



CHAPTER 4

BUILDING AND DETAILING ENGINES AND LANDING GEAR

Aside from cockpit and interior detailing, engines and landing gear are also areas of an aircraft model that call out for additional detailing, careful painting and basic weathering. This chapter focuses on five different engine and landing gear projects, as well as modifying and detailing parts on several additional aircraft.

DETAILING ENGINES

Aircraft with radial engines have big cowling and consequently large openings, which show off most of the face of the engine. All radial engines have a wiring harness, which is located at the base of the crankcase in the shape of a ring. The individual spark plug wires emit from this ring and metal jackets sometimes protect both the ring and the wires. The wires for each cylinder are located next to one another on the ring with a slightly wider space between sets of wires. One spark plug location is always centered on the front of the upper area of each cylinder, and the other is located either on the top or on the backside of each cylinder. If the kit's radial engine has a separate wiring harness or has one molded to the engine there are most likely stubs along the rings circumference where the wiring emits. Use a pin vise to set the drill hole locations and then use small drill bits to make indentations for the wiring. If the ring has no stubs you can mark the wiring harness for the correct number of spark plug wires for each cylinder and then drill small holes in the ring with a small drill bit so that the wires you add will have a positive seating.

You will also need to drill holes in the cylinders at the approximate spark plug locations. Be sure that the drill bit size that you use matches the size of the wiring you plan to use. For 1/48 and 1/72 scale engines, you can use strands of electronic wire and

for 1/32 scale kits, use brass-beading wire. You can also purchase photoetch detail sets for engines and they always include a wiring harness and the correct number of spark plug wires. These detail sets are specifically designed for a particular model kit and the photoetch parts fit onto the kit parts very well.

After you have completed drilling the holes for the spark plug wires, prime the subassemblies and then give them a coat of a gloss gray color. To accent the cylinders and highlight the cooling vans hand paint them a non-buffing gun metal metalizer color. Metalizer paints are thinned for airbrushing, but the non-buffing types can be applied with a brush to small areas. Due to the thinned consistency of the paint, and the fact that these paints do not adhere very well to gloss enamels, the paint will flow into the areas between the cylinder's cooling rings while only slightly staining the tops of the them. This will result in a two-color appearance to the cylinders and highlight the detail.

The tops of the cylinders are usually a darker color than the cylinders body, and to represent this paint the tops flat black or a non-buffing exhaust color metalizer. To accent the crank case bolts, paint them silver, applied with a sharpened round toothpick. To add a final touch, add a small square or rectangular black decal onto the crankcase to represent the manufacturer's plate. Photoetch detail sets usually come with several manufacturer plates for different locations on the engine. Cylinder push rods that are separate parts can sometimes be misaligned with the engine cylinder heads. In these cases I recommend that you cut the push rods off at their base and replace them with round plastic stock. You will need to form fit them one at a time and I recommend that you paint them prior to installation. The easiest way to do this is to paint a few lengths of round stock, cut approximate lengths, form fit each one into place and then attach them with super glue. To weather the engine I dust it with a mixture of brown and black pastel dust applied with a soft brush and then I airbrush a coat of clear flat to seal the pastel dust. Remember that these stains need to be very subtle so do not over do it.

The last step is to add the wiring and here is where checking documentation photos is important. Most spark plug wiring were encased in a copper, brass or metal tubing, but some radial engines had heavy, flexible cabling. If there is metal tubing, each spark plug wire will need to be form fitted into place and then attached. If the spark plug wiring is heavy cabling, you can glue the wire strands to the spark plug ring and then form fit each one into place. I usually do the front wires first and then locate the wires for the backs of the cylinders. If there is a second row of cylinders, I work on the front row first and then complete the back row.

If you decide you want to add wiring to an inline engine you will need to plan to remove one of the cowling covers so that you can see the detail that you worked so hard to add. This means additional work for cutting out the panel, thinning it and adding framing to the inside of the it. If there is molded on wiring to represent the spark plug wires, scrape the detail off using a number 11 X-Acto blade and smooth it out with a sanding stick, mark the locations of the spark plug wires and then drill holes for their locations. The spark plug wires are usually wrapped together and distributed along the length of the engine block or they are located inside a metal tube, which is located along side the engine block, and feeds each spark plug with a wire. For bundled wiring you will need to glue them individually in place to the spark plug locations and then bundle them together with tiny drops of super glue as you move toward the rear of the engine. If the wires are fed via a metal tubing, use a length of plastic rod with the correct number of holes drilled into it at locations evenly spaced that match the locations of the spark plugs on the engine block. The rod and wiring should be assembled and painted before attaching the wiring to the engine. You can highlight detail on in-line engines by painting different parts of the engine various shades and colors. The block is usually one color and the top of the engine and the rear components are usually different colors. The engine mounts and framing can be painted various shades of the same color. The overall effect of adding wires, painting the engine and mounts different colors and some basic weathering can turn even an average in-line engine into a masterpiece.

Another approach to detailing an in-line engine is to purchase a resin engine which usually comes with all the parts in resin and photoetch. Some of these kits are models in themselves. These resin engines usually fit together well and also fit onto your model without much effort. However with that said, the main components of a resin engine should be taped together and test fitted to be sure that there are no fit issues. If there are, the time to make adjustments and modifications is before you are well into your project. One last note on detailing piston engines is to consider using colored braiding wire to represent the different types of piping, plumbing and hydraulic lines that are typically found on the backsides of the engines and in front of the firewall.

If you are going to add detail to a jet engine you will need to decide how to open up access panels to see the detail. For this reason, most jet aircraft kits do not have engines although newer kits, especially those in 1/32 scale are now including them. Molded on piping and wiring is very difficult to remove without marring the engine so I recommend that you add additional piping and wiring to provide a perception of depth. Use various size plastic rods, especially if you are running several lengths together and always use super glue to attach them to the engine. Thin electronic solder also works well because it easily conforms to the shape of the engine. Junction boxes and other types of appendages can be added using various sizes and shapes of small square stock. Drybrushing to highlight detail is another technique you can use to bring out all the subtle surface detail molded

onto the parts. If you want to paint individual wiring, use a round toothpick so that only tiny amounts of paint are applied at a time, which prevents paint bleeding.

If there is no jet engine you can enhance the intake area by sanding off the backing of the jets engine vanes or blades. Run the part across a stationary piece of sandpaper in a circle 8 motion so that the plastic is removed evenly around the part. As the plastic gets thin it will become almost transparent. At this juncture you can use the tip of a number 11 X-Acto blade to remove the remaining plastic and clean up the individual blades. Use the part to draw an identical circle on sheet stock, cut it out, paint both parts and then position the circular disk you cut out approximately 1/16 of an inch behind the intake part. This will add an increased perception of depth to the intake area and also add an element of realism because the individual turbine vanes or blades will stand out.

PROPELLERS, ENGINE INTAKES AND EXHAUSTS

Propellers have mold lines so be sure to remove them, airbrush a coat of primer and then paint the tips the correct color, which is usually yellow. You can get a better shade of yellow if you first apply an undercoat of flat white. When the paint has dried mask the tips with 3M painters masking tape and then apply flat black. I like to add a few drops of flat white to my propeller color so that it is a dark charcoal. If the propeller's hub is a different color than the blades, you will need to mask the blades, re-prime the hub and then paint it the required color. Once you are finished painting the propeller, give it a coat of clear gloss. I find that a least two coats are necessary to get a really good clear gloss finish on flat black. Apply the decals to the blades and then seal the decals and restore the flat appearance of the propeller with a clear flat. If you want to weather the propeller blades, drybrush the leading edges with silver paint. Be sure the drybrushing is very subtle and very light. You can also use a silver colored pencil, but the silver lead should be just on the edge of the blades and be very subtle. The silver pencil color will also need to be sealed with a clear flat.

Exhaust ports can be hollowed out several different ways depending on the type of model you are building and the locations of the exhaust ports. Since these parts can become very fragile after drilling, especially in the smaller scales, all preparations such as cleaning, scraping and sanding should be completed prior to drilling. It is important that the surface that will be in contact with the drill bit be smooth and flat so that the drill bit will not skew off to one side. When selecting drill bits, start with the diameter that you want the finished hole to be and then select several other sizes that are smaller than the finished diameter. What you want to do is slowly work up to the finished diameter because if you try to remove too much plastic, you can fracture the part or collapse a side wall because the drill bit is gouging out too much plastic. Another advantage of working up to the needed diameter is that you can achieve very thin walls if you are careful and go slow.

I first place an indentation in the center of the exhaust pipe for a pilot hole and if it is not centered you can adjust it by angling the tip of the punch. Start drilling with the smallest bit and check the centering of the hole. If it looks good, move on to the next diameter and so on until you achieve the diameter opening you want. If your drill bit becomes offset from the center, you can correct this by removing the plastic from the off centered side with the tip of a number 11 X-Acto blade. This is a very delicate process so be gentle and go slow. I then move up two drill bit sizes, which usually helps to self-correct the off centered hole. If the exhaust has an oblong or elliptical shape you can still drill a round hole and then shape the opening to match the shape of the exhaust by using the tip of a number 11 X-Acto blade. Be careful, go slow and check your work frequently. When hollowing out exhausts, it is only necessary to go deep enough so that the exhaust port appears to be hollow, which is usually about 1/16 of an inch or so.

Cowling flaps, especially on a bomber, look much more realistic if the plastic between the cowlings flaps is removed. This can be done with a thin bladed razor saw. Engine vents can also be drilled out in a variety of ways, depending on the situation. The best way to hollow out these types of vents is to drill a series of very small holes around the perimeter of the opening, and then use a number 11 X-Acto blade to remove the plastic between the holes and then smooth out the sides with micro files. There is little room for error, and repairing gouges can be difficult due to the locations of some of these vents. Be sure that you protect the surrounding plastic with 3M painters masking tape so that if you slip with the drill bit or the files, there will be minimal damage to the surrounding plastic.

Air intakes can be open or have screen covers, so check your documentation to be sure. Fighter planes usually have big air intakes on the front of the cowling or around the front area of the fuselage, while two and four engine bombers can have intakes on the leading edges of the wings as well as on the engine cowlings. If the area is covered with molded on screening, cut it out and add photoetch screening. Photoetch screening can be very hard to cut to an exact shape, so I recommend that you attach the screening to the inside area of the part so that you can use an oversized section.

Piston engine exhaust ports generally take on an almost rust or mud color because the cast metal they are manufactured from

tends to take on that color due to the combinations of temperature and exposure to the elements. To paint exhausts, I use a burnt metal buffing metalizer, which I polish with a Q-Tip and then seal with a flat clear coat.

Jet engine exhausts nozzles are very complex pieces of equipment that can expand and contract depending on the jets speed and whether it is accelerating or slowing down. The nozzles are designed along the same principle as a film camera diaphragm. The diaphragm is a series of metal plates, which slide past one another to form a specific size opening. A jet engine's exhaust nozzle works the same way except it is a lot more complex. If you want a good representation of a jet exhaust purchase a resin exhaust that has all the details you could ever want molded onto the resin piece or as add on details. In most cases all you need to do is remove the resin casting block, do some sanding to flatten out the surface where the block was and then prime and paint the resin part. Be sure to clean the resin first to remove any mold release agents, otherwise the paint will not stick to the resin. When you paint the nozzle use buffing metalizer colors and use a Q-Tip to polish the paint. The Q-Tip will only touch the top areas of the open-close mechanisms resulting in a two-tone effect. I like to use combinations of metalizer buffing and non-buffing paints to help highlight these details.

DETAILING LANDING GEAR STRUTS AND WHEELS

The first step in detailing landing gear struts is to remove the mold lines and then fill in any injection marks and dimples. The vast majority of kits today have finely detailed landing gear with separate parts for the scissor type framing, which extends outward around the oleo and connects the upper strut and the lower strut, as well as having brake lines. If you are satisfied with the landing gear detail you can proceed to painting them the appropriate colors. I usually airbrush the metal sections of the landing gear first, and then I paint the brake lines flat black with a detail paintbrush. To bring out the subtle details of a landing gear you can drybrush it with silver, however the drybrushing should be very subtle with only a hit of silver on any raised detail. You can also drybrush the surface with a darker or lighter shade of the landing gear's base color and then drybrush on the silver paint. This will give you a multi-shade effect. The brake line clamps are usually a natural metal color so use your detail brush to paint these small details. The last step is to paint the oleo. The oleo is a shock absorber and it pushes up into the strut. It is usually a very shiny metal, which can be represented with a chrome paint color.

If your landing gear does not have any brake lines you can make them with stretched black plastic sprue for flexible lines and stiff brass wire for metal hydraulic lines such as the ones that are found on a B-25 bomber. The brake lines usually terminate near the axle or somewhere on the backside of the wheel hub. I locate the termination point, drill a small hole, place a small drop of super glue in the hole and then insert the brake line into the hole. If the brake line is flexible, I bend the end towards the strut after the glue has dried so that the line follows the length of the strut. The majority of brake lines are attached to the landing gear struts with thin flexible clamps like the ones used to secure the cooling hoses for your car's radiator. These can be simulated using a thin strip of masking tape that is layed over itself one time. There are usually two or three of these clamps on each strut. I always work from the brake line termination point up towards the top of the strut so that any excessive slack in the line can be worked out. To secure the tape I apply a small drop of super glue at the point where the tape ends and then I paint the masking tape with a silver or aluminum color.

The last step is to add some weathering. I sometimes drybrush the entire landing gear with a dark pastel dust and then I airbrush a coat of clear flat to seal the pastel dust. Be careful not to get the flat finish onto the oleo because it will dull the shiny appearance of the chrome paint. As a final note on landing gear I recommend that you stick with the plastic ones provided in the kit. Although white metal landing gear may appear to have better detail, the metal is very soft and if your model has any weight to it at all, the white metal landing gear will not be able to support the weight.

Many jet aircraft have solid wheel hubs while almost all propeller driven aircraft main landing gear wheel hubs have spokes. However, model manufacturers are forever molding solid wheels hubs with indented round or oblong spoke detail. To enhance the appearance of spoke wheel hubs remove the plastic between the spokes so that you will have an accurate representation of the hub. For hubs that have round indentations use a drill bit that is the same size diameter as the indentation and drill out the plastic. Oblong shaped holes are a little more challenging especially if you are working in the smaller scales, but with some patience and small drill bits and micro files you can make just about any shape. Once you have completed removing the plastic, sand the gluing surfaces smooth by sliding the wheel halves along a stationary piece of sandpaper and then glue the wheels together. When you glue the halves, be sure that the spoke holes on both wheel halves line up so that you can see through the hub. After the glue has dried, scrape the seam with a number 11 X-Acto blade and then sand it smooth. Check your work by painting the seam area with silver paint. If you find any cracks apply some super glue to the area and sand it smooth. Unfortunately, doing this also removes any tread detail that the manufacturer may have provided along the seam line, but this can be replaced. Place the wheel in a vise between two pieces of balsa wood to protect the plastic and then take a jewelers saw and cut the tread back into the wheel. Use the existing tread on both sides of the wheel to guide the saw blade. It only takes one pass with the saw to cut a slight indentation in the plastic. Once you complete a section of tread, rotate the wheel and work on a new section.

When you are done replacing the tread, remove the wheel and then wet sand it with 400 grit sandpaper. This will remove plastic burs located along the edges of the new tread lines that you cut.

You can also purchase resin wheels but there is still some work to do on them. True Details and Eduard make a wide range of resin wheels in just about any scale. You have to remove the pour blocks and drill the correct size holes in the hubs for the landing gear axle. Also, some resin tires have a flattened appearance to simulate the weight of the aircraft. While real aircraft tires may be slightly bulged due to the aircraft's weight some resin tires have some much "flat" to them that they appear to be needing air. If you carefully review reference photos of your aircraft you will see that the tires do not have a flattened appearance to them. You can reduce this flattened appearance somewhat by carefully wet sanding the sides of the tires with a sanding stick.

To paint the wheel apply a coat of primer to the entire part. Rubber is more of a dark charcoal and to achieve this you can mix a few drops of flat white to flat black. Airbrush the entire tire with this mixed color and after it dries place a strip of masking tape over the face of each side of the tire. Next, take a round toothpick or a pencil and run the tip around the edge of the rim where it meets the tire. The tape will stretch and stick to the rim and define the location where the tire meets the rim. To cut the excess tape from around the rim carefully run the tip of a number 11 X-Acto blade along the base of the rim using the rim as a guide. Remove the tape from the rim and then run the toothpick around the base of the rim again to ensure that the tape is sticking to the edge where the tire meets the rim. Airbrush primer on the rim to restore a neutral color and then airbrush it the appropriate color. You can also reverse this technique and paint the rim, mask it and remove the tape from the tire and then airbrush it. As a final note on this technique, masking tape will not stick as well to gloss paint as it will to flat paint.

If your kit has flexible tires made from rubber or some type of flexible material there may be a slight molding seam along the centerline of the tire. Trying to sand off this seam can mar the appearance of the tire. I have found that putting these parts in the freezer overnight helps the material respond to sanding. Another problem with these flexible tires is that they are dust magnets. Every tiny particle on your work bench will stick to them. The way to fix this problem is to give them a clear flat coat, but first you need to get rid of all the stuff that is clinging to them. I clean the tires by using masking tape to remove all the stuff stuck to these parts and then I immediately airbrush them with a clear flat coat.

