Apogee Components

PEAK OF FLIGHT

NEWSLETTER

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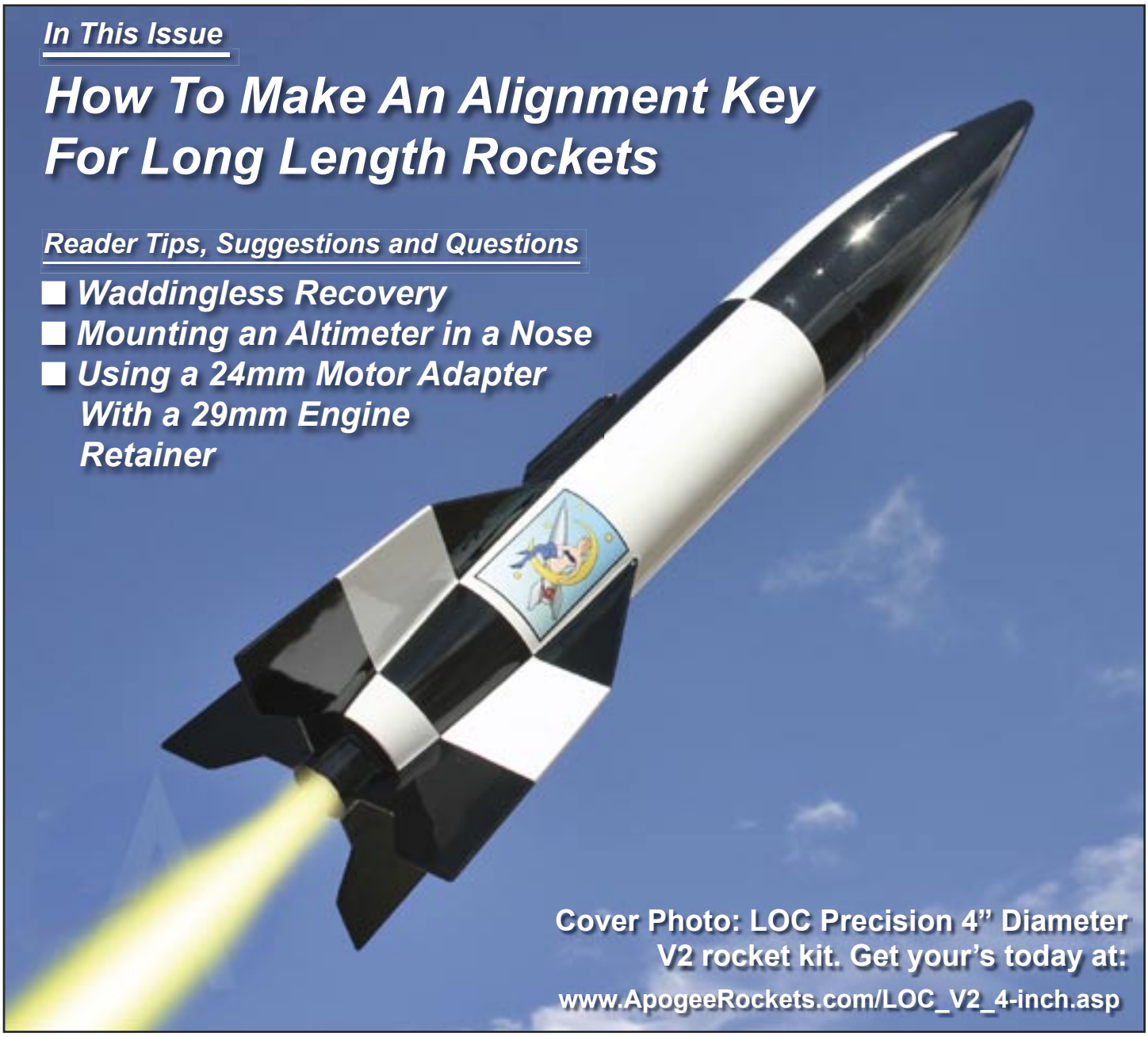

Cover Photo: LOC Precision 4" Diameter V2 rocket kit. Get your's today at:
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How to Add an Alignment Key to Your Rocket

By Daniel Cavender

On all of my high powered rockets, I like the hard-to-replace-or-repair parts to be built using anti zipper techniques. This usually means that the booster section has a permanent coupler epoxied at the top with a reinforced bulkplate and U-bolt. The whole section is designed and built to accommodate the largest motor I plan to fly in that rocket.

