Issue 630 / July 16th, 2024

PEAK OF FLIGHT NEWSLETTER

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

My Experience Papering Fins

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COVER PHOTO

Apogee Midge

The Midge was specifically designed for the NAR's "Payload Altitude" contest event, but it can be flown just for fun too. It is a two-stage rocket designed to carry both a small altimeter and the 28-gram NAR Standard Payload weight.

FEATURED ARTICLE

My Experience Papering Fins

by Joe Mustion

This article takes you on a journey through the author's own experience as a "Born Again Rocketeer", exploring the evolution of fin finishing methods - from the traditional sanding sealer to the modern Carpenter's Wood Filler, and finally, the game-changing "papering" technique using white glue or cyanoacrylate (CA) glue. Discover the pros, cons, and insider tips that will elevate your rocketry skills and leave your fins looking better than ever before.

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

About this Newsletter

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Apogee Diamondback Rocket blasts into the sky!

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

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My Experience Papering Fins

by Joe Mustion

I became a BAR (Born Again Rocketeer) in 2020. I was an enthusiastic rocketeer as a 'tweener and young teen in the 1960s. Life moved on and I turned into an adult with a family and a job. Decades later, after getting tired of drilling $200 holes in the ground with r/c airplanes, I once again turned my sights back to model (sports) rocketry. There were lots of changes in the hobby in the time that had transpired, all of which I see as favorable. One thing hadn't changed though: The challenge of getting a metal smooth finish on a wooden fin.

Sanding Sealer and Carpenter's Wood Filler

In my youth there was sanding sealer. It was somewhat effective and required harsh solvents for clean-up. I would spend hours judiciously applying sealer then sanding with decreasing grits of sandpaper for each of 3 coats. Sand, sand, sand, and sand again. The results were variable, sometimes a lot of the grain was filled and sometimes not so much. It never delivered on an expected smooth grain-free finish. Either I was not doing it right, or my expectations were too high.

In the 21st century, sanding sealer has gone out of vogue and Carpenter's Wood Filler (CWF) is in. Diluted to a toothpaste consistency, It works a lot like sanding sealer. Same 3 coats, same sanding (and more sanding), same finish variability. At least it cleaned up with water. There has to be a better way.

Papering Fins - White Glue Method

I don't remember how I discovered The Rocketry Forum (TRF), but there it was, social media for rocketeers - heavenly. Therein I read about a wooden fin finishing technique called "papering". Reference was made to a video by Apogee Components (Tim) that gave instructions on the

technique. I was game.

I found the video (#16 old, old - https://www.apogeerockets.com/Advanced_Construction_Videos/Rocketry_Video_16) on how to make paper skins using white glue. I tried this method. The results were good. Like a lot of things, this requires some practice and finesse. My results the first time were enough to be inspirational but not excellent. At long last, I found a technique that hid the grain completely and with much less sanding. With any finishing technique, the fins need to be prepared to the point that they are ready for paint. With sealer or CWF, assuming that 3 coats are applied, as many as 9 sandings may be needed. With papering, 3 sandings and a "coat" of adhesive are usually all that are required. Measuring and cutting the paper skins precisely saves trimming time later.

Figure 1: This is raw balsawood fin that has been sanded smooth.

A drawback is that the glue had to be applied in the right amount. If the applied glue looks white, there probably is too much glue. There should be a uniform clear sheen on the side of the fin prior to applying the paper. Too much glue will really mess up the papering job. Too little glue, and the paper will not stick properly to the fin. When done correctly, it provides a better finish than using sealer or CWF. No grain shows, but it is a matte finish, not glossy. Paper glued to wood; the finish is no surprise. If it really gets messed up, sand it all off and start over. Yes, I have done this.

In the videos, Tim suggests using water thin cyanoacrylic (CA) glue (https://www.apogeerockets.com/Building-Supplies/Adhesives/Insta-Cure-Super-Thin-CA-Glue-1-oz-BLUE) to treat the edges. I thought sanding CA glue would be a challenge, and I was afraid of water thin CA glue. If CA isn't used, the edges sometimes delaminate. They can be fixed up by putting a little glue on a toothpick and forcing the glue between the paper and the wood. I call this "ship in a bottle" work. I found white glue papering to be mostly satisfying, and I have used it on several rockets.

