Issue 653 / June 3rd, 2025

PEAK OF FLIGHT NEWSLETTER

Apogee Components, Inc. / ApogeeRockets.com / Colorado Springs, CO

Mako Mods—A Masterclass for Rocket Experimentation



PEAK OF FLIGHT NEWSLETTER

Issue 653/ June 3rd, 2025

COVER PHOTO



Apogee Mako—Multiple Colorways

The Apogee Mako can be constructed with various modifications.

FEATURED ARTICLES



Mako Mods—A Masterclass for Rocket Experimentation

by Tim Van Milligan

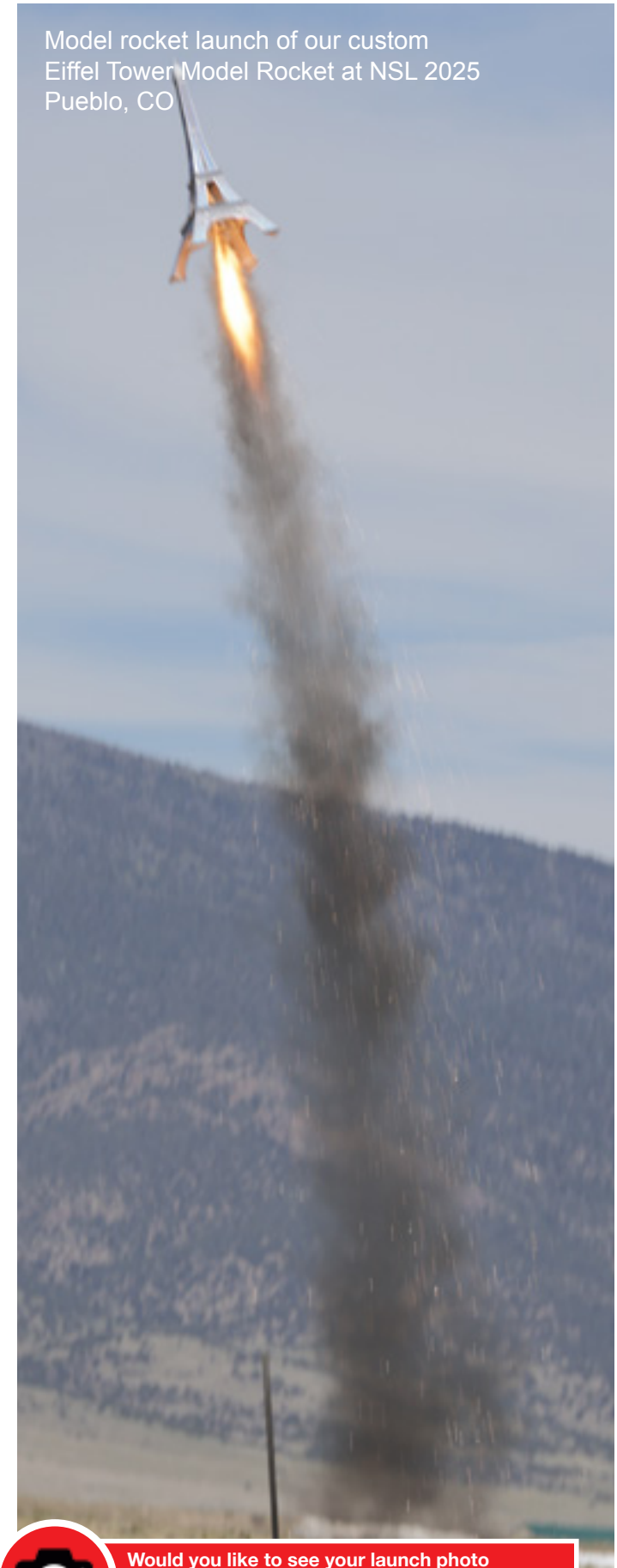
Learn about the various modifications that we sell for the Apogee Mako Model Rocket.

Apogee Components, Inc.
4960 Northpark Dr.
Colorado Springs, CO 80918
1-719-535-9335
www.ApogeeRockets.com

About this Newsletter

You can subscribe to recieve this e-zine FREE at the Apogee Components website: www.ApogeeComponents.com, or by clicking the link here **Newsletter Sign-Up**

Editor-in-Chief: Tim Van Milligan
Managing Editor: Michelle Mason
Content Editor: Martin Jay McKee
Layout Design: Ogden Sikel



Model rocket launch of our custom Eiffel Tower Model Rocket at NSL 2025 Pueblo, CO

Would you like to see your launch photo featured in the *Peak-of-Flight* newsletter? Submit your photo at apogeerockets.com.

PEAK OF FLIGHT NEWSLETTER

Why is There a Fake Motor In RockSim?

Issue 653 / June 3rd, 2025

www.ApogeeRockets.com



Mako Mods—A Masterclass for Rocket Experimentation

by Tim Van Milligan

Introduction

Ever looked at a rocket kit and wondered how you can make it better? We've all done that—but what if the kit manufacturer explicitly made a rocket that encouraged you to experiment with it? At Apogee, we did just that with our new kit, the Mako.

At Apogee, we believe that the Mako kit isn't just a model—it's a gateway to advanced rocketry skills. Designed with versatility in mind, this mid-power rocket is a blank canvas for experimentation, waiting for rocketeers to hack, tweak, and transform it into something unique. This isn't just about building a great rocket—It's about unlocking the problem-solving mindset of an engineer, the precision of a craftsman, and the thrill of seeing innovation soar. Our goal has always been to elevate the knowledge and skills of our customers so they can feel confident in their design abilities. This kit was built around that mission.

This article will go through several Mako modifications, or "Mako Mods" as we like to call them. Each modification is a practical "how-to" lesson, designed to enhance building skills, deepen understanding of fundamental rocketry principles, and ultimately make rocketeers more capable and confident modelers. These modifications will not only transform the Mako, but also build our customer's skills—turning them from a kit assembler into a true rocket customizer.



Figure 1: The Mako at lift-off.

What Comes with the Standard Mako Kit?

The Mako model rocket kit arrives ready to build into a formidable mid-power performer, inspired by the sleek efficiency of the ocean's apex predator, the mako shark. Opening the package reveals high-quality components including a 42-inch rugged airframe, precision laser-cut 1/8" Baltic birch plywood fins designed for through-the-wall mounting to the included 29mm motor tube, a durable Kevlar shock cord, and a vibrant parachute with a rugged parachute protector for reliable recovery. The basic kit is engineered as a Skill Level 3 project, offering a rewarding build experience that results in a rocket capable of impressive flights on E through G impulse motors, reaching altitudes nearing 2,800 feet.

