PEAK OF FLIGHT NEWSLETTER

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ADAPTING A CAMERA TRIPOD FOR A RAIL LAUNCHER

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APOGEE COMPONENTS

PEAK OF FLIGHT

Adapting a Camera Tripod for a Rail Launcher

By David Newill

Frankly, I have gotten to the point where getting down on my knees to make starter (igniter) lead clip connections is simply not fun! And when working with youth, it is so much easier to work at their eyeball height that an adjustable tripod-based launch pad makes the entire effort much more fun! Working at the level where you can actually see the connections and get them right means far more – nearly 100% - 1st time ignitions, which is especially important when one is helping newcomers to our aerospace hobby/sport.

FIGURE 1: HONEST JOHN AT LAUNCH

A 1010 rail launcher makes the flights even better! Large and heavier or slower rockets get that extra bit of stability [think TARC !] while eliminating "rod-whip" that comes from larger diameter designs or those with stand-off launch lugs used to clear the rod from a payload section.

Combining a 1010 rail with a tripod style launcher makes great sense – except for the minor matter of getting the rocket onto the rail…hmmm. And there are lots of plans for PVC or steel tube assemblies for such, however I really like carrying one item to the launch site, not a bag full of parts that I need to then assemble.

Fortunately, a typical camera tripod can easily tilt the rail down to a convenient loading position and even give you a very easily adjusted system for launch angle adjustments if needed. [Straight up is nearly always best!]

Here is one way to adapt a photo type tripod head to a rail launcher. You can use this as a thought starter for your own particular tripod.

Firstly, nearly all of the parts except the tripod and 1010 rail can be found at a local big-box hardware/builder's supply store. The 1010 rail can be sourced from several places – see below link in parts list. The tripod I'm adapting is an older Vivitar brand. Used camera tripods can be found online or at thrift resale stores like Goodwill or similar. Check to make sure the telescoping legs all lock firmly! Those that do not lock are usually easily fixed if you are handy with simple tools.

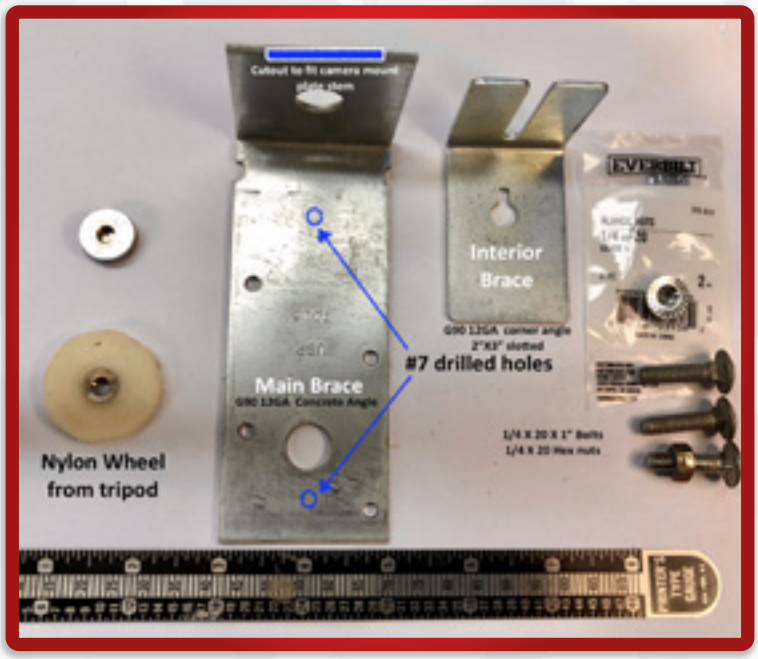

FIGURE 2: TRIPOD RAIL PARTS LIST

Parts list – {Figure 2} Left to Right – Camera Mount tension nuts from tripod camera mount plate, Main Brace Plate, Interior Brace Plate, ¼-20 flange nut, ¼-20 X 1" thread carriage bolts (only two needed) and ¼ -20 nuts. I also used an aluminum license plate and a 6"X 6" ceramic tile.

