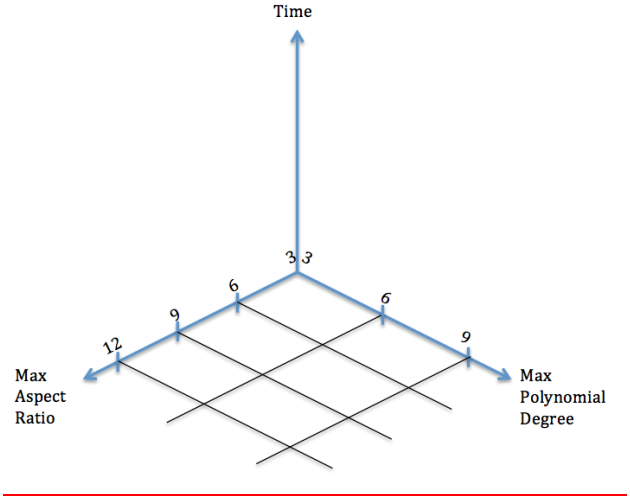
ME 360 – Final Project

Your team will redesign the front and rear rockers for use in the current formula car. The rockers are an integral part of the suspension system and connect to the chassis to the wheels mounts.

1. The rockers should be designed so that it can statically support the loads given below with a safety factor of 1.5.
2. They must be designed to minimize weight.
3. The part must be designed to be built using T6 7075 aluminum.
4. The analysis will require choosing a way to constraint the system that must be fully justified and discussed.
5. The design will also require devising a way to apply the given loads that must be justified and discussed.
6. You can change the geometry; but the position, radius and separation of the mounting wholes must remain fixed.
7. Create a 3D surface with the axes as shown to study the effect of mesh size and maximum polynomial order on computational cost (time needed to solve the problem). Use a 10% convergence criterion and multi-pass adaptive method. Also set the minimum allowable angles to 10 degrees and the maximum allowable angles to 170 degrees for edges and faces.



Once you have decided on an optimal design repeat the final analysis using AISI 4340 steel, T6 7075 aluminum and a third potentially optimal material of your choice. Use default values for mesh size and allowable angles, enforce a 5% convergence tolerance.

Deliverables

1. A proposed design stating the resulting safety factor, the total weight of the part and the optimal material chosen.
2. A presentation of your design work to members of the class, other faculty and students.
3. A report containing:
   a) The proposed design.
   b) A discussion of your design and justification for the choice.
   c) The visualizing material used in the presentation.
   d) Dimensional drawings.
   e) A drawing or drawings of the discretized part showing the final computational mesh, a discussion of the quality of the mesh, the type of elements used for your converged results, and the criterion used to decide that the solution was indeed converged.
   f) Structural analysis of the part showing a fringe plot, a list of the maximum von Mises stresses and indicating the precise location of the maximum stresses.
   g) A discussion explaining why you believe that the results presented are converged and represent a good approximation to the stress field under the given loads.