It's important to understand that while the Mako is an excellent platform for customization, and the modifications discussed here can greatly enhance its capability, these advanced "Mako Mods" – such as upgrading to a 38mm motor mount, installing a cluster engine mount, integrating dual deployment electronics, adding a GPS bay, or fabricating custom Longtail fins – are NOT included with the standard Mako kit. Embarking on these exciting projects will require the purchase of additional components and materials that you can find on our website.

Essential Prep for Customization Success

Before even picking up a tool, it's important to start thinking like a "modder." Rocketry customization isn't about random tinkering—it's a deliberate process of planning, testing, and problem-solving. Start by asking, *why modify the mako?*. Looking for higher altitudes? Testing recovery systems? Or simply craving the satisfaction of a bespoke build? This goal will shape every decision, from motor selection to fin design.

The most critical tool isn't a knife or epoxy—it's **RockSim.** This software acts as a virtual workshop for all things rocketry, such as simulating modifications before cutting a single part. Swap out motor mounts, test fin shapes, or add payload bays in RockSim, and instantly see how those changes affect stability, altitude, and flight dynamics.



The Mako kit itself is designed to be a modder-friendly platform. Its core strengths, such as the robust through-the-wall fin construction, high-quality materials like Baltic birch plywood for the fins, and its ample internal airframe volume make it exceptionally sturdy and adaptable for a wide range of modifications. This robustness gives you a solid foundation to build upon.

However, with great power comes great responsibility. Safety must always be the paramount concern. After any modification that adds, removes, or shifts mass, make sure to recalculate theMako's CG and CP in RockSim. Remember to maintain a stable configuration, typically with the CG at least one caliber (body tube diameter) ahead of the CP. Also, verify that there is an adequate thrust-to-weight ratio for the chosen motors; a rocket that's too heavy for its engine will struggle off the launch pad.

To get started, we've created three design files that are easy to modify in RockSim. Some of these show customization as described in this article:

Apogee Mako RockSim Files

Standard Mako

• www.apogeerockets.com/downloads/rocksim_files/Mako.zip

38mm Mount & Dual Deployment Ebay

• https://www.apogeerockets.com/downloads/rocksim_files/Mako-38mm-DD.rkt

Longtail Fins and 29mm Cluster Motor Mount

• https://www.apogeerockets.com/downloads/rocksim_files/Mako-longtail_3x29.rkt

More information at www.ApogeeRockets.com

Finally, always review the National Association of Rocketry (NAR) or Tripoli Rocketry Association (TRA) safety codes, especially if these modifications significantly increase the rocket's weight or the power of the motors that will be used.

NAR High Power Safety Code *https://www.nar.org/content.aspx?page_id=22&club_id=114127&module_id=669238*

TRA Safety Code *https://www.nar.org/content.aspx?page_id=22&club_id=114127&module_id=669238*

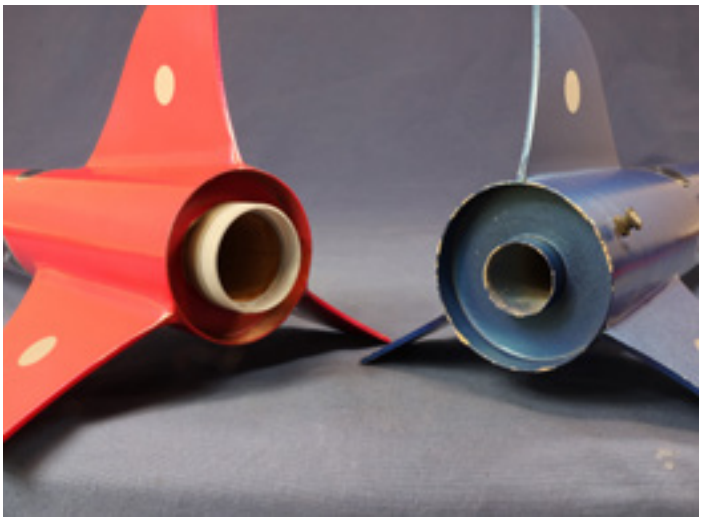


Figure 2: Back-end comparison of the 29mm vs 38mm mount

Upgrade to a 38mm Motor Mount

Imagine the exhilarating thrust and higher altitudes achievable by launching the Mako on powerful 38mm motors. To make this a reality, begin with our **Motor Mount Adapter kit 38-74.** This isn't an easy change for an already built Mako; the motor mount is the core of the rocket, and once epoxied, it's there to stay. Therefore, this upgrade must be part of the initial construction plan. This modification is a great lesson in building for higher power, teaching how to properly select and install components designed to handle significantly increased thrust that is common for 38mm motors.

Great builds always start with RockSim. Before even unbagging the Mako kit parts, open the Mako design file and replace the standard 29mm motor tube and centering rings with the 38mm motor tube and the correctly sized centering rings from the upgrade set. RockSim makes it easy to adjust their masses accurately. Now, select a motor from a wide range of 38mm motors that makes sense for the desired flight. Need help finding a motor? Check out our **Advanced Construction Video #300,** that shows just how quickly RockSim can provide a list of available motor choices that will work well in the Mako.

Motor Mount Adapter Kit *https://www.apogeerockets.com/Building-Supplies/Motor-Mount-Kits-Adapters/Motor-Mount-Kits-for-Body-Tubes-56mm-and-Up/Motor-Mount-Adapter-Kit-38-74*

ACV #300 *https://www.apogeerockets.com/Advanced_Construction_Videos/Rocketry_Video_300*





Run simulations in RockSim and pay very close attention to the stability analysis. A 38mm motor will shift the Center of Gravity (CG) rearward. It's important to check and see if the standard Mako fins will provide sufficient stability (a margin of at least one caliber, preferably 1.5 to 2 for higher power) or if larger custom fins may be needed (like the Longtail Shark Fins, another pre-planned mod). RockSim will also help to predict the new flight altitudes.

When beginning the Mako build, use the 38mm motor tube and the corresponding centering rings from the upgrade set instead of the standard 29mm parts. On the fin tab, there is a perforation line to shorten the tabs. Because of the larger diameter motor tube, the fin tabs need to be shortened. Cut them along the perforated line with a razor saw or with many passes of a hobby knife.