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About this Newsletter

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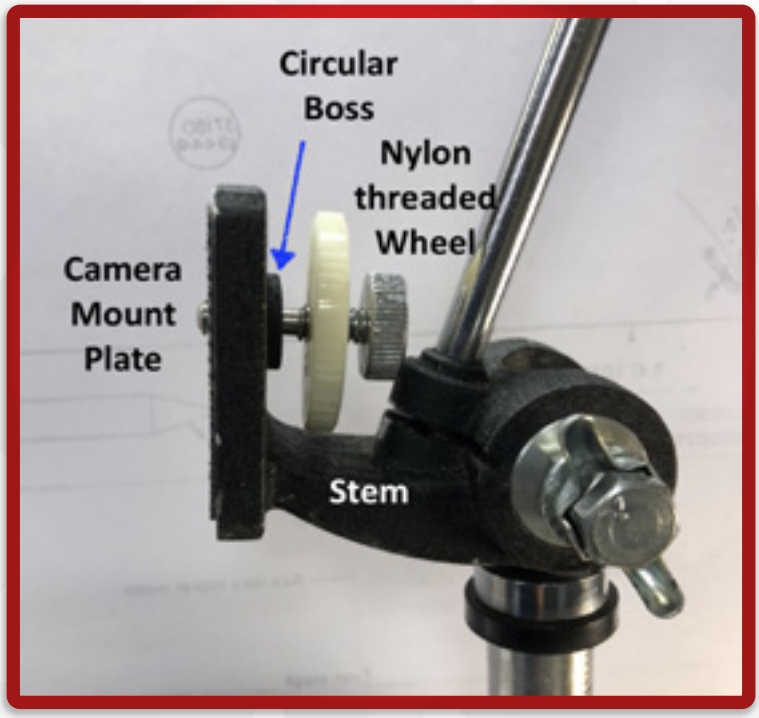

FIGURE 3: TRIPOD RAIL CAMERA MOUNT AS-IS

Tripod head – as in {Photo 3}

[NOT ALL Camera tripod mount plates are the same! So adapt the below as necessary for your particular tripod!] My first thought was simply to bolt a 90° angle plate onto the camera hold down thread. You quickly find out the moment arm of the 1010 rail will overcome this sort of connection. Instead, I went with a clamping arrangement that captured the entire camera mount plate between two 90° angle plates. [See photo #16]

Start by disassembling the threaded mount that fits into the camera mount plate of the tripod. In my case, the small "silver" knob actually is threaded to the end of the longer thread extending through the plate and up into the camera base. Then off came the larger nylon wheel with a pressed-in-place nut.

An examination of the curved "stem" from the tripod adjustment head – the bigger part that allows it to pivot and tilt – showed this to be a casting with radius curves on the stem to camera plate and the round "boss" that holds the "captured" longer camera mount threaded rod. Those impact some of the next steps.

Measurements count! {Photo 4} Of particular note for this step is the width of the "stem" where it meets the camera mount plate and the diameter of the cast "boss" in the center. For this assembly, the main brace has to fit "under" the camera mount plate – hence the brace must be trimmed to fit both the "stem" and the "boss". Marking the dimensions on the brace is shown. {Photo 5} NOTE! This particular design mounts the rail to one side of the camera mount plate – not over one of the ends!

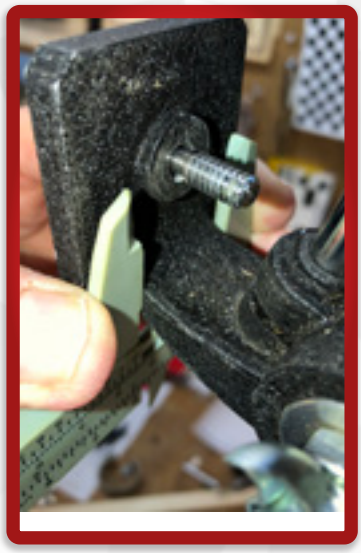

FIGURE 4: TRIPOD RAIL CAMERA MOUNT MEASURE

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Adapting a Camera Tripod for a Rail Launcher