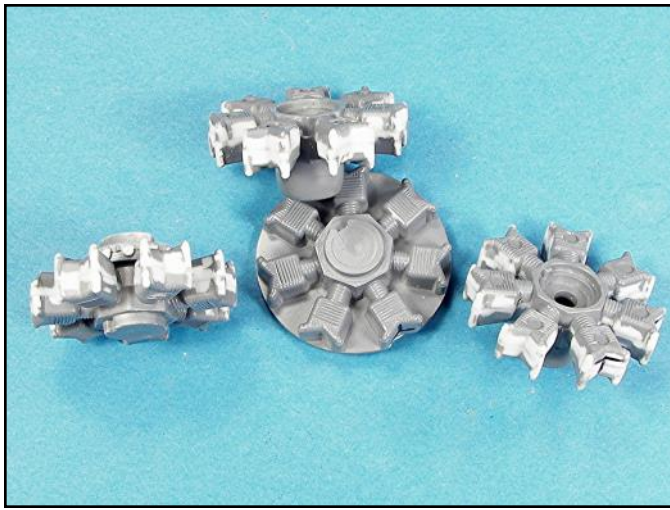
DETAILING LANDING GEAR BAYS AND DOORS

Most kits offered today have a lot of detail in the landing gear bays and on the doors, but you can still enhance them with photoetch detail sets and careful painting. If you are building an older kit use your reference photos to determine where interior framing and piping and hydraulic lines are located. You can use different size plastic rod and strips to replicate interior framing, piping and hydraulic lines. There is no set size for each scale, but I recommend that you install rod and strip sizes that look "in scale".

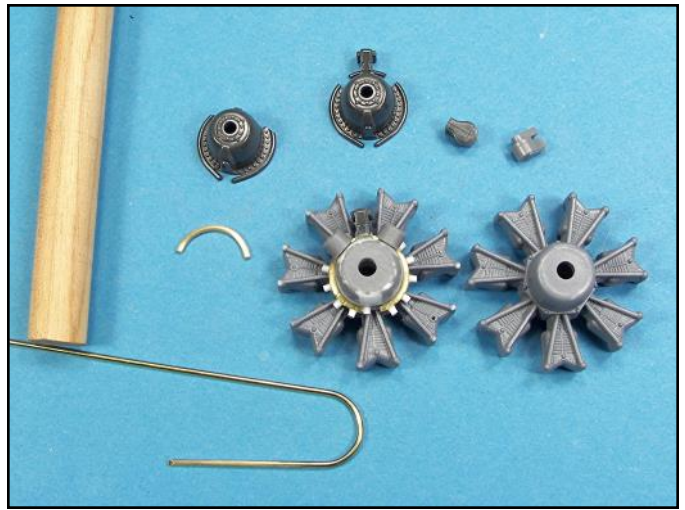
Refer to your picture documentation to locate framing and then draw pencil lines on the kit parts. Glue the plastic strips to represent the framing along the lines using longer lengths so that you can position them correctly. Use a thin wire applicator to apply tiny amounts of super glue along the edges of the strips. The capillary action of the super glue will seep along the underside securing the strips into place. Once the glue is dry you can cut the framing to its proper length and then carefully and lightly scrape off the residue glue along the side of the framing using the tip of a number 11 X-Acto blade. To replicate hydraulic lines and other types of plumbing details you can either form fit rod lengths into place or drill holes on both sides of the landing gear bay so that you can slide plastic rod through both ends. You may also want to paint the landing gear bay and the rod detail separately to simplify your detail painting.

If the landing gear doors have no detail, you can enhance their appearance by purchasing a photoetch detail set specifically designed for landing gear doors. Eduard markets hundreds of exterior detail sets for all aircraft types and scales, and they typically include enhancements for the interior areas of the landing gear door such as the framing. If there are no detail sets available you can add some detail with strip stock or sheets of plastic depending on how the inside of the doors look. To add framing, you will need to draw the locations of the strips onto the door. Be sure too offset the lines from the edges of the doors perimeter. Check your documentation for the approximate design of the framing and then duplicate it. Remember that it does not have to be exact; you just need to approximate the frame's appearance. Some door interiors have perforated sheets of metal attached to strengthen the doors and these can be duplicated using a sheet of plastic with the shapes drawn on it and then cut out. The finished sheet is then laminated to the inside of the door, and here again, make sure that the sheet is slightly smaller so that it is offset from the edge.

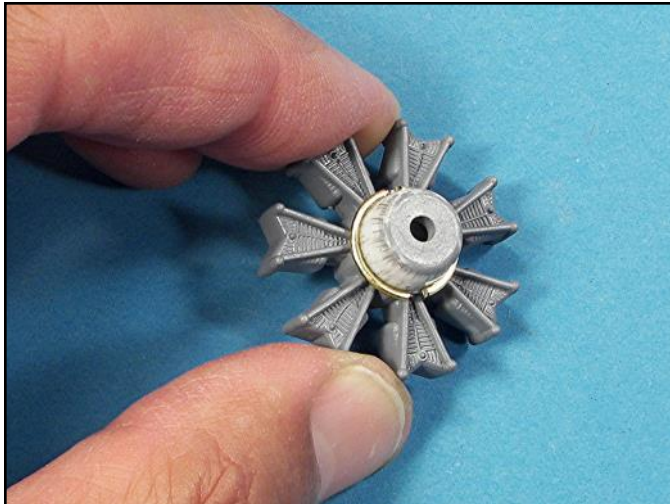
To weather landing gear bays and the doors, drybrush silver paint along all the raised edges to replicate worn off paint and then add subtle pencil pastel dustings in the light to dark gray colors. Once you finished adding the pastel dust colors seal the dust by airbrushing a clear flat color, which will also tone down the drybrushed silver paint color.



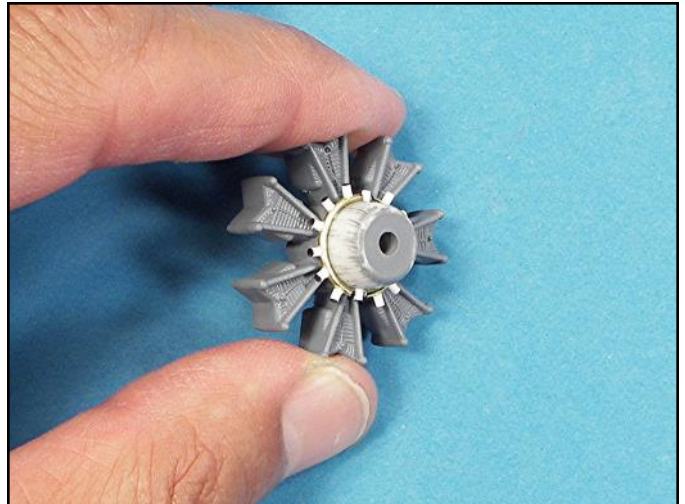
B-26 engines are R-2800's with 18 cylinders, but these kit parts have 14 cylinders and no wiring detail. Plastic or resin engine replacements would be too small for the kit's engine nacelles so these kit engines had to be detailed.



The engines had no wiring harness so stiff brass wire was bent into shape using a wood dowel. A set of Monogram 1/48 scale R-2800 engines were used as a guide to help position the wiring harness.



Two sections were cut from the shaped brass wire and glued into place around the crank case.



Next, small sections of round stock were cut to length using a Northwest Short Line Chopper and glued into place.



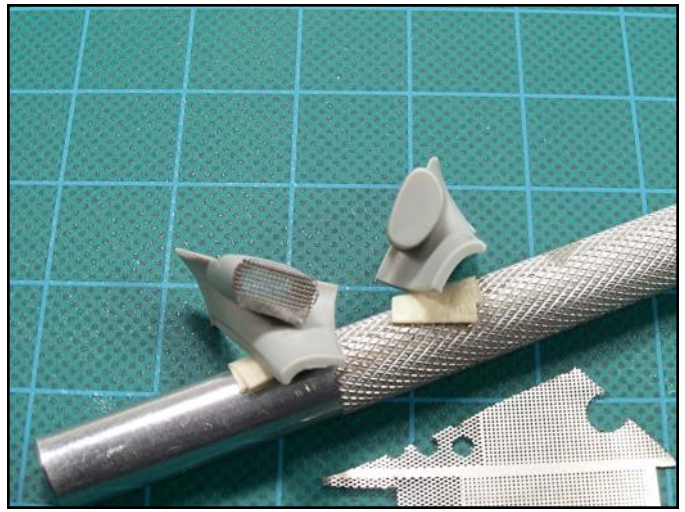
The left and right distributors were added from my spare parts box along with a center oil pump from a Monogram B-26 engine. Holes were also drilled into the cylinders and the wiring harness stubs for the spark plug wires.



The crankcase, cylinders and push rods were carefully painted and then the spark plug wiring was added using brass beading wire.



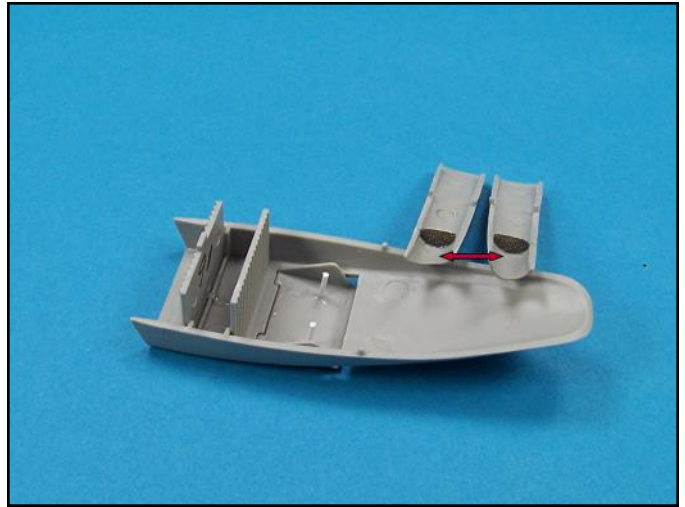
The kit supplied engines look much better with the added detail and careful painting. The cylinder count is not correct but the overall appearance of the engine is much better.



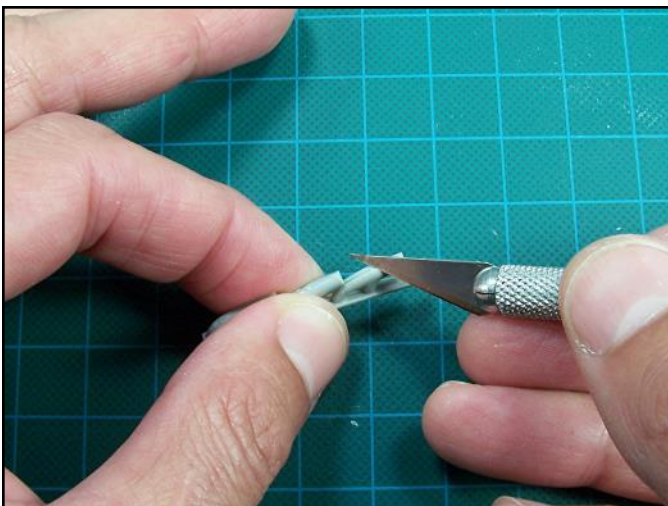
These Mig-3 molded on air intakes were carefully drilled out and then photoetch screening was cut to shape and glued into place.



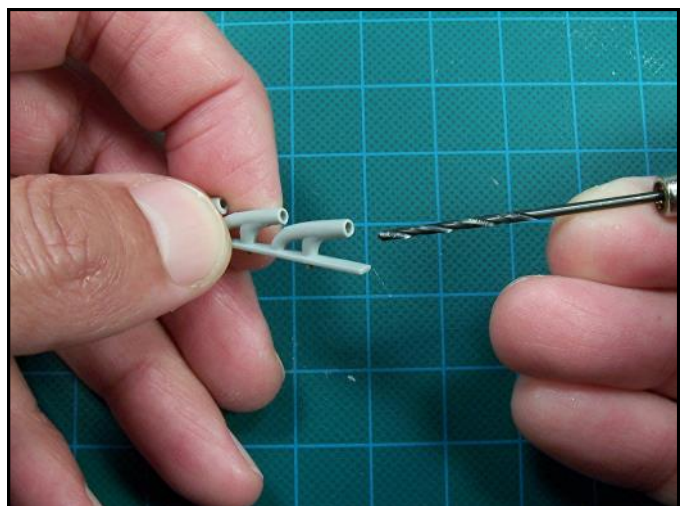
This large radiator screen was painted with a gun metal color and then the framing was carefully drybrushed with silver paint to make the surface details stand out.



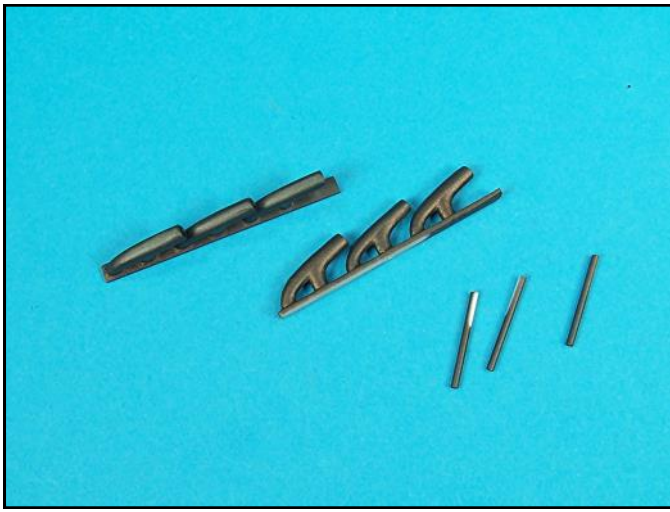
There were no actuators for the air exit door so small lengths of plastic rod were added to replicate them. Photoetch screening was added to the fuselage air intakes.



To remove the mold lines on engine exhausts carefully scrape them off with the tip of a number 11 X-Acto blade. Use light pressure to remove the mold lines so that you do not distort the shape of the exhausts.



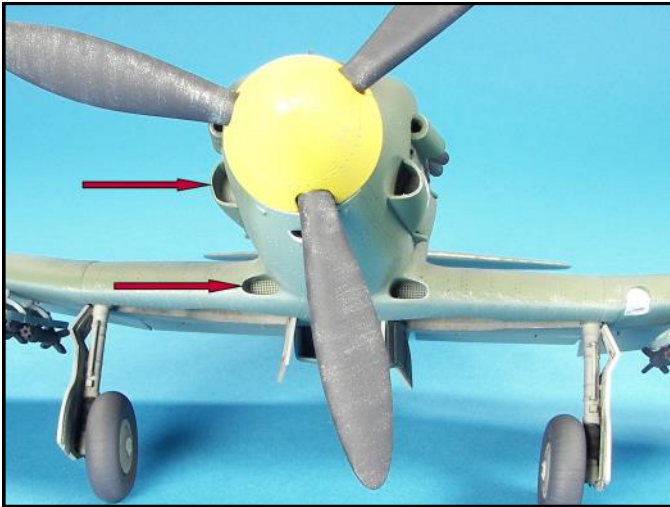
The exhaust ports were carefully drilled out with a small drill bit and then larger ones were used to slowly enlarge the holes until the desired opening was achieved. Note how thin the walls of the hollowed out exhaust ports are.



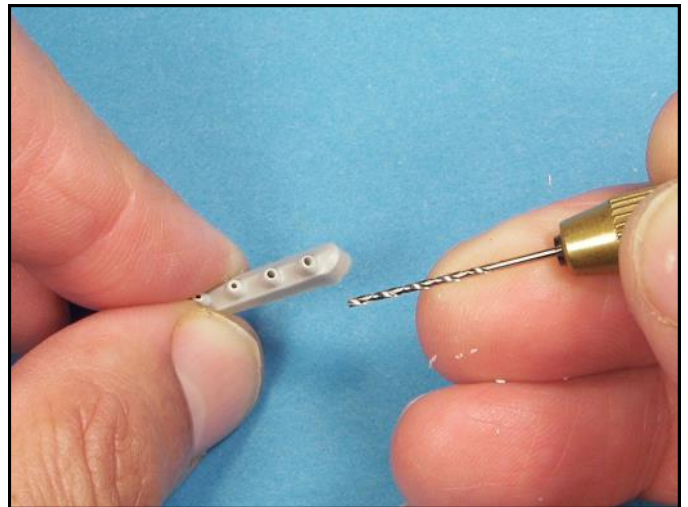
The exhaust ports were then airbrushed a burnt metal metalized color.



Note how realistic the exhaust ports look now that they have been hollowed out.



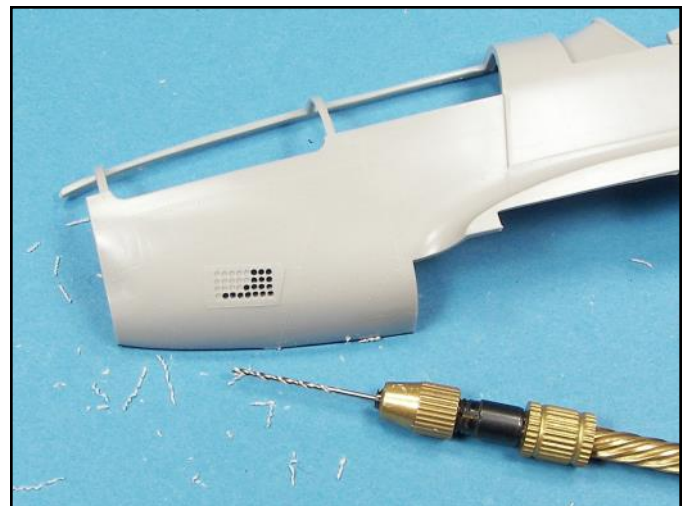
The addition of photoetch screening also enhanced the appearance of the air intakes on the wings and the fuselage sides.