The assembly process for the motor mount itself is similar. Ensure that the 38mm motor tube is securely bonded with high-strength epoxy to both the centering rings, and through them, to the inner wall of the Mako's airframe. The motor retention system, likely an Aero Pack 38mm retainer or **Apogee's own 38mm retainer**, will also be integrated at this stage

By undertaking this modification from the ground up, rocketeers will gain invaluable experience in working with components designed for higher power, mastering the nuances of robust motor mount assembly, and perfecting epoxy bonding techniques for critical high-stress areas. A pro tip: when applying epoxy to the centering rings, ensure that smooth, strong internal fillets are created where the rings meet the motor tube and the inside of the airframe. These fillets distribute stress and are vital for a durable motor mount capable of handling repeated high-power flights.

38mm Retainer *https://www.apogeerockets.com/Building-Supplies/Motor-Retainers-Hooks/Screw-on-Retainers-38mm/Apogee-38mm-Plastic-Screw-On-Retainer-Set-1-pk*

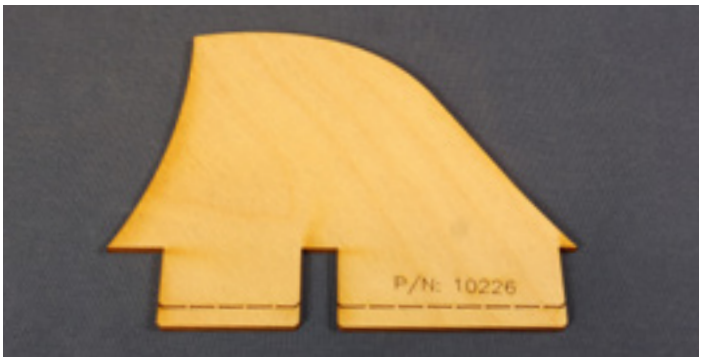


Figure 3: The cut-line on the fins, showing removal for 38mm

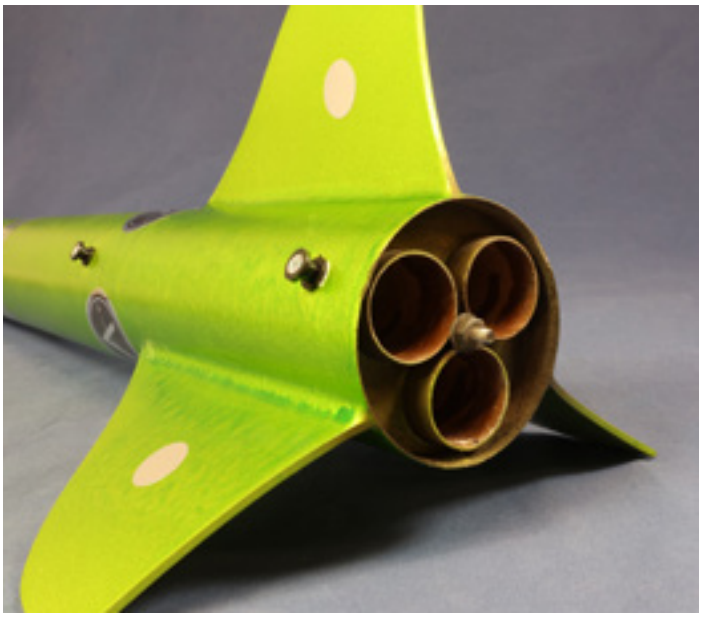


Figure 4: 3-Engine cluster mount on an Apogee Mako

3-Engine Cluster Mount

For a truly spectacular launch that turns heads and rumbles the ground, consider modifying the Mako to fly on a cluster of three engines. This advanced project begins with the **Triple Motor Mount Adapter Kit 29-74**, which will include the necessary motor tubes and specially designed centering rings

Similar to the 38mm upgrade, this is a modification that fundamentally alters the rocket's core and must be integrated during the Mako's initial assembly. Attempting to install a cluster mount into an already-built Mako airframe is impractical. This mod will teach rocketeers the principles of reliable simultaneous ignition for multiple motors, and how to manage the significantly increased thrust and altered aerodynamics of a clustered configuration.

Simulating flights with a cluster involves selecting identical motors for all tubes. Stability is paramount here: depending on which motors are used, the concentration of mass at the rear will significantly shift the CG aft. It may be necessary to pair this modification with larger fins (like the Longtail Shark Fins) to ensure the Mako remains stable. RockSim will be an indispensable tool for verifying this CG/CP relationship.

Triple MMT *https://www.apogeerockets.com/Building-Supplies/Motor-Mount-Kits-Adapters/Motor-Mount-Kits-for-Body-Tubes-56mm-and-Up/Triple-Motor-Mount-Adapter-Kit-29-74*



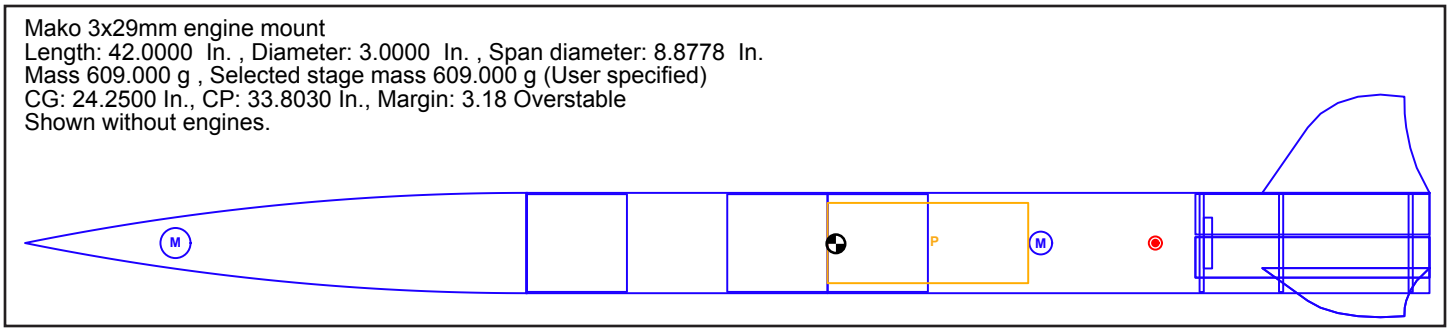


Figure 5: The Mako RockSim file with three 29mm motors.

During the actual construction of the Mako, assemble the cluster motor mount using the parts from the Apogee set. Once the cluster mount assembly is glued up, epoxy it into the Mako's main airframe as the kit gets assembled, much like a standard motor mount. The only deviation is that the motor mount will need to be twisted ever so slightly so that one side of the fin tab touches the motor mount tube, as shown in **Figure 6**. Also, use the **Fin Alignment Jig** to make sure the fins are perfectly perpendicular to the tube.