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FIGURE 5: TRIPOD RAIL MOUNT MAIN BRACE MARK UP

FIGURE 6: TRIPOD RAIL HEAD STEM CLEARANCE

I used a hacksaw to start the cut for the "stem" pocket, then a small grinder to remove the metal, creating a long rectangular slot. [Photo 6} The existing large hole in short leg of the main brace was a near perfect fit for the "boss" (got lucky there) - but both the slot and hole needed to be chamfered with a 45º relief to fit the radius of the casting edges so that the main brace plate fits tight to the bottom of the camera mount plate. This is done with a half-round or third circular ½" bastard file. {Photo 7} A bit of trial and re-fitting is likely needed to get a good tight fit to the underside of the camera mount plate. {Photo 8}

Next, the inside brace is fitted to the top of the camera mount plate and the three parts clamped into position. {Photo 9} There is a ½" hole in the interior plate already. Now I simply used a permanent marker to color the location of that hole onto the main brace interior. Removing the parts, I use a centerpunch {Photo 10} to mark the location for an almost ¼" hole for the carriage bolt. The actual drill

FIGURE 7: TRIPOD RAIL BASE THREAD CAST BOSS CLEARANCE

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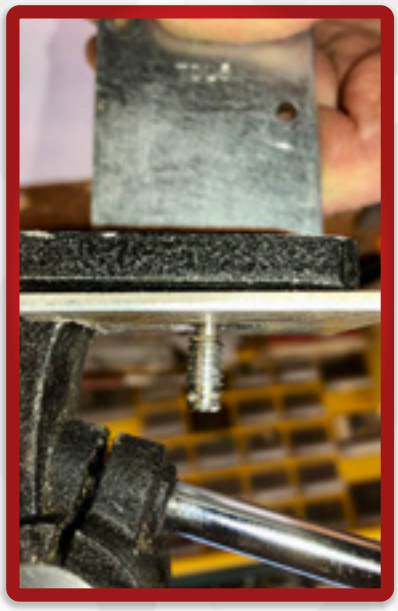

FIGURE 8: TRIPOD RAIL MAIN BRACE FITTED

size used was a #7 or 13/64th so I could use a proper sized tap later. You could use a 3/16th drill as well, but be careful with the tap!

As the brackets are stamped steel, you may find them "work hardened" and so a center punched start, good sharp bit, some cutting oil and a proper slow speed to the drill will make these holes go much easier – take your time or a drill bit will be broken! If you are using the right speed and pressure, you will see small curls or chips of cuttings come from the flutes of the drill.

Using a shop square, I lined up a second identical hole near the top of the main bracket. This one will fit a second ¼-20 bolt and align the 1010 rail.

After the holes were drilled, a ¼-20 tap {Photo 11} was used to create threads through the main bracket. [That is why the hole is very slightly undersized] Again, cutting oil is the secret to getting a good clean thread from the tap.

Now you need to get the ¼-20 carriage bolts reshaped slightly to fit into the channel of a 1010 rail. Depending

FIGURE 9: TRIPOD RAIL INSIDE BRACE CLAMPED

FIGURE 10: TRIPOD RAIL MAIN BRACE PRE-DRILL

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FIGURE 11: TRIPOD RAIL TAPPING ¼-20 HOLE

on the bolts you get, they might just fit – but probably need to be filed flat on two edges {Photo 12}. Here too, a bit of trial fitting is needed. The bolts should just slide into the rail {Photos 13 & 14}.

The last part to be fabricated is the blast shield holder. In my case an old aluminum license plate was fitted for a 6" X 6" piece of ceramic tile. The tile lasts nearly forever, and does not conduct electricity in case your starter clips are resting on it. Any easily bent .020 steel or aluminum sheet metal would work for this – 6" wide by 9" long.

I simply used a vice as a metal brake and folded up a bottom lip to fit the tile thickness, then scored two lines for the size of the tile and a place for a hole to bolt the blast shield to the rail {Photo 15}.