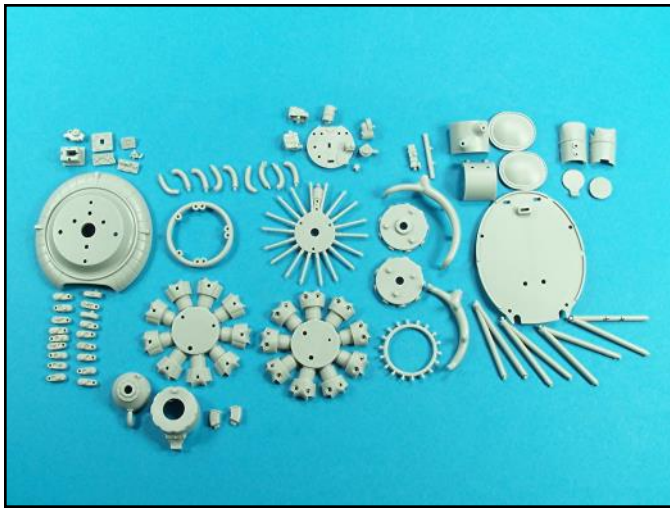
Here is another example of using smaller drill bits and then slowly enlarging the holes so that the walls can be made thin. Using a large drill bit the first time would have collapsed the sides of the exhaust ports, destroying the part.



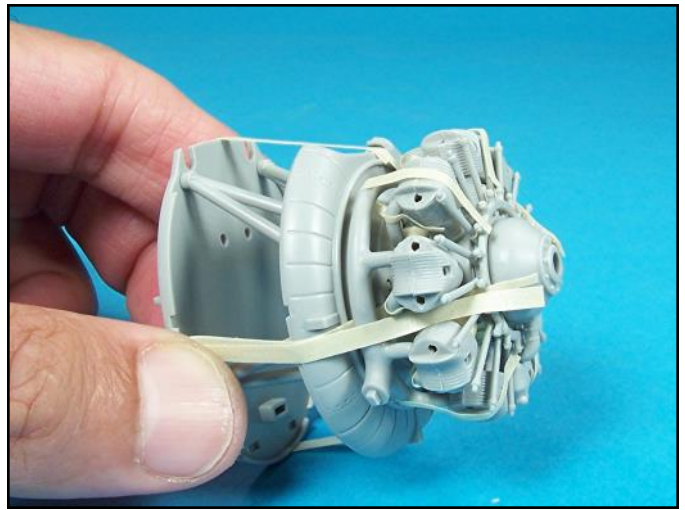
The engine exhausts on this F6F Hellcat were hollowed out using the same drilling technique.



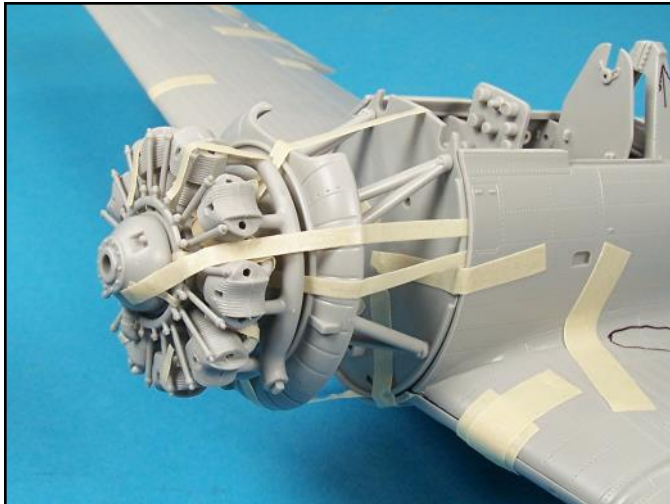
The engine breather holes on this P-51 Mustang fuselage were carefully and slowly drilled out. This was a much easier approach then cutting out the breather panel and replacing it with a photoetch part.



A lot of newer kits are providing well detailed engines that are models onto themselves.



I like to always tape the engine parts together on these types of engines to make sure that everything fits.



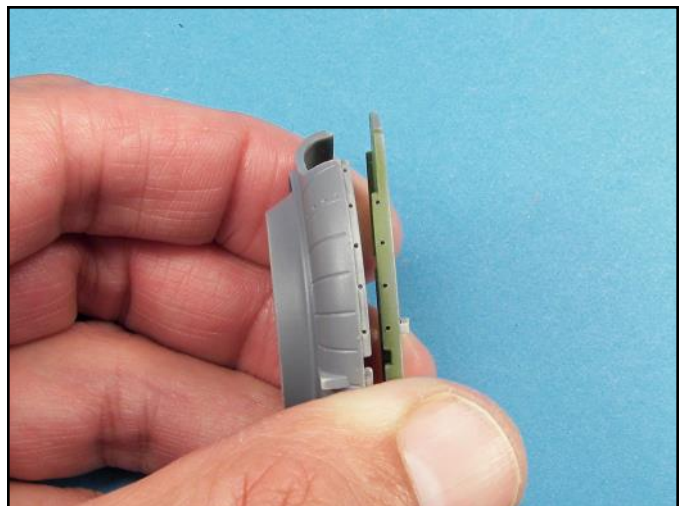
Taping the engine together and then attaching it to the fuselage is also a good techniques to be sure that the heat shield and engines brackets also fit together well.



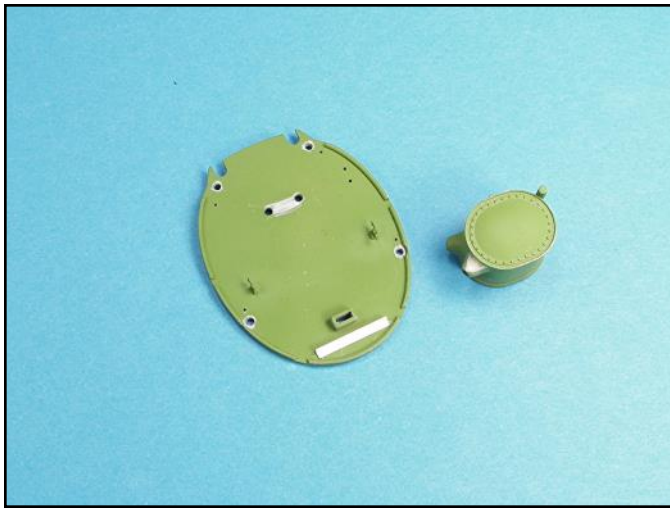
The last step in test fitting the engine is to be sure that it does not interfere with the engine cowling parts. On some kits the engine cylinder straps on the ends of the cylinders need to be thinned so that they do not interfere with the cowling.



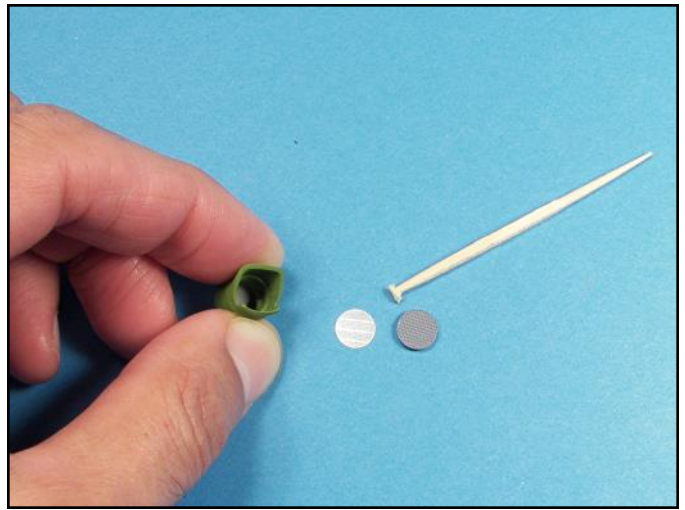
This heat shield had mold punch outs that needed to be removed. Sandpaper was wrapped around a thin section of balsa wood to get into this tight area.



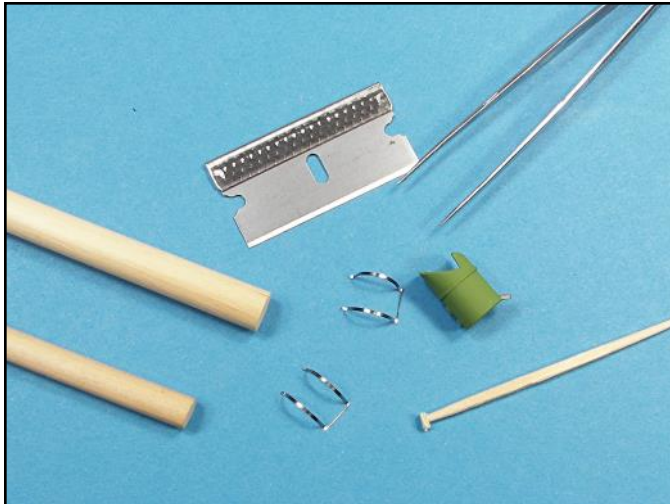
Since the cowling panels were going to be left off to display the interior details, the holes for the quick release fasteners needed to be added using a small drill bit.



The firewall and oil tank were painted and prepared for the addition of photoetch parts.



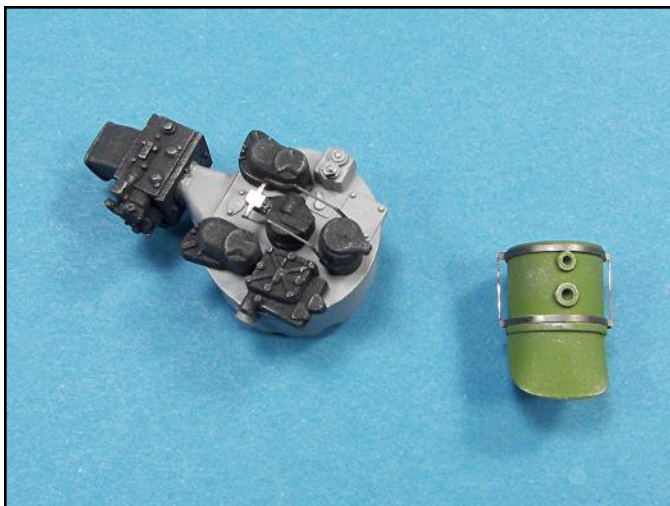
The air intake screen for the oil cooler was replaced with a photoetch detail part. The photoetch part was positioned into place using a toothpick with a tiny length of masking tape folded over itself on the toothpick's tip.



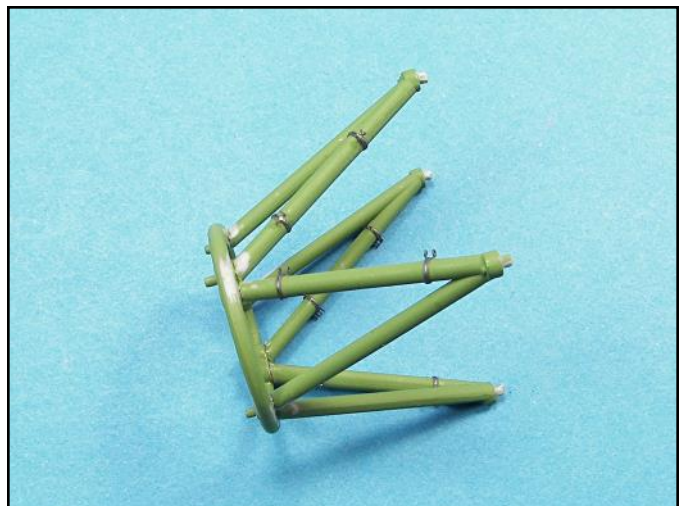
These Eduard photoetch detail parts were shaped with wood dowels slightly smaller than the diameter of the plastic part so they would fit tightly around it.



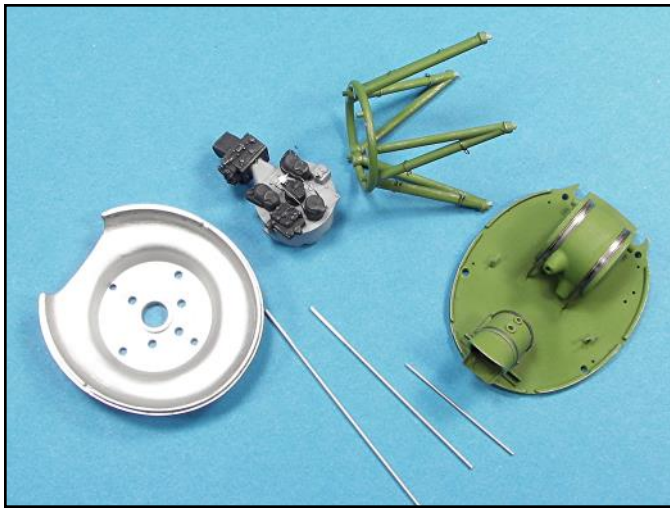
The backside of the engine also had a lot of detail parts that needed to be airbrushed prior to assembly.



The subassemblies were drybrushed with silver paint to make the petite surface detail stand out. Note how tight the photoetch framing fits around the oil cooler intake thanks to careful shaping of the photoetch with a wood dowel.



The Eduard photoetch detail set for this engine also had wiring and plumbing clips which attached to the engine bracket.



The firewall parts are assembled and painted, and are ready for additional detail work.



The heat shield and engine frame got a final fit check. Checking and rechecking part assemblies is the best way to prevent a misalignment problem.



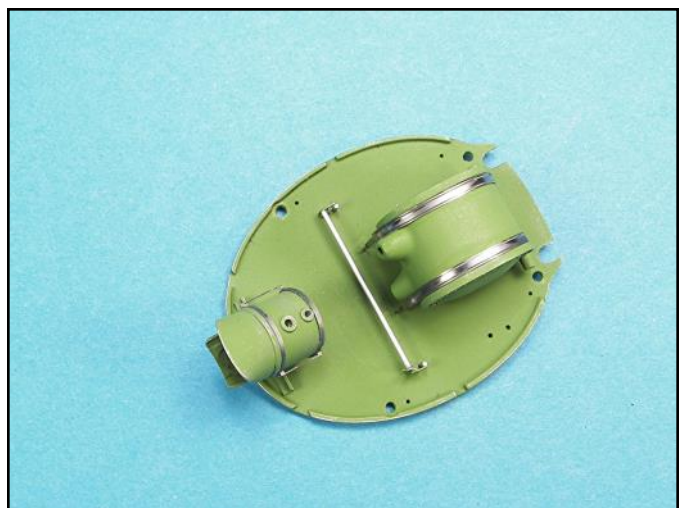
The wiring and plumbing for this engine assembly was accomplished with brass beading wire stretched straight and then painted with indelible markers.



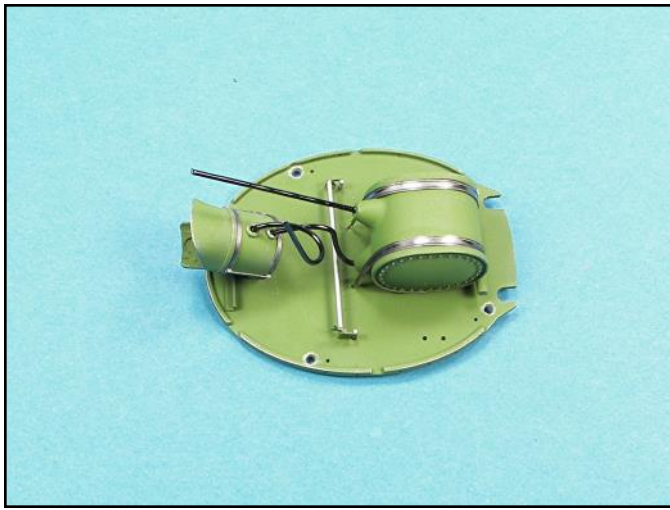
Colored wiring has been added to the photoetch clips.



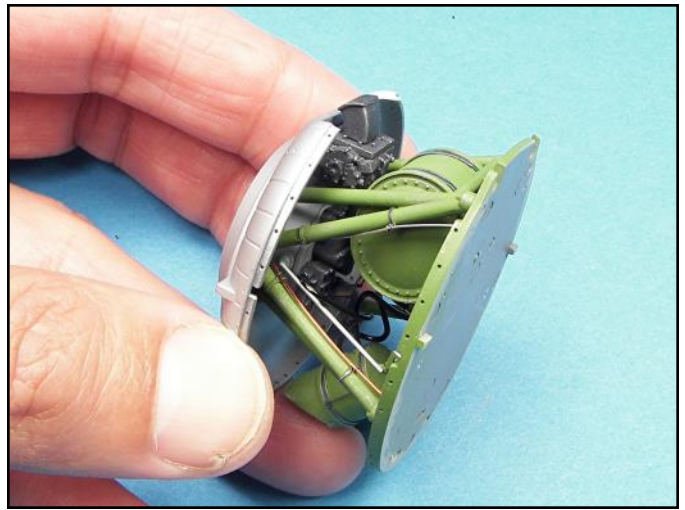
The subassembly details were then added to the backside of the heat shield.



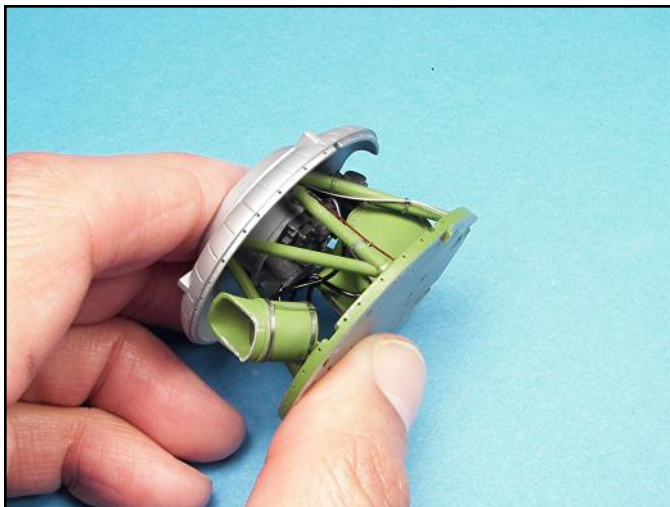
The firewall assembly is now ready for the additional plumbing to connect the oil tank to the air cooler.



