

PEAK_{of} FLIGHT

NEWSLETTER

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***THE GUILLOTINE...
MORE THAN A FIN JIG***



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The Guillotine...More than a Fin Jig

By Charles Macklin

My original design for the Guillotine Fin Alignment Jig was first made public in the early fall of 2011 and soon afterward offered for sale here on Apogee Components. Since that time, I have received a good deal of email (most of which has been positive) about certain improvements and modifications to make this already versatile device even more so. Some of these suggestions have in fact already been incorporated into its present form, some have been rejected but all suggestions have been read and considered.

Right off the bat I had discussions with Tim Van Milligan about whether or not the device should be made shorter to accommodate smaller rockets like the Estes Alpha. I made the point that making the device shorter would also make the longitudinal alignment less accurate in much the same manner that pistol sights are less accurate than those of a rifle. My view prevailed on this issue and the original overall length of roughly 9 inches remains. It was and is also my contention that the average beginning rocket builder was not going to shell out the then \$85 price tag and that most purchasers would already be experienced builders.

My suggestion was and is that when a shorter rocket or booster section is being constructed, that a simple workaround to the problem would be an additional section of body tube and coupler be temporarily used to extend the overall length so that it would span the two fixed end panels plus an amount sufficient to attach the fins. Most of us who have been at this for any length of time will have graduated from simple kits and soon find ourselves building scratch-built projects, but whether it's a prefabricated kit or a pure scratch build, this technique works.



FIGURE 1 - SHORT TUBES REQUIRE AN EXTENSION



FIGURE 2 - EXTRA TUBING AND COUPLER ALLOW FOR SHORTER TUBES TO FIT

Another way to create an extension for a short rocket body requires some very minor modifications to the tops and bottoms of the square hole in the sliding end panels and the V-cut in the fixed end panels. Where the router bit forms a 90-degree corner in these panels, it also leaves a radius echoing the diameter of the router bit used. The newer versions are made with a 1/8" diameter bit in a CNC machine, while older units were made with a 1/2" pattern routing bit leaving either a 1/16" or a 1/4" radius respectively. Cutting out these radii allows for a whole range of

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things. First off, it allows a length of aluminum angle to span the length of the device, and thus be used to support a short body tube or booster section.



FIGURE 3 - SHORT TUBE IS CRADLED BY THE ANGLE



FIGURE 4 - ANGLES CAN BE USED TO SUPPORT SHORT TUBES

This mod also allows an angle to be inverted and secured in the upper portion of the sliding end panels, thereby functioning as a straight edge for cutting accurate slots in thin wall body tubes with an X-ACTO knife. This is much preferable to slicing your hand with the knife and produces a very clean cut in the workpiece as long as it is done with a new blade. Masking tape can be used to further ensure that the body tube does not rotate or slip.



FIGURE 5 - ANGLES CAN BE INVERTED TO MAKE A STRAIGHT EDGE



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We also made design modifications to accommodate smaller diameter rockets, where the horizontal flanges of the aluminum alignment rails can make it difficult to see that the root edge of the fins are in proper alignment with the fin markings. Coping out the horizontal flanges would probably solve the problem but create a rail that was less stiff and thus prone to bending. A better solution is to simply attach aluminum flats to the inside surfaces of the rails with masking tape and project them outward and opposite from the normal configuration. This modification can also be a solution when a design involves five, six or more fins where the overhanging angle flanges might create an obstacle.



FIGURE 6 - ATTACH ALUMINUM FLATS TO EXTEND THE RAILS



FIGURE 7 - EXTENDED RAILS ALLOW FOR ODD FIN CONFIGURATIONS

In addition to its versatility for holding the rocket during construction or repairs, the box-shape of the guillotine fin jig allows it to be used as a storage container for common items, such as glue bottles, pencils, tape, and balsa scraps. During the development of the fin jig, we had considered making the side panels with cut-outs to reduce weight, however, we found that would add another step in manufacturing, and we liked the idea of the box-shape having an alternate use as a storage box.