I also like to have one rail button within two inches of the bottom of the rocket and the other within one body diameter of the unloaded rocket's center of gravity. For my rocket designs, this almost always means that the forward rail button is on another section of the rocket. It goes without saying that the two rail buttons must be aligned with each other.

I used to accomplish this by shear pins alone. I would carefully align the rail buttons on my bench and then drill the holes for the shear pins.

This worked well for a while, but then I stumbled upon one of those special cases where I accidently torqued the rocket getting it onto the pad and sheared the pins. I didn't know until the rocket separated prematurely during the coast phase and deployed the drogue chute at near 500 miles per hour. I got the rocket back, but I recognized the need for a way to take the torsion load off of the shear pins. While I was at it, I thought, wouldn't it be nice to have an easy way of aligning those tiny shear pin holes too? Then I got the idea. A triangle shaped alignment key! Perfect!

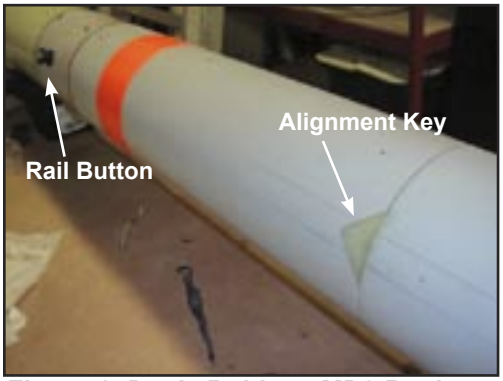

Figure 1: Dan's Rubicon MD2 Rocket with Key Engaged

Preparation and Setup

This was so easy to do. All I needed was my rocket, a pencil, a coping saw with a thick blade, a long straight edge, a little sand paper (150 – 220 grit), some masking tape, and some epoxy. Most rocket builders already have these items.

I decided that the easiest place to place the triangle alignment key would be on the back side of the rocket in line with the rail buttons. I wrapped a little bit of masking tape around the coupler between my rocket segments and assembled them. If your segments are already snug you might not need to do this. I assembled the two segments and aligned the rail buttons with the straight edge.

I then drew a straight line between the two rail button extending about 3 inches on either side of the separation plane. I then disassembled the segments and removed the masking tape. With the pencil and straight edge, I drew an equilateral triangle that was 1 inch tall and 2 inches wide onto the airframe segment. The top vertices of the triangle were on the line that I drew earlier. The bottom edge of the triangle was on the edge of the airframe. I continued the line up onto the coupler on the booster to help place the triangle in a later step.

How To Cut the Alignment Key

I used the coping saw to carefully cut out the triangle

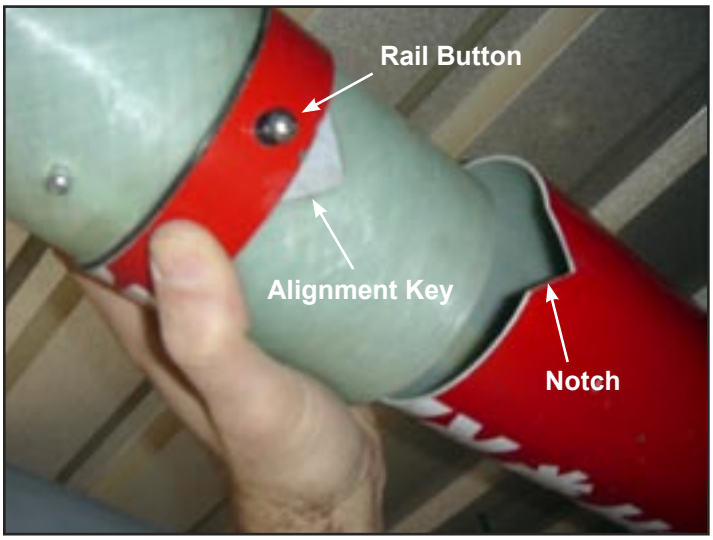

Figure 2: Parts of the rocket separated so that you can see both the key and the notch.

