A Penn State Rocket

By John Brohm NAR #78048

From time to time, I receive a few enquiries about the methods and materials I use to build and finish my models, and I thought perhaps this information might be of interest to the broader community. If not, or if you're already comfortable with your finishing regimen, then disregard this note and press delete. However, if you're a bit like me and are curious as to how other folks craft and finish their models, then there might be something of interest for you in this note.

I'll start by saying that there's no one "correct" way to build and finish a model. Whether you're only interested in using water-based materials or are more comfortable with a solvent-based finishing system, each regimen will produce top notch results so long as the modeler puts the time and effort in to master the materials and techniques. As a young model builder just starting out, I would get very frustrated with my results; no matter what I did, all my models seemed to turn out awful, and nothing like the artwork on the kit box. It was some years later, when I happened across a book in the local hobby shop, that my whole outlook on finishing changed. That book taught me that anyone could produce a nice looking, well finished model, and that it wasn't about being born with special skills, it was about understanding the methods and materials, and then practice, practice, practice. The book was entitled "There are No Secrets", written and published in the early '80's by Harry Higley. Harry was a highly regarded master modeler and craftsman, and his approach and philosophy for model finishing completely changed mine.

So, in the spirit of "There are No Secrets", permit me to share a few of the things that I do, starting with a short backstory for this particular build.

A Big Ten Story

Some years ago, while my son was attending The Ohio State University, I thought it would make for a nice gift to build for him an OSU-themed model that he could either fly or display. The model was built from LOC/Precision's Onyx kit, and the following photos shows the finished result.

Photo 1: Miss Ohio State, circa 2007

Photo 2: Fin Sunburst Pattern

All the markings were painted on the model, except for the OSU logo. That was a vinyl sticker that I had purchased at the college bookstore during a visit with my son.

Well, a few years following graduation our son met an absolutely wonderful girl while working in the Philadelphia area. The young lady was a graduate from another Big Ten school, Penn State. Despite the football rivalry between these schools the two got married, and have since produced for us three absolutely beautiful grandbabies. Anyway, with Penn State now part of our family I felt it wasn't right that the OSU model was sitting there all alone, and so I broke out another LOC Onyx with a view to finishing it in a nod, if you will, to the Nittany Lions.

A Penn State Rocket

The motor mount for this model is a rather simple affair – a 29mm tube and two 1/8" ply centering rings. In the following photo one can see I've added a Kevlar shock cord anchor, making sure the total length doesn't exceed the internal length of the airframe; this minimizes the risk of a zipper, or tear, in the airframe as a consequence of a sharp deployment event.

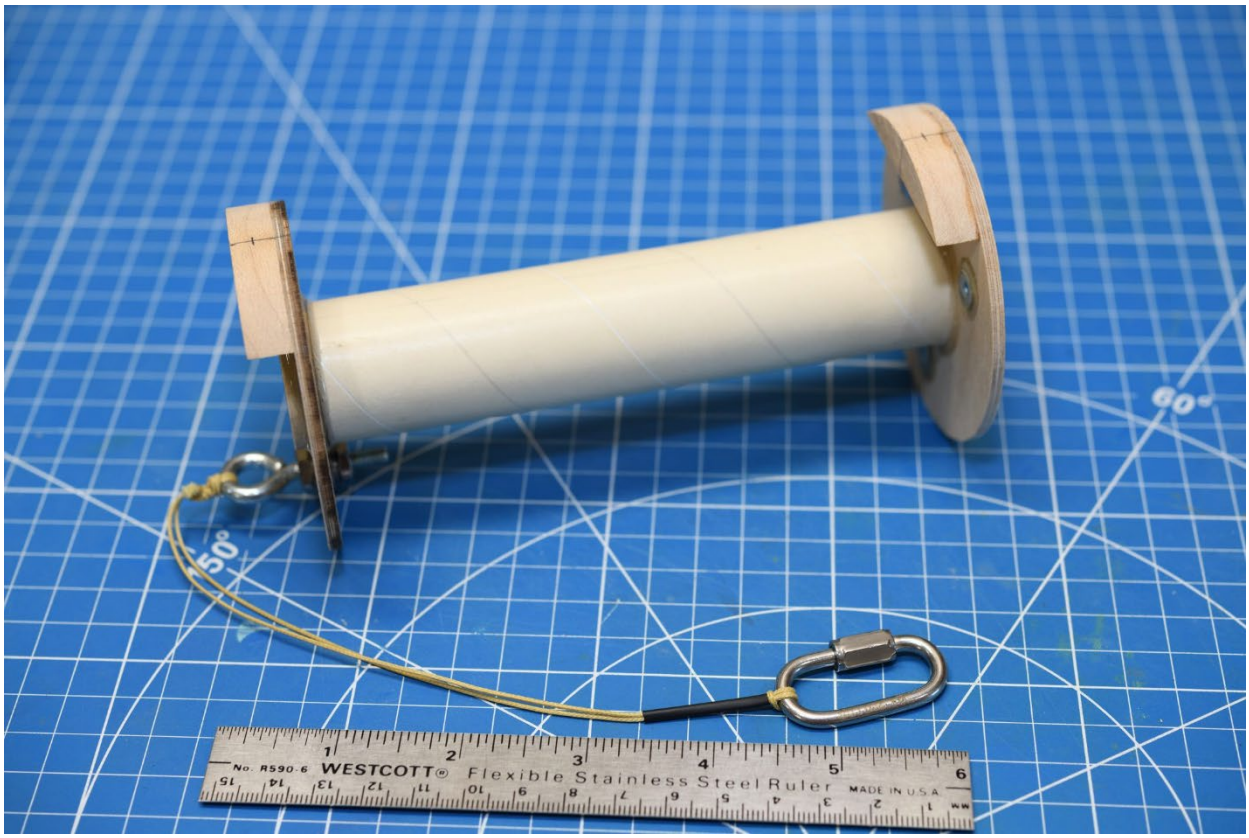

Photo 3: The Motor Mount

One can see I've also added a pair of maple blocks to the Motor Mount Assembly. These were cut and shaped from 3/8" square maple stock, the kind the model airplane guys use as the engine bearers for their motors. These will be used to securely seat rail buttons on the model. At our club we're moving away from

rod launch lugs for mid-power and higher power models (F impulse and greater), as we don't like the rod whip risk caused by heavier models when launched from rods. So, we are encouraging our members to move to rail buttons on their larger new builds.

Once the motor mount is installed, those blocks will be drilled and tapped for the 8-32 machine screws that fasten the buttons to the model. The maple blocks provide an excellent anchor and reduce the risk of a button pull to almost zero.

One will also notice some blind nuts on the aft centering ring. These are for mounting a PML (Public Missiles Limited, now owned by LOC/Precision) motor retainer. When the OSU rocket was built the PML retainer was a commonly available motor retainer; AeroPack had their screw-on retainers but they were/are machined from aluminum, and were/are considerably more expensive. And this was before Estes came out with their plastic retainers. So PML it was, and I decided to do the same for the Penn State rocket. The following photo shows what the PML retainer looks like.