The oil tank and air cooler plumbing were made from solder and painted with a black indelible marker.



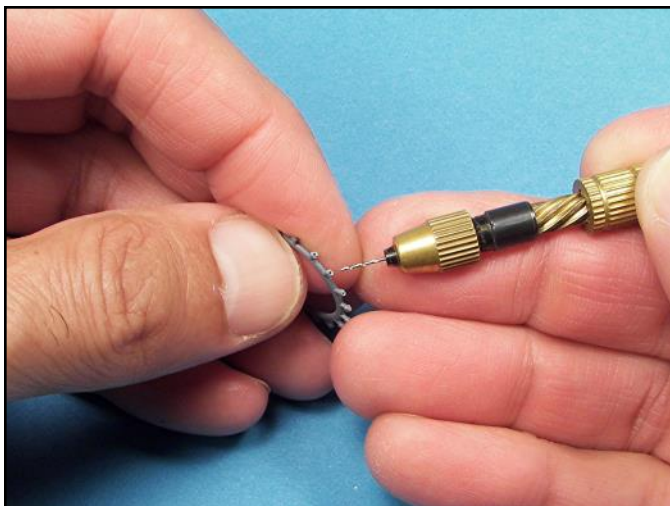
The firewall and heat shield sub assembly were then glued together.



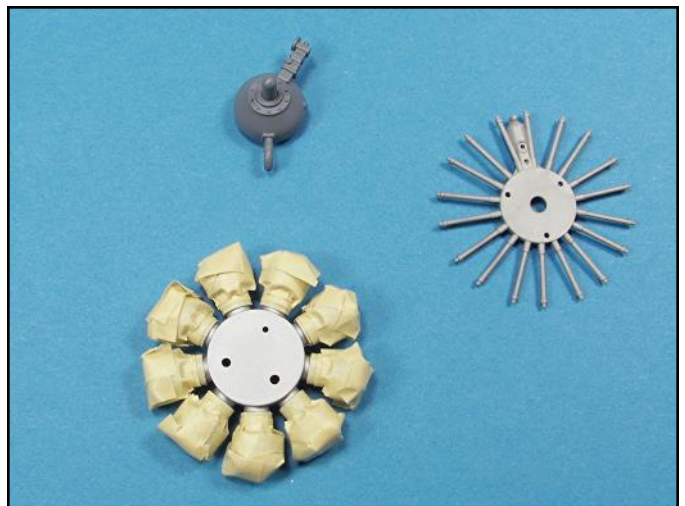
Additional plumbing detail was then added to the area between the firewall and the heat shield.



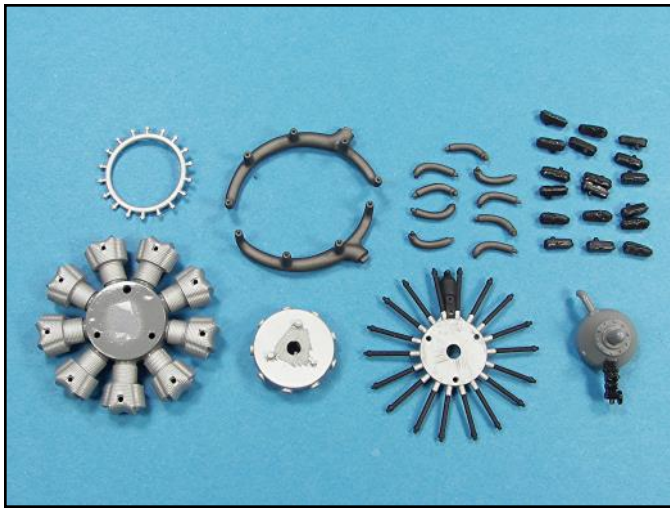
The first step in drilling out the engines wiring harness for the spark plug wires is to indent the surface for a drill bit.



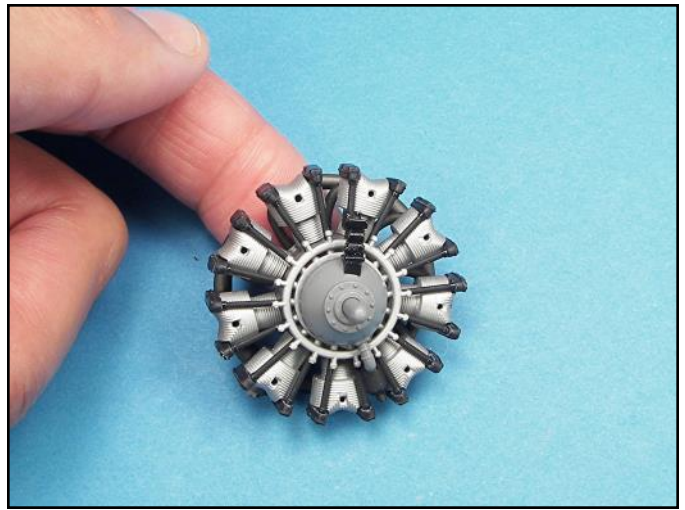
A .018 inch (number 77) bit was used for drilling out the ends of the wiring harness.



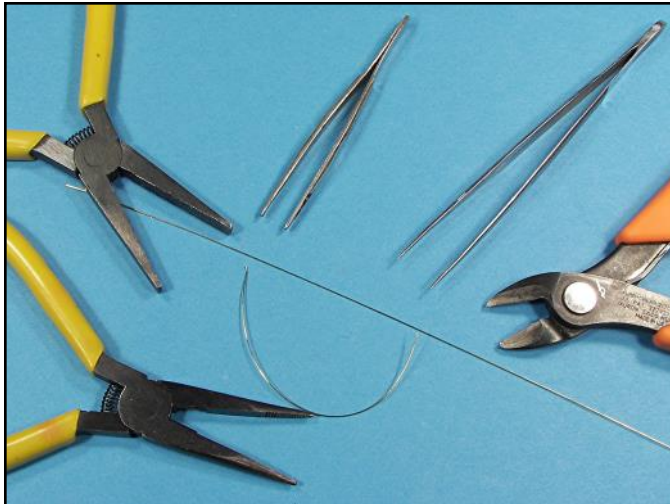
The cylinders were airbrushed and then masked for additional painting.



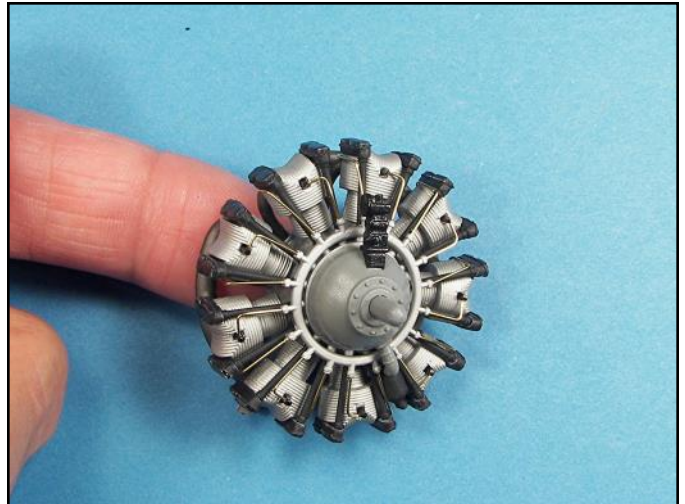
All the engine parts have been airbrushed and now it's time to assemble the engine and add additional details.



Note how all the different colors add depth and detail to the assembled engine.



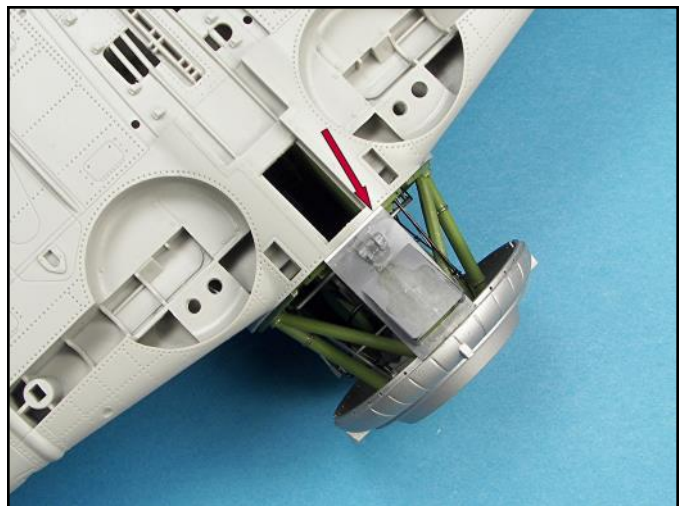
Brass beading wire stretched out will be used for the spark plug wiring.



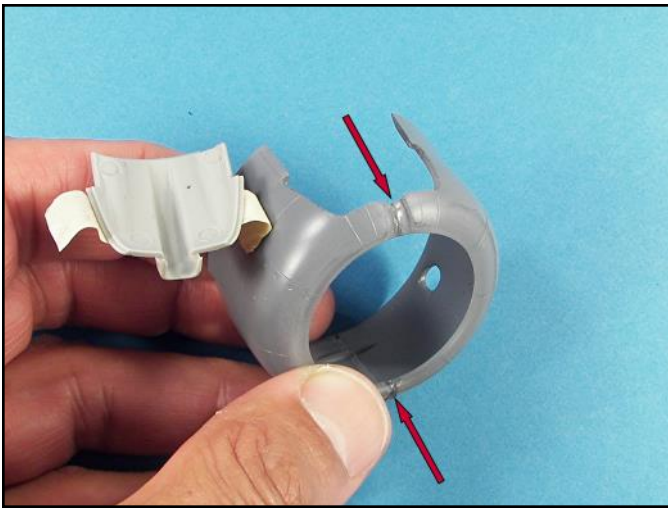
There are two spark plug wires for each cylinder, one in the front and one in the back side.



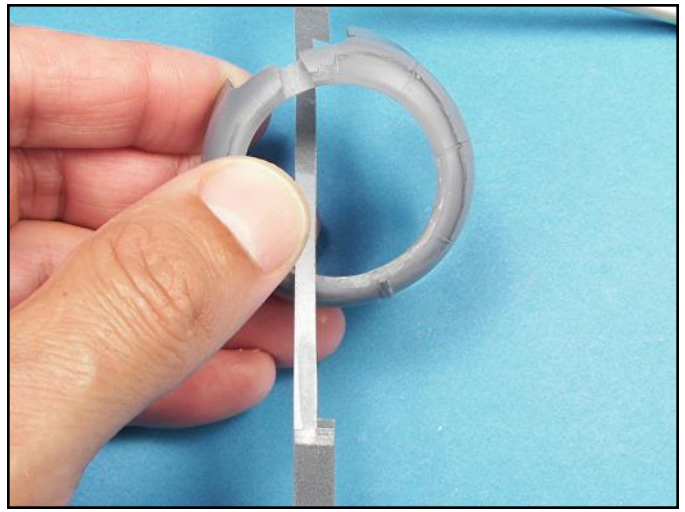
The firewall/heat shield subassembly is attached to the fuselage and now it's time to start adding the cowling parts.



The forward fuselage halves which covered the area forward of the firewall, were cut into panels. The lower section was glued together and was slightly short so a plastic strip had to be added to fill the void.



The cowling halves were glued together and the seams were filled with super glue. The top panel was set in place to help position the halves together. It will be attached last.



A Flex-I File sandpaper strip was cut thin and the seam areas were wet sanded smooth.



The upper cowling section was super glued into place and the seam was lightly scraped with the tip of a number 11 X-Acto blade. The plastic was then wet sanded smooth and polished with a 0000 steel wool pad.



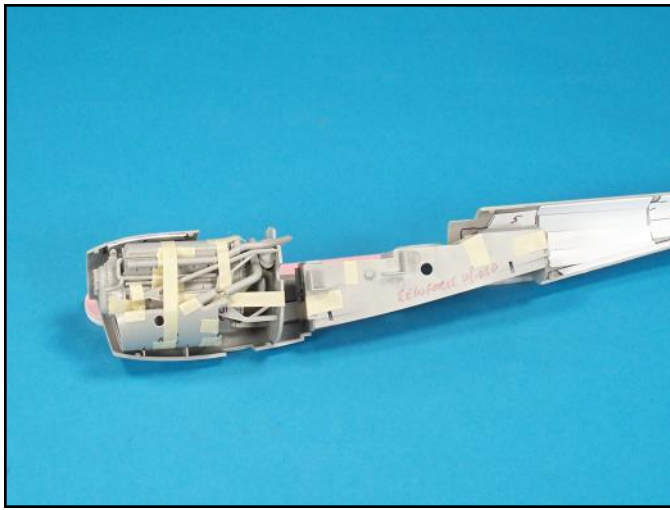
The positioning taps on the heat shield for the cowling needed to be scraped down a little so that the cowling would fit correctly.



With the aircraft painted, the area between the firewall and the heat shield fuselage has plenty of detail displayed.



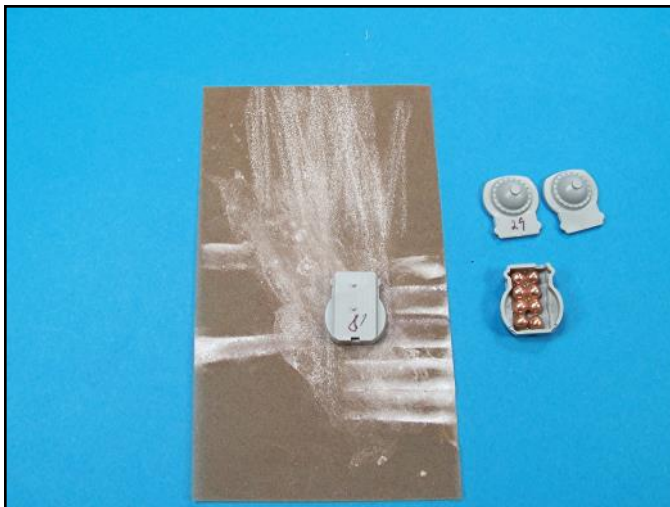
Careful painting and a choice of colors, which complement one another along with spark plug wiring really helps make all the detail stand out on this engine.



The engine, mounts, firewall and lower air intake subassemblies were taped together to check their fit. These subassemblies were then all taped together to ensure that everything fit inside the engine boom on this P-38.



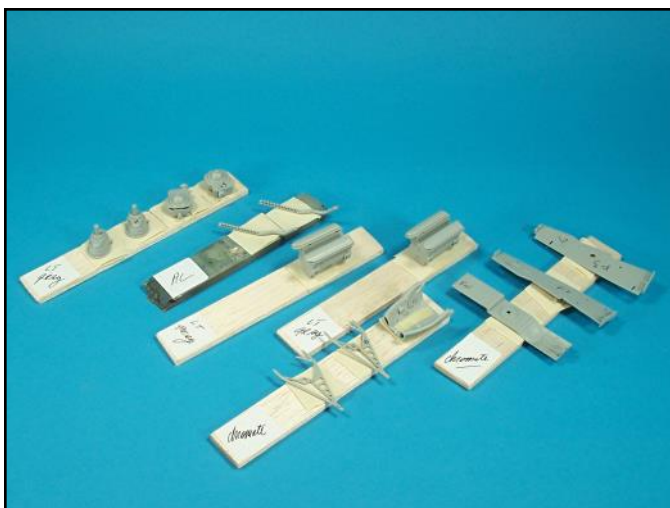
The landing gear bays and the super charger piping also got a fit check.



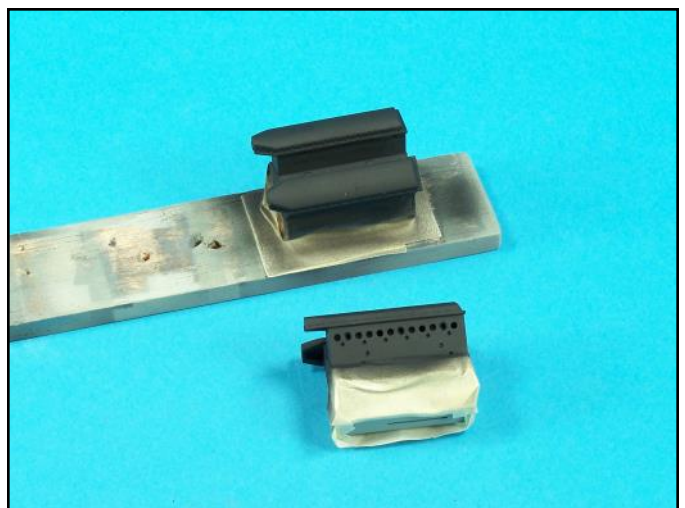
Since the engines are forward of the balance point, on a P-38, they were filled with copper coated bee bees.



