



RhinoCAM at Riverview Hobbies

[Riverview Hobbies, LLC](#) opened for business in 2010 with the goal of producing high quality aftermarket poured-resin products for scale modeling kits, an industry worth 1.5 billion dollars in the US alone, according to the [Hobby Manufacturers Association \(HMA\)](#). Jim Orth, owner/operator of Riverview Hobbies uses [Rhino](#) and [RhinoCAM](#) to design and program the CNC toolpaths required to machine single and multi-cavity molds for their aftermarket kits.

Just like installing aftermarket components on a new automobile, scale model kit enthusiasts can purchase and install aftermarket components for their scale model kits. This allows them to change the look and style of their original model kit.



The RhinoCAM Difference

Prior to 2010 Jim was a career electronics software engineer with no prior experience with either 3D CAD or CAM software. Since the beginning Jim has relied exclusively on Rhino and RhinoCAM to help him perfect the design and production techniques he relies on today. These techniques allow Riverview Hobbies to produce aftermarket scale model kits whose components meet and exceed the quality and craftsmanship of the original kit components!

“Why do we use RhinoCAM? It’s cost-effective, accurate and not difficult to understand! I like the integration between Rhino and RhinoCAM – it allows a workflow where changes in the design process are immediately visible to the CAM toolpaths which is invaluable. Plus, your tech support is always there when I need help. The close relationship we have developed over the years means a lot to me. I’m very happy with RhinoCAM!”

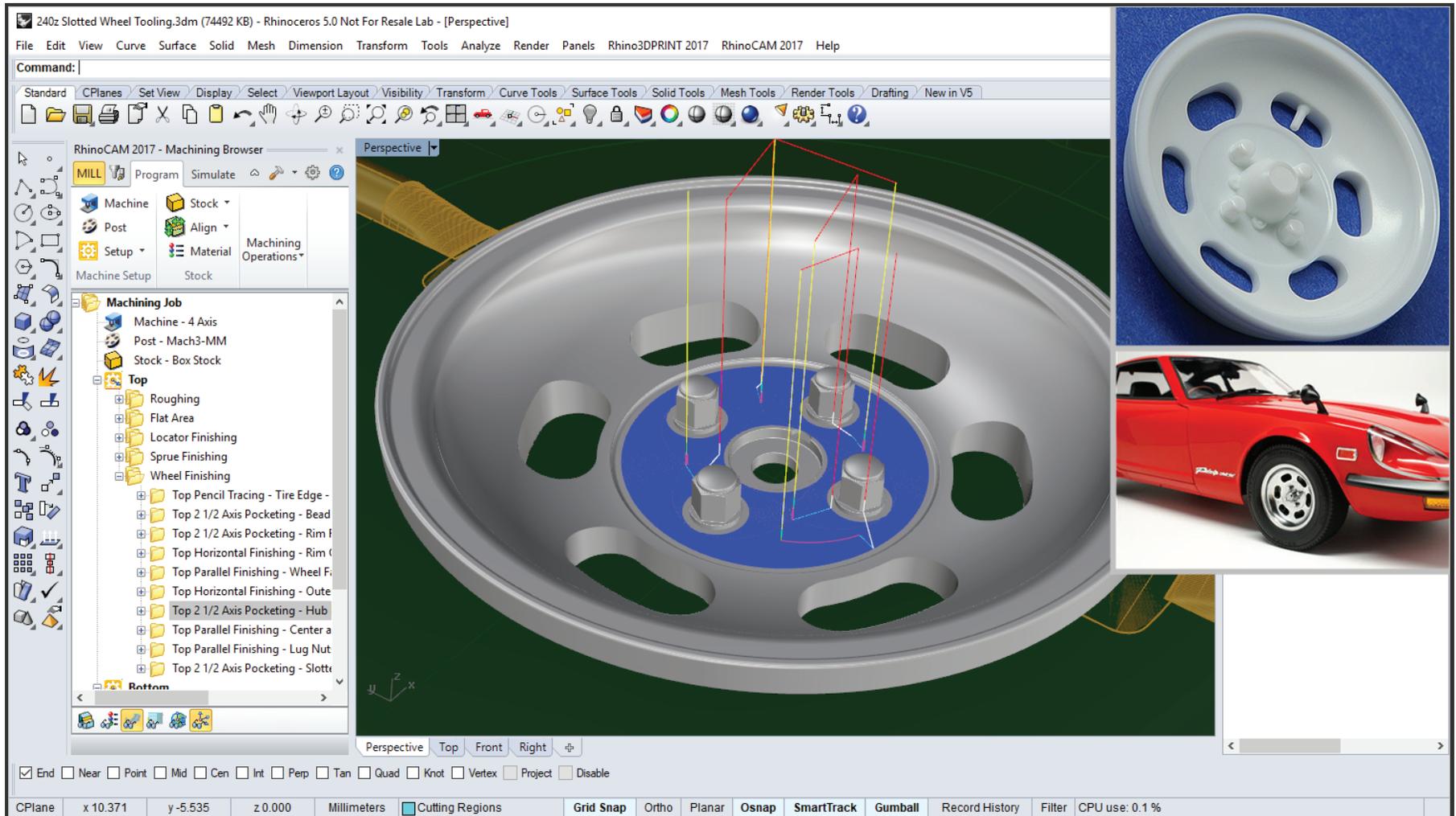
Jim Orth, Owner/Operator, Riverview Hobbies, LLC