I cannot quantitatively state how much strength

the paper adds. I papered the finds on My Big Daddy. It has had a long and storied life. At least one flight with no parachute deployment (nose hinge, not ballistic) and a pond landing on another flight. All the insides have been replaced. Sometimes, it's launched with a "G" motor. The fins on this rocket have never broken in any capacity -'nuf said.

CA Method

Recently, I resumed rocket building after a long hiatus. When getting ready to paper the fins, I returned to the Apogee video to review the procedure. I discovered that Apogee also had a video (#381 - https://www.apogeerockets.com/Advanced_Construction_Videos/Rocketry_Video_381)

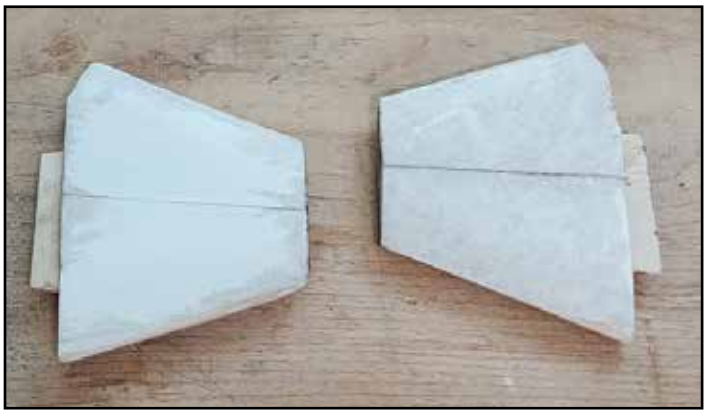


Figure 2: The CA method with paper applied to fins.

with an alternative fin covering technique using CA. During my hiatus, I had purchased capillary tubes for the CA bottle. The same as in the video. These tips give much better flow control than the bottle nozzle. I no longer fear water thin CA; I strongly respect it. CA can glue your fingers together in less than a minute.

I think this method works better than the white glue method. Follow the instructions in the video closely. Respect the CA. The paper towels work great. I think they spread the CA as much as they absorb it. This is desirable. If some glue should find its way from the fin to the bench,

wipe it up with a paper towel right immediately. If there is any delay to cleanup, say more than 30 seconds, there will probably be undesirable consequences. Tim used “Happy Hands” in the video. I didn't have any. Instead, I put my hand in a plastic bag that the newspaper comes in and use it like a mitten. CA didn’t stick to it. I tried rubber (dishwashing) gloves. The CA sticks very well to that, like it does to human skin. Do not use! Stick (pun intended) to plastic film as instructed in the video. The rubber gloves are “vinyl” (probably PVC), plastic film is usually polyethylene (PE). Evidently, CA does not stick to PE. When in doubt, test it first.

I did the deed, following instructions on the video. The results were great! Except for a couple quickly wiped up drops that found their way to the bench, the CA stayed where it was supposed to. The paper is almost completely saturated with the CA. If the paper is precisely measured and cut, all that is needed is some sanding on the edges. Tim did not mention that the combination of the CA and the paper makes a hard surface that is more like fiberglass (FG), than like paper. I really like this; I expect that this makes the fin stronger than the white glue method. This is a lot like FG. A fiber mat (paper) is saturated with a plastic matrix (CA, sort of) which makes a material stronger than the individual components. I don't think that the paper can be saturated using the white glue method. For precise results, I numbered each fin with a matching skin, i.e. I lightly wrote “1” on the fin and its corresponding skins, then erased it just before assembly. That way, I could cut all eight of the skins out at once and be ready to proceed. Once the CA starts to flow, this process is fast, much faster than the white glue method. Part of it might have been a lingering fear that the CA would set up fast, it does, but not instantly. I didn’t have any problems with the CA setting up prematurely, just be diligent and work quickly. Some sanding will be