FIGURE 12: TRIPOD RAIL ¼ 20 CARRIAGE BOLTS FILED

FIGURE 13: TRIPOD RAIL BOLT FITTED

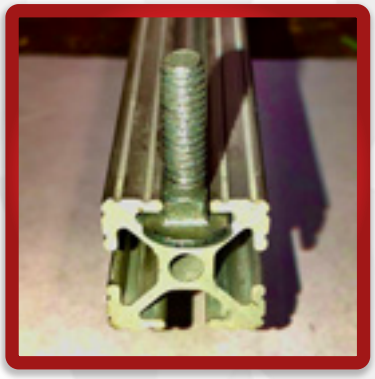

FIGURE 14: TRIPOD RAIL BOLT SLIDES IN

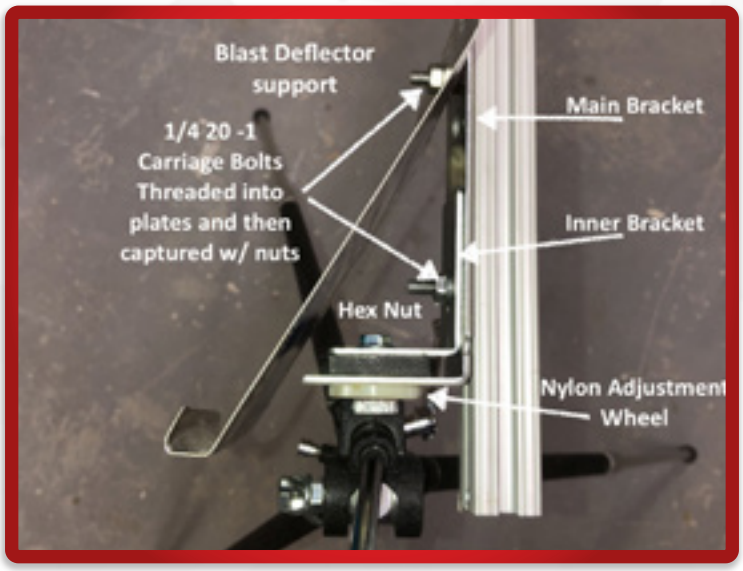

FIGURE 21: TRIPOD RAIL ASSEMBLY

FIGURE 15: TRIPOD RAIL BLAST DEFLECTOR

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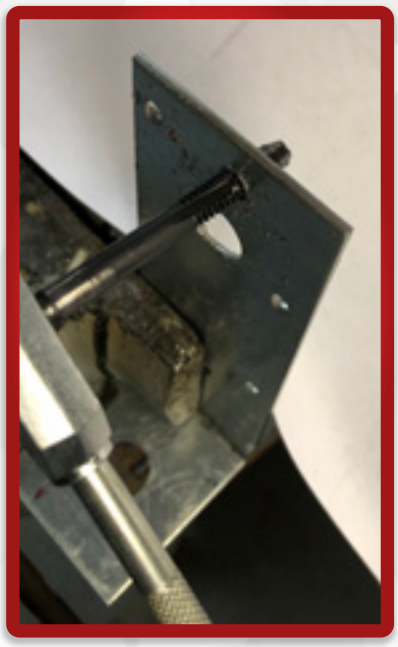

FIGURE 16: TRIPOD RAIL ASSEMBLY

Assembly starts with the main bracket over the threaded rod, the interior bracket on top of that same rod, the ¼-20 Flange nut to tie them together and the threaded nylon wheel to tighten those bits together. The small silver threaded cap finishes it off – probably not a key need.

Now the two ¼-20 carriage bolts are screwed through the two threaded holes from the "outside" of the main brace and snugged tight. Make sure the flats are lined up for the 1010 rail slot. Fortunately, the square head on my bolts was just right for the needed clearance, but snug enough to keep the rail from simply sliding on too easily.

Laying the assembly flat on the workshop floor makes inserting the 1010 rail easier. If the rail is too tight on the main mounting plate, you might need to back off the carriage bolt ½ turn.

Add ¼-20 nuts to the interior of the assembly, mounting the blast shield support in the process. Tighten as needed and you are done! {Photo 16}

One tip - {Photo X - Tripod Rail Zip-Tie Trick} I always have a few small zip ties in my range box. They are like masking tape for some applications. At the launch site, I zip them around the 1010 rail to hold the alligator clips wires to the launcher so there is no tension on the starter in the motor, and I use a second one to act as a block or stop for the rail button or rail guide on the rocket, positioning the nozzle near the clips and the blast plate, but giving me room to work. That upper zip-tie should be just snug enough be repositioned if you are careful and used for different rockets button / rail-guide positions.

I carry the tripod launcher to my site as one assembly, not removing or re-installing the rail, although it can be done easily with an adjustable wrench.

FIGURE 17: TRIPOD RAIL TILTED FOR LOAD

Set-up consists of extending the tripod legs and locking them. If a leg does not feel secure, a zip-tie secured to the smaller diameter tube to the rescue! Don't use tape, it makes a mess for later.