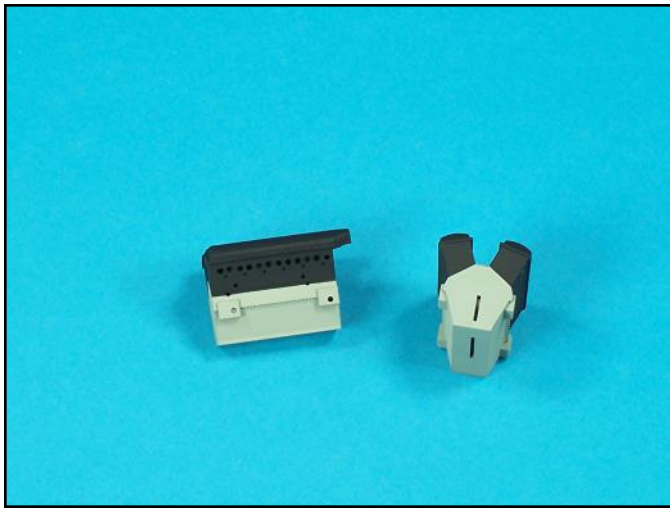
Every area inside each engine was filled with copper coated bee bees and then white glue was squirted inside these areas to secure them in place.



The engine subassemblies were primed and then painted their primary surface color.



The lower engine blocks were masked off and the upper areas were airbrushed flat black.



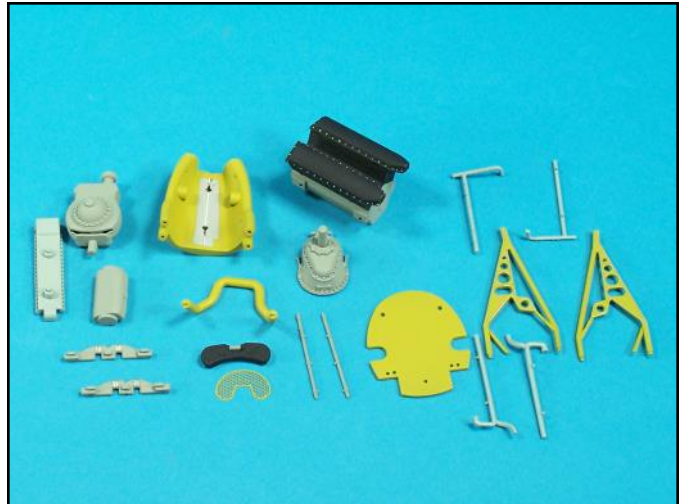
Note the sharp demarcation lines between the colors thanks to good masking.



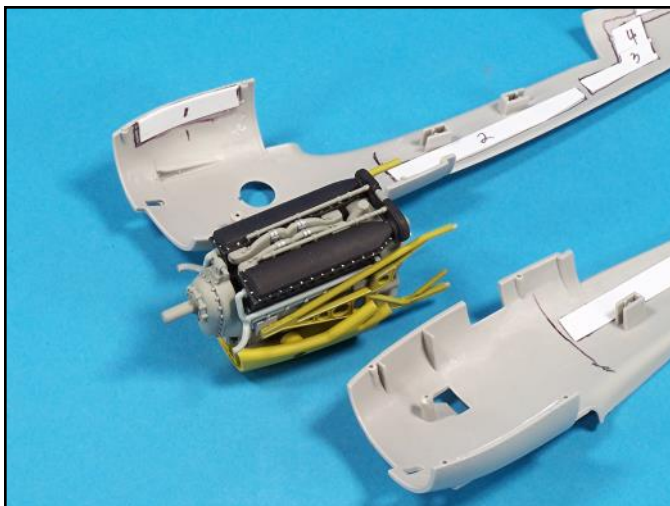
The center sections of the lower air intakes had voids that were filled with various thicknesses of plastic strips.



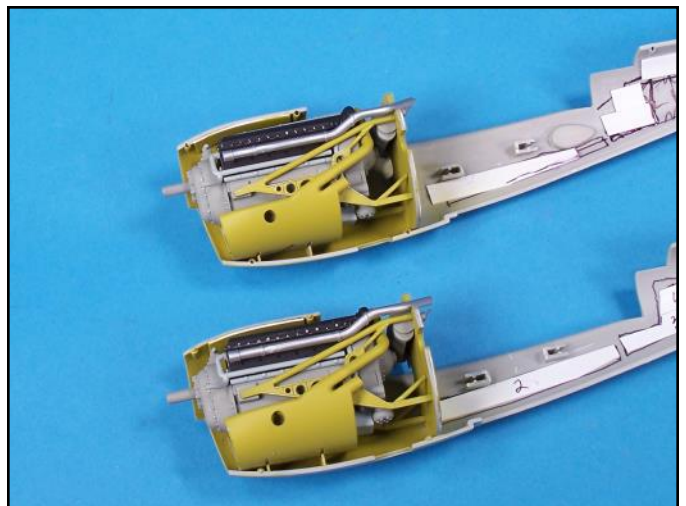
The plastic thickness on many new kits is very thin. Reinforcing the plastic by laminating sheets of plastic to the inside areas with super glue will prevent flexing of the plastic, which can crack a seam.



Note the bolt heads on the upper engine block valve covers have been painted silver. The tip of a round toothpick was used to apply a tiny amount of paint to each bolt head.



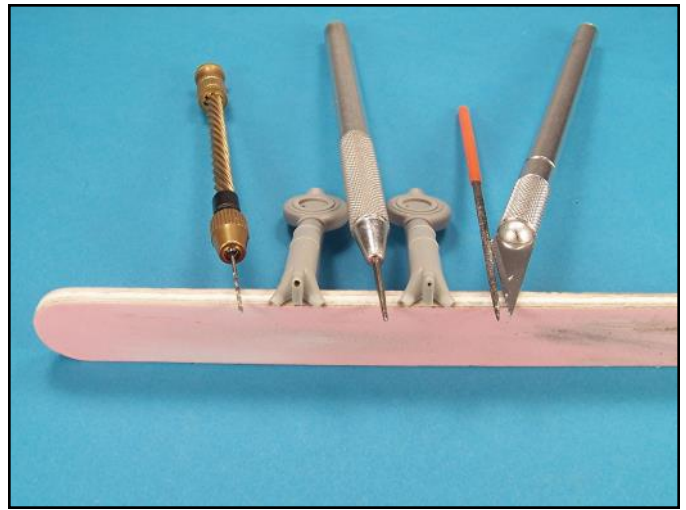
The assembled engine looks great. The different colors and sharp demarcation lines between the colors will help make the details stand out with several removed access panels on the engine booms.



Both engines received a final test fitting and then they were glued into place.



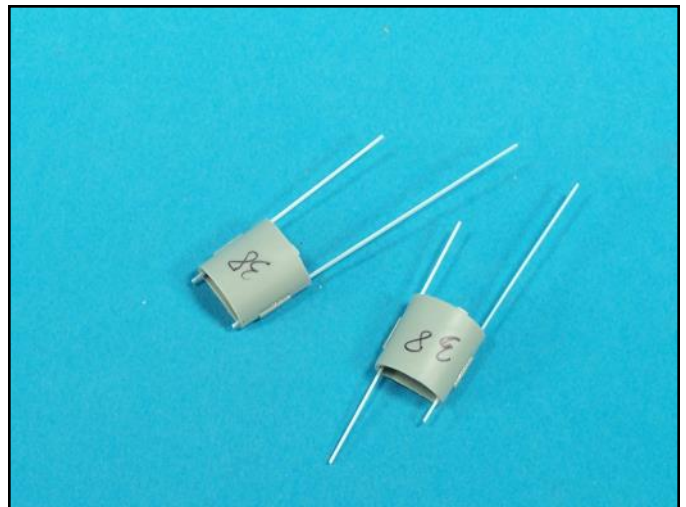
The supercharger parts on this P-38 kit are well detailed and they just needed the sprue attachment points cleaned up and sanded smooth.



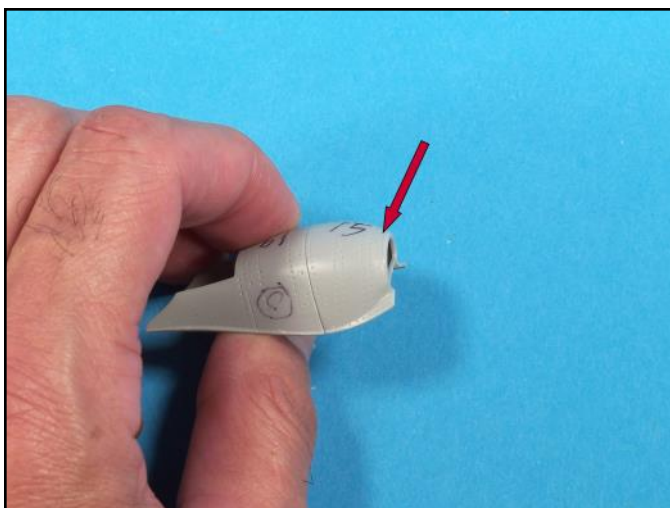
The supercharger air inlets were opened up with a drill bit.



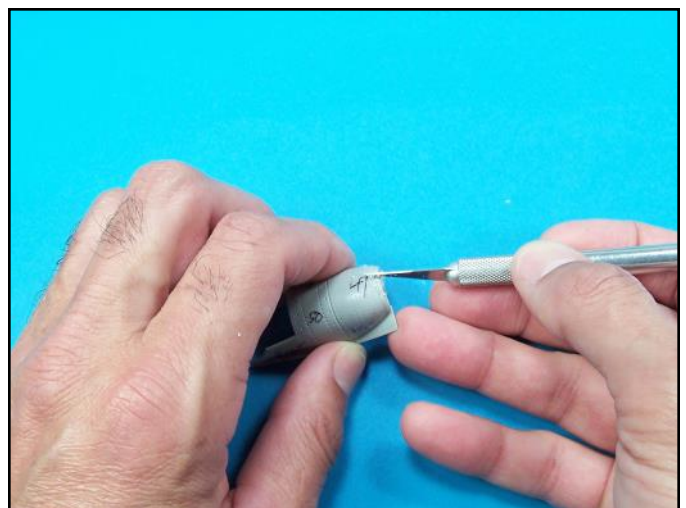
The side boom engine air intakes on this P-38 kit were multi-piece assemblies that had some fit and void challenges.



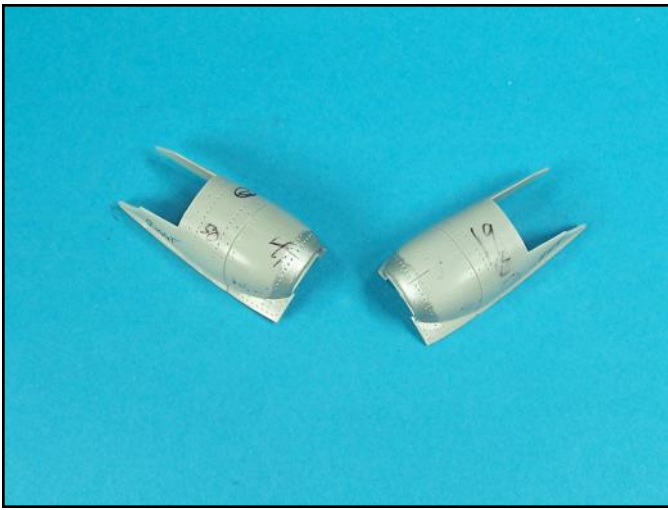
The interior areas of the air intakes had seams that were hidden by covering them with .030 inch half round.



The leading edge of each of the four air intakes had separate parts that were oversized.



The solution was to carefully scrape the oversized plastic off after the parts were super glued into place.



Silver paint was used as a crack and flaw detector. An additional application of super glue was needed and then the surfaces were wet sanded smooth.



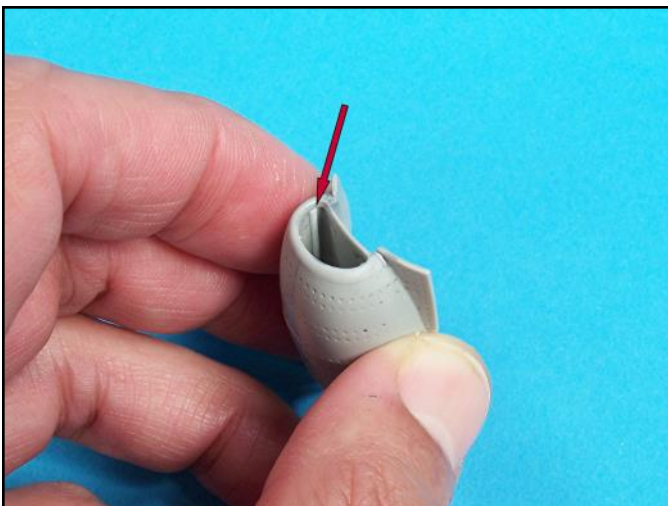
The leading edge area looks great thanks to careful applications of super glue, careful scraping and wet sanding.



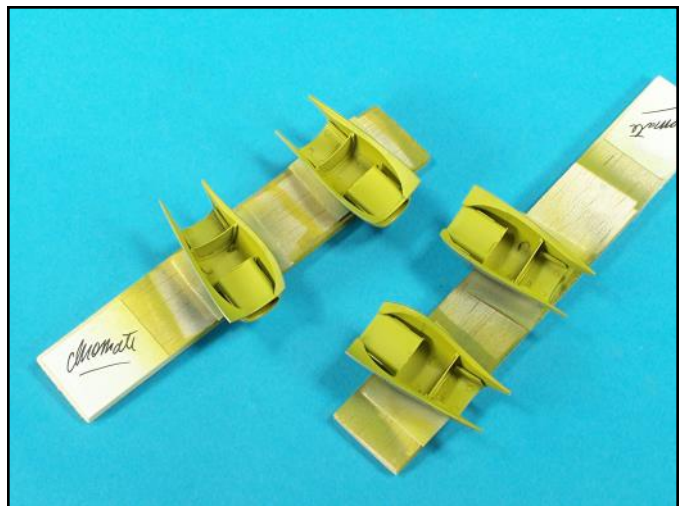
The surfaces of the side boom air intakes were polished with 0000 steel wool.



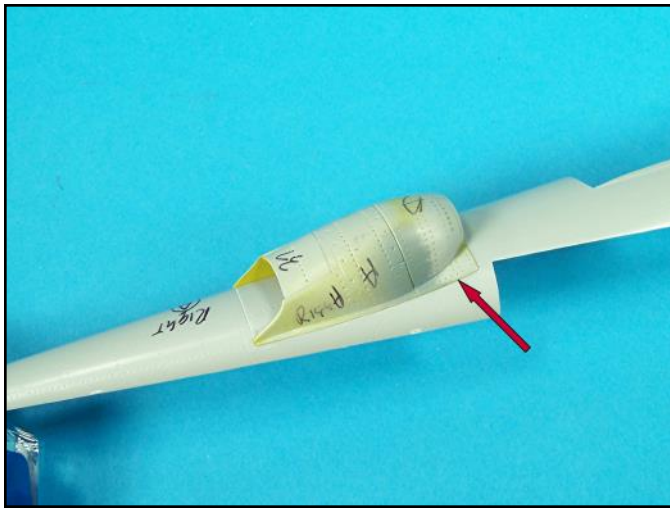
The photoetch screening was then added.



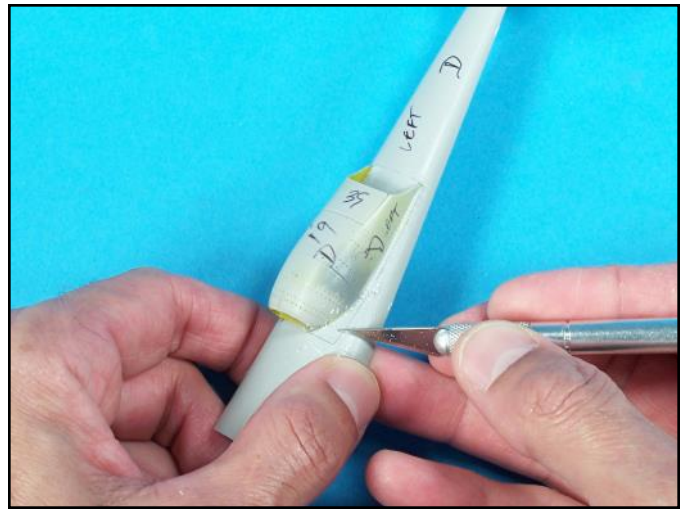
Once the interior areas are airbrushed the half round that was added to hide the interior seams will not be noticeable.



Now that the interior areas have been airbrushed, it's time to glue them to the boom sides.



The surfaces of the air intakes were slightly higher than the surrounding areas. Several applications of super glue were applied to the perimeter of each air intake.



The edges were then carefully scraped flat. To prevent the blade from gouging the plastic, hold the blade at a 45 degree angle and use very light pressure to scrape the plastic and super glue smooth.



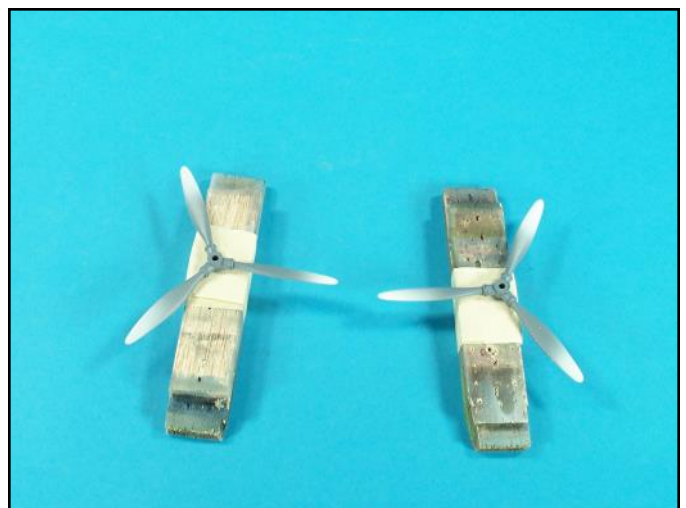
The edges of the air intakes were checked with silver paint to be sure that the surfaces between the edges of the air intakes and the booms were flat.