The Datsun 240ZG Slotted Mag Wheel Kit

We recently sat down with Jim to discuss his use of RhinoCAM where he agreed to show us some of his exciting projects. Shown below are toolpaths for the [Riverview Hobbies RVH121001 Slotted Mag Wheel Kit designed for the 1/12 Tamiya Datsun 240ZG](#). Jim uses a Minitech 4 Axis machining center and Mach3 controller in these examples.

To produce his molds, Jim uses RhinoCAM toolpaths to cut positive mold cavities of each side of the mold from jewelry wax. A silicone negative of each mold half is then produced.

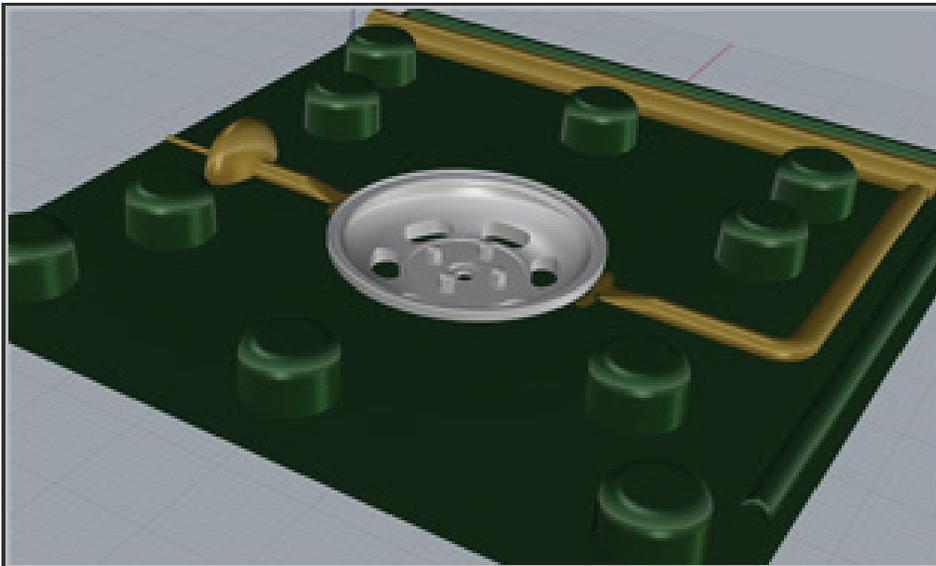
The silicone negatives are then used to produce positive mold cavities from tooling resin. Once cured, these are then hand sanded and polished to perfection. The final production silicone molds are created from the finished tooling and are used to produce the molded components for the wheel kits detailed below.



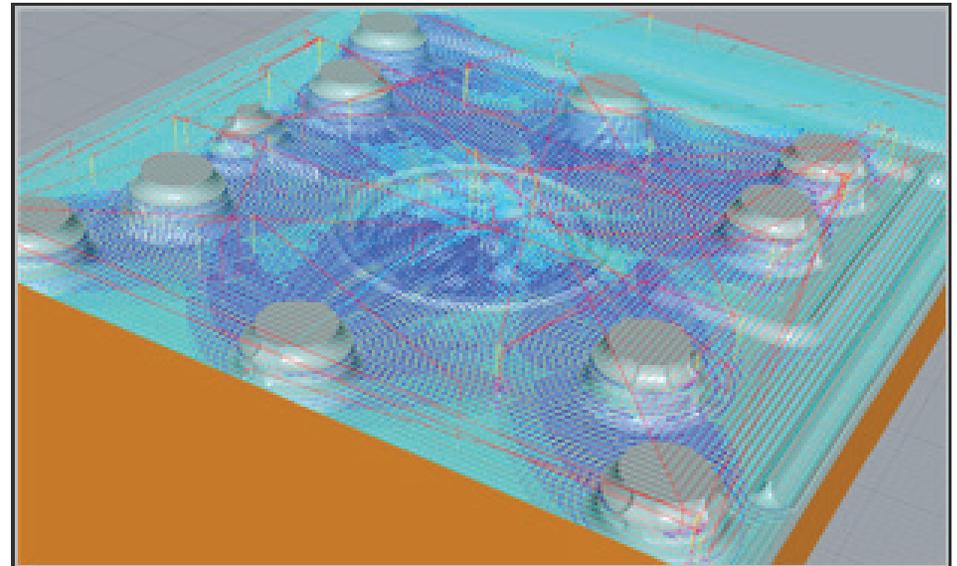
(Main Image) Shown modeled in Rhino, is a prototype mold cavity of the Riverview Hobbies RVH121001 Slotted Mag Wheel Kit for the 1/12 Tamiya Datsun 240ZG model kit. On the left we see the RhinoCAM MILL Machining Browser listing toolpaths for the indexed 4 Axis machining job. (Top Right) A production component is shown. (Bottom Right) The 1/12 Tamiya Datsun 240ZG model kit is shown complete with the Riverview Hobbies RVH121001 Slotted Mag Wheel Kit.