FIGURE 8 - YOU CAN USE THE GUILLOTINE BOX AS A STORAGE CONTAINER

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FIGURE 9 - APPLYING FILLETS

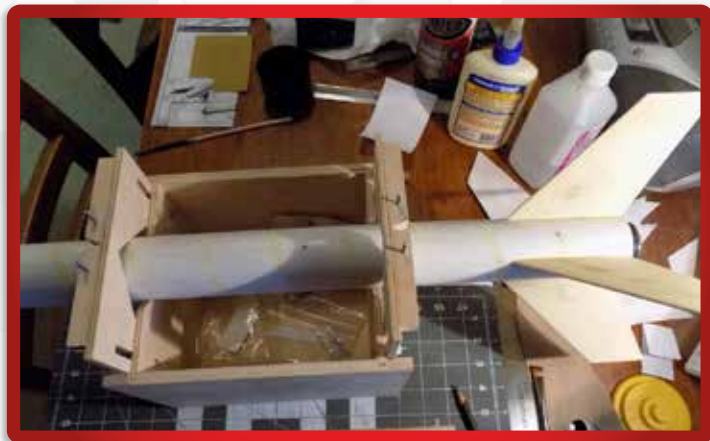


FIGURE 10 - THE JIG CAN HOLD THE ROCKET TO APPLY FILLETS

The Guillotine can also be used as a simple vise when applying fillets to the junction of the root fin edges to the body tube, or any other task that the project be kept in a stable position. After the fin adhesive has fully set, the aluminum alignment rails can be removed allowing the body tube to be rotated so that the fillets can be applied in the "valleys" thus formed. Taping the sides of these valleys and the use of a round dowel are helpful in this process, as is patience.



FIGURE 11 - TED MACKLIN

With regard to the Large Guillotine fin jigs, after some time I began to get a number of complaints involving the quality control on the aluminum rails, and I knew it was time to make a change. When I first started making the large unit, I was using 2" x 2" x 0.125", 6063-T52 architectural aluminum, mainly because it was what was readily available. It came in 16' lengths, and the profile of the cross-section had a sharp inside radius, so it would nestle

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together neatly in a shipping tube. I now provide all large jigs with 2" x 2" x 0.1875" 6061-T6 structural aluminum,



FIGURE 12 - CHARLIE MACKLIN

which is considerably more rigid and square. The downside is that these come in 25' sections which are somewhat awkward to handle around the shop, and they cost more, and the fillet in the extrusions do not nestle together very well. But I don't get any more complaints on the product and that is a beautiful thing!

A modification that I fully endorse is to modify the bottom with the addition of a heavier panel that can be secured on or adjacent to a drill press and used to more accurately drill holes for rail buttons and other things of similar nature that require precision alignment.



FIGURE 13 - USE THE JIG AS A VICE



FIGURE 14



FIGURE 15

One thing that has continued to vex me is finding a way to "index" the fin locations around the circumference of a given body tube on the device itself. Because the device is

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adjusted to fit the workpiece, every tube will have a different diameter and thus a different center point, making this challenging. For now, the best way I've found is the simple, old, tried and true method...making a paper wrap. Works every time it's tried!

<https://www.apogeerockets.com/education/downloads/Newsletter309.pdf>

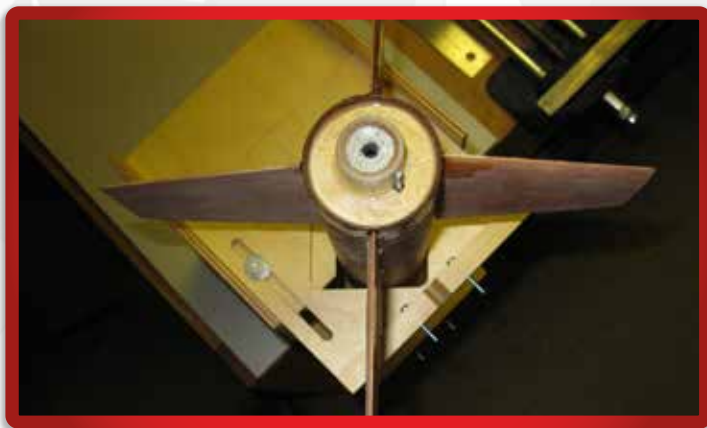


FIGURE 16 - THE JIG CAN BE SET ON ITS END

The Guillotine can be stood on one end when working on the "business end" and I'm not aware of any other fin jig that can be used in this manner. When Tim claimed that the Guillotine was "one of the most versatile and revolutionary alignment fixtures that we've ever seen" he wasn't just Whistling Dixie, and this versatility is only limited by the imagination of the user.