The wiring for the igniters must also be planned. A launch controller capable of delivering sufficient current to ignite all motors simultaneously will be needed, wired in parallel. See our **Advanced Construction Video #282** on clustering motors for the tactical steps necessary for success.

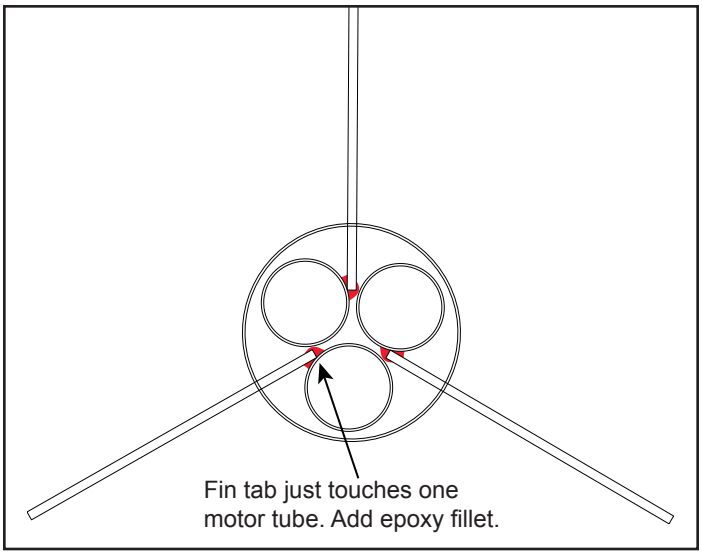


Figure 6: Rotate the motor mount so that one side of the tab touches the motor tube, and then epoxy them into place.

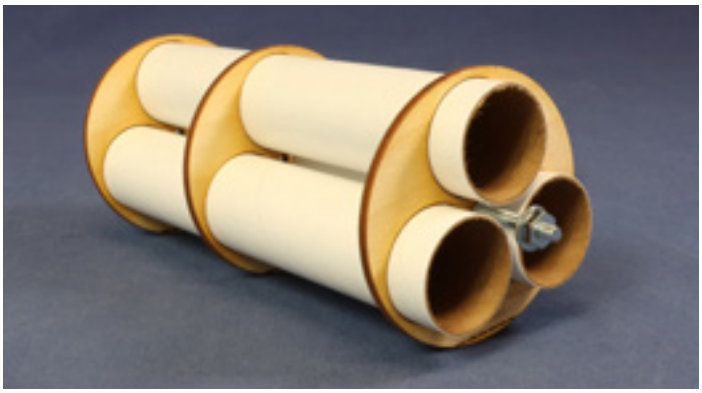


Figure 7: 3-Engine cluster motor mount adapter assembled

The skills a rocketeer will develop include high-precision assembly, an introduction to basic electrical wiring for ignition systems, and a practical understanding of the unique flight dynamics of clustered propulsion. A vital pro tip: Always select motors with sufficient thrust, so that the rocket will have adequate thrust even if one motor fails to ignite. In this case, adequate thrust means that the rocket still leaves the launch pad at 30mph if only two of the three motors ignite. RockSim is easy to use to test this by just installing two motors into the rocket, and putting a mass object into the third tube to account for the dead weight of the motor that doesn't ignite.

Fin Alignment Jig *https://www.apogeerockets.com/Building-Supplies/Tools/74mm-Thin-Wall-3-Fin-Alignment-Guide-1-pk*

ACV #282 *https://www.apogeerockets.com/Advanced_Construction_Videos/Rocketry_Video_282*

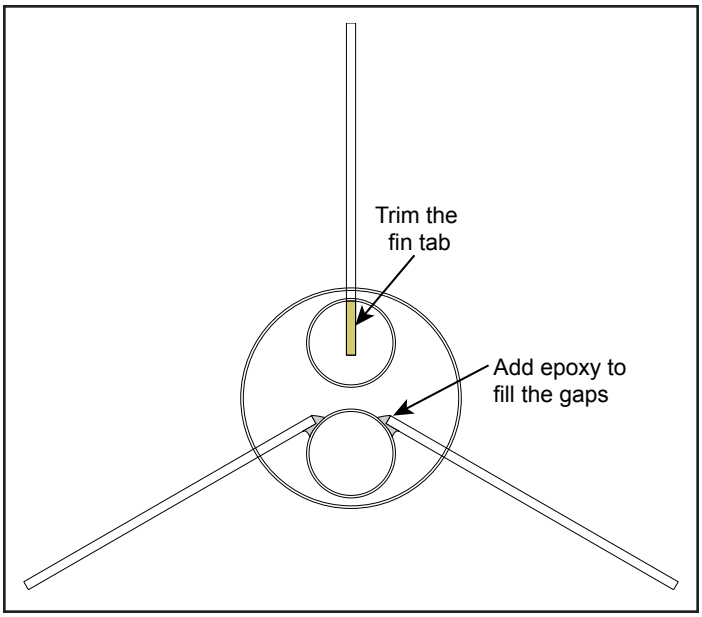


Figure 8 - With the two-engine cluster modification, the tabs on two of the standard Mako fins won't actually touch the motor tube, but adding substantial thickened epoxy fillets can make them rock solid.



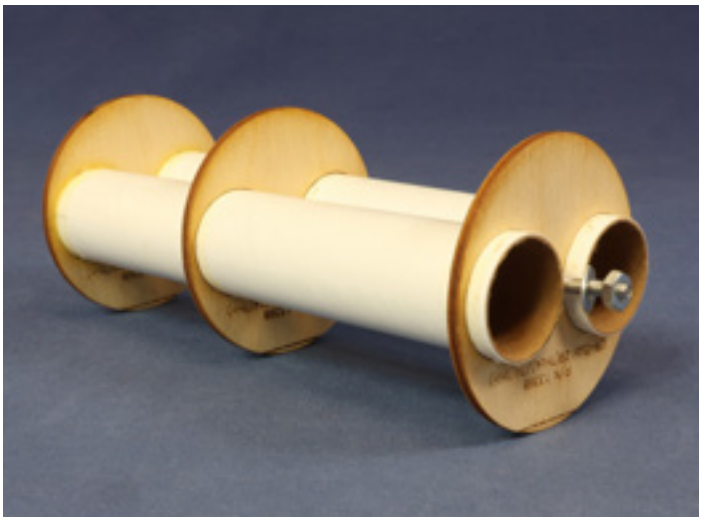


Figure 9: 2-Engine cluster motor mount adapter assembled

2-Engine Cluster Mount

This mod will require the **Dual Motor Mount Adapter Kit 29/27**. Installing a 2-Engine Cluster into the Mako is actually a little harder than installing the 3-Engine cluster that was described above. The reason has to do with the through-the-wall fin tabs.

