Team 3
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Cross Over Bike: Frogger
Version 2

A cross over bike is to be designed for the mass consumer market. The expected sales volume is 100,000 per year. Affordability, excellent performance/cost ratio and light weight are most important to be successful in this market. Below is an initial design for manufacturing. The table lists the design requirements and the FEM testing results for a load case of f1 = 50 lbs, f2 = 75 lbs and f3 = 75 lbs.

Requirement	Required	FEM Result: Version 1	FEM Result: Version 2
Manufacturing Cost	≤ 5.2$/part	$5.22	$5.05
Performance: d1	≤ 0.060 mm	0.052 mm	0.045mm
d2	≤ 0.009 mm	0.0034 mm	0.0055mm
First Natural Frequency (Restrained)	≥ 295 Hz	289 Hz	272 Hz
First Natural Frequency (Unrestrained)	≥ 505 Hz	476 Hz	487 Hz
Mass	≤0.27 lb	0.246 lb	0.27 lb

Figure 1 below shows our initial manufactured design. We arrived at this design through two major modifications on an initial sketch. Theses modifications were based on FEM results. The first modification was to move the bar, which had connected the two fixed holes, to a diagonal bar connected the two rightmost holes. The second major modification was to use the design freedom for the location of the leftmost hole. The hole was moved diagonally upward to the limit of the design freedom. Other minor modifications included the redistribution of mass through editing bar thickness.

Figure 2 below shows the modified manufactured design. Reducing cost was the driving factor for the modifications made after the initial manufactured part was tested. Fillet radii were increased whenever possible. Straight paths were made tangent to the circles rather then fillets inserted to join the circle and path. The constraining factor for reducing cost was the mass.