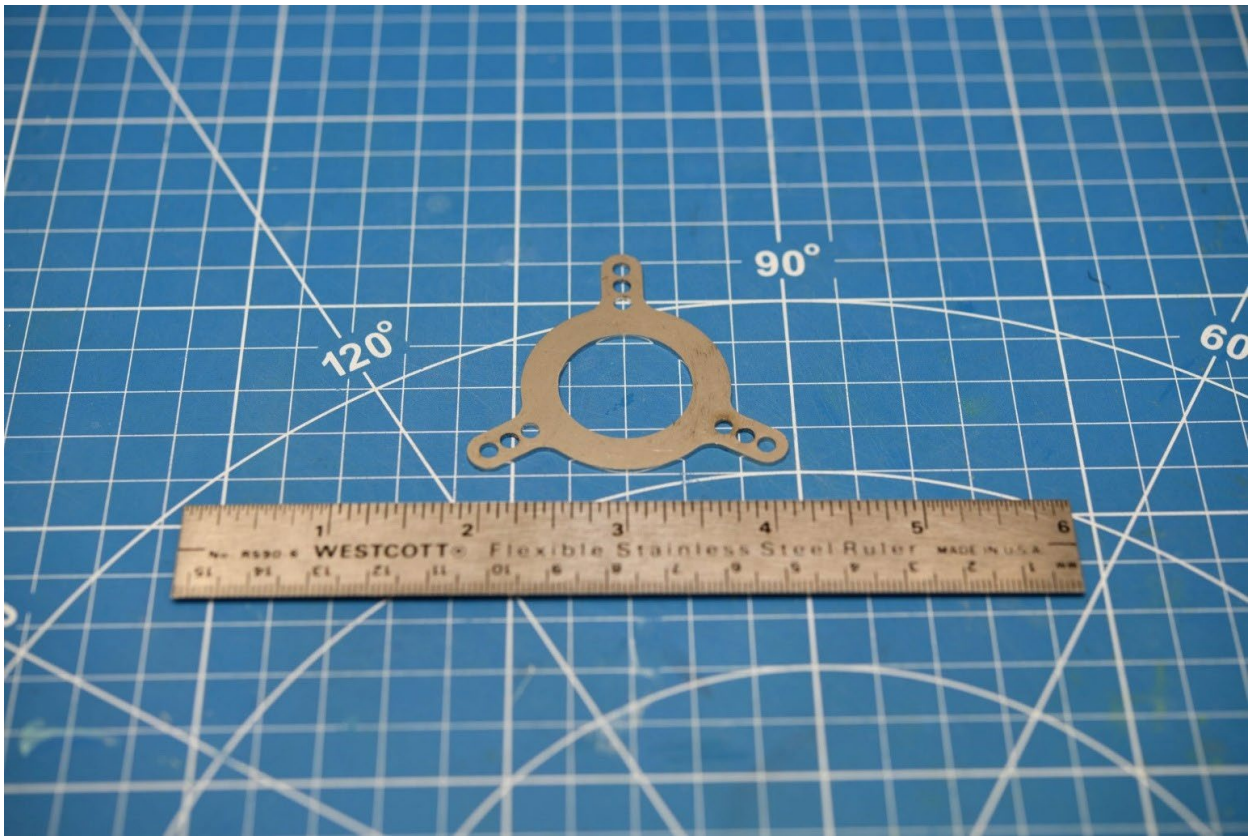

Photo 4: Motor Retainer

Before installing the motor mount, I filled the seams in the airframe. I used Bondo Glazing & Spot putty for this, dry-sanded smooth with #320 grit. In the following photo one will note that I've filled both the surface seam and the seam that sits beneath the outer glassine wrap. In this case the underlying seam is actually the bigger of the two, and it's my practice to fill both, as over time that underlying seam will reveal itself if not

filled. Ejection pressure, changes in humidity, etc, can cause an unfilled underlying seam to flex, eventually appearing in what otherwise might be a very nice paint job. So, I fill both.

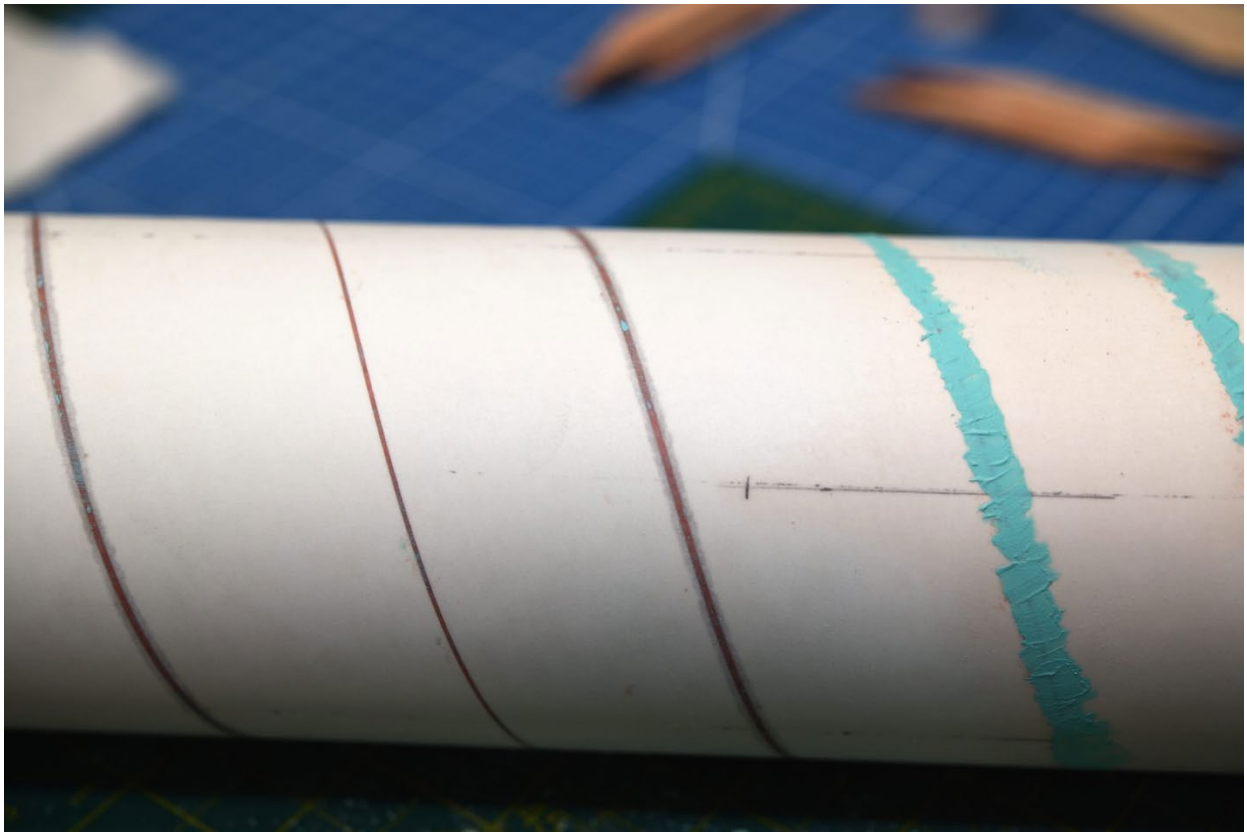

Photo 5: Filled Seams

In the photo above, one will also note the green putty. This I applied as a second pass after sanding the Bondo-filled seams, because there are always divots and other fill defects left over from the first pass. Plus, Bondo shrinks a little as it cures, so there will likely be low spots in various places along each seam. That green putty is 3M's Acryl Green, but just about any sandable putty would work for the second pass.

Note that Bondo and Acryl Green are solvent-based. Some folks eschew solvent-based compounds, which is entirely ok. From a finishing perspective the point of the double pass is to ensure the final sanded surface is totally smooth and presents with as few blemishes as possible. This is the objective regardless of the filler type one chooses to use.

Next, I marked the airframe for the fin and rail button locations. Once the epoxy for the motor mount had cured, the airframe was drilled and tapped to accept the rail button mounting screws.