Once the alligator clips cable from the launch controller / battery is in place and zip-tied, the rocket is prepped, and the rail tipped over nearly 90° and the rocket slid onto the rail. [Photo 17} Wow is that easy! Pivot

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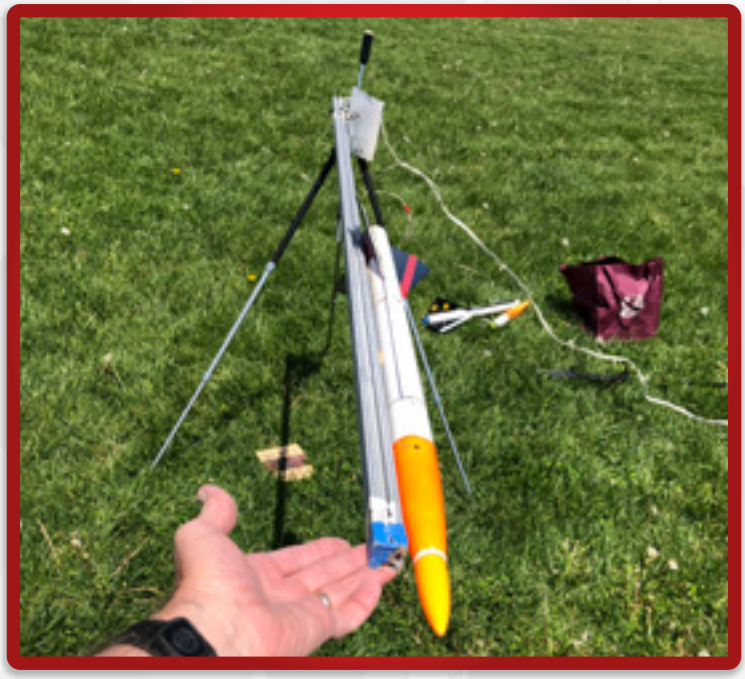

FIGURE 18: TRIPOD RAIL TILTED FOR LOAD

the rail to the launch angle, then rotate the head as desired, install the ceramic blast shield and you are ready for launch {Photo 18}.

Check out our Facebook page
www.facebook.com/ApogeeRockets

This launcher has been used for two years now with no issues or modifications. The largest rocket launched was a mid-power design with "F" engine {Photo 19}. It should be robust enough for most sport and mid-power rocket launches. Clearly heavier high-power rockets need proper ground support equipment. The tripod is not sturdy enough for a high-power rocket, and likely will fall over very easily. Be SAFE!

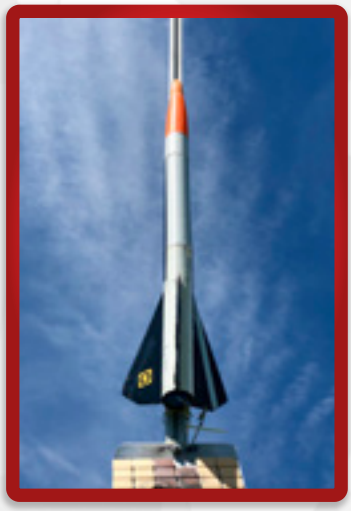

FIGURE 19: TRIPOD RAIL W/ HI-FLYER XL SINGLE STAGE

Parts List

Qty	Nomenclature	Source	Est. Cost
1	1010 Framing rail – 6'	https://www.grainger.com/product/80-20-Framing-Extrusion-10-Series-2RCP8	$32
1	Photo Tripod	Thrift Shops – Craig's List – etc.	$10 – or free!
1	Main Brace	Home Depot – UTDL5 G90 Concrete Angle	$5
1	Interior Brace	Home Depot – UBL3 G90 Corner Brace	$4
2	¼ - 20 1" Carriage bolts	Home Depot pack of 12	$4
2	¼ - 20 Nuts for above	Included in pack of 12	--
1	¼ - 20 Flange Nut	Pack of 2	$2

Fabled Flyer Rocket Plan

Download the ***RockSim*** design file for the Fabled Flyer at:
https://www.apogeerockets.com/Peak-of-Flight-Rocket-Plans