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Add an Alignment Key To Your Rocket

that I drew on the airframe segment. The coping saw was perfect for this step. I cut up one side to the tip and then up the other side to the tip.

Once the key was cut out, I used the sand paper to clean up the edges of the triangle and the notch in the airframe. I lightly sanded the inside surface of the triangle piece and wiped it with alcohol to prepare it for the epoxy. I also lightly sanded and wiped the surface of the booster coupler where the triangle will be epoxied.

Epoxy The Key on the Booster

I mixed just enough epoxy to coat the inside surface

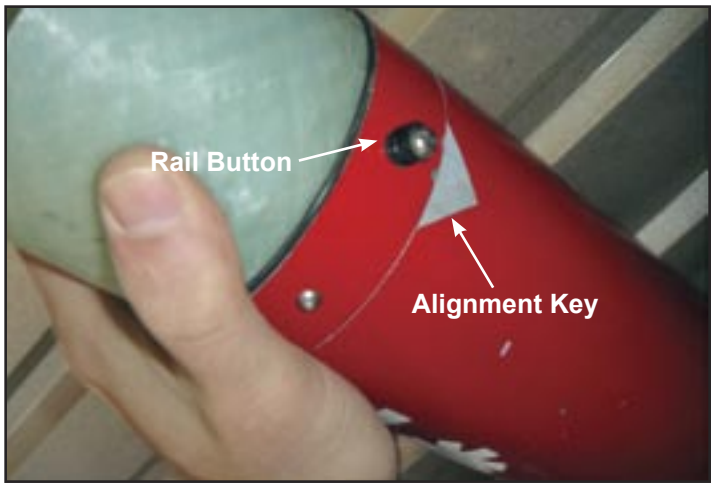


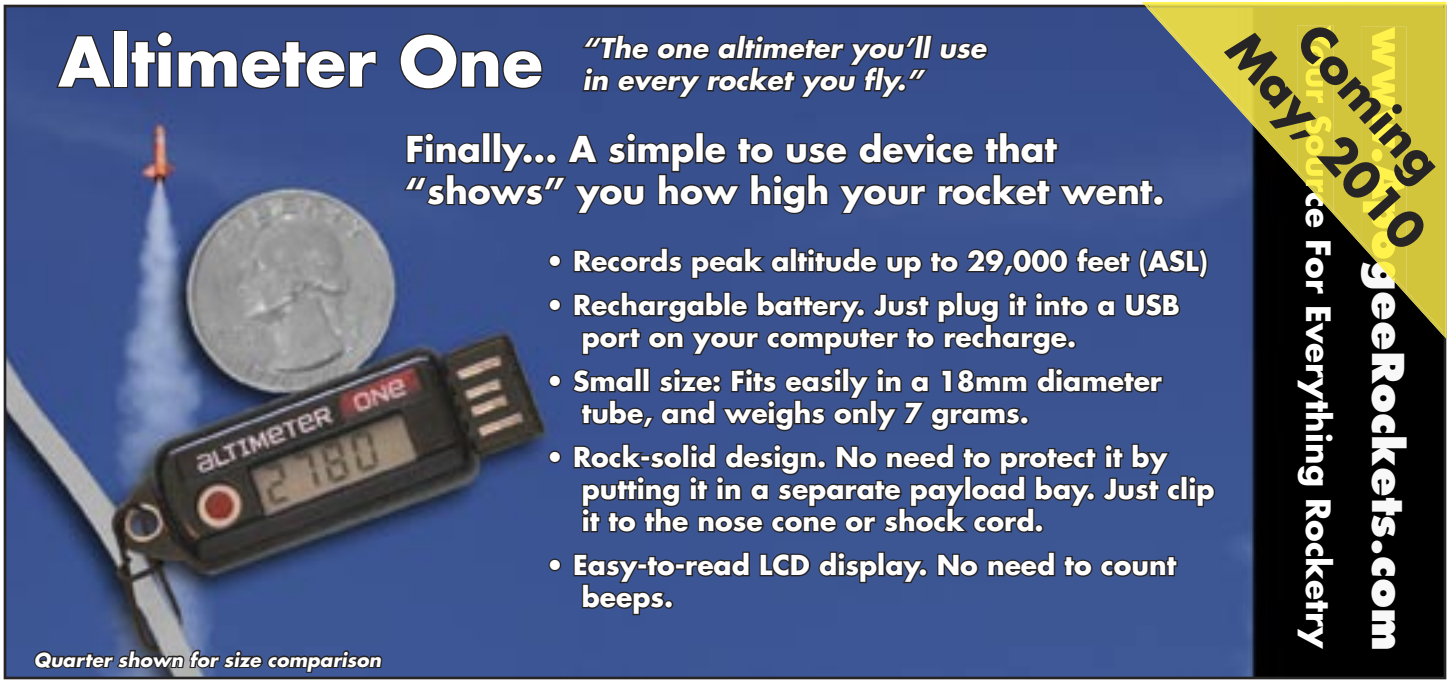
Figure 3: Alignment key engaged. Now the rail buttons line up, and there is no torque on the shear pins.