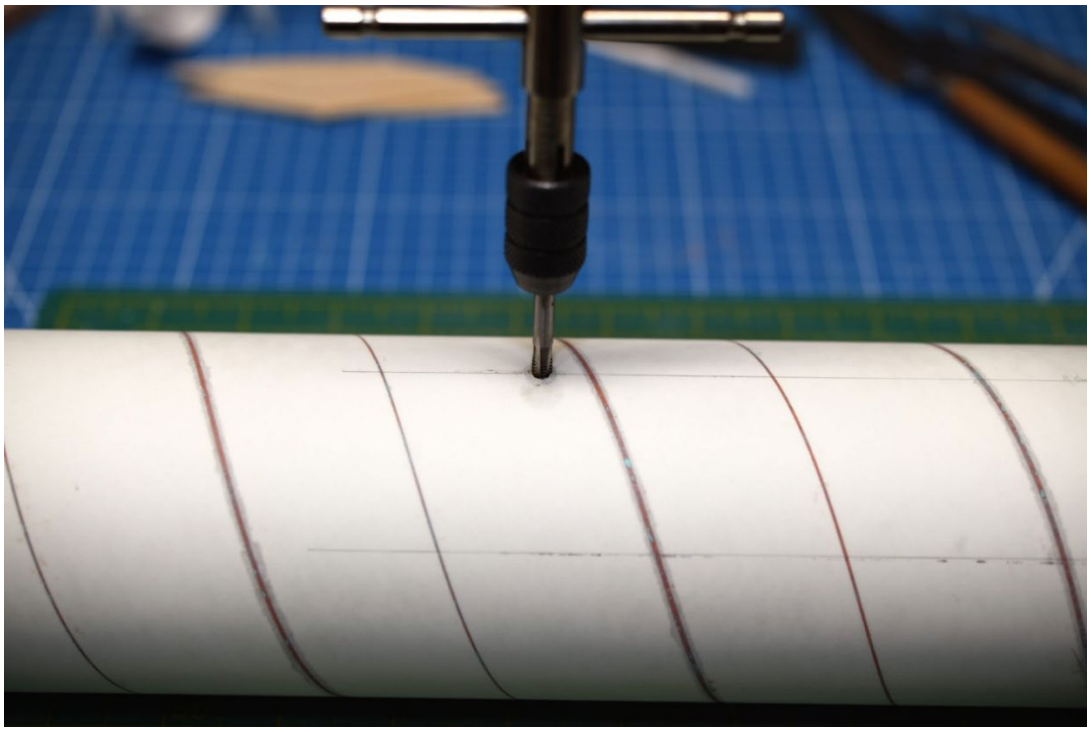

Photo 6: Rail Button Tap

And then a test fit of the rail buttons

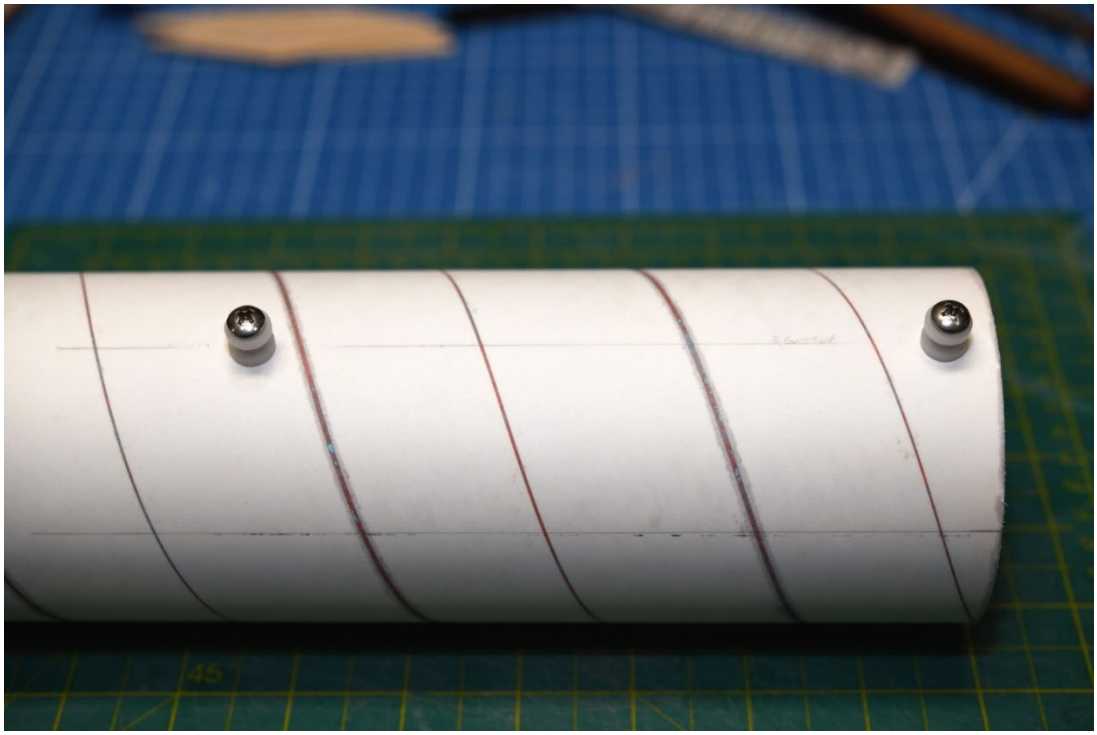

Photo 7: Rail Button Trial Fit

Now for the fins. The fins had their outer edges rounded, and then each fin was covered with a piece of K&S SilkSpan and three coats of Randolph non-tautening Nitrate dope, SilkSpan and dope being my preferred surface filler. But lots of guys use just plain old SIG sanding sealer, others use Elmer's CWF, still others like to paper their fins with label paper. Pick the poison of your choice; each method can be made to work to produce an excellent result. For more info on those alternative methods, I'd recommend logging onto the Rocketry Forum and doing a search there – lots of examples and descriptions of these methods.

Once the fins were prep'ed, they were each mounted with a bead of 5-minute epoxy. I have a set of fin-mounting guides that I had crafted from picture/photo mat board, and they provide a quick and simple way to tack-mount the fins, properly spaced, without glue running all over the place.