Fabled Flyer Parts List

10086 - (1) AT-18/18" (6pk)
10131 - (1) AT-33/18" (6/pk)
13028 - (1) CR-13/18 (2/pk)
13032 - (1) CR-18/24 (6pk)
13052 - (2) 1/8" Launch Lug 1" Long (6pk)
13404 - (1) CR-18/33 Cardstock (4/pk)
14099 - (1) Balsa Sheet 1/8" x 3" x 18"
20068 - PNC-33MM (BT-55) (2/pk)
24046 - Regular "D" Crimped Engine Hook (6/pk)
29121 - 12" Parachute Pack
30325 - 100# Kevlar Shock Cord (per foot)
41100 - Fabled Flyer Decal Sheet

Order parts at:
https://www.apogeerockets.com/Quick_Order

Build Notes

- Refer to the Advanced Construction video series on how to build a rocket from plans - https://www.apogeerockets.com/Advanced_Construction_Videos/Rocketry_Video_287 to help in building this kit.
- The only suggestion we have on this rocket is to "paper" the fins for extra strength. The grain direction on the rear portion that hangs down, is sort of weak. It could snap on a hard landing. You can see the papering technique in Advanced Construction Video #16 (https://www.apogeerockets.com/Advanced_Construction_Videos/Rocketry_Video_16).

Fabled Flyer *By Tim Van Milligan*

About the Design

The backstory on this rocket is that it was one of the prototypes for a new Apogee rocket kit. Our goal in this case, was to make a simple skill-level-one design that people would find easy-to-build. When we make kits, we often do several concepts for the decals and the overall color scheme. Of the many design choices for the new kit, it came down to two options: the Fabled Flyer, or the Habu (https://www.apogeerockets.com/Model-Rocket-Kits/Skill-Level-1-Model-Rocket-Kits/Habu). It was really a tie vote amongst our staff for which one would go in production. It came down to a coin-flip, and the Habu won.

But we liked the Fabled Flyer as well, so we decided to make it into a newsletter plan that people could build themselves. You'll find the only major difference between the Fabled Flyer and the Habu is the shape of the fins and the decals. Originally, they had the same fin shape, but we modified the Fabled Flyer for this plan just to make it a bit different. In actuality, the Fabled Flyer is actually released before the Habu!