Additional Information

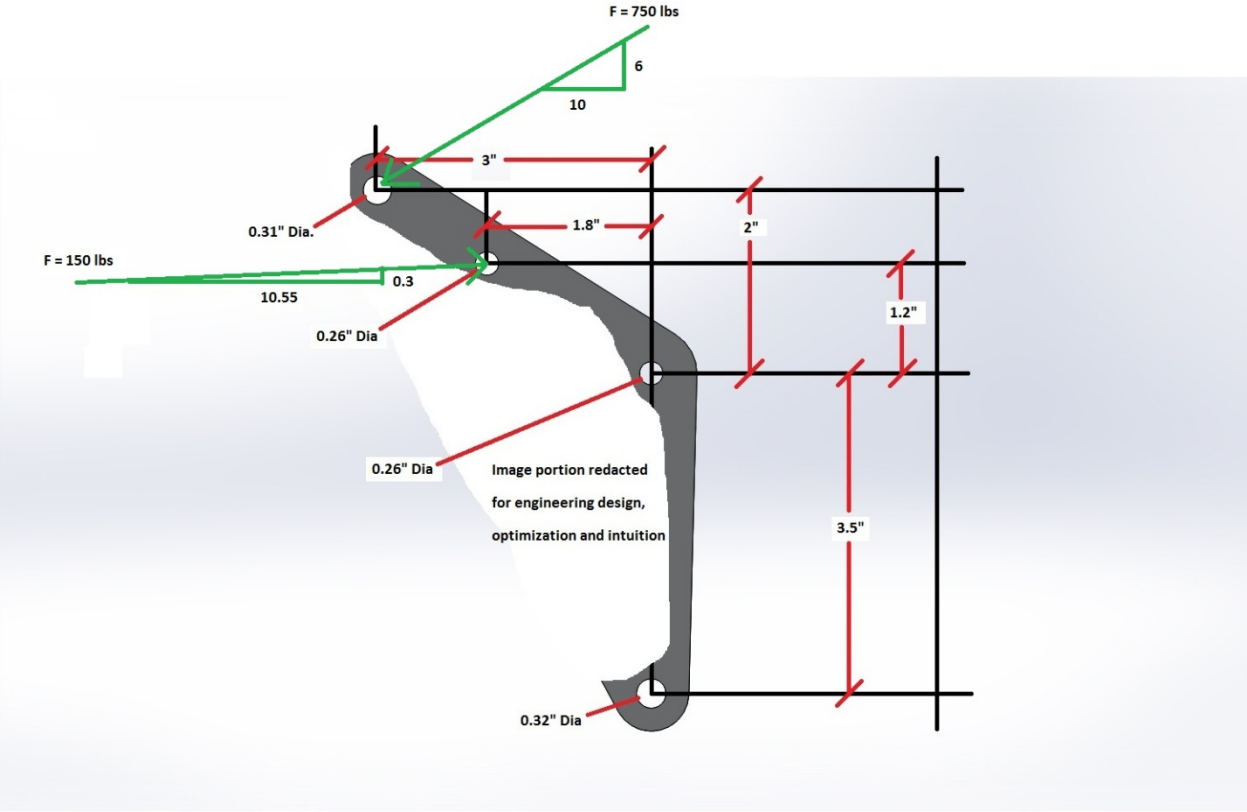
Design III Final Project, Spring 2013

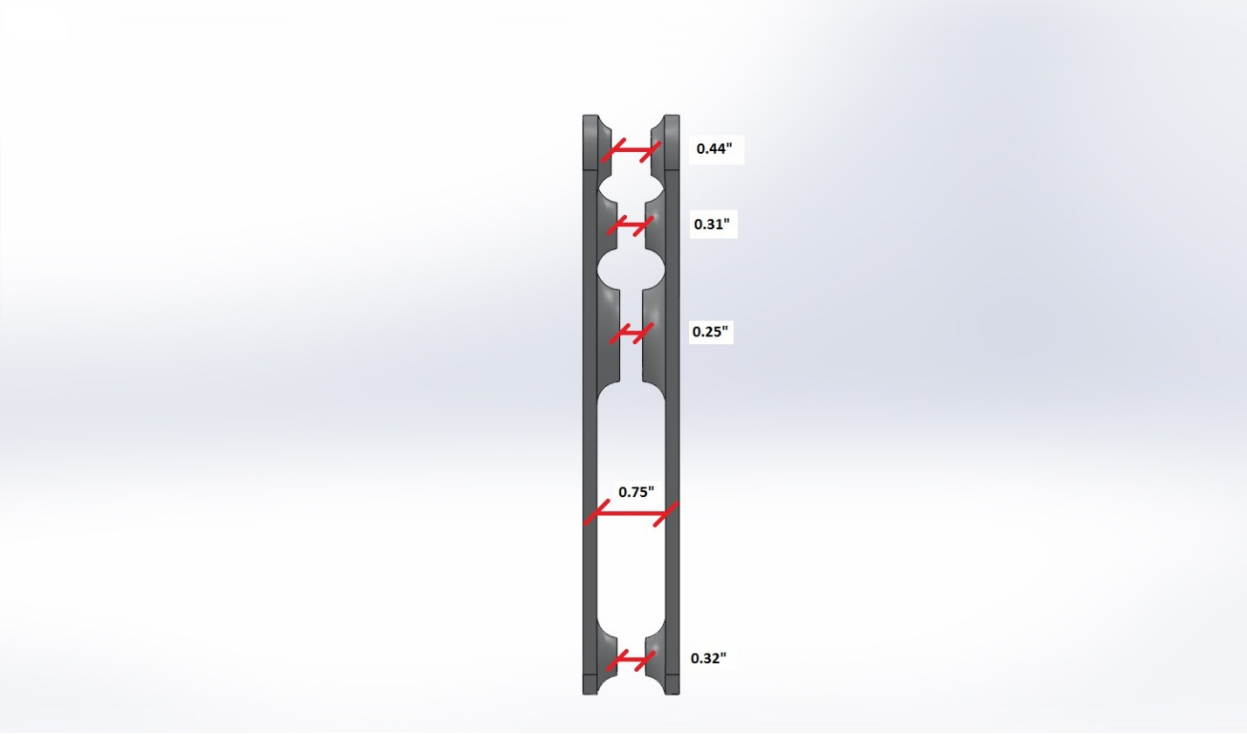
The final project consists of both the front and rear bell cranks on the current FSAE car. Parameters are given in inches. If a mounting hole does not have a force applied it is assumed to be a pin-joint. The part constructed and subsequently analyzed must follow the constraints listed below.

<u>Jesse's section, Front Bell Crank</u>

Anthony's section, Rear Bell Crank

Front Bell Crank Parameters





Rear Bell Crank Parameters