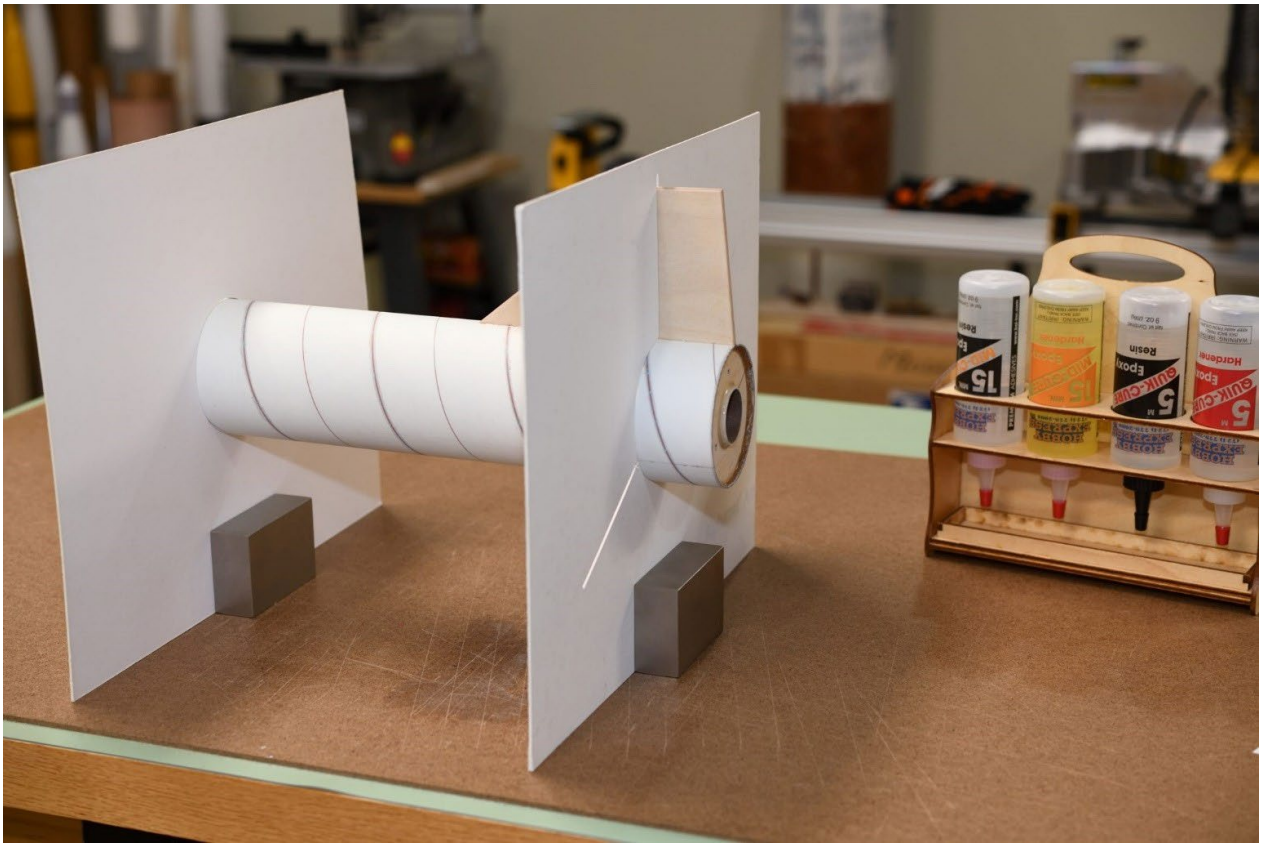

Photo 8: Mounting the Fins

Once the three fins were installed, it was time to set up for the fin fillets.

Photo 9: Fin Fillet System

The photo above shows the stuff I use for filleting. 5-minute epoxy, some stir sticks, the always important Nitrile glove, and some high proof IPA. I have that upside down glue caddy that you see there in the background, as it allows me to store my epoxy bottles upside down, ever ready for a squeeze. A few years ago, I was searching the internet for such a thing, because it's a pain waiting for the epoxy to flow to the bottle tip in a partially empty bottle. Turns out no one offered an upside-down glue caddy at the time, so I started searching for someone willing to design and burn one for me. That led to a nice gentleman at Retro R/C, who thought the idea would make for a great product. And it has – he now sells various versions of this upside-down glue caddy on his website http://retrorc.us.com/boxescaddysandtoolracks.aspx

For filleting, I start by marking out the fillets. For fins this size I like to use 3/16" fillets. Once marked, I tape them off; I do a pair of fillets at a time, making sure they've cured enough that the epoxy won't sag or run before turning the model for the next pair. If the epoxy sets up quickly, then I'll just do them one at a time.

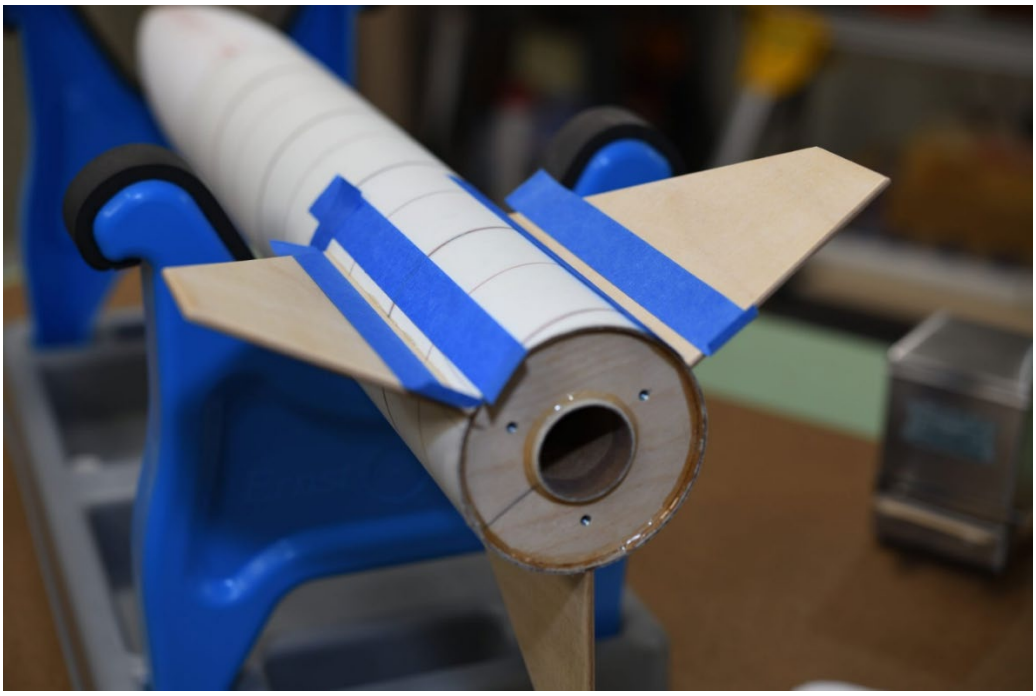

Photo 10: Fillet Masking

Once the epoxy is placed in the masked area, I'll form the fillet with the index finger of my gloved hand. The IPA is used for a final smoothing. Then I remove the masking tape. The tape shouldn't be left on too long, or a hard dam will occur along the edges of the tape as the epoxy begins to set. Once done, the fillets should look something like this.

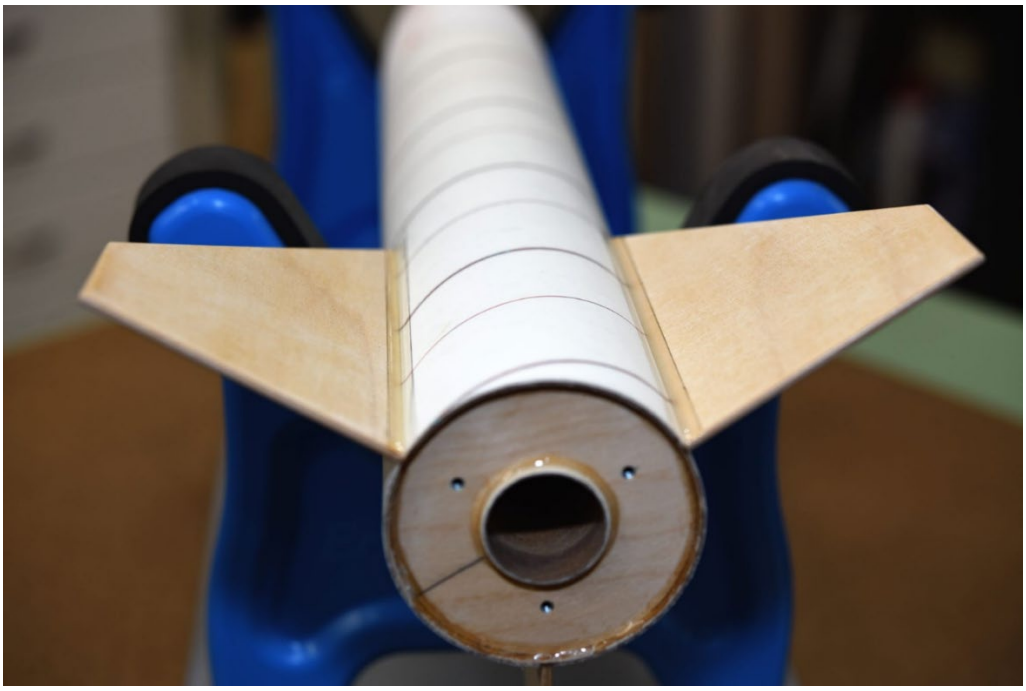

Photo 11: Finished Fillets

Once all three fins are done and the epoxy is fully cured, we have a model ready for the paint shop.