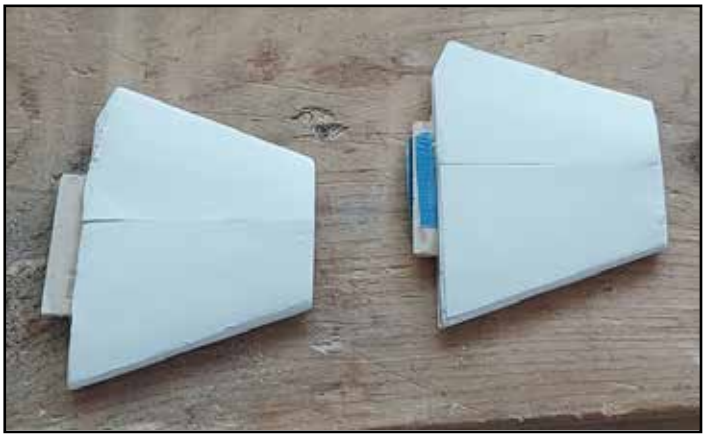


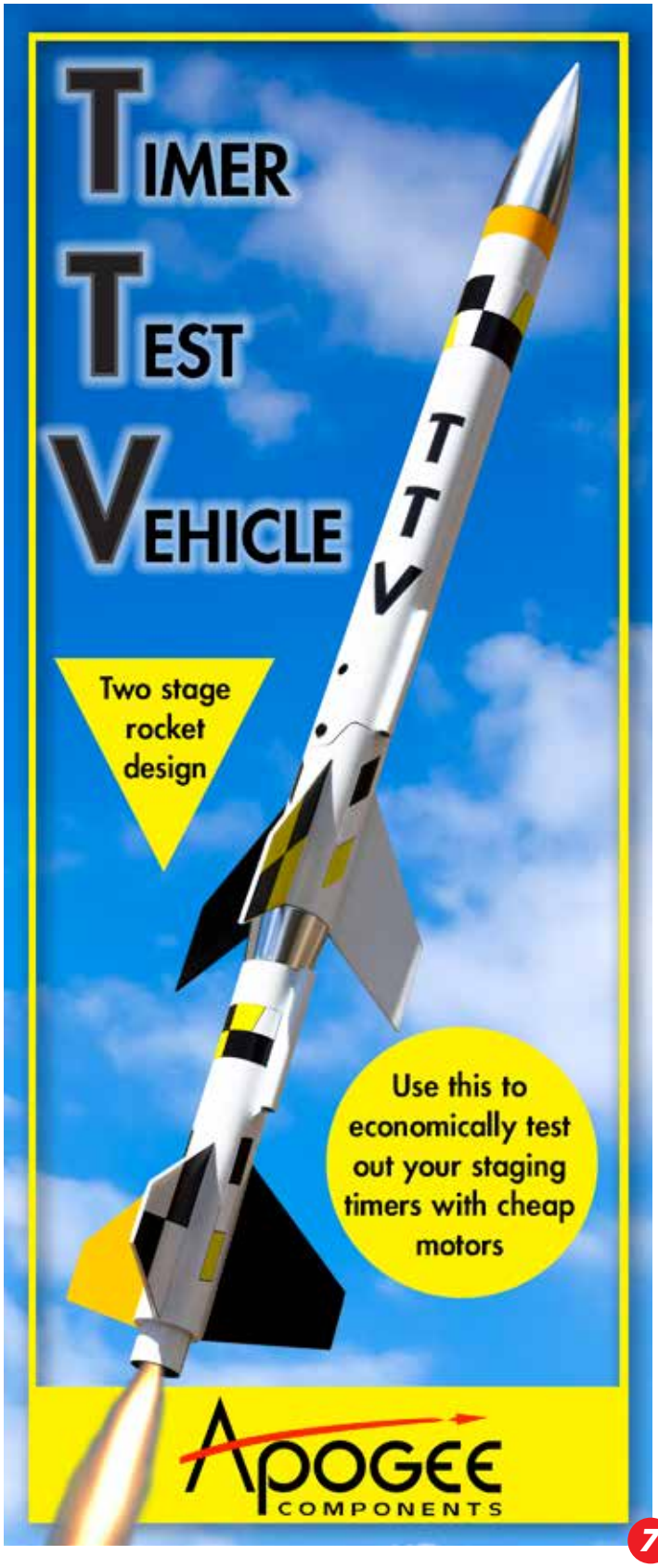
Figure 3: Primer has been added to the papered fins.

required to get the edges right. The CA will sand ok. Feather the paper to match the wood.