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Fabled Flyer Rocket Plan

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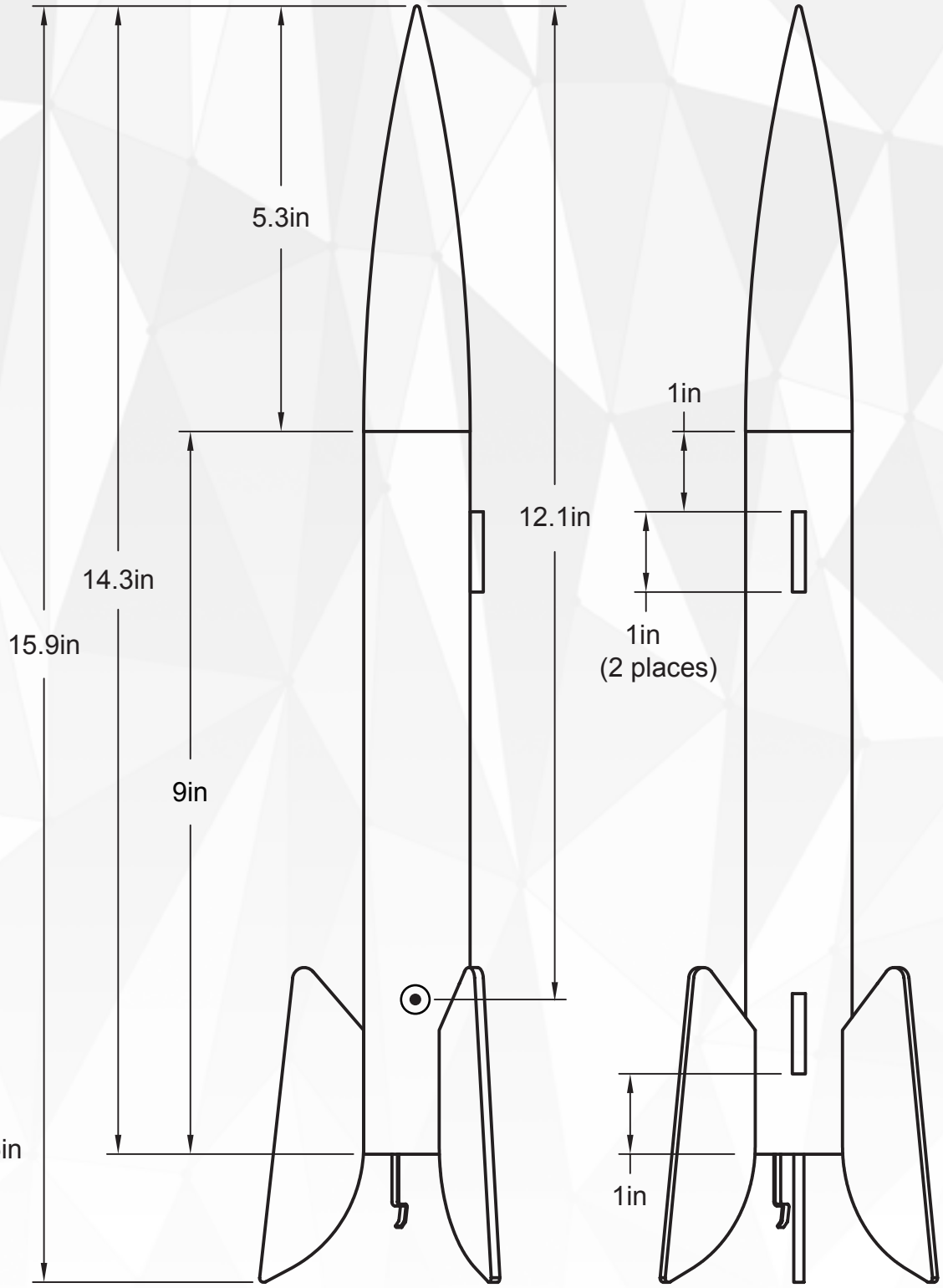
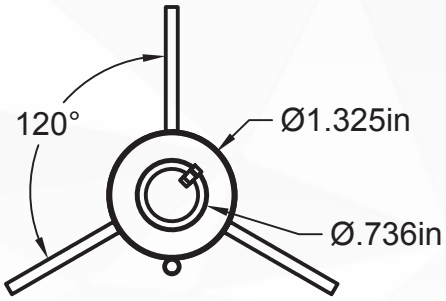
Side View



Rear View



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Fabled Flyer Rocket Plan

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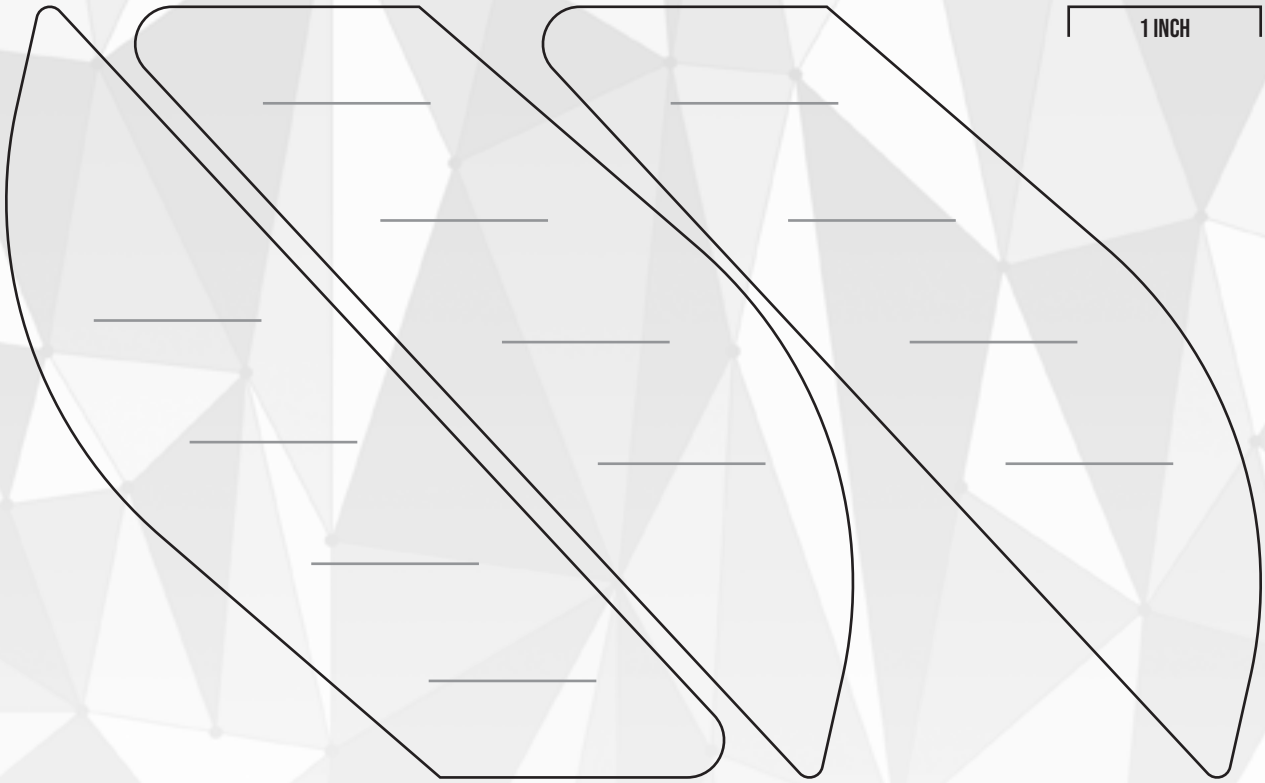
Fin Template