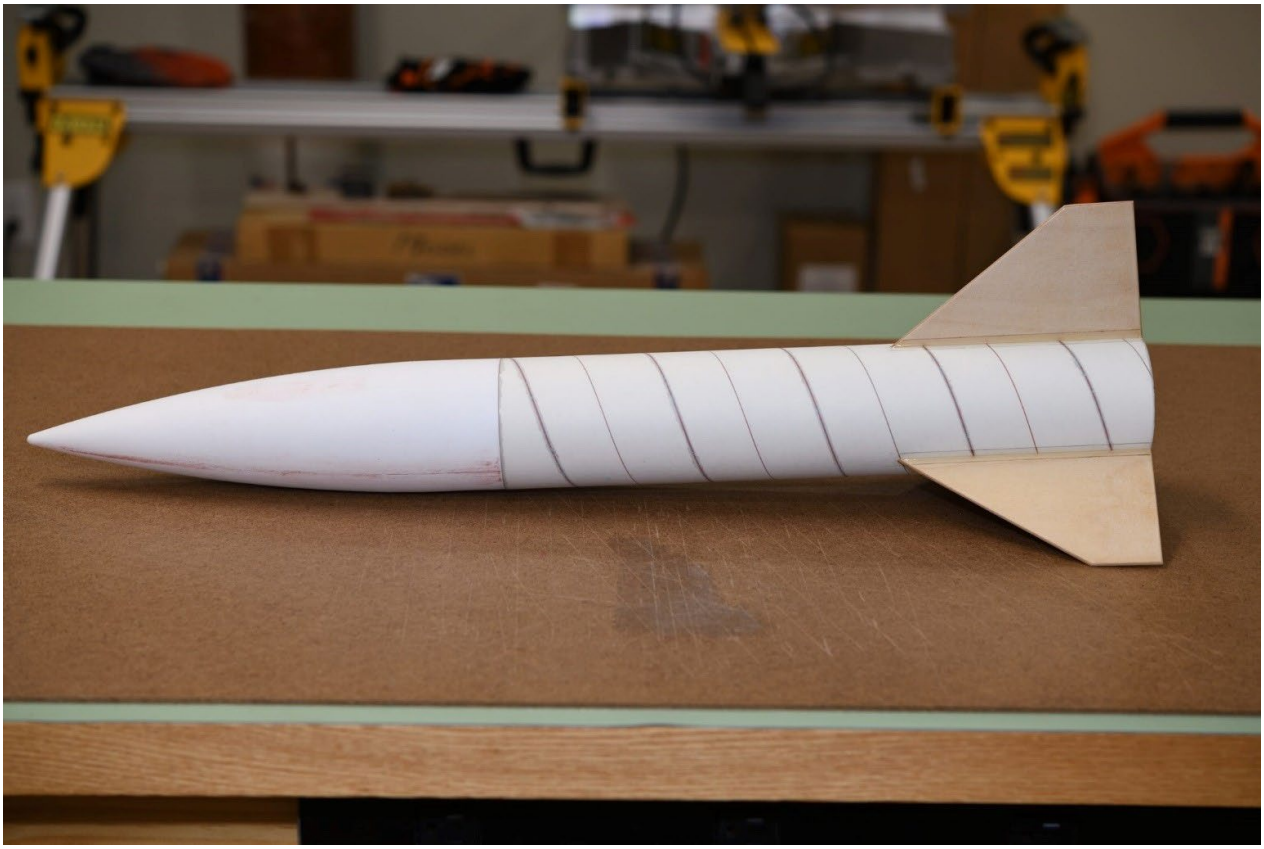

Photo 12: Ready for the Paint Shop

Finishing

The model was primed with Rustoleum Automotive Gray primer. This is my preferred primer, as it has a good solids content, dries quickly, and wet-sands wonderfully once cured. I start with two coats of primer, and then candle the surface looking for any remaining seam issues or surface defects that may remain. Any that are found are filled and sanded, and then the model is re-primed.

I wet-sanded the fully primed and cured model with a #400 grit, followed by a wet-sand with #600. Even though the #400 leaves what appears to be a smooth surface, close examination will reveal a number of surface scratches – the #600 resolves those. The next photo shows the model ready for paint; a close look shows a soft reflection of the 6" straightedge in the nose cone, highlighting a very smooth, primed surface. Such a surface makes a good starting point for paint.

