

Jenny Hu & Elizabeth Jordan
Team 2
16.810
CAE Results
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The preliminary design for the Family Deluxe bicycle frame has been analyzed using the CAE tools. The requirements specified for this frame are:

- **Performance:** $\delta_1 \leq 0.063\text{mm}$, $\delta_2 \leq 0.010\text{mm}$, $f_1 \geq 270\text{Hz}$
- **Mass:** $m \leq 0.251\text{lbs}$
- **Load Case:** $F_1 = 50\text{ lbs}$, $F_2 = 50\text{ lbs}$, $F_3 = 100\text{ lbs}$

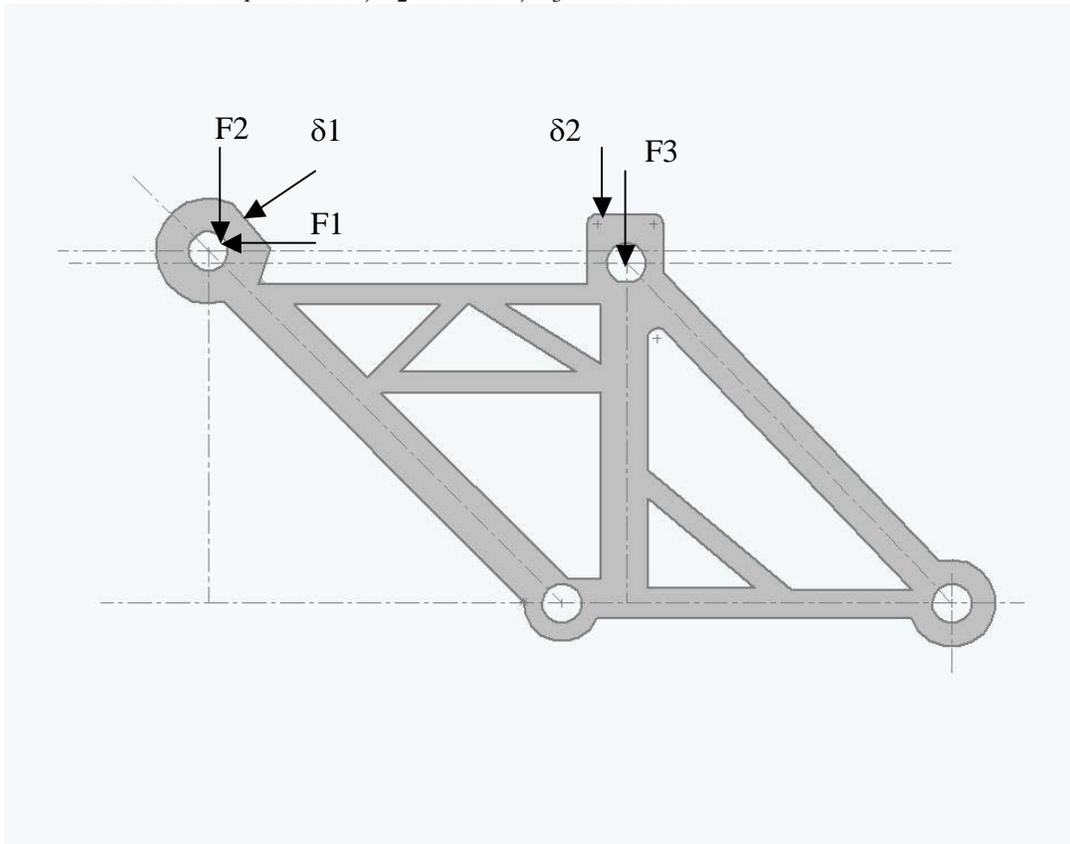


Figure 1: Design of Family Deluxe bicycle frame

Based upon the analysis of the current design, the following results were obtained:

- **Performance:**
 - $\delta_{1x} = .1038\text{mm}$, $\delta_{1y} = .0668\text{mm} \Rightarrow \delta_1 = .1234\text{mm}$
 - $\delta_2 = .0169\text{mm}$
 - $f_1 = 269.58\text{ Hz}$
- **Mass:**
 - $m = 0.248\text{lbs}$
- **Safety:**
 - For a factor of safety of 1.2, the part did not show failure, using the von Mises stress criterion

Although these results do not meet the requirements for the part, the current design is the results of many improvements to the original concept for the frame. This design was created in order to meet the most critical of the design requirements (mass), further improvements will be made to the design of this structure in order to optimize the structure for the less critical requirements. Cost analysis could not be performed at this time, and will be considered later.