.2 – Baja SAE car broken down at race, being towed by an ATV

ATV's are commonly available at race for recovery of non-running Baja cars. However, sometimes Baja cars are damaged so severely that towing with ATV's is difficult. Referring to Fig.[1], a common damage mode is to lose an entire front corner – wheel, upper and lower suspension control arms, and shock absorber (typically caused by tree and rock collisions). In that case, the Baja car has only three wheels, and cannot be towed as in Fig.[2].

Baja cars missing a corner are typically towed piggyback by lifting the front of the Baja car onto the rear of an ATV so that the Baja car's forward belly pan rides on the back of the ATV seat. The Baja car is then tied down to the ATV, and this awkward assembly gets under way. The Baja driver usually stays seated in the Baja car in order to be in a safe place and to operate the Baja car brakes.

Piggyback towing ties up relatively scarce recovery resources. Many people are needed to lift the Baja car and make the towing attachment (this is also dangerous, as footing on rough parts of the race course is bad). The time it takes to piggyback the Baja car is time during which the race course is obstructed (yellow flag time – bad for racing). And the tow proceeds slowly back to the paddock because the ATV driver must take extra care, and so the recovery ATV is late in returning to its station.

The design problem drawn from all of the above is that Baja cars with missing corners need to be returned safely to their paddocks. The decision to develop a product anticipates solving this design problem with an intermediate attachment between an ATV and a three-cornered Baja car to facilitate hook up and tow.

The first race of the 2012 Baja season, Baja SAE Auburn 2012, will take place April 19-22 in Opelika. A recovery ATV crew is ready to go. Some prototypes of the above product have been attempted, but the recovery service stands willing to incorporate any good ideas that MECH 3200 students might generate. For general information about Baja cars, see <http://www.sae.org/students/mbrules.pdf> , and especially Article B4.2.

This subject should be complicated enough to exercise the full range of the material in the text. Grading will be entirely on the basis of how well this material is exercised in the final report and presentation.

Progress

Each project team is expected to follow the same route from Problem Definition to Design Embodiment as is outlined in the text, the lectures, and has been followed in the MECH 3200 homework assignments. After suspension of lecture in MECH 3200, each team will meet biweekly (mandatory) or weekly (optional) with the Instructor to discuss and review their progress. Progress, as revealed in these meetings, will be scored as 20% of the total project grade. In order to stay on schedule, teams should be ready to discuss the following topics in their progress meetings with the instructor:

Week	Design Progress
7, 9 March	Problem Definition, Domain Knowledge, Engineering Characteristics
14, 16 March	Engineering Design Specification, Concept Generation
21, 23 March	Concept Decision and Regeneration
28, 30 March	Configuration Design
4, 6 April	Advanced Configuration Design
11, 13 April	Parametric Design
18, 20 April	DFX

Deliverables

Written Project Report. Each project team will submit a written report, detailing their design logic and design solution. The report is due on Friday, 27 April, at 4:45 pm.

Peer Assessment. Each person must submit an evaluation of the relative contribution of their teammates. The submission must be by e-mail to the instructor. The object is to determine whether each person was effective at, above, or below the mean for that team. **Those not turning in peer assessments will receive a score of zero for the Team Project.** The peer evaluations are due before midnight on Friday, 27 April.