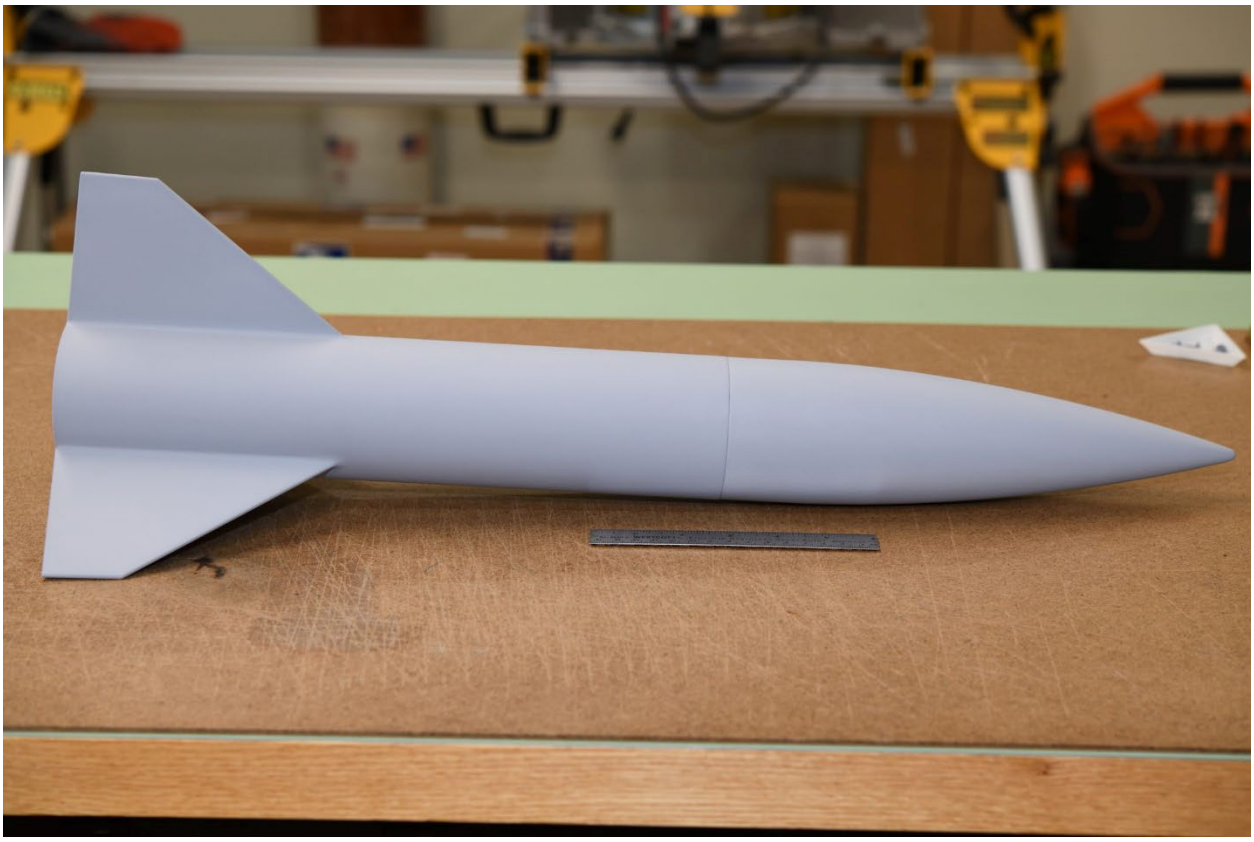

Photo 13: Fully Primed

I like to finish my models with lacquer paints, as these dry very quickly, and allow a recoat within 10-15 minutes. For this particular build I'm using Dupli-Color's Perfect Match automotive rattle can paint; the white is Dupli-Color BGM0153 Polar/Arctic White.

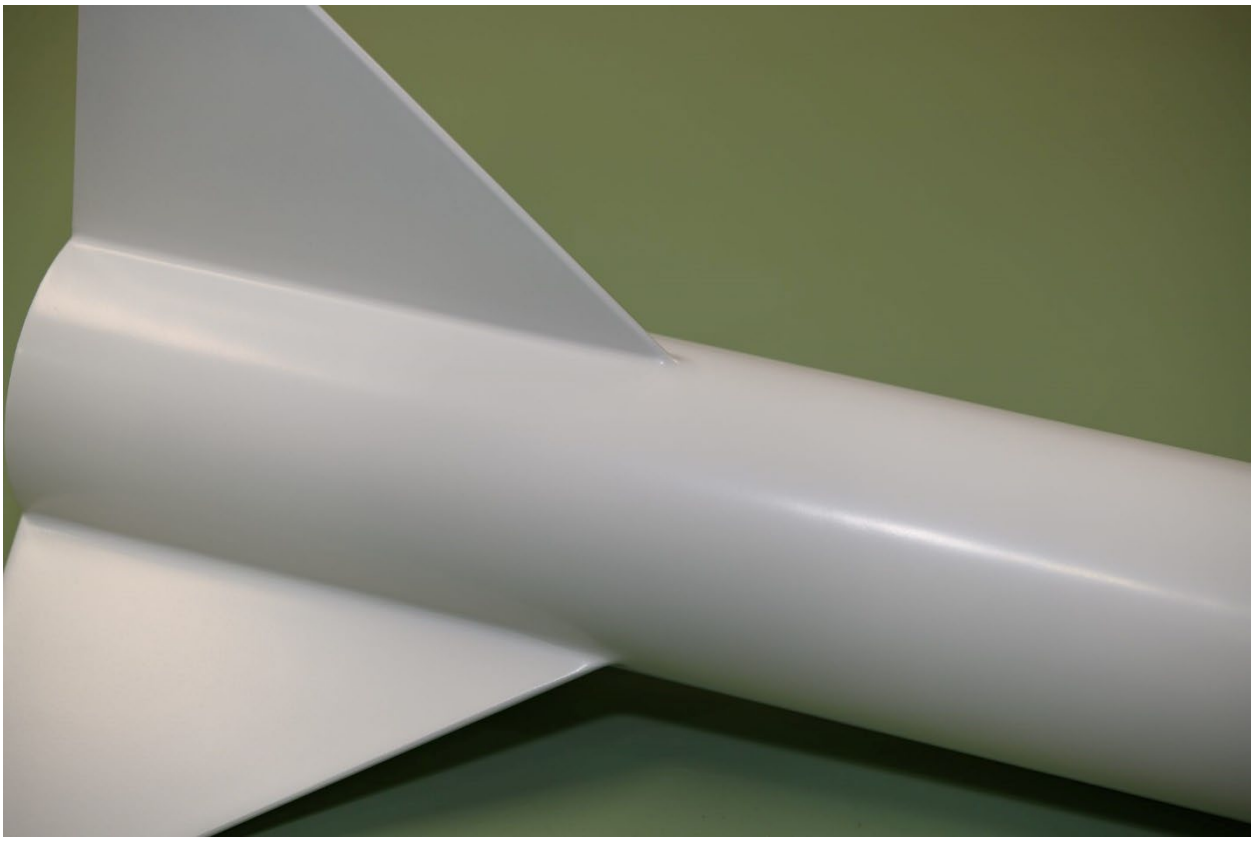

Photo 14: White Paint

Next, the model was masked with Tamiya masking tape to map out the areas that will be sprayed blue. More specifically, I use Tamiya tape anywhere I need a sharp line. Over the years, Tamiya tape has performed the best for me, producing perfectly sharp lines with no edge bleed, and without having to take extra steps to seal the tape edges before spraying. I also use Tamiya tape anywhere on the model where the masking will come into contact with the prior surface paint - I've not had an occasion where Tamiya tape pulls up the underlying paint, provided of course I've allowed the prior paint to properly cure.

Tape and masking in place, the model was sprayed with Dupli-Color Perfect Match BFM0187 Dark Blue Metallic.

Photo 15: Blue Paint

These short, somewhat stubby, rockets usually have large fin surface areas, and so I like to use a sunburst pattern to fill in the fins. In this case, I'm accenting the blue paint with Dupli-Color Perfect Match BCC0410 Bright Silver Metallic. In this sunburst pattern there is an inner and outer silver accent ray, and each must be masked and sprayed separately. We'll begin with the outer ray. I'll also take this opportunity to tape, mask and spray the silver accent bands located forward and aft of the front blue band.