Roughing Operations

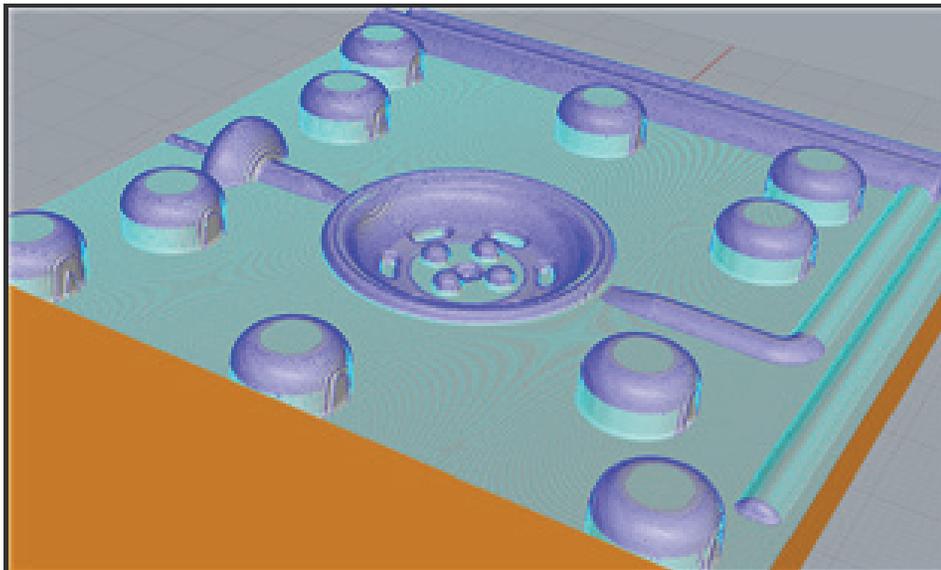
This is an indexed 4 Axis setup in RhinoCAM with two rotational axis positions at 0 degrees (Top Mold) and 180 degrees (Bottom Mold). The prototype wheel cavity shown below is only 31.5mm in diameter. Each of the hex lug nuts are only 1.5mm wide! Shown below are the roughing toolpaths for the Top side of the mold. The box stock dimensions are 146 x 92 x 18. Notice the use of Parallel Finishing as a roughing toolpath (leaving 0.3 of stock) and also as a flat area clearance operation using a 0.81 dia. Flat Mill.



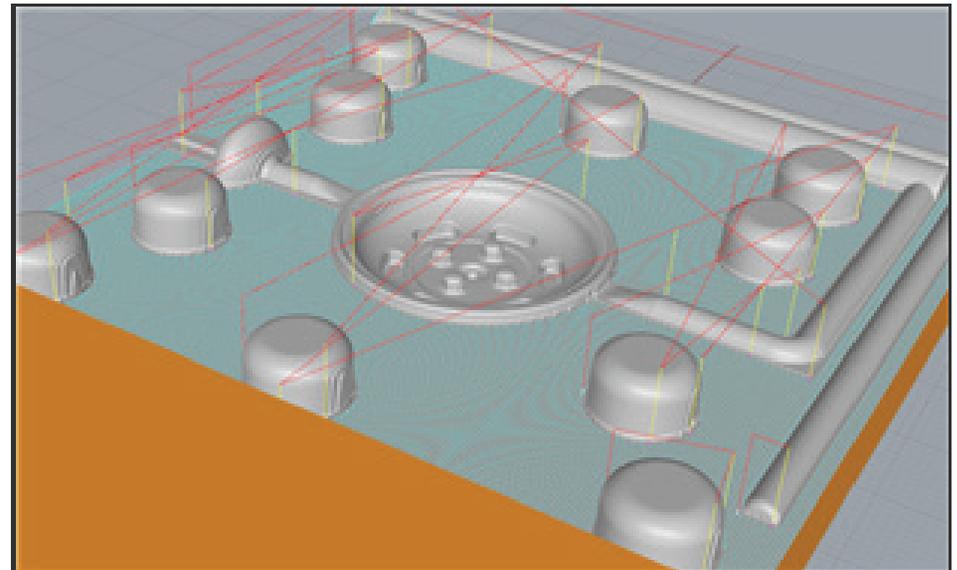
The top side of the Rhino part is shown with the slotted mag wheel in the center. The locator pins are in green and the sprue lines are in gold.