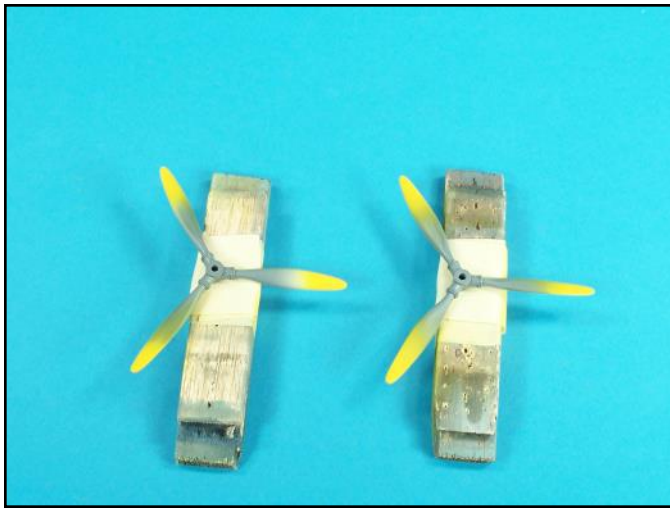
The surfaces were then wet sanded smooth and then the plastic was polished with 0000 steel wool.



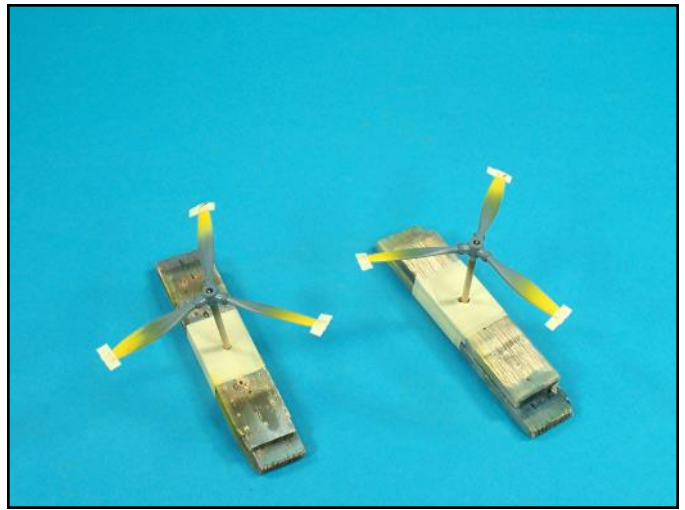
The kit's P-38 propellers were not shaped correctly so they were replaced with ones from a Revell kit. There were dimples on the surfaces of the blades that were filled with strips of plastic and then sanded smooth.



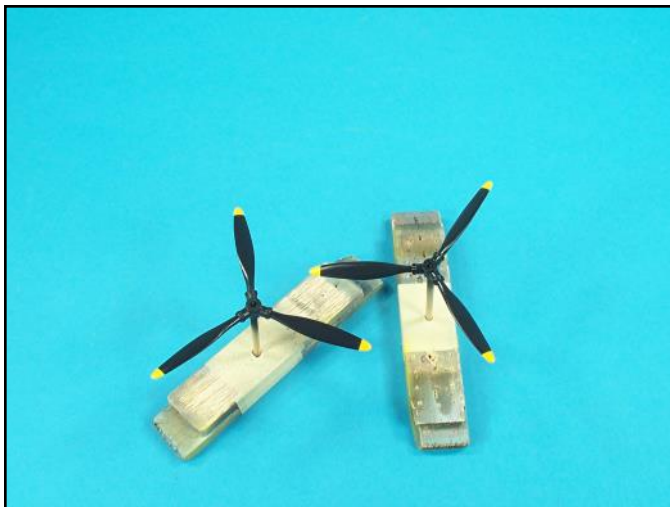
The propellers were primed and then both sides of the tips were airbrushed with flat white. This color is a great undercoat for flat or gloss yellow.



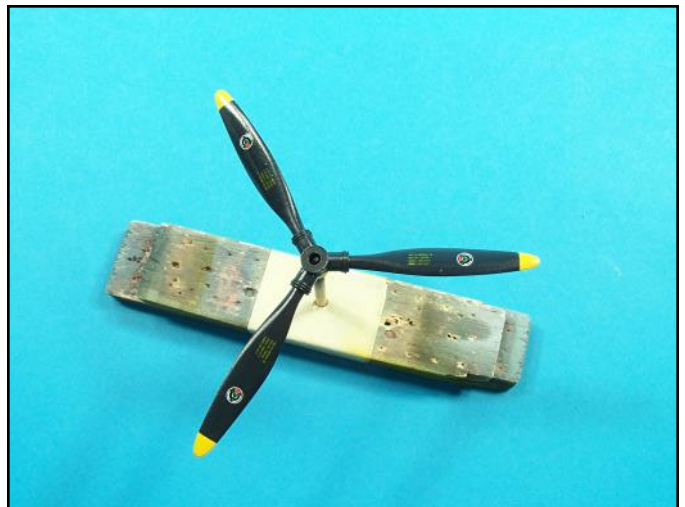
Both sides of the propeller tips were then airbrushed with flat yellow.



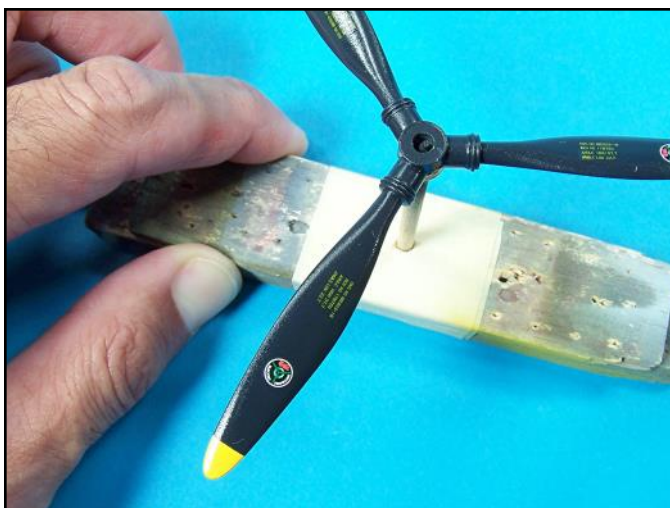
Both sides of the tips were then masked. Be sure that the masking on both sides of the tips match.



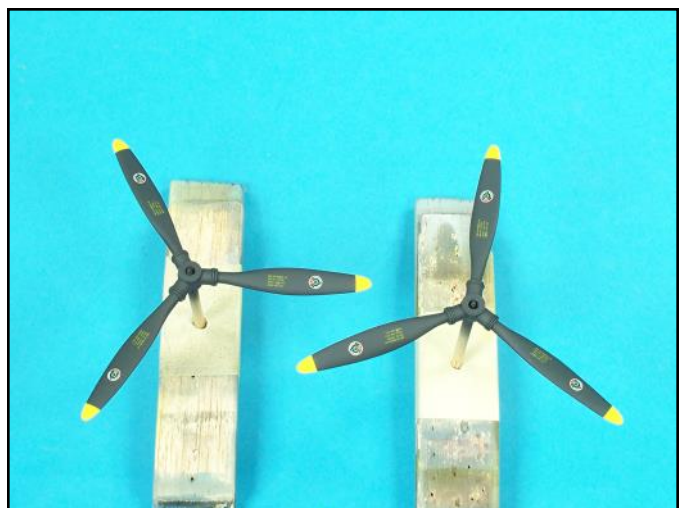
The blades were then airbrushed flat black and then given two coats of clear gloss for the propeller decals.



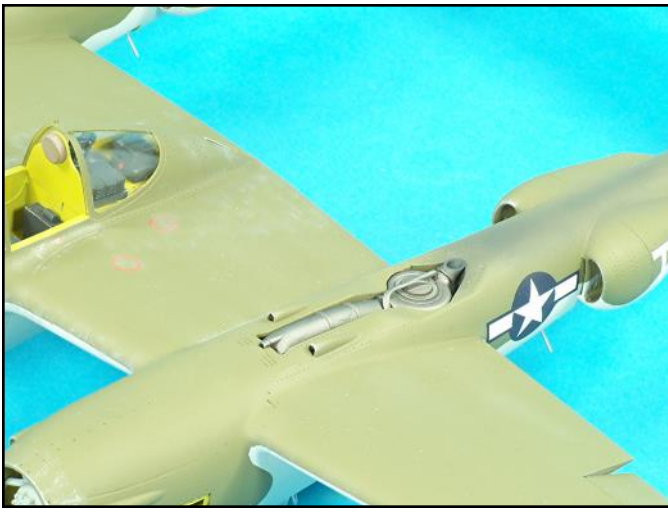
The positioning of the decals need to be the same distance from the tips.



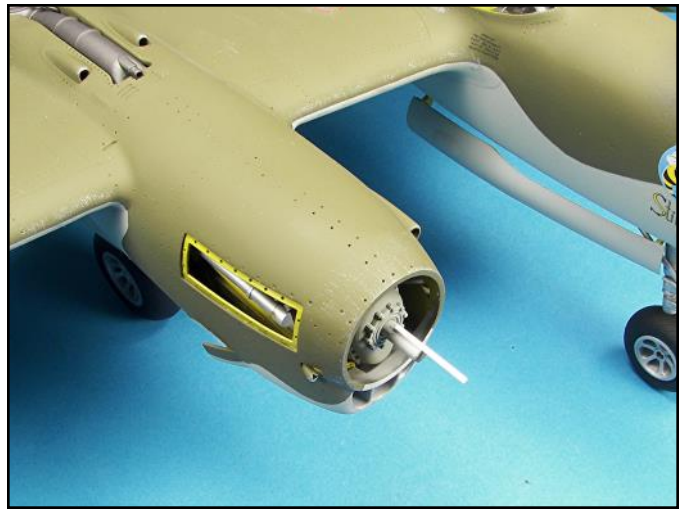
A good coat of clear gloss prevents any silvering of the clear carrier film of the decal.



The propellers were then given a coat of clear flat to seal the decals and restore the flat black color.



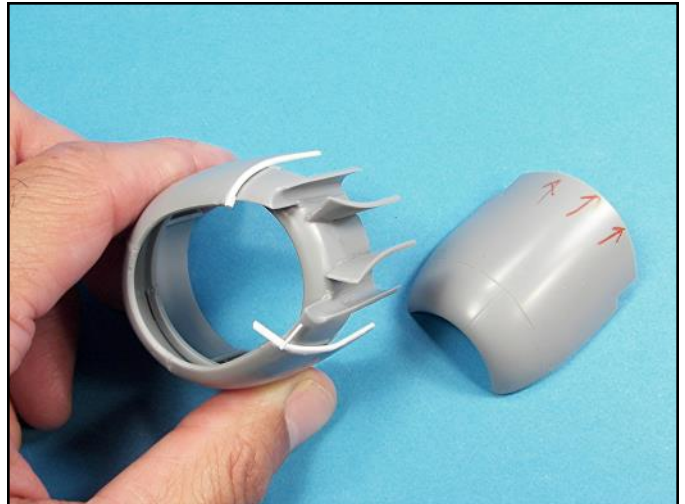
The superchargers were airbrushed with a buffing metalizer. Note the subtle exhaust staining.



The diameters of the propeller shafts were too small. The easy solution was to glue a spacer onto the shaft so that the propellers would fit tightly on the shafts.



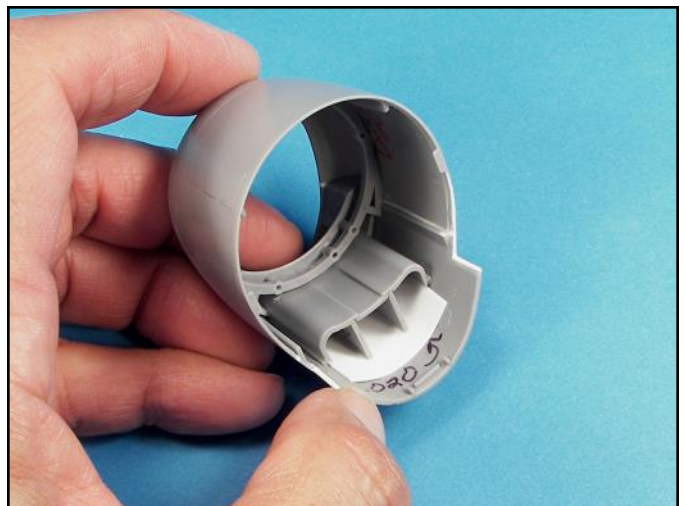
The propeller hub and base were painted flat red with a few drops of flat white added to lighten up the color. Note how the spacer centered the propeller assembly on the engine boom.



Test fitting this P-47 engine cowling onto the fuselage showed that there was a step between the cowling and the fuselage. To fix this problem, a .030 inch thick strip was super glued to the bottom area.



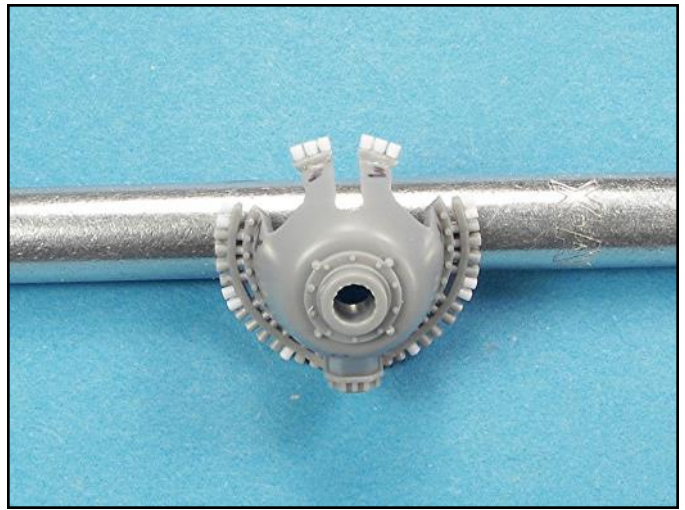
With the added strips cut and sanded smooth, the engine cowling now has the correct depth eliminating the step between it and the fuselage.



Due to the added strips the air intake vanes no longer touched the interior bottom of the cowling. To fix this problem, a .020 inch thick section was cut, shaped and slipped into place.



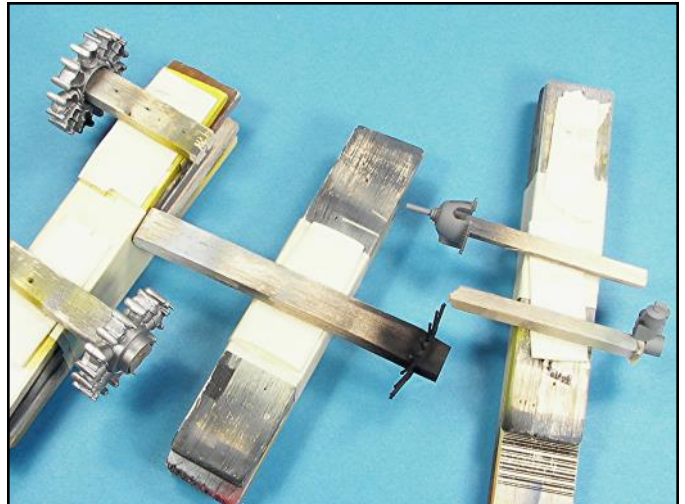
The cowling assembly now has the correct depth and the unrealistic step is now gone.



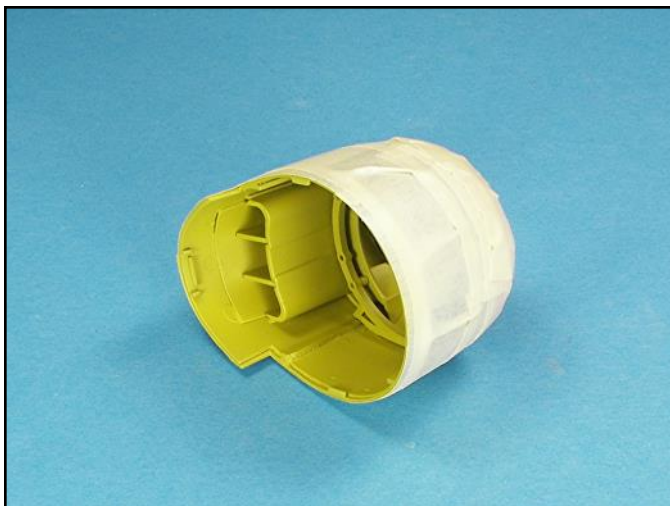
The P-47 engine wiring harness did not have the correct number of spark plug wiring points, as each cylinder has two spark plugs. The additional spark plug points were added with plastic rod.