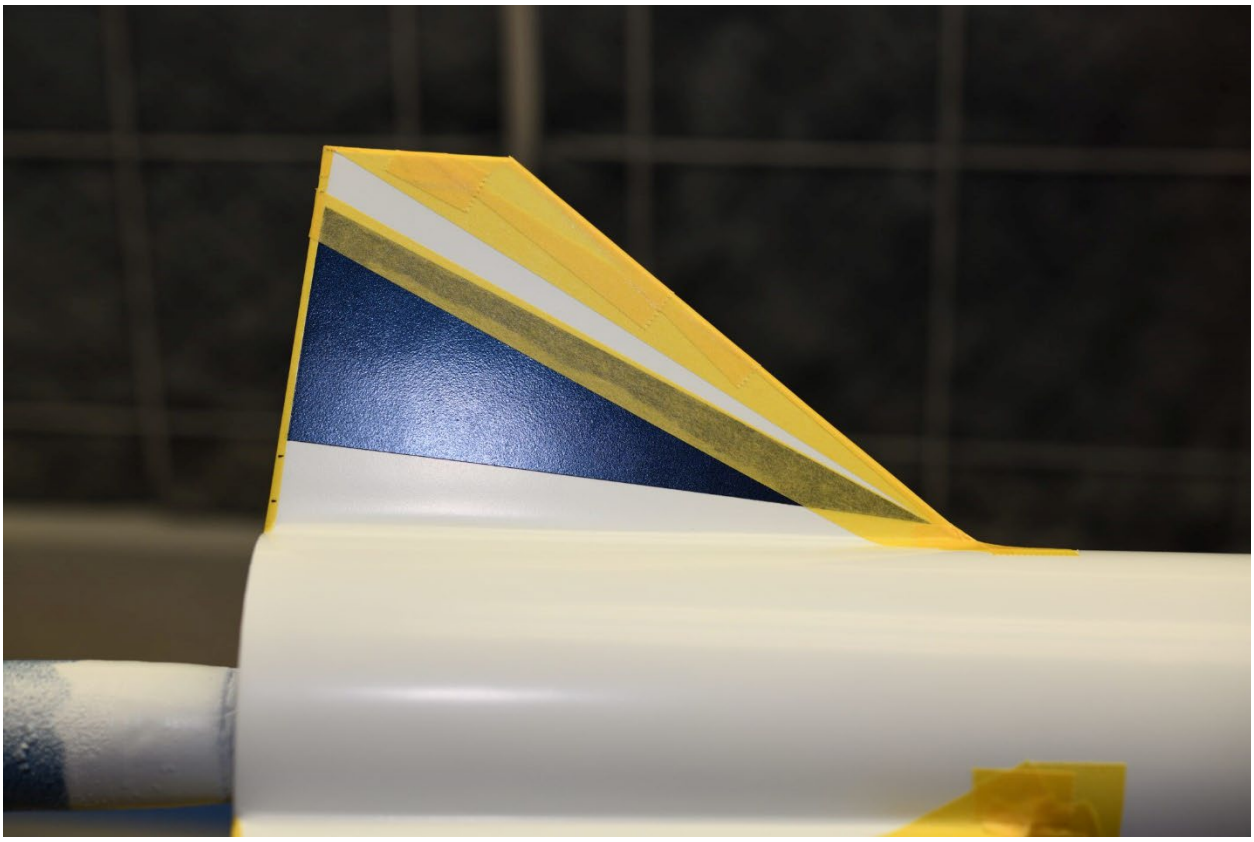

Photo 16: Starting the Outer Silver Ray Masking

Photo 16, above, shows the beginning of the outer ray masking. The photo's angle also highlights the orange peel that often accompanies spray lacquers. No problem; we'll resolve that orange peel in the final finishing stages.

I use plastic grocery bags as the fill-in masking material. I don't like using paper, especially newsprint, for fill-in masking, as paper can allow for paint soak through, and newsprint can quite easily transfer its printing ink to the underlying paint surface. I like plastic grocery bags as they are cheap (free), super flexible, and are paint-impervious provided the plastic is doubled over. Otherwise, there is a risk of a pinhole providing a paint-through path, and if a pinhole exists, the paint will surely find it.

Once all the tape edges are burnished and the fill-in masking is doublechecked for gaps, holes, and any other surreptitious port of entry, the silver is sprayed. Removal of the masking gives us our reveal.

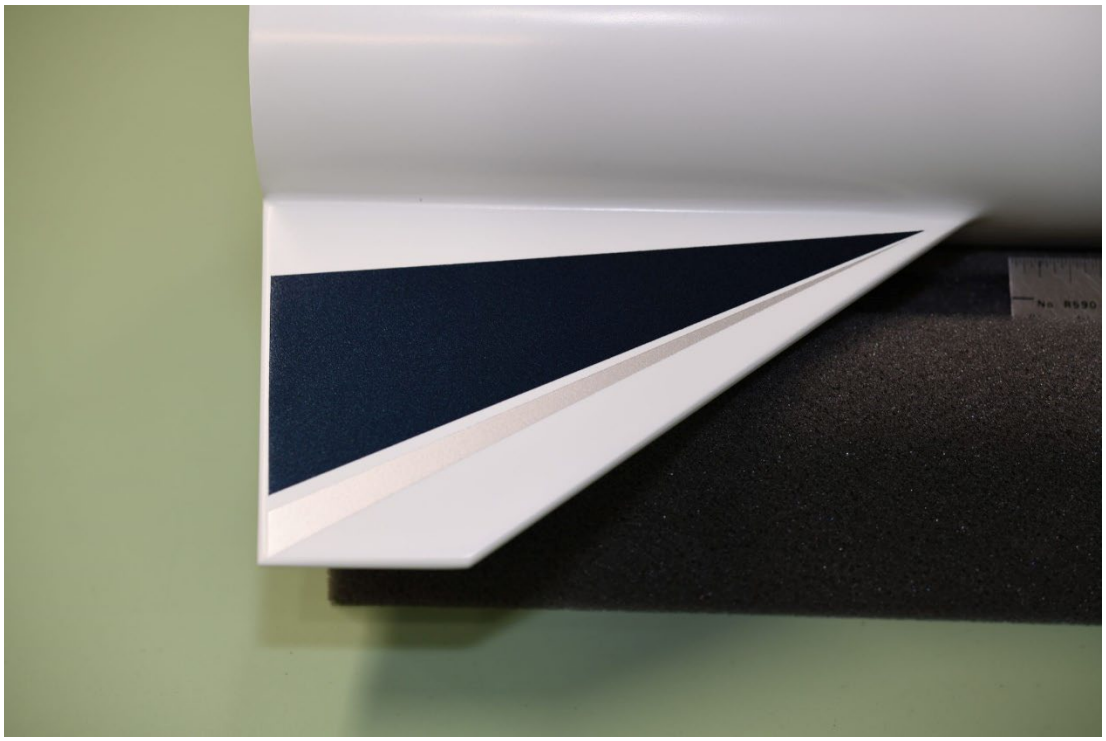

Photo 17: Outer Silver Ray

Once the paint's dry, we can mask for the inner ray.

Photo 18: Masking the Inner Silver Ray

Removal of this masking gives us a completed sunburst paint pattern on each fin.