Horizontal Roughing using a 3.18 Dia Ball Mill, 25% step over and 2.0 step down leaving 0.6 of stock.



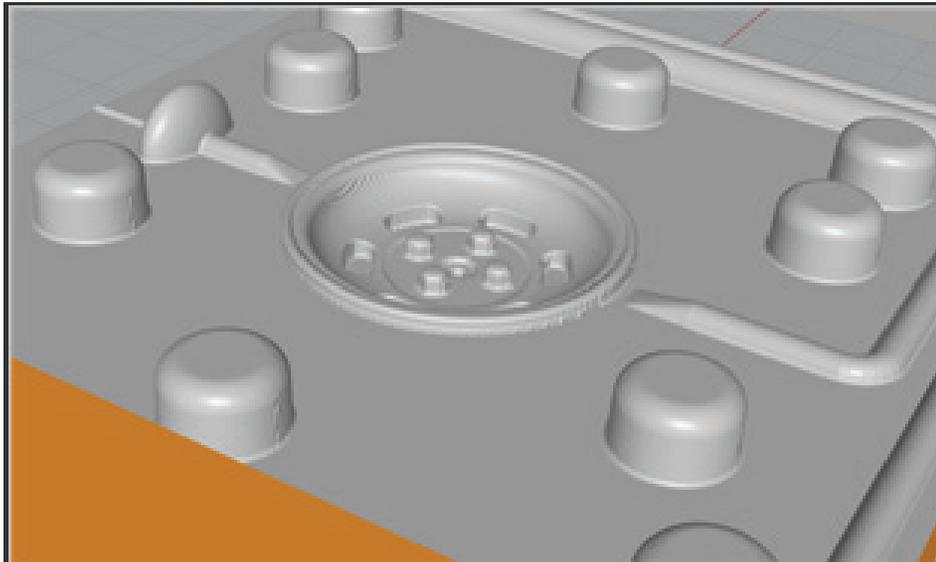
Parallel Finishing using a 1.02 dia Ball Mill, 25% step over leaving 0.3 of stock.



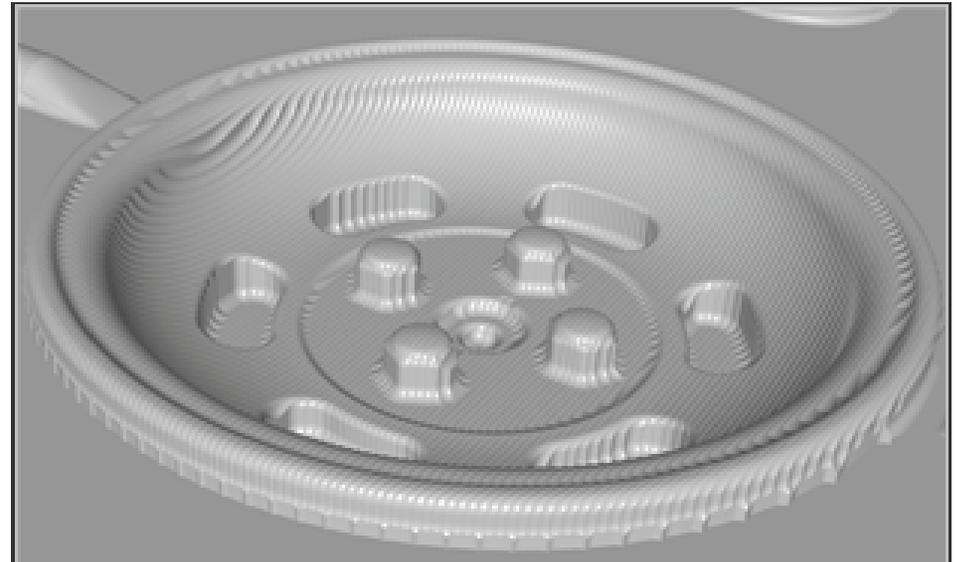
Parallel Finishing using a 0.81 dia End Mill, 50% step over leaving 0 stock. This toolpath is contained to the perimeter of the flat parting plane areas only.