One ingenious fellow who must and shall remain anonymous has even used his jig to hold his rocket in place while he tested various ejection loads. Interesting, but I

don't recommend this as a routine technique unless you have an unlimited budget.

Finally, a word of caution. At least one customer recently informed me that when he tried to pass his 6.17" diameter tube through the 6.187" square hole it would not fit and so he forced it in and managed to split the top of the sliding panel. My advice...don't try this at home! When you approach the upper limit of any size Guillotine, there comes a point at which it will not work as intended, just as a Crescent wrench will not go beyond the limit of its adjustment screw and you would have to go to the next size range up. So, if you want a larger, custom size for your particular



FIGURE 17 - CUSTOM SIZED GUILLOTINE

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About the Authors



FIGURE 18 - CHARLES "TED" MACKLIN

Shown in the photograph is Charles Macklin, also known as "Ted," standing next to the prototype "Trimaximus" kit rocket. Mr. Macklin and his son, Charlie, have been flying model rockets for over 30 years. It was around the year 2000 that they jokingly coined the phrase "Mack-



lin Missile Works" because of how focused they were on a hobby that would later become a business. In late 2011, Mr. Macklin invented the "Guillotine Fin Jig", and Charlie had a hunch that they should contact Apogee to get started marketing the invention, which turned out to be a success. Visit us at macklinmissileworks.com for our full product line.

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Alliance Raider Rocket Plan



A design by James Bassham

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Alliance Raider Rocket Plan

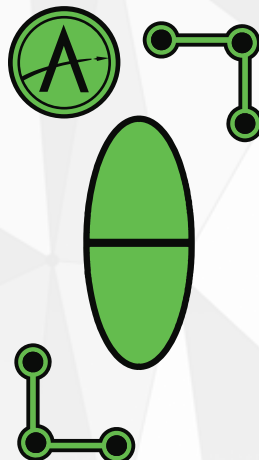
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Download the **RockSim** design file for the Alliance Raider at: <https://www.apogeerockets.com/Peak-of-Flight-Rocket-Plans>

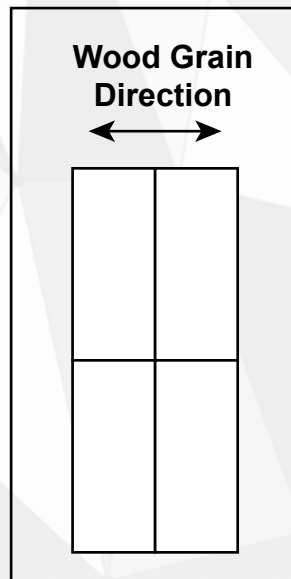
Alliance Raider Parts List

- 12002 - (1) Motor Mount Kit 13mm/18mm
- 10086 - (1) 18mm dia. (BT-20 size) Body Tube (8" long)
- 19803 - (1) PNC-18D Nose cone
- 10141 - (1) 41.6mm dia. (BT-60 size) Body Tube (1" long)
- 13052 - (2) Apogee Launch lug - 1/8" X 1"
- 30325 - (1) #100 Kevlar Shock Cord - 48 inches long
- 30303 - (1) 2" wide Mylar Streamer - 24 inches long
- 14098 - (1) 1/16" X 3" X 18" Balsa wood fin stock