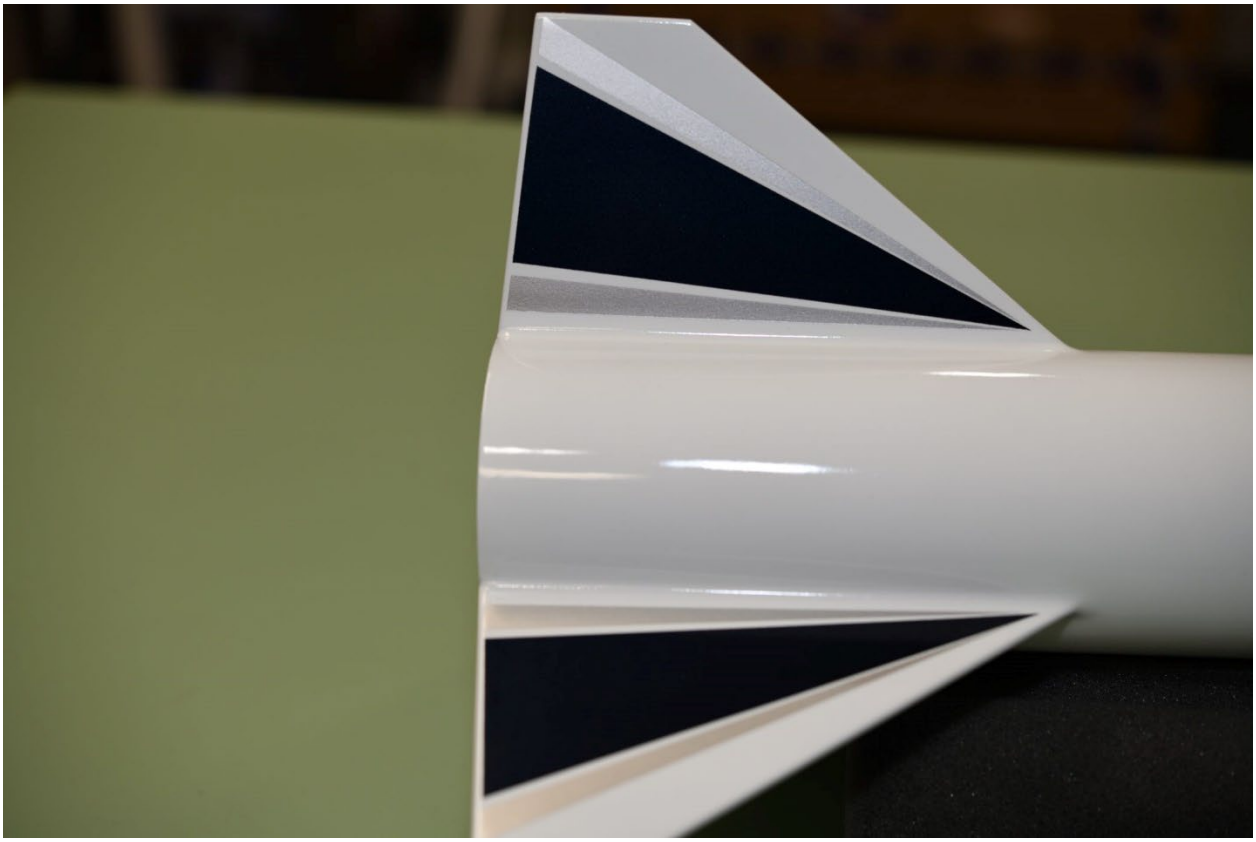

Photo 19: Finished Sunburst

The paint was left to cure overnight, and then the model was sprayed with Rustoleum Crystal Clear enamel. This initial clear coat forms the base for the application of the Penn State decal.

The Decal

The next photo shows the vinyl logo that I had initially planned to use on the model.

Photo 20: Vinyl Logo

I wasn't completely happy with it as the logo color wasn't a great match to the blue paint I was using. Finding a blue lacquer spray paint in a shade close to Penn State blue was difficult, and then finding a logo sticker that would match that bordered on the impossible.

The second problem was more daunting. In an uncommon moment of caution, I decided to test the vinyl logo with the clear coat spray I intended to use. I'm glad I did, as the spray immediately beaded up on the vinyl – there was little point moving forward with this sticker. I was now confronted with making my own decal.

A Google search left me adrift in a sea of choices but I eventually settled on a logo found at www.cleanpng.com

Figure 1: Penn State Nittany Lions Logo

I thought this one was more interesting, and the two-tone graphic meant it would be a better match to the color scheme I was deploying on the model. Importing this image into a graphics software allowed me to adjust the size of the marking and also the shade of blue. All this extra effort left me with a better marking with a closer color match as compared to that simple store-bought vinyl logo.

The image was printed on Bare Metal Foil's Expert's Choice Laser decal film with an HP LaserJet printer. Given its size, I chose to overspray the marking with a light coat of Rustoleum Crystal Clear before application – doing so would prevent the laser toner from flaking off while handling the decal, and at the same time stiffen the film, aiding the handling and placing process. The marking placed with little difficulty, and having previously applied an initial gloss coat on the model I found that the decal settled just fine without the aid of any decal setting solution.

As for the placement itself, I generally avoid eyeballing it if I can; usually I'll measure and lay out a frame of Tamiya masking tape that the edges of the decal can bump up against during application. This gives me a solid alignment reference to work to. This case was no exception, other than a little more layout was needed to accommodate the odd shape of the marking.

Photo 21: Decal Applied

Final Finishing

The marking was left to dry overnight, and then two more coats of Rustoleum Crystal Clear were sprayed over the entire model. Once this had fully cured, the model was wet-sanded, rubbed down, and then hand waxed. Doing so resolved any remaining scratches leftover from the earlier wet-sanding, as well as any orange peel that may have lingered, as we saw in our earlier Photo 16.

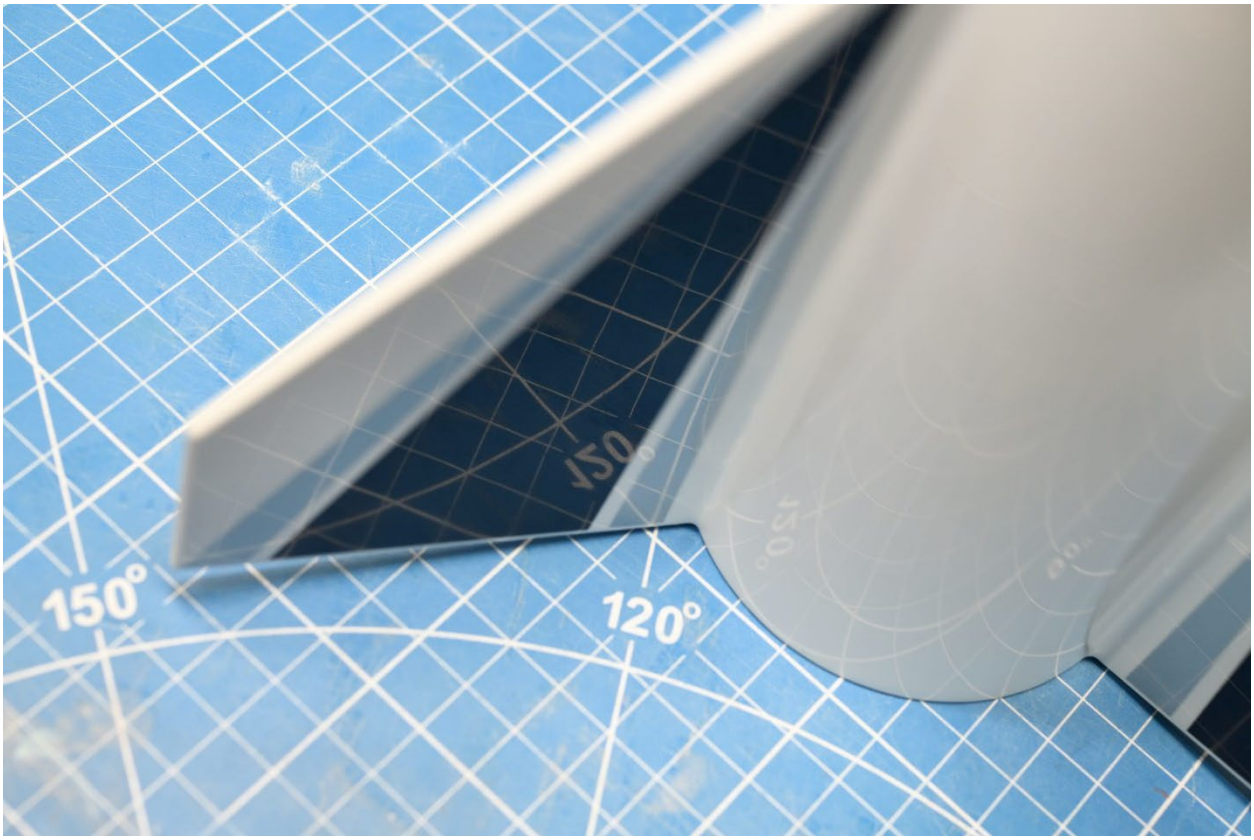

Photo 22: Orange Peel Resolved

After all that elbow grease, we arrived at a finished Nittany Lions Rocket, ready to take its rightful place in a House Divided.

Photo 23: A House Divided