The CA papered fins have a splotchy appearance. Primer is required for the paint to have a uniform color. I used Bulls Eye 1-2-3 primer. 2 light coats gave the desired results. I haven't used any other primer, so your results may vary. After priming, the fins are ready for paint. Like primer, only a couple of light coats of paint are sufficient. If the fins are carefully examined, flaws in the paint or papering can be seen, but the general appearance at any distance is very good. I expect with a little practice, and attention to detail, that perfect results can be obtained. The yellow fins were glossy (metal-like, Yay!), and the orange not so much. I cannot account for this. Maybe it was because the orange paint was old and the yellow new. It might be possible to gloss up the orange fins with some fine grit sandpaper or rubbing compound. Since there isn't much paint on them, I am not going to risk removing what little paint there is by trying to shine them up. They look good enough as is. Like Tim said, "I can live with it."

Weight

In video #381, the description says that the papering process works "without adding much weight"." I investigated how much weight is



actually added. To cut to the chase, the answer is about 10%. Realize that this is not a scientific study, I only weighed 4 fins. There may not be a linear relationship when scaling up to larger fins. More data is needed to determine if this percentage applies widely. That being said, it may give a general idea of how much weight is added using the CA paper method. I also weighed the fins with paint to get an idea of the total percent weight added to the raw wood fin. The average total added weight is about 17%. The table below summarizes my results.

Fin Weight Comparison

	CA -paper			paint		
Fin #	Initial weight	final weight	Percent change	Initial weight	final weight	percent change raw - final
1	8	10	20	10	10	20
2	8	9	11	9	9	11
3	9	9	0	9	12	25
4	8	9	11	9	9	11
Average % Change			**11**	**Total Average change**		**17**

This may seem to be a lot, but paint is heavy (dense), especially when compared to balsa and paper. One of the pleasant surprises when I returned to model rocketry recently is that larger motors are available at a reasonable price. Back in the 70's it was hard to scratch enough money up from the paper route up to buy a mighty "D". "E" and "F" motors were just coming on to the scene and were quite pricey. A good finish will substantially add weight to a rocket, but now you can just buy a bigger motor!

In summary, papering fins can provide a paint-ready finish with less work than other balsa finishing methods. In some instances, the CA method can result in a smooth, glossy finish. Practice should improve the quality of the outcome. All finishing methods add weight. Using the CA method, I documented what weight was added during my construction. I also provided data on the weight of the painted fins. This gives guidance on deciding what finishing method to use. Whatever finishing method is used, enjoy building and launching rockets.

About The Author:

Joe Mustion is a retired rocketeer living in Florida and is a member of the Tampa Bay Rocketry Association. Prior to retirement, Joe had a career was working for USDA helping farmers conserve water and wetlands. He is married over 40 years to the same woman, and has two adult children.

PEAK OF FLIGHT NEWSLETTER
Article Submission Guidelines
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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 nice 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 more common articles that we reject all the time, because we've published on these topics before:

- How to get a L1 Cert
- How to get an L2 or L3 Cert
- Building cheap rockets
- How to 3D print parts
- Building Low Cost Launch Equipment (pads and controllers)
- Getting Back Into Rocketry After a Long Hiatus
- How to Build a Rocket Kit
- How to Build a Computer (too technical)

ARTICLE & IMAGES SUBMISSION

Articles may be submitted by emailing them to the editor. Article text can be provided in any standard word processor format (MS Word, Libre Office, etc.) or as plain-text. Graphics, meanwhile, should be provided 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 a width of 1200 pixels for two-column images. If possible, it is generally preferable for images to be simple enough to be readable in a two-column layout, but special layouts can use the whole page width if required.

Send the images separately via email as well as showing 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 have been run in another publication before inclusion in the *Peak-of-Flight* newsletter, but it may be based on another work such as a prior article, R&D report, project 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.

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

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