Finishing Operations

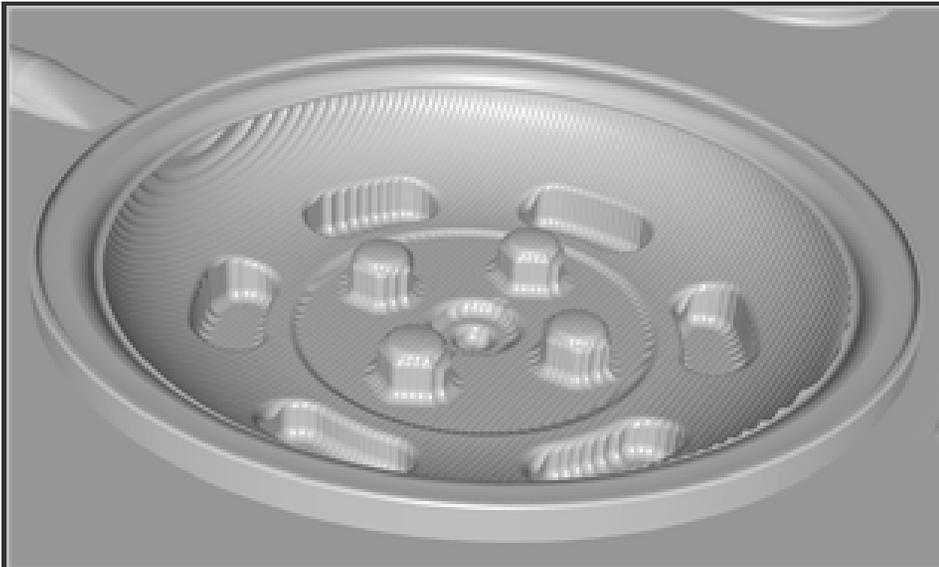
Shown below are the finishing toolpaths for the top side of the mold. Because of the ultra-fine detail and small step over values, we have chosen to display only the resulting in-process stock models. The descriptions below illustrate the power and accuracy of the RhinoCAM toolpaths that Jim depends on. The attention to detail and quality is impressive. Let's have a look.



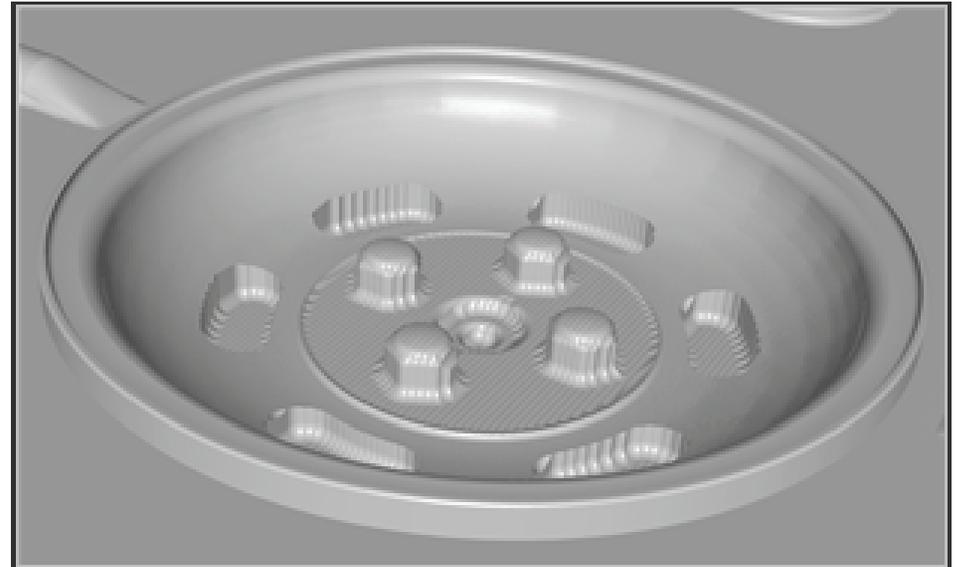
Here we see the the results after three parallel finishing operations contained to the locator pins, bar and sprue. A 0.81 Ball Mill is used with a stepover of 10% (that's 0.003" step over!).



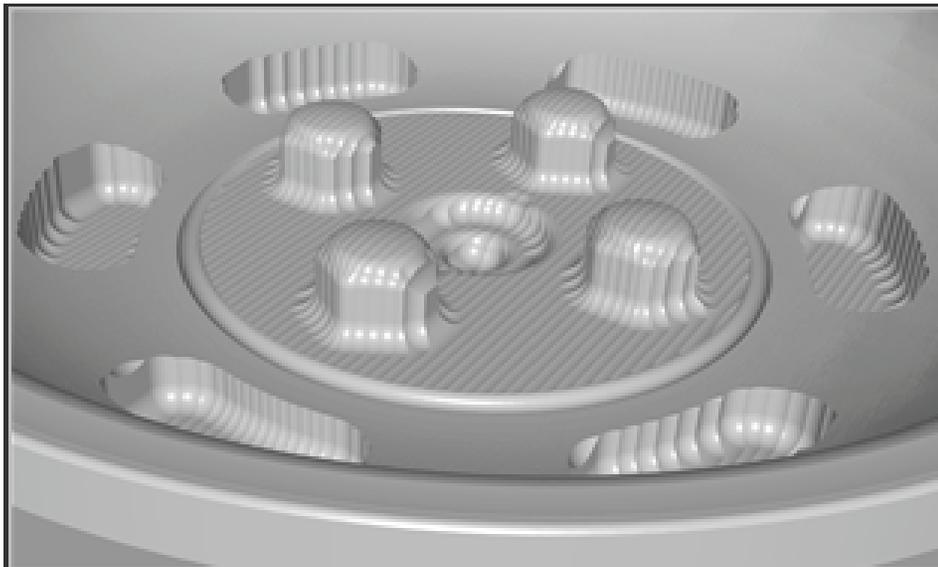
Here we see a close-up of the wheel cavity. We can clearly see the 0.3 stock allowance that still needs to be removed.



