

# Assembly

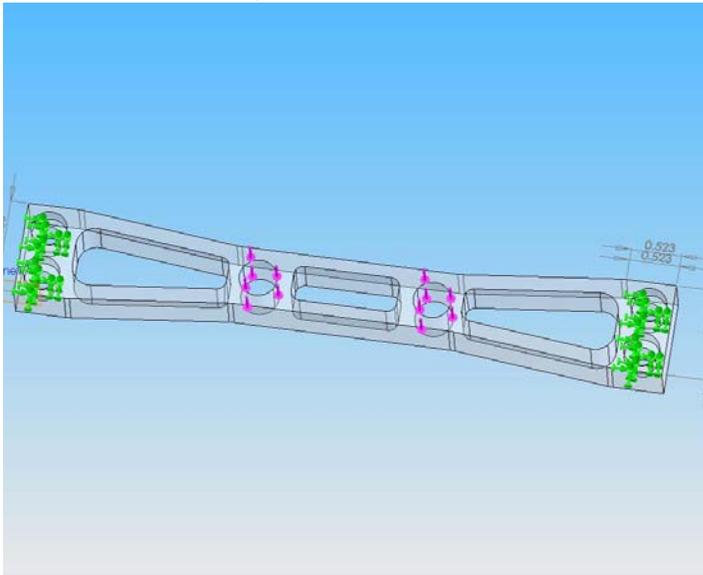
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The assembly of the climber was based off of the previous recursion. The plates should be swappable with the previous model, since the interfaces were maintained for a faster learning curve.

### **Belay Side Bar**

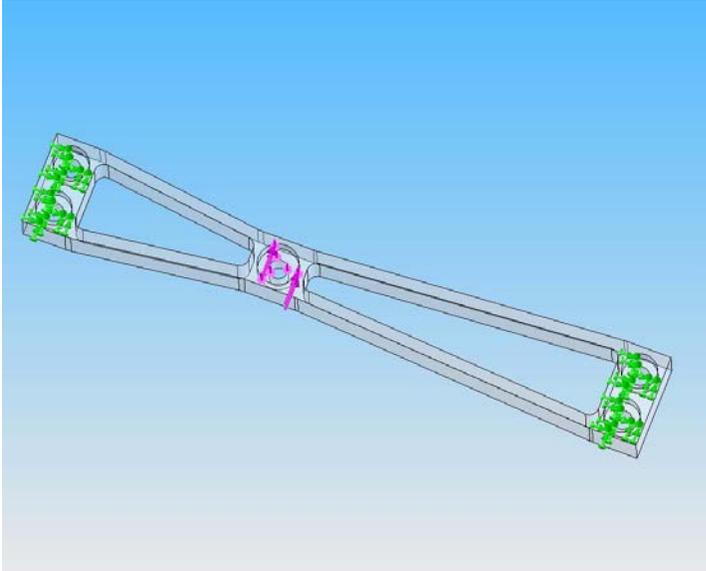
The belay side bar is made up of 1/2" polycarbonate. The piece is water jetted out of the sheet of polycarb. After the polycarb is sanded down to make the edges even to the thousandths, the screw holes will be bored using the mill. After zeroing the mill, centers are used to start all the holes for the belay side bar. The mill is used to accurately bore the 1/4" holes into the four corners. The two center belay holes use a 7/16" inch drill bit to create the proper width. After the holes are drilled, the corners are counterbored.



The belay hook is added to the center two holes, with nuts to make sure that it is set securely. 1/4" hex screws are used to mount the corners into the top slots on the side plates. A total of two belay side bars are created.

### **Side Bar**

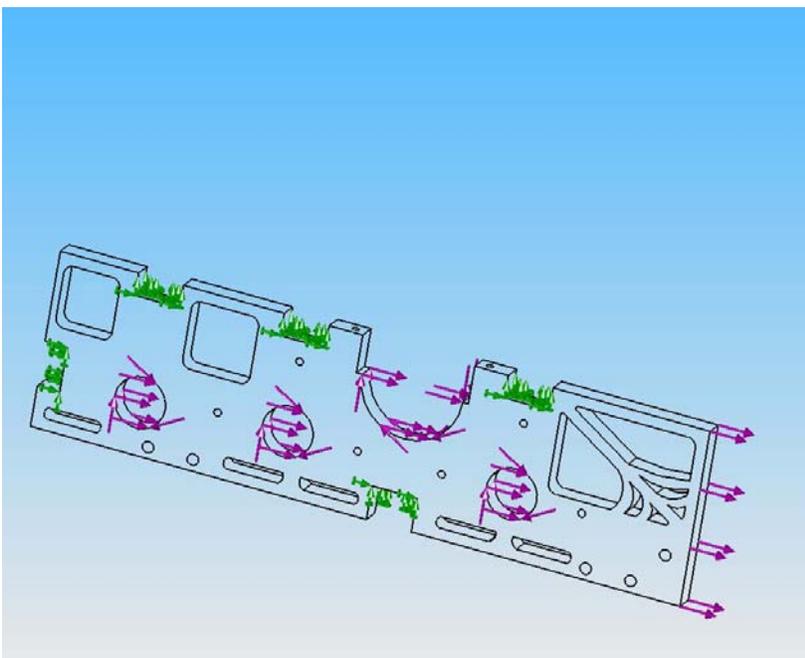
The side bars are manufactured identically to the belay side bars, with the exception of the center. There is only one central hole and it matches the dimensions of the outer holes exactly.



