

# THE 3-D PRINTING DEPARTMENT

## Building a Krauss-Maffei ML 4000 “Cab Unit”—Part 3

By Roger Nicholson



**It was time to give my Krauss-Maffei ML 4000 an identity.** As it turns out, not all KM “cab units” look the same—Later models incorporated design changes that were needed to improve performance. These changes were also retrofitted to earlier models, so even their appearance changed over time.

For example, over time, it was determined that there was an issue on the KM with exhaust gases recirculating into the fresh air intakes, particularly in tunnels. A temporary solution was to add external ducts from the air intakes down the side of the locomotive to pick up fresh air from nearer the track. Later versions of the “cab unit” incorporated the intakes internally and vented them through the side panels, which is why you will see some “cab units” with the “Southern Pacific” logo located higher on the side above the air intakes. I decided to model this particular unit on the first generation of the “cab unit,” locomotive #9000. My model represents the earliest version of the “cab unit.”

The second generation of KM units delivered to the Southern Pacific were of a different design, with a hood, walkways, and railings. Gone was the nose that is somewhat reminiscent of an F unit. These second-gens were called “hood units.” Only one operational KM survives today—a “hood unit” owned and operated by the Niles Canyon Railway that has been painstakingly restored over the years.

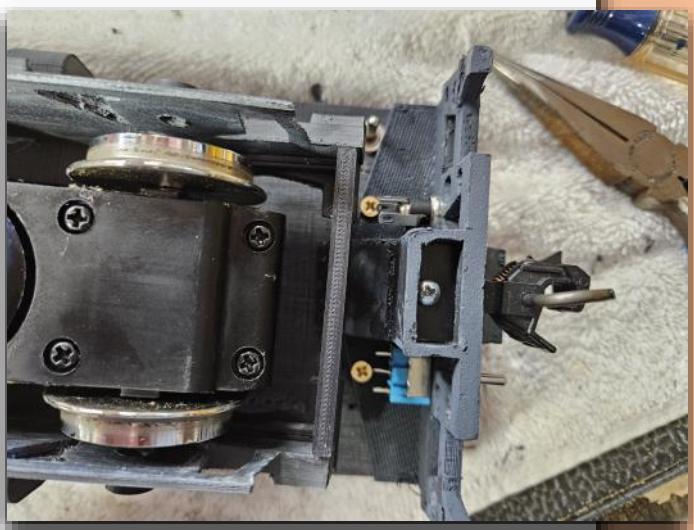
## Wiring up the prototype unit

I decided that my prototype #9000 would have RailPro installed. I spent a good amount of time trying to figure out where to place a couple of

switches and a charging jack so that they would be unobtrusive. I finally settled on placing the on/off switch and the charging port on the rear coupler frame. I

placed a second switch at the rear of the frame. This will allow me to switch between the internal Li-ion battery pack and an external battery car. When the internal battery runs down, I can simply switch to an external battery car and continue to operate until I have time to recharge the internal battery.