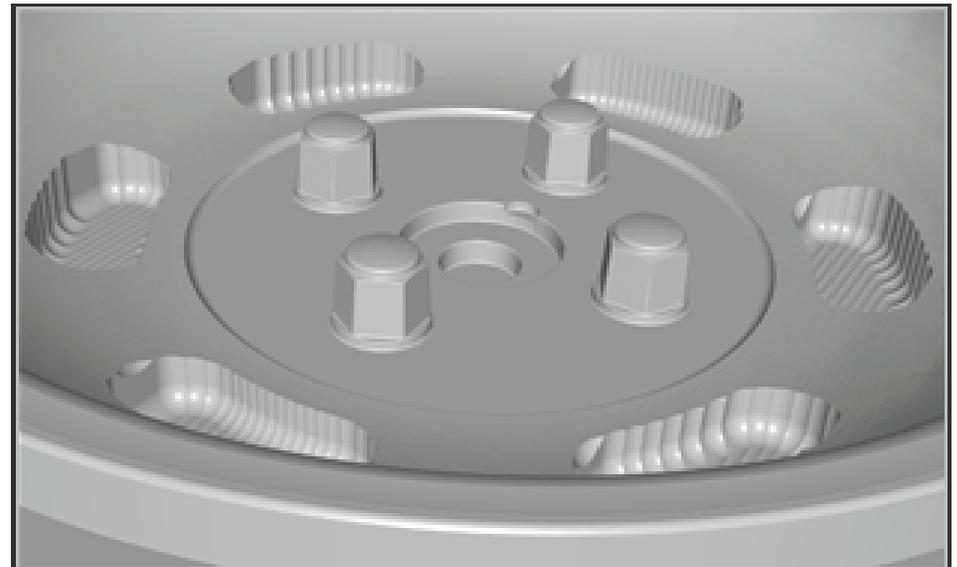
Here we see the results of a 3 Axis Pencil Trace (0.81 Dia. Flat End Mill), 2½ Pocketing and a 3 Axis Horizontal Finishing (0.51 Ball Mill), all on the outer rim.



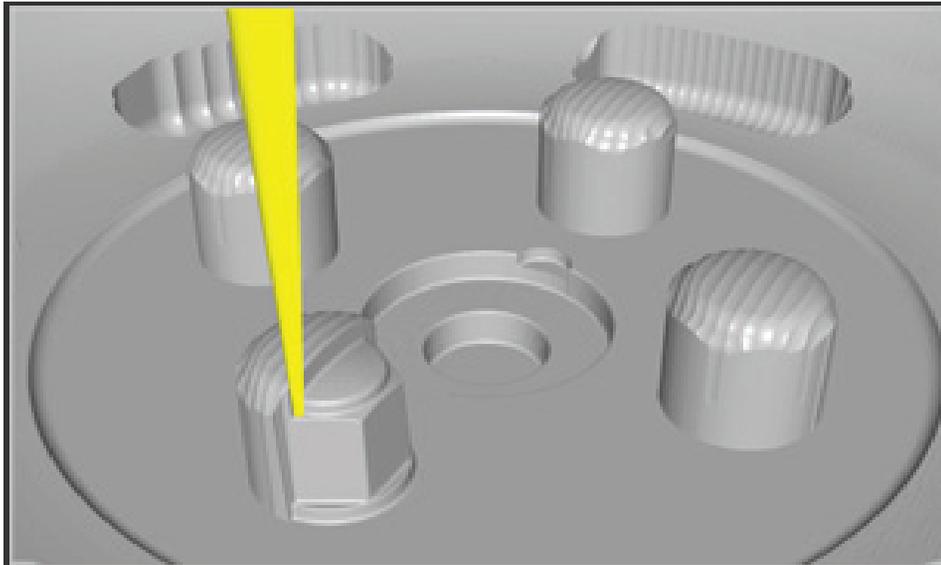
After another Parallel Finishing toolpath, this time between the outer rim and the center cap using a 0.51 Dia. Ball Mill and a step over of 0.01 (that's 0.0004")