Figure 4: A one-two punch for learning how to build big rockets: "Model Rocket Design and Construction" and "Modern High Power Rocketry 2."

of the triangle. Using the mixing stick for the epoxy, I laid a thin coat of epoxy onto the inside surface of the triangle. I carefully placed the triangle onto the booster coupler with the bottom of the triangle laid against the shoulder of the booster. I aligned the tip of the triangle to the line I drew on the coupler earlier. I was careful to clean up any epoxy overrun from the triangle. It is easier to wipe it up than to sand it off.

After the epoxy cured, I fit the two pieces together and confirmed that I had a good alignment. I used some sand paper to clean up dried overrun.

The alignment key makes it very easy to mechanically align the rocket segments and take the torsion load off of the shear pins. I spend less time trying to align those small shear pin holes too.



Reader Questions, Comments, and Suggestions

Answers by Tim Van Milligan

Waddingless Recovery

Romeo Collado writes:

I've learned so much about rocketry from your web site so I thought I'd give something back. I'm not sure if you've seen anything like this yet but I thought I'd share it with you anyway.

I stumbled on this idea while working on a recent 3" diameter scratch built rocket project. I was toying with different wadding-less recovery systems and was test fitting a centering ring for baffles. I looked around for something to push the ring down the body tube about 6" and reached over for my plastic drink bottle which was conveniently next to me. The bottle fit. In fact it fit PERFECTLY! Ten minutes later I completed what I call PPP (parachute protective piston) for lack of better terminology. Just cut the top off the bottle and you are done!

It is light weight, strong, easy to make, and cheap. To protect the bottom from the heat of an ejection charge I simply taped a piece of cardboard to the bottom of the cylinder. You could also use foil tape (typically used for AC/Heating ducts) for added protection. If your bottle is a little small for the BT you are using, just glue a centering ring to its bottom. You can experiment with different size plastic bottles to suit your needs. Just another way to re-use them and help our environment.

Hope that you find this tip useful. Please feel free to share it with the rocketry world.

Figure 1: Just cut a plastic juice bottle!

Figure 2: Parachute Protective Piston

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Reader Questions, Comments, Suggestions

Tom Shoemaker has this neat tip: *"I modified an old, beat up Aerotech Initiator (www.ApogeeRockets.com/Aerotech_Initiator.asp) nosecone, using Velcro to hold the altimeter during it's flight.*

Figure 3: How-High Altimeter velcro'ed to the inside of the nose cone shoulder.

Figure 3 shows the altimeter's yellow "holding pouch" which has black Velcro strips used to secure the pouch to the inside of the nosecone's sticky back Velcro patches. It's a kluge but it worked. I simply turned on the altimeter, secured it inside of the nosecone, taped the nosecone back together and launched.

Figure 4: Tom's flight with the altimeter in the nose.

Figure 4 shows the actual flight on 27 Mar 2010, at the SARA "Desert Heat". The rather pronounced tilt of the flight is real, the launch angle was into a rather strong wind. The windage allowance was pretty good since the rocket landed about 300 feet from the medium power launch pad. The recorded altitude was 1198 feet."