Normally, the base of the fin tab should sit against the motor mount tube. Unfortunately, with three fins and only two motor mount tubes, there is a slight problem. On initial inspection, they don't touch the tubes inside.

In **Figure 8**, note that the standard through-the-wall tabs on two of the fins are either not quite long enough, or are positioned such that they don't make direct contact with one of the motor mount tubes. However, they are so close that a little bit of thickened epoxy can effectively fill the small gap between the bottom of the fin tab and the nearest motor mount tube, creating a robust structural bridge. We strongly recommend using a quality thickened epoxy, like **G/Flex 655 Thickened Epoxy** for this task, since its high viscosity means it won't run or sag, allowing you to build up the necessary material to fill these gaps.

Dual Motor Mount Adapter Kit 29/27 *https://www.apogeerockets.com/Building-Supplies/Tools/74mm-Thin-Wall-3-Fin-Alignment-Guide-1-pk*

G/Flex 655 Thickened Epoxy *https://www.apogeerockets.com/Building-Supplies/Adhesives/G-Flex-655-8-oz*

We also recommend using a **3-fin alignment jig** to hold the fins perfectly straight and correctly oriented while the epoxy hardens. For the third fin, the tab is actually too long and will interfere with the dual-motor assembly; in this case, the fin tab will need to be carefully dry-fit it and trimmed to the correct depth for a proper seat against a motor tube or the centering ring structure.

Wiring the two motors for simultaneous ignition is easier than the three-motor cluster, but take great care at the launch pad to make sure it is properly situated. Also, test the motor selection with RockSim to ensure that one motor will safely lift the rocket in case there is a mis-fire with the other motor.

Through this specific 2-engine cluster modification in a 3-fin rocket, rocketeers will develop several advanced skills, such as problem-solving for adapting standard parts to non-symmetrical internal geometries, mastering advanced epoxy application techniques to bridge gaps for strong bonds, and ensuring precision alignment with challenging internal structures. Rocketeers will also gain experience in custom-modifying parts (like trimming a fin tab) and develop a keen understanding of how load paths are managed when fin tabs don't bear directly against a motor tube, making the epoxy fillets critically important structural elements.

It's a good idea to not go overboard with the internal epoxy fillets. It won't take much to create a strong joint, and any extra will just make the rocket heavier than necessary. Do ensure that the thickened epoxy not only fills the void, but also fully encapsulates the end of the fin tab and creates a good bridge to the nearest motor tube. This epoxy connection becomes the primary load path for those fins.



Integrate Dual Deployment

To safely recover a Mako from the impressive altitudes achievable with more powerful motors, integrating a dual deployment system is a highly recommended modification. This modification uses a **74mm (3" Thin-Wall) Ebay kit** from Apogee, which will provide the necessary laser-cut coupler for an electronics bay, bulkheads, switch band, and the plywood sled inside. This is another modification that must be planned from the very beginning of your Mako build, because the standard coupler is removed from the build and the upper tube isn't glued onto the rocket in order to be attached to the front of the ebay.

3" Thin-Wall Ebay Kit *https://www.apogeerockets.com/Electronics-Payloads/Electronic-Bays/74-mm-3in-Thin-Wall-Ebay-Kit*



Figure 10: Mako with the dual deployment ebay modification



If a standard dual-deployment set-up is desired, the upper tube will be a little short to house the main parachute below the shoulder of the nose cone. In this case, remove the base of the nose cone so that the parachute can instead be stored inside the interior of the nose cone. Without the base of the nose cone, a new anchor point for the shock cord will be needed to keep the nose cone attached. In this case, use the **PNC-74 Internal Bulkhead Kit** from Apogee that provides an anchor point inside the nose cone. An alternative to this is to pour epoxy into the tip of the nose cone and embed the Kevlar™ shock cord directly into the epoxy. Normally, this can't be done with a large nose cone because typically large nose cones are made from Polypropylene, a slick plastic material that nothing sticks to. But the Apogee nose cone is made from high-impact Polystyrene, which epoxy attaches quite easily.

Jumping into RockSim, modify the Mako design to include an added electronics bay section. This is a simple mod, involving just adding a bulkhead on the end of the existing tube coupler, and then adding a mass object to account for whichever chosen altimeter is used (e.g., from Altus Metrum, Featherweight Altimeters, or Missile Works). Lastly, add the mass of the battery, switch, wiring, and the e-bay hardware itself.

Key skills gained include integrating electronics into an airframe, the safe preparation and use of black powder or equivalent ejection charges, and the mechanics of multi-device recovery. A critical pro tip: thorough ground testing of the entire dual deployment system is non-negotiable. For some altimeters, it may be needed to use a vacuum chamber (even a simple DIY one can work such as the one in **Peak-of-Flight Newsletter 628** to simulate an ascent and descent, verifying that your altimeter triggers your test ejection charges at the programmed altitudes.

PNC-74 Internal bulkhead *https://www.apogeerockets.com/Electronics-Payloads/Electronic-Bays/PNC-74-Internal-Bulkhead-Kit*

POF #628 *https://www.apogeerockets.com/Peak-of-Flight/Newsletter628*



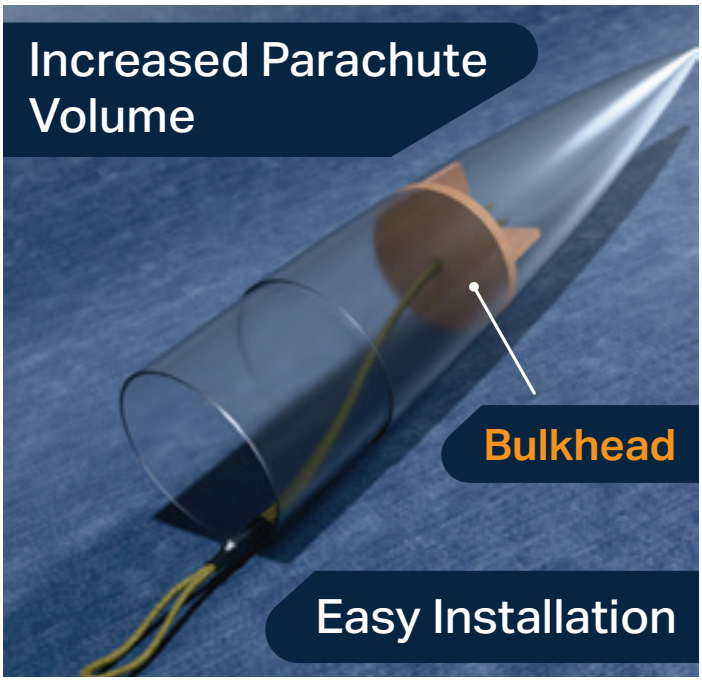


Figure 11: The Internal Bulkhead can be used to allow the parachute to be installed inside the nose cone.