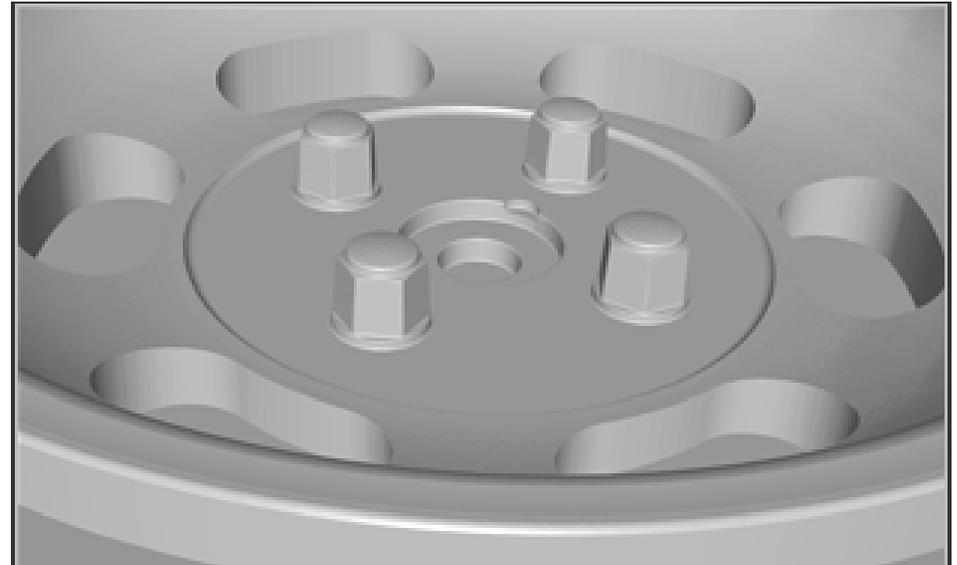
After zooming in, we see the results of another Horizontal Finishing toolpath, this time on the outer hub. To really appreciate the control and accuracy of RhinoCAM, have a look at the next two images.



After pocketing the center cap, Jim uses a Tapered Ball Mill and Parallel Finishing to complete the 4 lug nuts.



Cutting Tool: 3 Degree Tapered Ball Mill, Corner Radius: 0.0635
Flat Dia.: 0.00017, Step over: 5%



2½ Axis Pocketing finishes the 6 slotted holes using 0.81 Flat Mill.

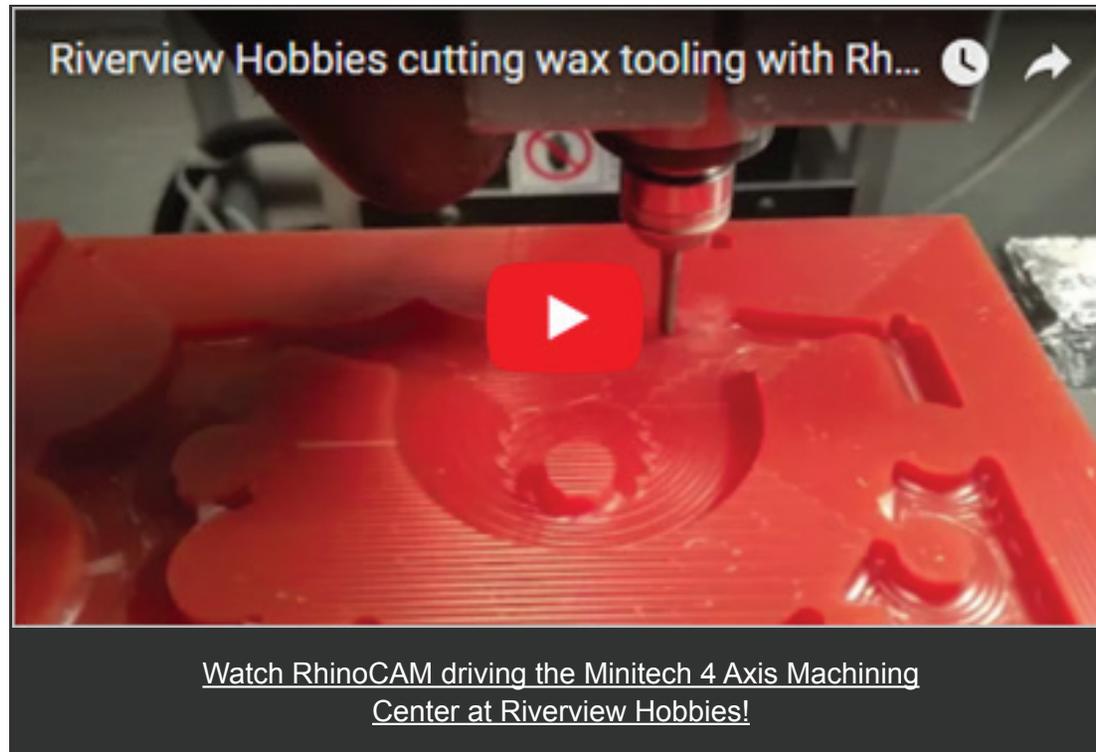
The completed top half of the positive wax prototype mold cavity is shown below along with the finished production components.