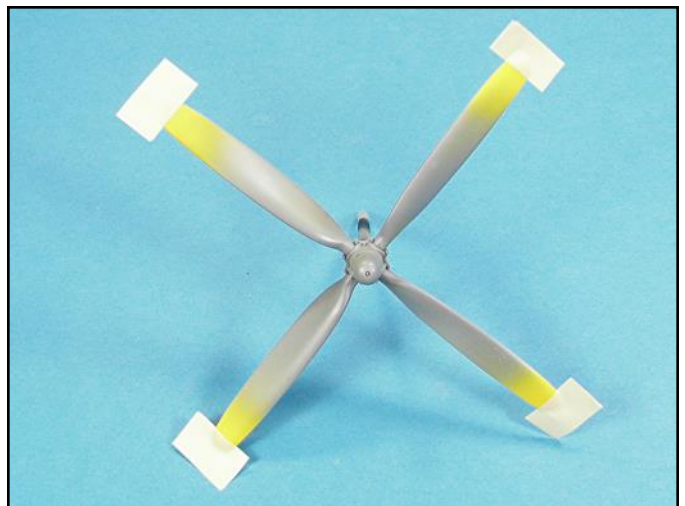
Holes for the spark plug wires were carefully drilled out using a .0145 inch (#79) drill bit. The punch was used to create an indentation in the surface of the plastic for the drill bit.



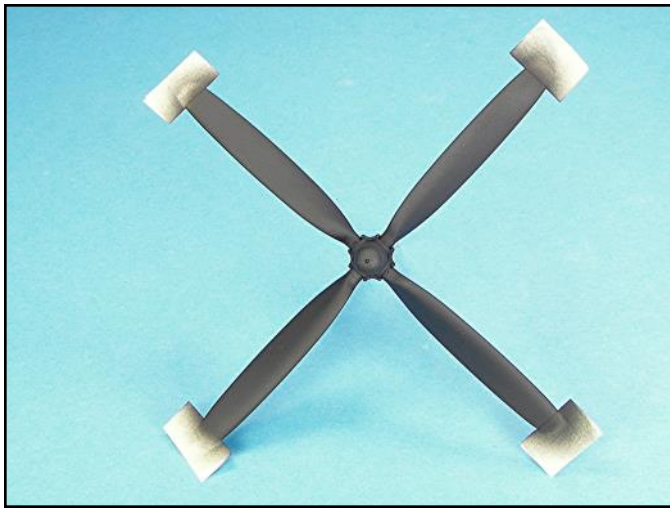
With the drilling completed, the engine parts were primed and then airbrushed their appropriate colors.



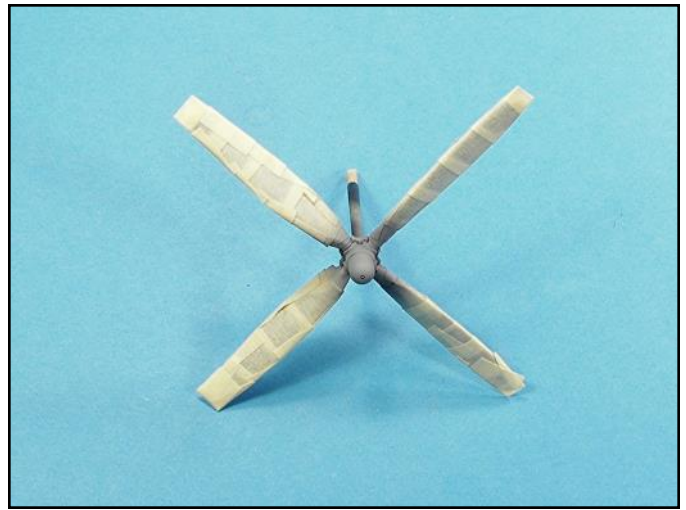
The exterior of the cowling was masked and the interior area was airbrushed using a pressure of 15psi.



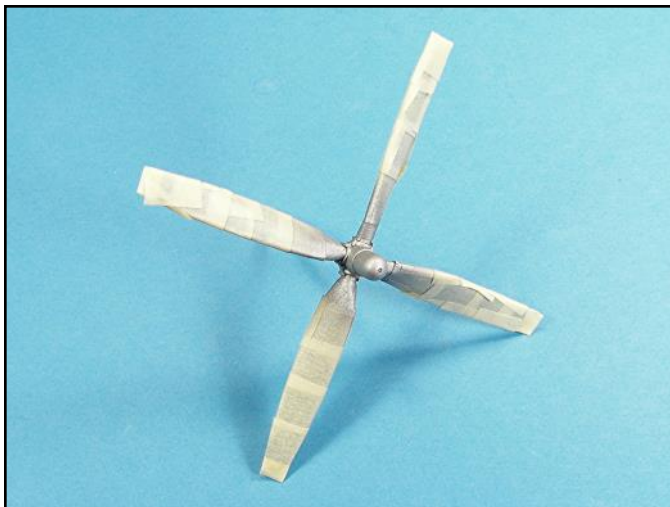
The propeller tips were airbrushed flat white, then flat yellow and then the tips were masked.



The propeller blades were then airbrushed flat black.



The propeller blades were masked and the hub was re-primed.



The hub was then airbrushed with metalizer aluminum.



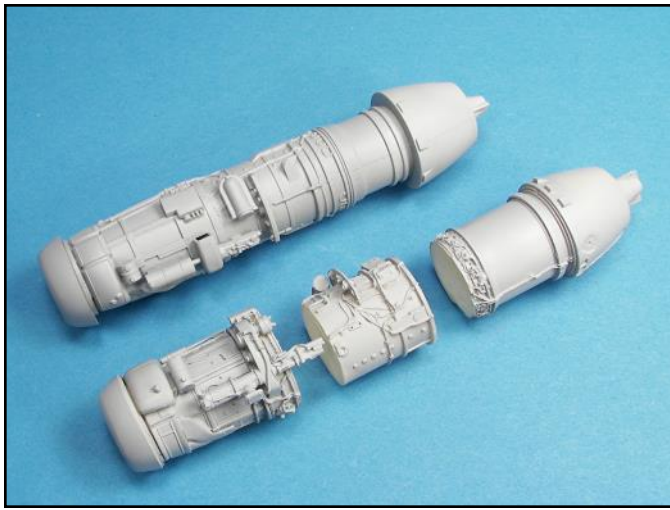
The propeller colors have sharp demarcation lines thanks to careful masking.



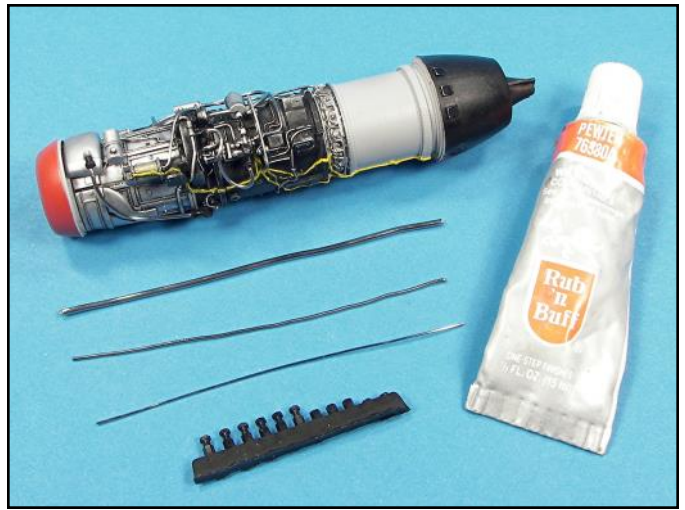
The spark plug wiring was added using brass beading wire. Note how all the colors complement one another.



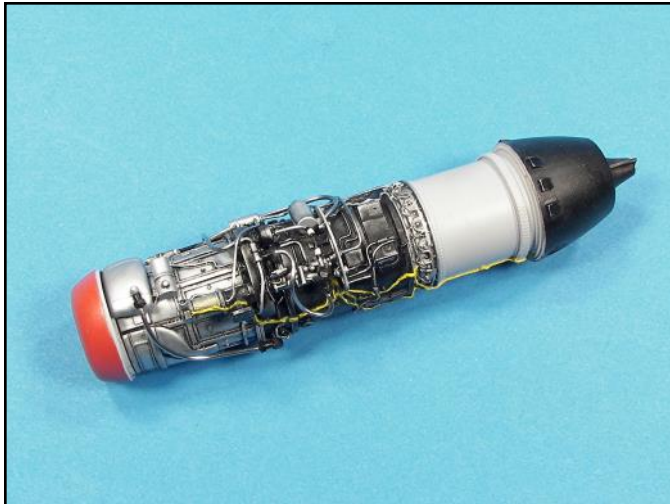
This resin jet engine is well cast and once the casting blocks are removed, the parts will be ready for priming. Be sure to clean the parts to remove any mold release agents.



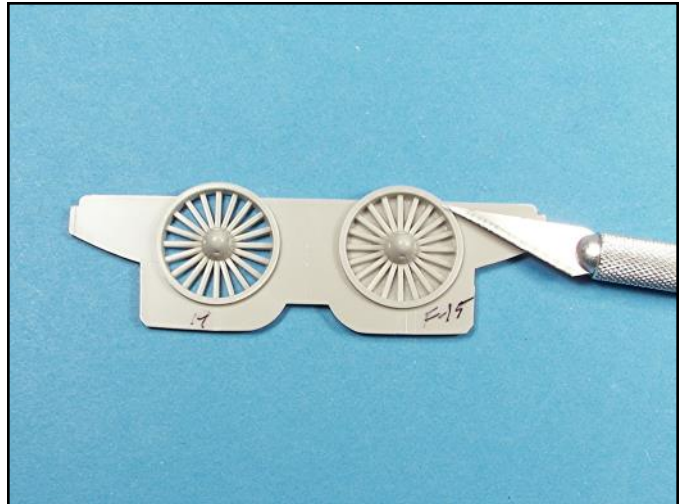
With the parts primed all the detail stands out. The flat black, flat gray and flat red colors will be applied first, then masked off for the application of the metal color.



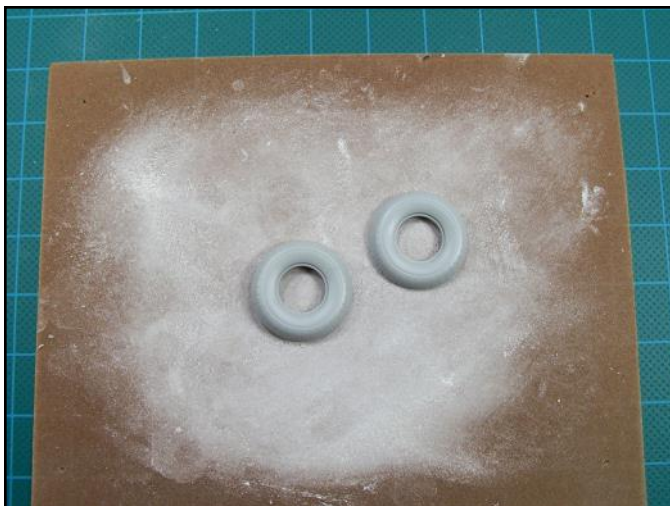
Rub & Buff was used for the metal areas of the engine, however a metalizer color would work just as well. The small details were painted with the tip of a round toothpick.



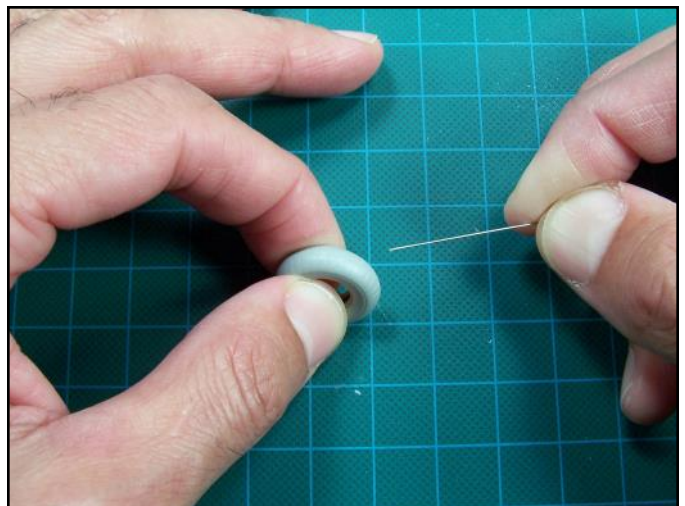
The finished resin engine looks great and displays a lot of detail.



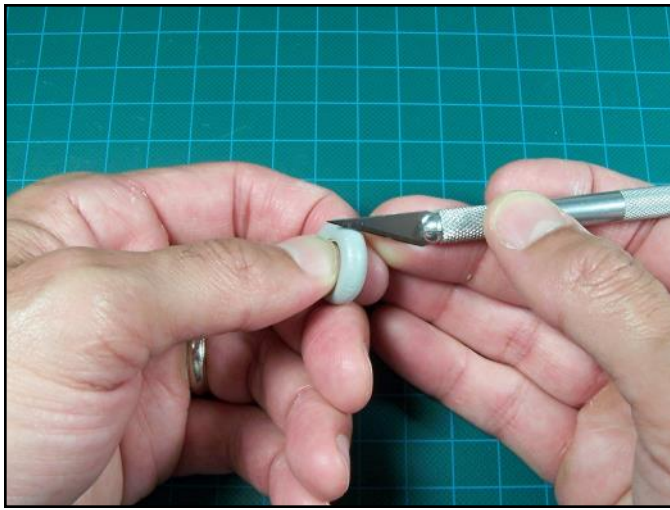
Many jet kits just have the vane detail. To make this part look more realistic sand the backing until the plastic is paper thin and then cut out the excess plastic between the vanes. To create some depth, add a painted backing behind the vanes.



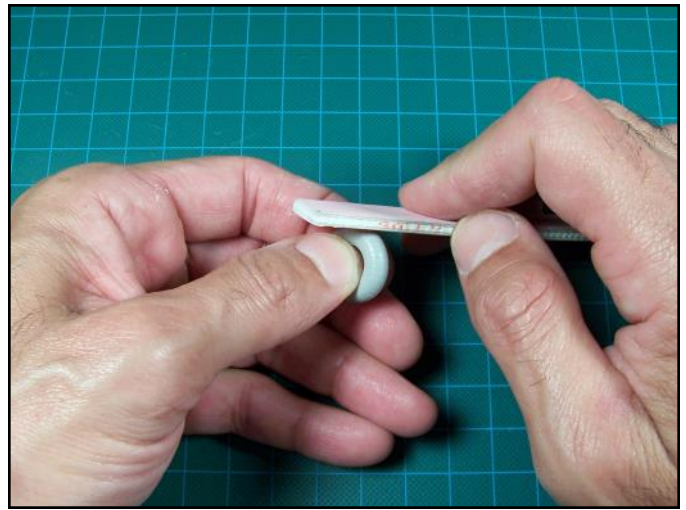
To get a tight fit on these Mig-3 wheels, they were run cross a stationary piece of sandpaper.



The wheel halves now fit very tightly and a tiny bead of super glue was applied along the seam line. The capillary action of the glue will pull it in between the halves making a very strong bond.



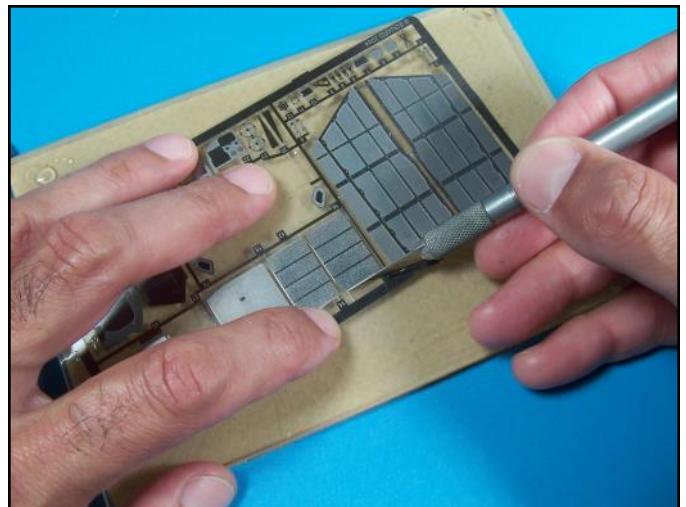
The super glue was then carefully and lightly scraped off.



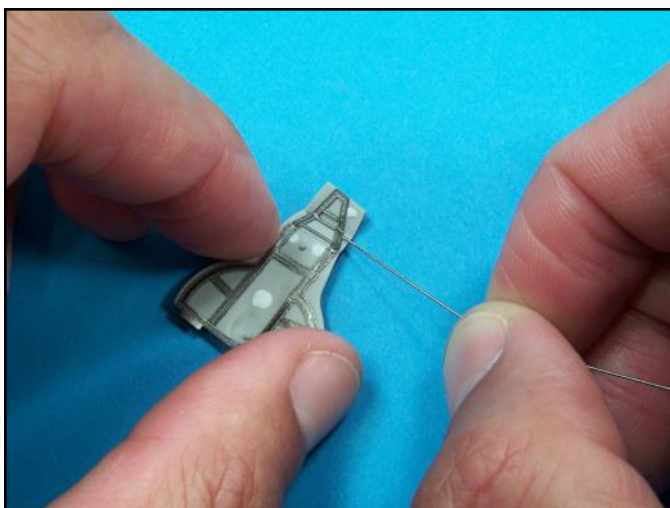
The seam was then polished with a wet sanding stick.



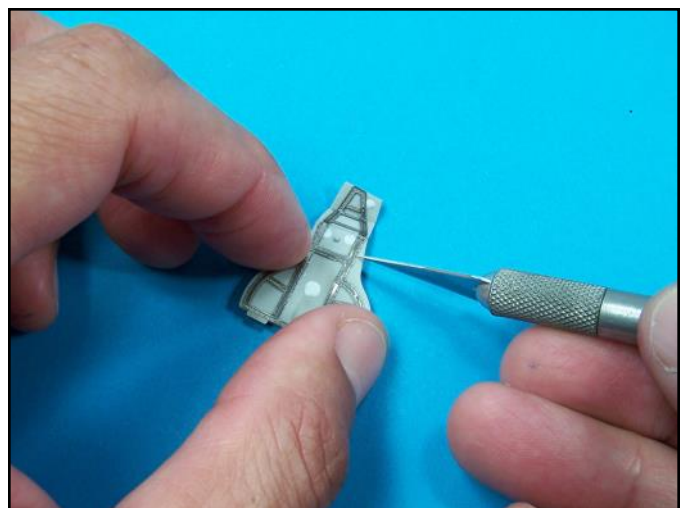
There were a lot of mold punch outs on the inside of these landing gear covers. Since the Eduard photoetch set had framing detail for these parts, the deep punch outs were filled with disks and the entire surface was sanded flat.