PEAK OF FLIGHT NEWSLETTER

Why is There a Fake Motor In RockSim?

Issue 653 / June 3rd, 2025

www.ApogeeRockets.com

Alternate Head-End Dual-Deployment Set-Up

For an innovative approach to dual deployment, opt for a "head-end" configuration made popular by the Wildman Punisher. Instead of placing the electronics bay (e-bay) coupler in the middle of the rocket, which is the traditional method, move it to the very front of the main body tube, effectively making the e-bay assembly the shoulder for the nose cone. This will primarily use the 74mm (3" Thin-Wall) Ebay kit from Apogee, but with some clever adaptations. This setup is often seen in high-performance fiberglass rockets where the nose cone shoulder is a separate component. While the Mako's stock nose cone has an integrated shoulder, this mod cleverly repurposes the e-bay. This modification must be decided upon before beginning a Mako build because it involves altering the nose cone, and changing how the forward section of the rocket interfaces with the main airframe.

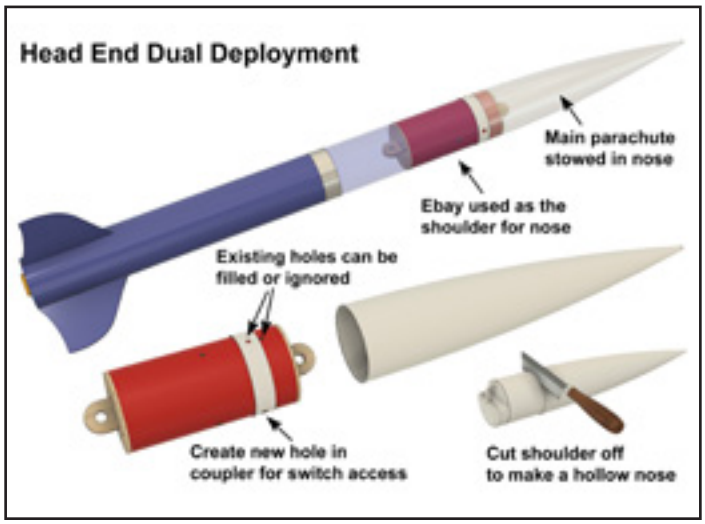


Figure 12: When the e-bay becomes the shoulder for the nose cone, you have "head-end" dual-deployment.

The design phase in RockSim will be crucial. Roketeers must model the e-bay components at the forward end of the main body tube. The main parachute will now reside within the hollow of the nose cone itself, while the drogue parachute typically remains in the upper part of the main airframe, just behind the e-bay. Simulate flights to ensure this new mass distribution and recovery sequence results in a stable flight and reliable deployment events.

Here's how to approach the build: The rocket's stock nose cone already has a shoulder attached, but for this mod, carefully cut it off using a fine-toothed razor saw, ensuring a clean, perpendicular cut. This allows the paper coupler from the e-bay kit to slide directly into the base of the nose cone. It doesn't need to go in very far, but it must be "far enough" to create a secure connection. Critically, this needs to be a very snug fit, which in our case, it already is. This assembly relies on a friction fit to prevent the nose cone from sliding off prematurely during flight. Because the fit is sufficiently snug, shear pins will likely not be necessary to keep the nose cone attached, thus keeping the assembly clean and simple.







Next, let's make a simple modification to the e-bay kit itself. The switch band—a ring that often holds arming switches and also acts as a stop—will be installed on the e-bay coupler, but not in the middle location originally intended (where pre-drilled rivet holes are). Instead, insert the coupler into the modified nose cone, then slide the switch band up the coupler until it just touches the base of the nose cone. Mark this position. Next, drill only the hole needed for the push-button arming switch in the switch band and the underlying coupler. The other pre-drilled holes in the switch band won't be needed for attachment here, so they can be filled with any type of modeling putty and sanded flush with the surface of the tube for a smooth finish.

The switch band, even in this modified position, still serves an important purpose: it acts as a stop to prevent the e-bay coupler from accidentally sliding too far down into the top of the main body tube. This could be possible at lift-off because the inertia of the e-bay assembly would want it to stay in place while the rest of the rocket accelerates upwards.

As with the traditional mid-body e-bay location (described above), the main parachute's shock cord anchor will need to be securely mounted into the tip of the nose cone. In this head-end configuration, there isn't much room inside for the nose cone bulkhead kit. Therefore, a strong anchor point will need to be created by bonding the shock cord end into an epoxy plug that should be carefully formed in the tip of the nose cone. Ensure this is a robust connection by tugging on it after the epoxy has cured.

This head-end dual deployment modification will teach rocketeers precision cutting of plastic components (the nose cone shoulder), how to adapt kit parts for uses beyond their original design intent (re-purposing the e-bay coupler and switch band), and techniques for creating strong, reliable friction fits. Additionally, experience will be gained in creating robust shock cord anchor points in confined spaces using epoxy, and the development of a deeper understanding of alternative dual deployment configurations and specific assembly challenges.

Another pro tip—the success of the head-end deployment often hinges on the friction fit between the e-bay coupler and the inside of the nose cone. After cutting off the original shoulder, test this fit repeatedly. If it's too loose, the outer diameter of the coupler can be built up slightly by adding a wrap or two of thin masking tape or even a very thin layer of paper glued securely. If it's too tight, carefully sand the outside of the coupler (or the inside of the nose cone with sandpaper wrapped around a dowel) until a snug fit is achieved that requires firm pressure to engage and disengage. Also, there won't be much need for a big ejection charge to push the ebay out of the nose, since there isn't much volume that needs to be pressurized.

Add a GPS Tracking Bay

Recovering the Mako, especially after a high-altitude flight or a drift on a windy day (even with dual-deployment), can be greatly aided by a GPS tracker. While some GPS units can be integrated into a dual deployment e-bay, if a dedicated bay is desired, or there isn't a need for dual deployment, the nose cone is an excellent location for this. We suggest using the **3" (Thin-Wall) Nose Cone Ebay** from Apogee. This is one mod that won't need to pre-planning, because it can be added later, even after the standard Mako has been built. The mod involves cutting off the bulkhead (the very bottom base) of the nose cone and sliding the ebay sled right into the nose itself.



