

16.810 Engineering Design and Rapid Prototyping

Team 1: Family Economy Bike

Jaclyn Cichon, Alison Gallagher-Rogers

January 31, 2004

Requirements

Product Type: Family
Economy

Priorities: 1. Cost
2. Mass
3. Structural Performance

Performance Requirements:

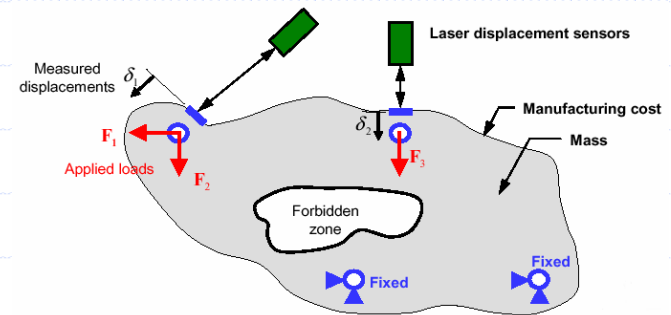
Manufacturing Cost (C): $C \leq \$3.6/\text{part}$

Performance: displacement $\delta_1 \leq 0.078 \text{ mm}$, $\delta_2 \leq 0.012 \text{ mm}$
first natural frequency $f_1 \geq 195 \text{ Hz}$

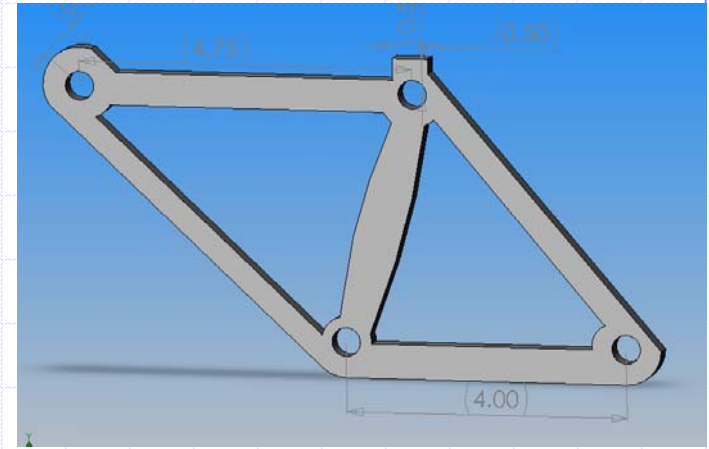
Mass (m): $m \leq 0.27 \text{ lbs}$

Surface Quality (Q): $Q \geq 2$

Load Case (F): $F_1 = 50 \text{ lbs}$, $F_2 = 50 \text{ lbs}$, $F_3 = 100 \text{ lbs}$

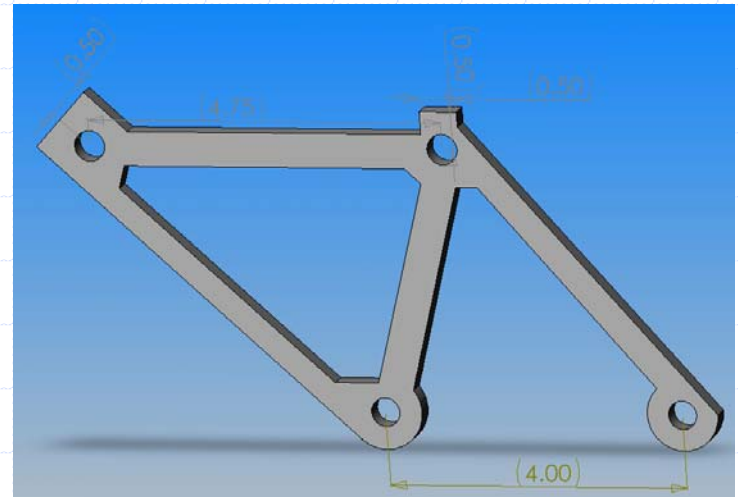


Initial Design: Concept #1



	Requirements	FEA	Testing
<u>Manufacturing</u>			
<u>Cost:</u>	$\leq \$3.60$	\$5.15	NA
<u>Performance:</u>			
δ_1	≤ 0.078	0.061	0.168
δ_2	≤ 0.012	0.008	0.073
f_1	≥ 195	229	467
<u>Mass:</u>	≤ 0.27 lbs	0.25lbs	0.25lbs
<u>Surface Quality:</u>	≥ 2	3	3

Redesign: Concept #2



	Requirements	FEA	Testing
<u>Manufacturing</u>			
<u>Cost:</u>	\leq \$3.60	\$3.60	NA
<u>Performance:</u>			
δ_1	\leq 0.078	0.062	0.151
δ_2	\leq 0.012	0.009	0.046
f_1	\geq 337	345	349
<u>Mass:</u>	\leq 0.27 lbs	0.21lbs	0.21lbs
<u>Surface Quality:</u>	\geq 2	2, 5	2, 5