The prototype positive wax top mold cavity of the Riverview Hobbies RVH121001 Slotted Mag Wheel Kit



(Left) Here we see the completed 1/12 scale Tamiya Datsun 240ZG model kit complete with the Riverview Hobbies RVH121001 Slotted Mag Wheel Kit. (Right) The wheel kit components.



1/12 Scale Tamiya Porsche Turbo RSR Type 934 Wheel Kit

Here is another wheel kit designed specifically for the [1/12 Tamiya Porsche Turbo RSR Type 934](#). This kit offers builders an easy to use contemporary wheel option for their Street and Tuner builds. The 1/12 scale resin wheels replace Tamiya kit parts L2 and L8 without any modifications to adjacent parts or changes in wheel mounting technique. Look at the accuracy and attention to detail on display in the 25 cap head screws around the wheel rim!

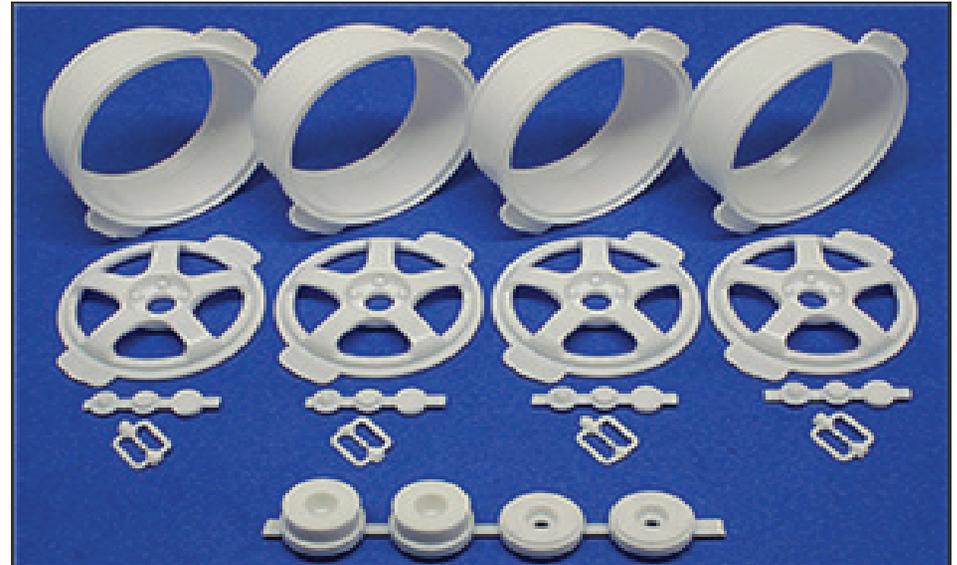
The kit includes 4 inner wheel sleeves and wheel faces (outer chrome wheel sleeves from the Tamiya kit are required) along with 4 hub adapters sized for the front and rear axles (2 front and 2 rear). Also included are 3 optional resin wheel center treatments; an exposed axle nut, dust cap or full cover center cap along with 4 resin valve stems. Here is a look at the wax mold, kit components and final assembly.





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The Porsche 934 wheel kit wax mold machined from RhinoCAM toolpaths



The Porsche 934 wheel kit components



The production Porsche 934 Wheel Kit tooling in resin



The Tamiya Porsche Turbo RSR Type 934 with Wheel Kit assembled

More About Riverview Hobbies

We would like to thank Jim Orth, Owner/Operator of Riverview Hobbies for allowing us to share their RhinoCAM success story! For more information about Riverview Hobbies and their complete line of aftermarket kits, we invite you to visit them online at riverviewhobbies.com.

More about RhinoCAM

RhinoCAM is available in five different configurations (Express, Standard, Expert, Professional and Premium). The parts shown here were programmed using the Expert configuration. Here are some additional details about each of the available configurations. For the complete features list, visit the [RhinoCAM Product Page](#).

- **RhinoCAM Express:** This is a general-purpose program tailored for hobbyists, makers and students. Ideal for getting started with CAM programming. Includes 2 & 3 axis machining methods.
- **RhinoCAM Expert:** Includes the Standard configuration plus 4 Axis machining strategies, advanced cut material simulation and tool holder collision detection.
- **RhinoCAM Premium:** Includes the Standard, Expert and Professional configurations plus 5 Axis simultaneous machining strategies.
- **RhinoCAM Standard:** This is a general-purpose machining program targeted at the general machinist. This product is ideal for the rapid-prototyping, hobby and educational markets where ease of use is a paramount requirement. Includes 2-1/2 Axis, 3 Axis and Drilling machining methods.
- **RhinoCAM Professional:** Includes the Standard and Expert configuration plus advanced 3 Axis machining strategies, 5 Axis indexed machining, machine tool simulation, graphical toolpath editing and a host of other features.