Figure 13: 3" thin wall nose cone ebay, on a green Mako

Using RockSim, simply add the mass of the desired GPS tracker and any mounting hardware to the nose cone section of the Mako design using a component called a "mass object." Adding weight to the nose cone is generally beneficial for stability, but always make sure to check the final CG/CP relationship in RockSim.

A pro tip—some silver paints may block the radio signals from penetrating the nose and getting to and from the electronics. Before flying, always test the GPS tracker on the ground by placing it inside the completed nose cone bay and verifying that it can acquire a satellite lock and transmit its location accurately.

Longtail Shark Fins

For rocketeers looking to slightly alter their Mako's flight characteristics and visual profile, installing the **Mako Longtail Shark Fins** offers a super-simple upgrade. These larger, uniquely shaped fins are pre-cut from high-quality 1/8" Baltic birch plywood, meaning there is no need to construct them from raw stock or templates. Their primary purposes are twofold: firstly, their increased surface area and distinct profile move the rocket's Center of Pressure (CP) further rearward, substantially enhancing stability, which is often crucial when upgrading to more powerful motors or adding other modifications that shift the Center of Gravity (CG). Secondly, they give the Mako a more aggressive, custom aesthetic that truly stands out on the launch field. Because these fins utilize the Mako's robust through-the-wall attachment method, their installation must be part of the initial Mako kit construction.

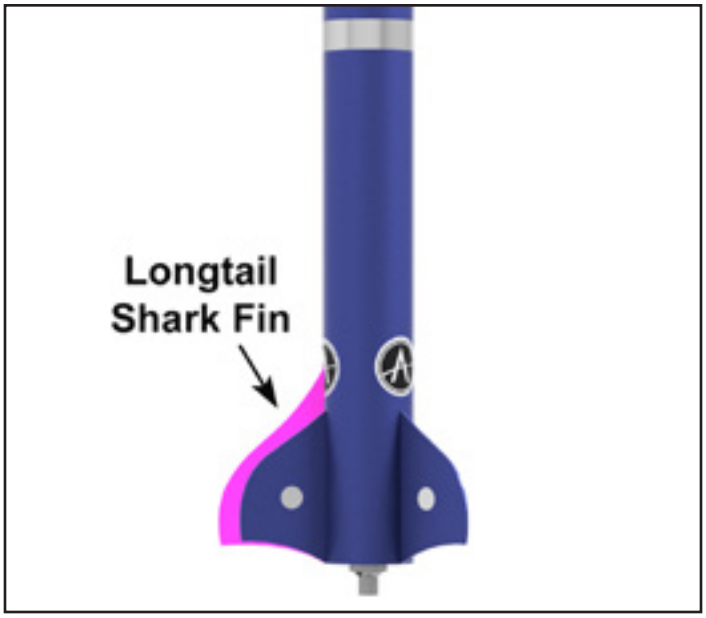


Figure 14: The Longtail Shark fins (pink) compared to the size of the standard fins that come with the Mako kit.

3" Thin-Wall Nose Cone Ebay *https://www.apogeerockets.com/Electronics-Payloads/Electronic-Bays/3in-Thin-Wall-Nose-Cone-Ebay*

Mako Longtail Shark Fins *https://www.apogeerockets.com/Building-Supplies/Replacement-Parts-for-Kits/Replacement-Fins/Mako-Longtail-Shark-Fin*

When beginning the construction of a Mako, use the pre-cut Longtail Shark Fins instead of the standard Mako fins. The through-the-wall tabs on these fins are designed to fit into the fin slots on the Mako airframe and engage with the motor mount tube. Before gluing, ensure the fins are properly prepared – typically, this involves light sanding of the edges for smoothness and to remove any laser-cutting char, which can interfere with a strong glue bond. At this point, rocketeers may choose to round or airfoil the leading and trailing edges for improved aerodynamics, even though the basic shape is already pre-cut.

Pro tips for installing the Longtail Shark Fins—even though the Mako has through-the-wall fins, we recommend using the 3-fin alignment jig to make sure the fins are perfectly straight. Take extra time with the fillets on the fins – a strong, straight fin attachment is the foundation of a successful flight with these impressive fins.

Troubleshooting and Resources

This article is about encouraging rocketeers to take some risks and modify the Mako kit. But let's be honest: things can go wrong. Maybe a cluster ignites two motors instead of three, sending the Mako spiraling. Perhaps the delay was wrong, and the rocket suffered a fouled parachute. Don't panic—this is where growth happens. This happens to us, too. We use it to find ways to get valuable rockets back in the air again.

Apogee's **Advanced Construction Videos** and **Peak of Flight Newsletter** archives are secret weapons that will show rocketeers how to fix things that don't go as planned. Our philosophy is that most things can be fixed - rockets can be repaired, and even made better than before.

Did a fin snap on landing? Video #269 covers repairing a through-the-wall fin. Confused about setting up dual deployment? Newsletter 626 walks through the necessary steps for success. Every problem has a solution, and we have the resources to help. Please reach out to us for help finding any necessary resources that may be difficult to find.





Figure 15: The longtail shark fins (pink & green) vs regular (blue)

Advanced Construction Videos *https://www.apogeerockets.com/Advanced_Construction_Videos/all?m=education*

Peak of Flight Newsletters *https://www.apogeerockets.com/Peak-of-Flight?pof_list=archives&m=education*

Conclusion

Many skills can be learned when taking up any number of Mako modifications, and these are skills that will prove invaluable for any future rocketry endeavors, whether that's tackling another advanced kit, venturing into scratch-building custom unique designs, or even preparing for a high-power rocketry certification attempt.

The journey to expertise is ongoing. We encourage all rocketeers to choose a Mako Mod that will challenge them. Plan it carefully using RockSim, leverage the rich library of resources available from Apogee Components, and then dive in. The sky is not the limit; it's just the beginning in a rocketeers' journey within this incredible hobby.

About The Author:

Tim Van Milligan (a.k.a. “Mr. Rocket”) is a real rocket scientist who likes helping out other rocketeers. He is an avid rocketry competitor and is Level 3 high-power certified. He is often asked what is the biggest rocket he’s ever launched. His answer is that before he started writing articles and books about rocketry, he worked on the Delta II rocket that launched satellites into orbit. He has a B.S. in Aeronautical Engineering from Embry-Riddle Aeronautical University in Daytona Beach, Florida, and has worked toward an M.S. in Space Technology from the Florida Institute of Technology in Melbourne, Florida. Currently, he is the owner of Apogee Components (http://www.apogeerockets.com) and also the author of the books: Model Rocket Design and Construction, 69 Simple Science Fair Projects with Model Rockets: Aeronautics, and publisher of the “Peak-of-Flight” newsletter, a FREE ezine newsletter about model rockets. You can email him by using the contact form at https://www.apogeerockets.com/Contact.