The assembly requires the same screws as before. The side bars are placed in the side slots of side plates and bolted into position. The central hole is bolted to the motor mount, in order to increase the stability between all the pieces. A total of six side bars are created.

### **Side Plate**

The side plate is the last piece to be water jetted from the  $\frac{1}{2}$ " polycarbonate. The axle holes, measuring 1" diameter, are created on the mill in order to maintain the precision level created by the previously manufactured pieces. Holes have to be drilled and tapped in all of the side bar slots, a total of eight for each plate. The bolt holes for the brakes and motor mounts also have to be drilled by the mill. They are the same dimensions as the previous holes in the side bars. However, these holes do not have to be counterbored.

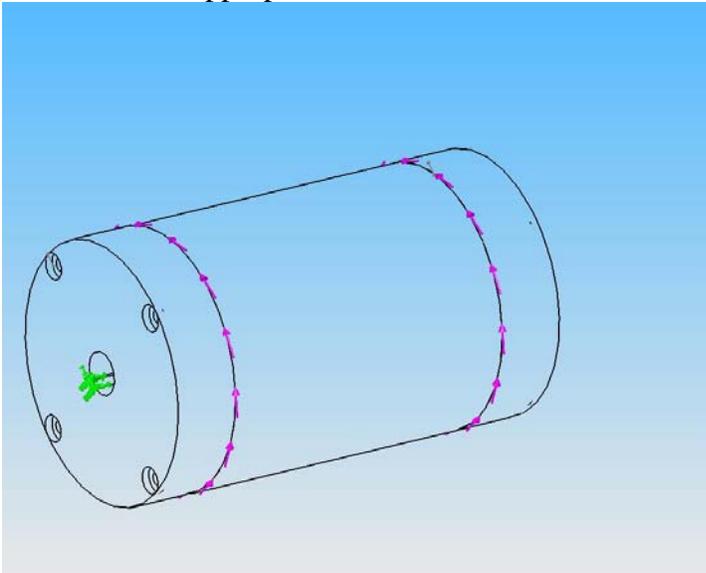


Assembly with the side plates is more involved than the previous pieces. The side bars all have to be mounted with the screws. The motor mount has to be affixed with the screws. Ball bearings have to be placed for the top set of rollers. The rollers are then slipped into place in the proper holes. The brakes are then screwed on with 5/32" Phillips head screws over the appropriate roller. Finally the clamps and gears are bolted on. Then the two halves can be attached together.

### **Rollers**

The rollers are created from solid polycarbonate rods. The rods are cut to length with a band saw. Then they are placed into the lathe in order to hollow out the center of the rod. The newly formed tube then has four 5/32" screw holes drilled and tapped into it on each end.

A smaller piece of the original polycarbonate rod is drilled with an axle hole in the center. It also is drilled with four screw holes. Two donut shaped pieces are attached to either end of the roller with the appropriate screw.



The rollers are then attached to the axle and slid into the proper spot on the side plate.

The guide rollers are similarly manufactured except for the donut pieces. They are angled on the lathe in order to create a flanged roller. They are mounted in the same fashion as the other type of roller.

**16.810**

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**Cost Estimation Sheet**

Section	Rate	Qty	Total Cost
<b>I. Design and Engineering</b>			
Labor Rate for Each Designer	\$75/hour	5	375
Labor Rate for Each Cad/Cam Machine	\$40/hour	4	160
<b>II. Materials Cost</b>			
Polycarbonate Sheet	\$19.47/sqft	3	58.41
Polycarbonate Rod	\$62.50/ft	2	125
<b>III. Waterjet Manufacturing</b>			
Labor Rate	\$55/hour	1	55
Machine Use Rate	\$100/hour	1	100
<b>IV. Other Machining</b>			
Labor Rate	\$35/hour	4	140
<b>V. Assembly Rate</b>			
Assembly Work Labor Rate	\$55/hour	2	110
Miscellaneous Test Rate	\$55/hour	4	220
		Hours	Cost
	Total	21	1343.41