You might be wondering about putting the vent hole on the nose cone. This is OK with altitude-only altimeters like the Altimeter One and the How-High Altimeters. For data-logging altimeters, like the PerfectFlight Alt15K/WD, you do need the vent hole to be on the straight section of tube in order to prevent false altitude readings.

On altitude-only altimeters, the altimeter will slow down enough at apogee and at deployment that the pressure will equalize quickly inside the nose cone so that you do get an accurate altitude reading on the device.

Engine Adapters With Engine Retainers

A common question we get at Apogee is "can you use

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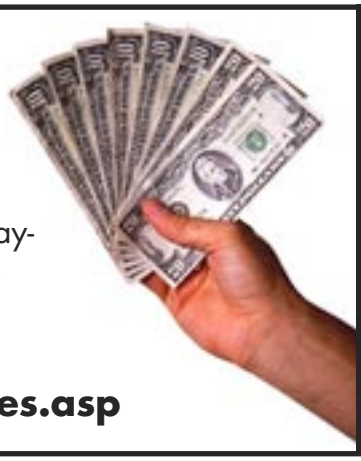

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Reader Questions, Comments, Suggestions

the 24mm motors in rockets that use the 29mm AeroPack Retainers?" The answer is yes.

First of all, we recommend the engine mount adapter, part number 12008 (www.ApogeeRockets.com/motor_mount_kits.asp). It has a standard engine hook that will hold the 24mm motor securely into the adapter. That is important.

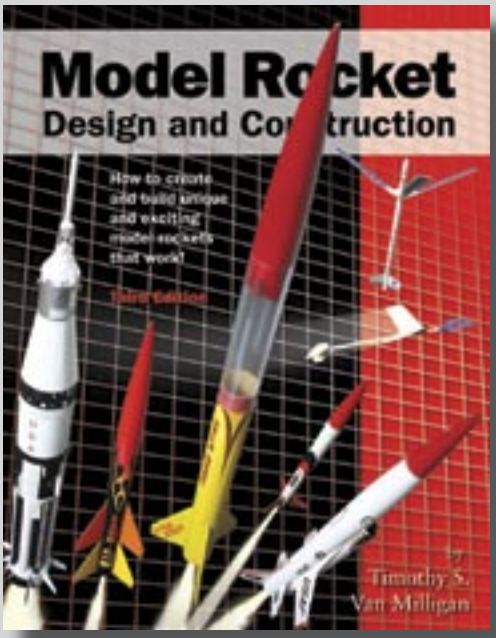
Next, cut some masking tape 1/4-inch wide, and build up a stop over the aft-most centering ring (see Figure 5). This stop is going to prevent the whole engine mount adapter from sliding forward into the 29mm tube that is in your rocket kit.

Figure 5: Build up a layer of masking tape on the aft centering ring to prevent the adapter from sliding into the 29mm tube that is in the rocket kit.

Figure 6: With the retainer cap screwed into place, the motor mount adapter is securely locked in position.

Once you insert the adapter into the tube, screw on the engine retainer cap (see Figure 6). Once the cap is in place, the whole assembly is locked into place and cannot move either in the forward or rearward direction,

There are two important things you must consider before using the 24mm motor in the bigger kits. First, will the smaller motor have the power to safely lift the rocket into the air? And second, as you can see from Figure 6, the engine will be further aft in the rocket. Becasue of this, the CG will move rearward making it less stable. You will need to check with RockSim (www.ApogeeRockets.com?rocksim.asp) to make sure that the rocket is safe and stable in both instances. Otherwise, we recommend staying with a high-thrust 29mm diameter motor.



Model Rocket Design and Construction

By Timothy S. Van Milligan

New 3rd Edition Now Shipping!

This new 328 page guidebook for serious rocket designers contains the most up-to-date information on creating unique and exciting models that really work. With 566 illustrations and 175 photos, it is the ultimate resource if you want to make rockets that will push the edge of the performance envelope. Because of the number of pictures, it is also a great gift to give to beginners to start them on their rocketry future.

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