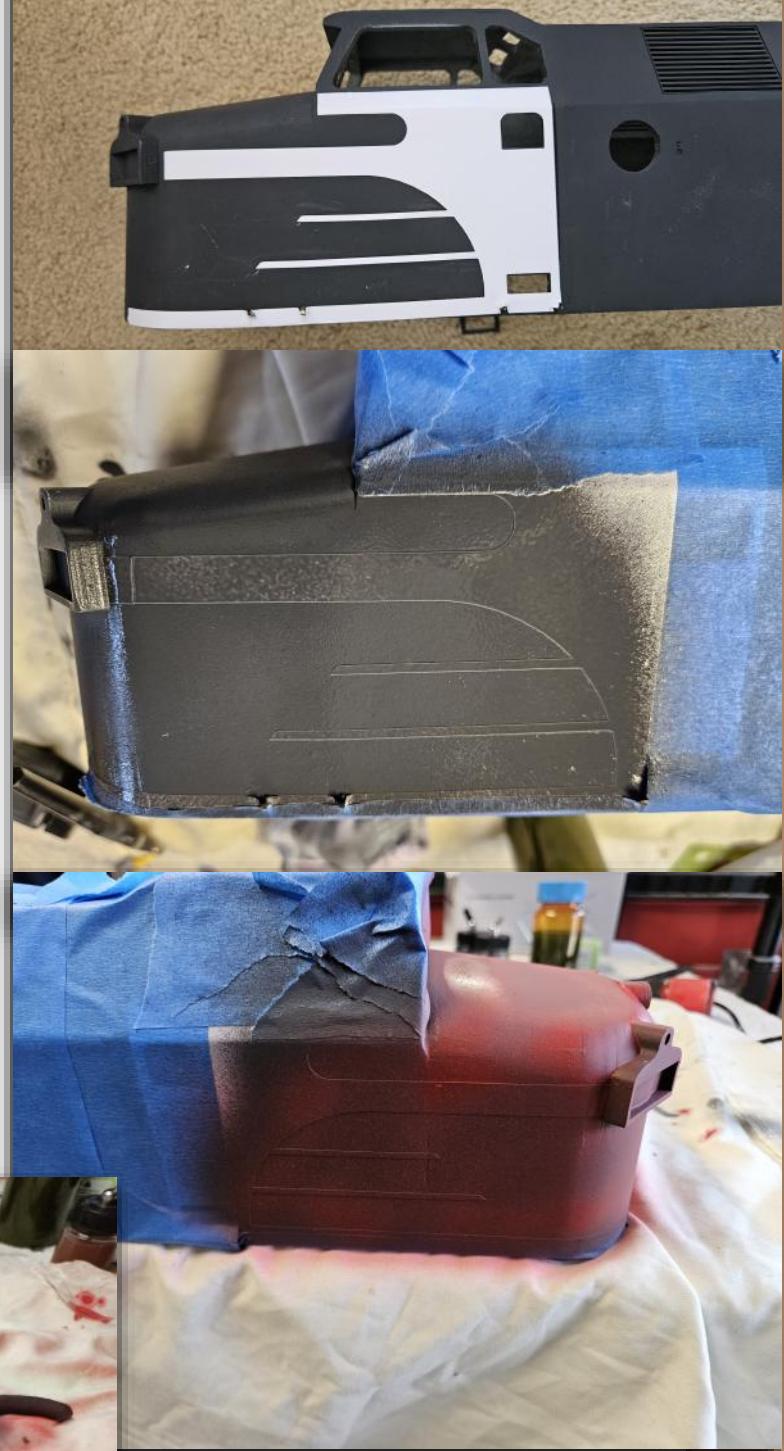
I used a design for the RailPro board holder that I had created for the SW 1500 and adapted it to fit the KM. I installed a speaker, and then wired everything up, including the front and rear lights. I am currently using a 4-cell Li-ion Shark robot vacuum battery, but intend to replace it with an 8-cell battery pack in the future.



## Painting the prototype

I airbrushed the entire locomotive with my own mixture of colors to approximate "SP Lark Dark Grey" using acrylics. KM number 9000 was painted in the SP "bloody nose" colors. Using my original CAD design, I created a template for the red "bloody nose" pattern against the locomotive nose, then created a black-and-white image of it. After scaling the design to fit the actual locomotive, I transferred the image to a vinyl cutter and cut a stencil. The stencil included the cutouts for the step and door window, which allowed me to accurately align it to the locomotive.

The stencil was masked off and then airbrushed with the grey background to seal the edges against leakage. The entire nose of the locomotive was then given numerous thin coats of red until I achieved the desired effect. Removing all of the tape and the vinyl template revealed the final result. I was pretty happy with how it turned out.



The "Southern Pacific" and "9000" lettering was applied in the same manner using a vinyl stencil and airbrushed using white acrylic. For the number boards on the nose, I used vinyl numbers produced using my vinyl cutter.



## Windows

I designed a set of window frames that could be inserted into the locomotive body from the outside, then hand-cut clear acrylic to fit the back of the frame. I epoxied the acrylic to each frame, then glued the frame into the locomotive body. The cab windows presented a bit of a challenge due to the various angles in the openings in the locomotive body that the frame needed to negotiate. I eventually achieved something I could live with, but am continuing to improve the design.



## Grab irons and handrails

In order to bend the 1/16-inch brass rod for the grab irons and handrails, I used a bending jig. I then painted the rails white and installed them on the locomotive.

In my next installment, I take the prototype out in public for some “road tests” to see how it performs.

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