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Fabled Flyer Rocket Plan

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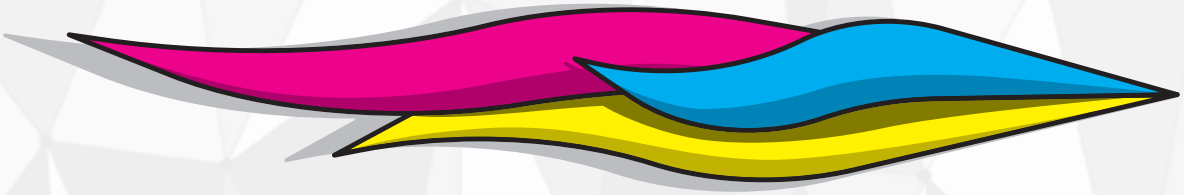
Purchase Decals

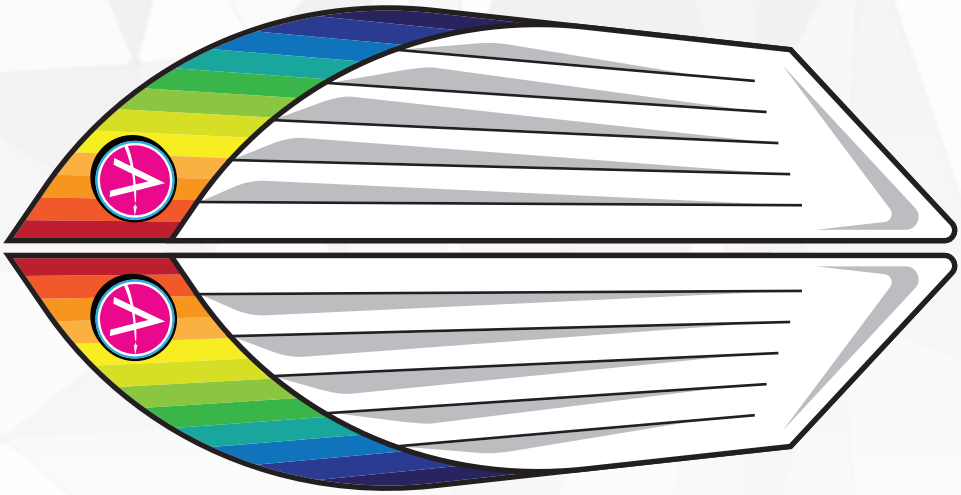
You can print the below decals or purchase printed decals here: https://www.apogeerockets.com/Building-Supplies/Replacement-Parts-for-Kits/Replacement-Decals/Fabled-Flyer-Newsletter-Plan-Decal

Body Tube Decals

White; body tube

1 INCH



Fin Decals

White; 6 total, one for each side of the fin