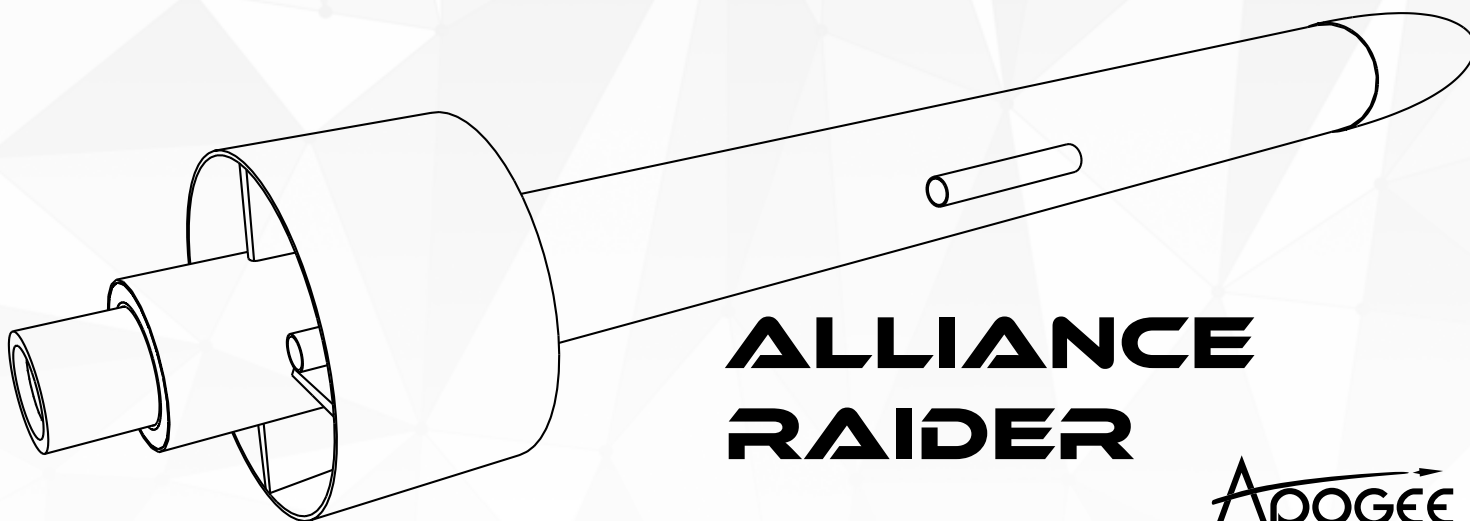
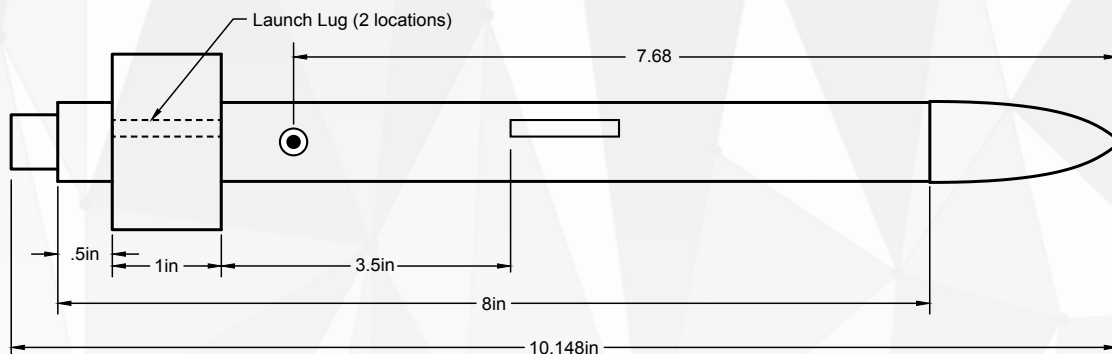
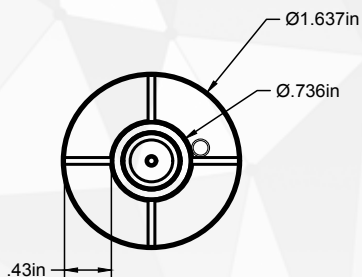
Decal Sheet
1-1/2" X 2-1/2"



Wood Grain
Direction



Balsa Sheet
1/16" Thick
1-1/2" X 3"



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