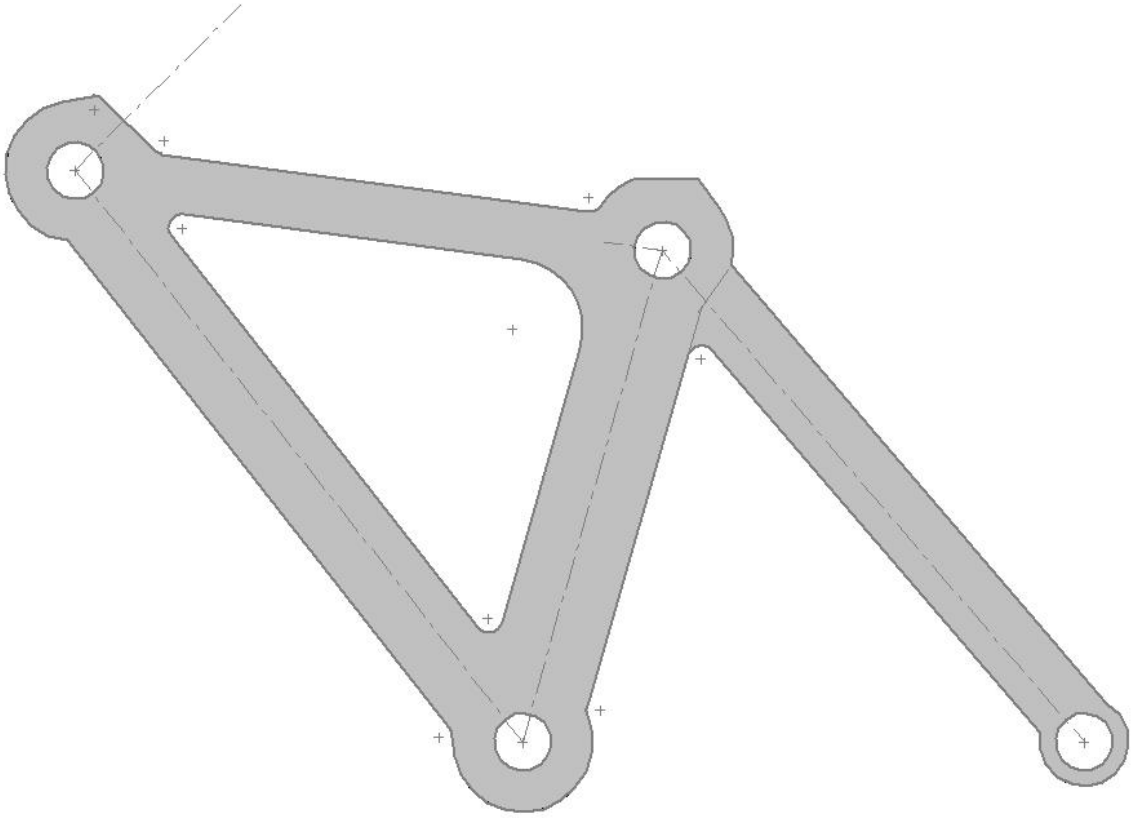

Figure 1. Initial manufactured frame for the Frogger model.

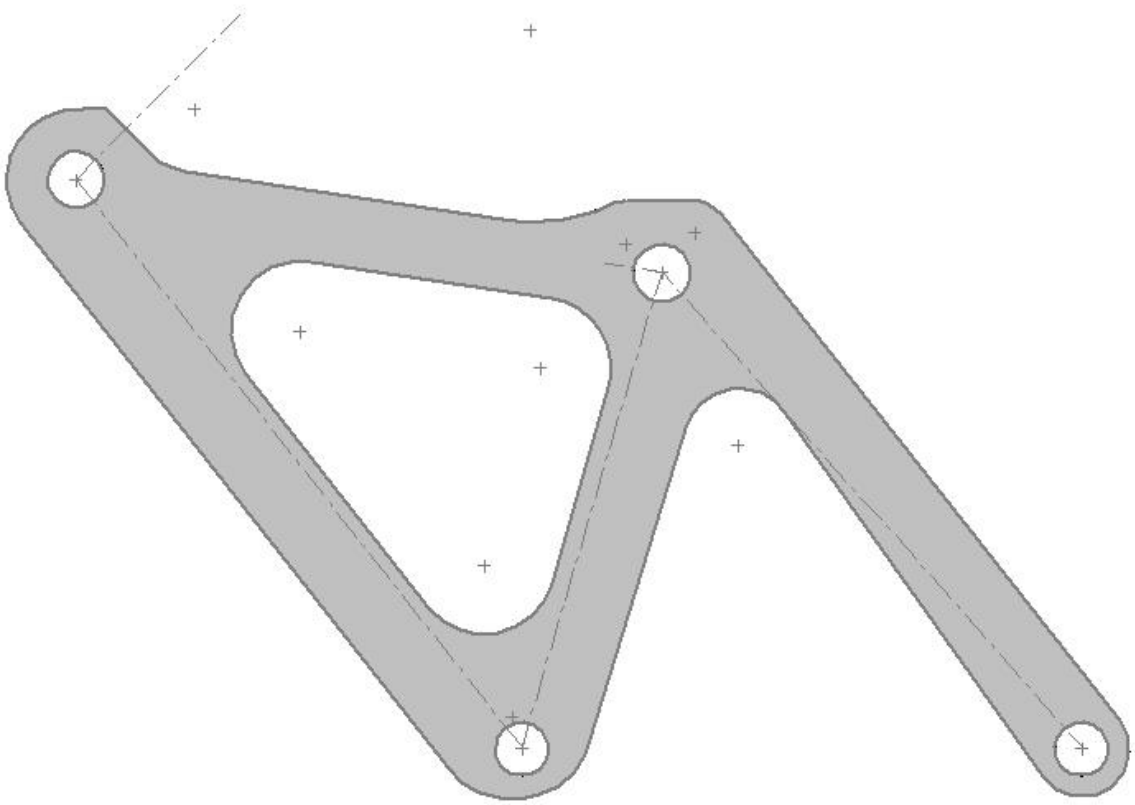

Figure 2. Final manufactured frame for the Frogger model.