PEAK OF FLIGHT NEWSLETTER

Article Submission Guidelines

Issue 653 / June 3rd, 2025

www.ApogeeRockets.com

SUBMITTING ARTICLES TO APOGEE

We are always looking for quality articles to publish in the *Peak-of-Flight* newsletter. Please submit the "idea" first before you write your article. It will need to be approved first.

When you have an idea for an article you'd like to submit, please use our contact form at **https://www.apogeerockets.com/Contact**. After review, we will be able to tell you if your article idea will be appropriate for our publication.

Always include your name, address, and contact information with all submissions. Including best contact information allows us to conduct correspondence faster. If you have questions about the current disposition of a submission, contact the editor via email or phone.

CONTENT WE ARE LOOKING FOR

We prefer articles that have at least one photo or diagram for every 500 words of text. Total article length should be between 2000-4000 words and no shorter than 1750 words. Articles of a "how-to" nature are preferred (though other types of articles will be considered) and can be on any rocketry topic: design, construction, manufacture, decoration, contest organization, etc. Both model rocket and high-power rocket articles are accepted.

CONTENT WE ARE NOT LOOKING FOR

We don't publish articles like "launch reports." They are nice to read, but if you don't learn anything new from them, then they can get boring pretty quick... Example: "Bob flew a blue rocket on a H120 motor for his certification flight." As mentioned above, we're looking for articles that have an educational component to them, which is why we like "how-to" articles.

You can see what articles and topics we've published before at: **https://www.apogeerockets.com/Peak-of-Flight?pof_list=archives&m=education**. You might use this list to give you an idea or two for your topic.

Here are some of the common articles that we reject all the time, because we've published on these topics before:

- How to get a L1, L2, or L3 Cert
- Building cheap rockets and equipment (pads & controllers)
- How to 3D print parts, or a Rocket Kit
- How to Build a cheap Rocket Kit
- Getting Back Into Rocketry After a Long Hiatus

ARTICLE & IMAGES SUBMISSION

Articles may be submitted by emailing them to the editor. Article text can be provided in any standard word processor format, or as plain-text. Graphics should be sent in either a vector format (Adobe Illustrator, SVG, etc.) or a raster format (such as jpg or png) with a width of at least 600 pixels for single column images or 1200 pixels for two-column images. It is preferable for images to be simple enough to be readable in a two-column layout, but special layouts can be used.

Send the images separately via email as well as show where they go by placing them in the word processor document.

ACCEPTANCE

Submitted articles will be evaluated against a rubric (available here on our website). All articles will be evaluated and the results will be sent to the author. In the evaluation process, our goal is to ensure the quality of the content in *Peak-of-Flight*, but we want to publish your article! Resubmission of articles that do not meet the required standard are heavily encouraged.

ORIGINALITY

All articles submitted to Peak-of-Flight must not run in another publication before inclusion in the *POF* newsletter, but it may be based on another work such as a prior article, R&D report, etc. After we have published and paid for an article, you are free to submit them to other publications.

RATES

Apogee Components offers **$300** for a quality-written article over 2,000 words in length. Payment is pro-rated for shorter articles.

WHERE WILL IT APPEAR?

These articles will mainly be published in our free newsletter, *Peak-of-Flight*. Occasionally some of the higher-quality articles could potentially appear in one of Tim Van Milligan's books that he publishes from time to time.



PEAK OF FLIGHT NEWSLETTER

Issue 653 / June 3rd, 2025

Article Submission Guidelines

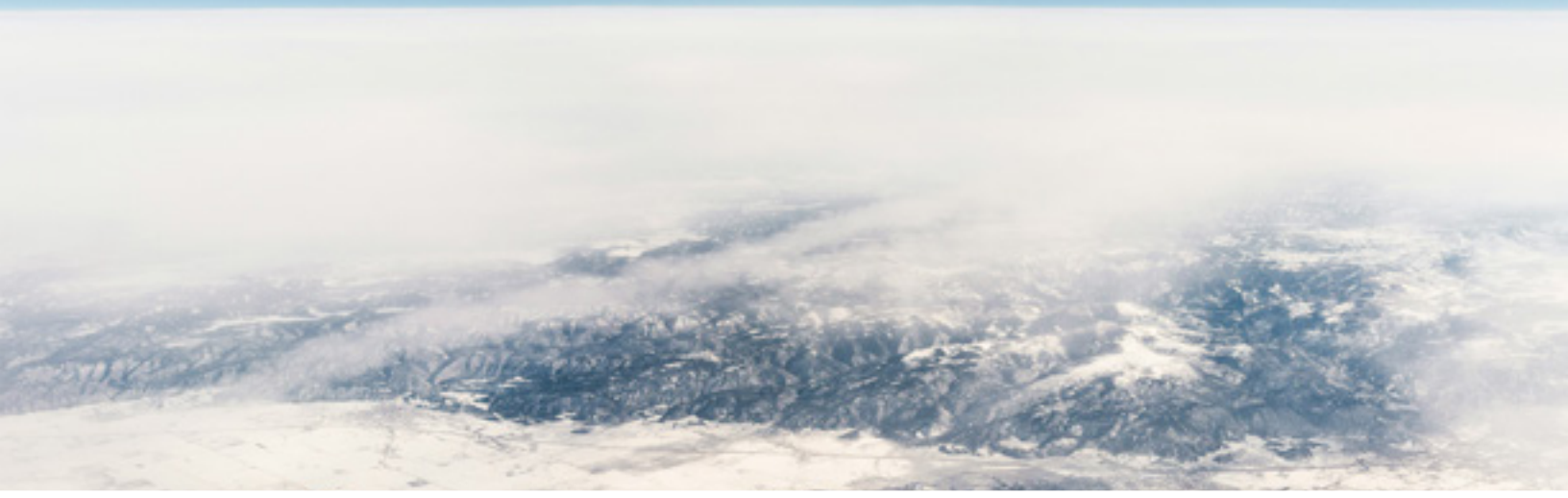
www.ApogeeRockets.com





Apogee Components, Inc.
4960 Northpark Dr.
Colorado Springs, CO 80918
719-535-9335

Your Success Is Our Mission!



www.ApogeeRockets.com