When cutting stainless steel photoetch use a Plexiglas base. You will also run through a lot of number 11 X-Acto blades because the stainless steel will break the tips frequently.



The photoetch parts were run across fine grit sandpaper to clean the gluing surfaces. The parts were then formed fitted and positioned and then a tiny bead of super glue was applied along the outside edges.



The excess glue was then carefully and lightly scraped off by holding the blade at a 45 degree angle to prevent the tip from gouging the plastic.



Note how clean the surface of the plastic is. There is no glue residue, which would show up once the parts were primed and painted.



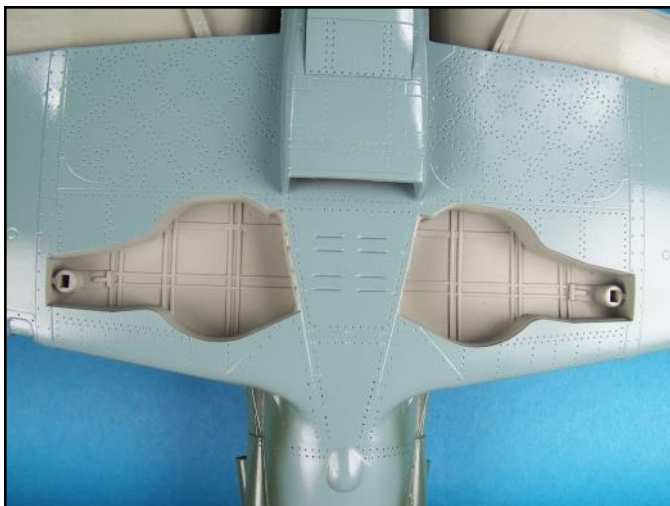
The landing gear parts on this Mig-3 are ready for final assembly. The wheel hubs on this kit were separate parts, which eliminates the need for masking.



The tail wheel had a lot of surface detail that was carefully masked and airbrushed.



To paint the wheel wells on this Mig-3, the area around the openings were carefully masked and then larger sheets of masking tape were applied to protect the surface from overspray.



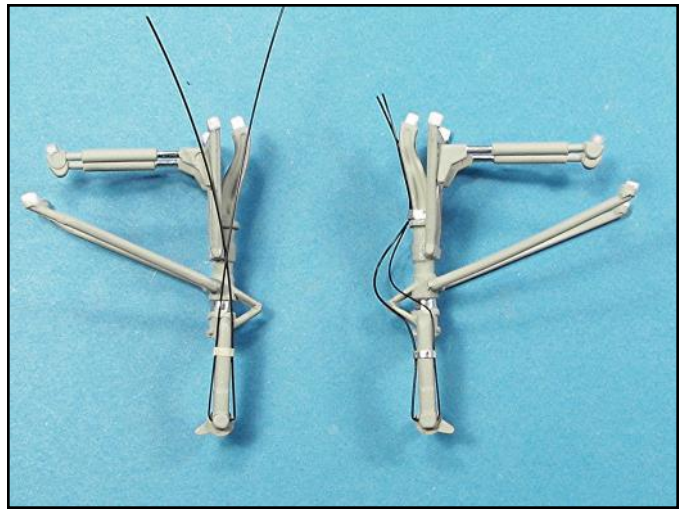
Careful masking around the openings and using low pressure when airbrushing (15psi) gave excellent results.



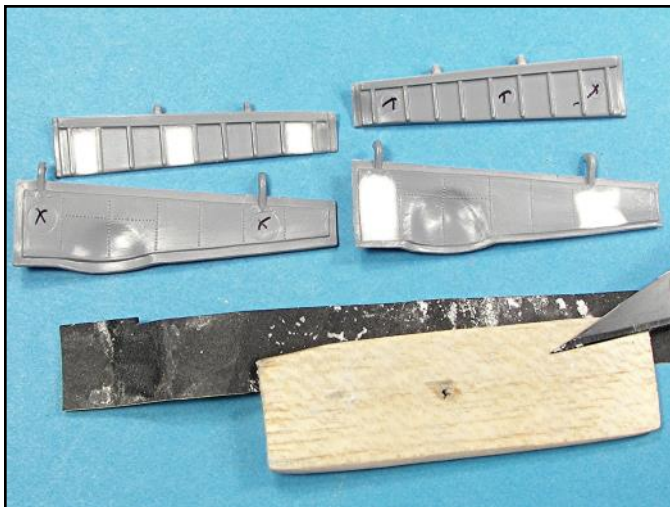
These 1/48 scale B-26 landing gear parts were white plastic. They were primed to make the mold lines and mold punch outs easier to see.



The B-26 landing gear were assembled, re-primed and then airbrushed with a light gray color.



The hydraulics were carefully painted using a detail brush and the brake tubing was made from stretched black sprue. The brake tubing was attached using tiny strips of masking tape that was then painted silver.



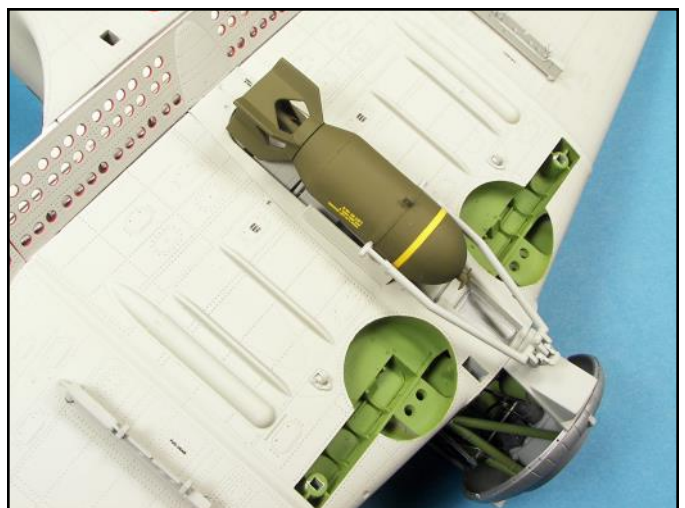
The mold punch outs on the inside of these landing gear doors had mold punch outs that were carefully and lightly sanded out using a length of wet fine grit sandpaper wrapped around a length of balsa wood.



These SBD landing gear legs were one piece parts with a lot of surface detail. Both a detail brush and a round toothpick were used to paint the details.



Careful masking, detail painting and airbrushing make all the difference with the appearance of landing gear, hubs and tires.



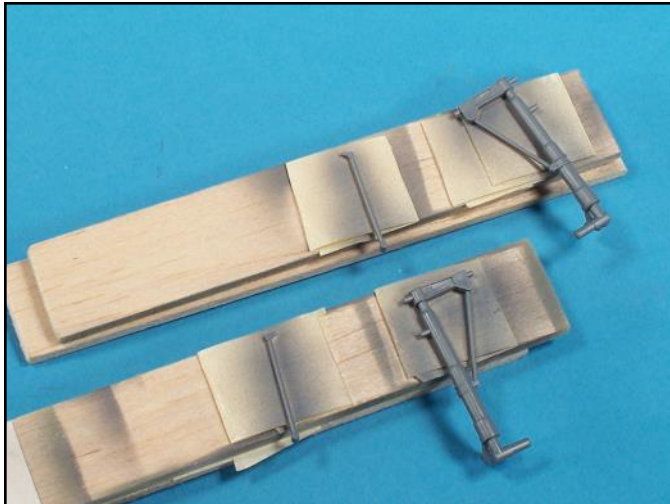
The edges of the landing gear bays were carefully masked with small strips of masking tape, then larger pieces of tape were applied to protect the surrounding surface paint. Note the sharp demarcation lines between colors.



These P-38 landing gear parts had mold punch outs that were deep. I drilled the holes slightly deeper, glued plastic rod into the holes, cut the rods and carefully sanded the surface smooth, with a Flex-I-File and a sanding stick.



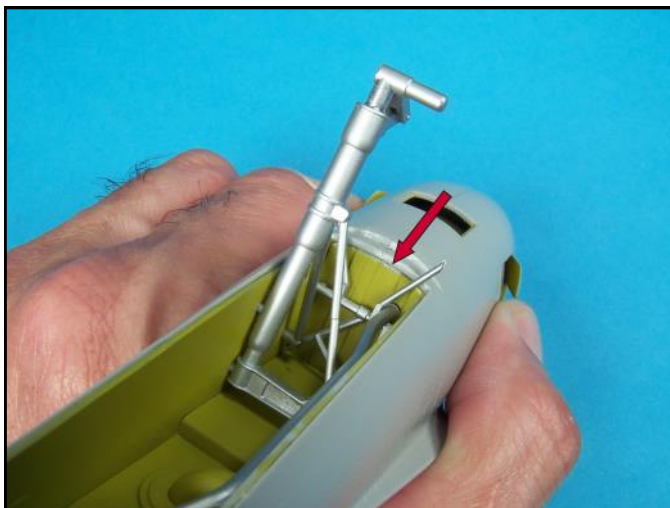
Silver paint was applied to check for flaws and then the surfaces were polished with 0000 steel wool.



The landing gear were primed and then airbrushed with an aluminum metalizer color.



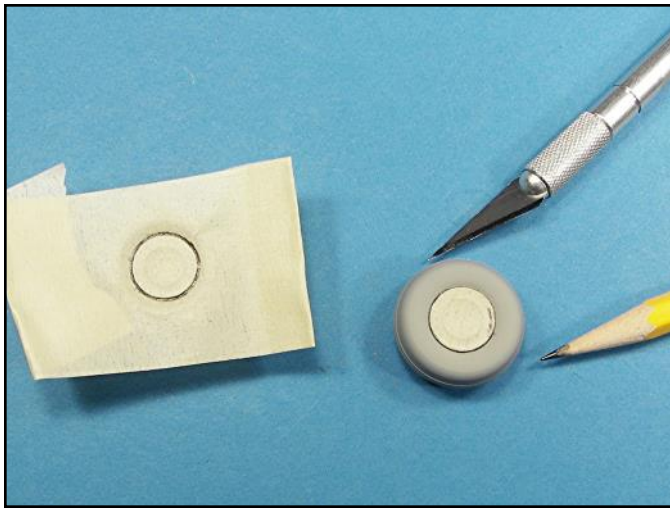
The P-38 landing gear bays have been assembled and they are now ready to be installed into the P-38's booms.



There was a void between the landing gear bay and the boom. To fill this void, white glue was applied to the void area and then the glue was painted with a detail brush.



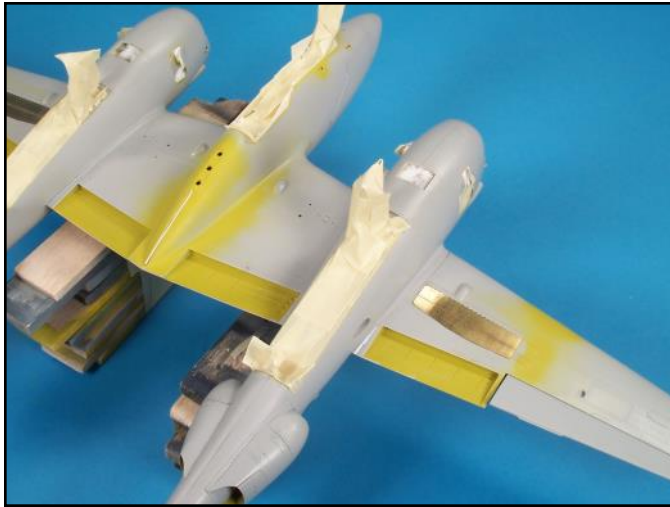
The forward P-38 landing gear needed some tweaking after its fit check. This is why it is important to always check the fit of parts.



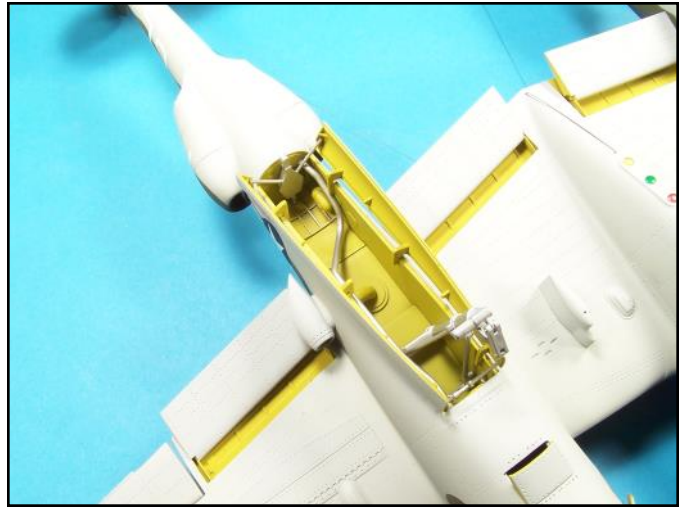
These wheels were primed and the hubs airbrushed. The hubs were then masked for the flat black application. A sharp pencil was used to outline the hub and act as a guide for the tip of the blade.



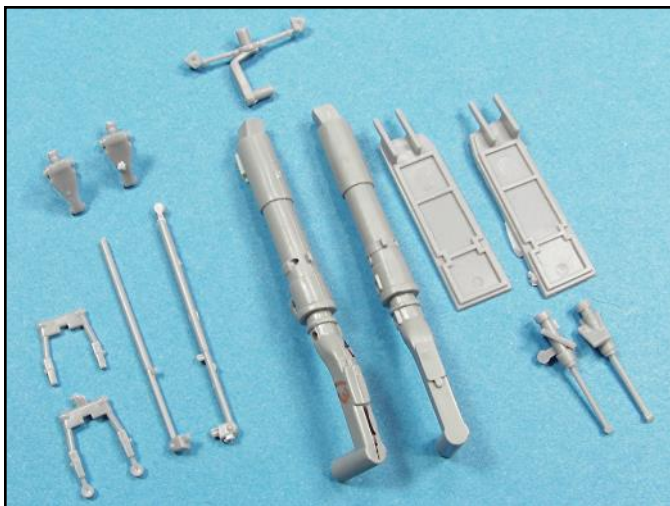
These P-38 wheels are made of a flexible material that has no casting seam. However, they are dust magnets. They were cleaned with masking tape and then immediately given a coat of clear flat to seal the material.



The interiors of the landing gear bays were stuffed with tissue to create a base for the masking tape to attach to. Careful masking of the landing gear bases and legs takes time, but if you are careful, there will be no paint bleeding.



Note the sharp paint edges between the colors. This is due to careful masking and using an airbrush at low pressure (15-20 psi).



The landing gear parts on this Hasegawa P-47 are well detailed and there are minimal mold punch outs. Those that exist are in areas that will be hard to see once the landing gear are assembled.



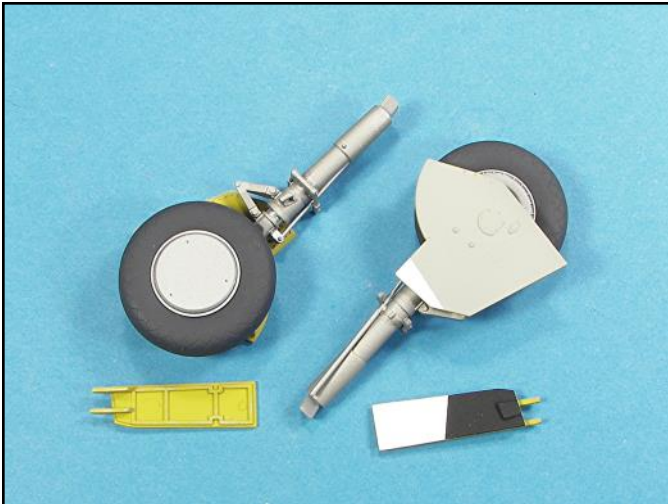
The tread on these P-47 wheels will need to be restored. Otherwise, they will not look right once they are painted.



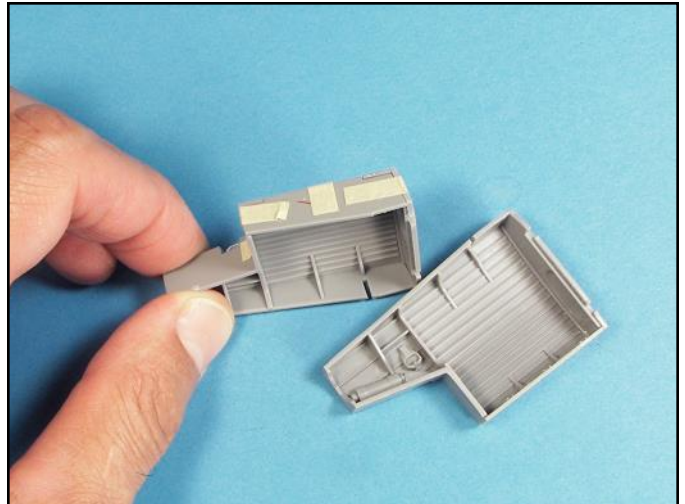
The surfaces were checked for flaws with silver paint as a last step before restoring the tread.



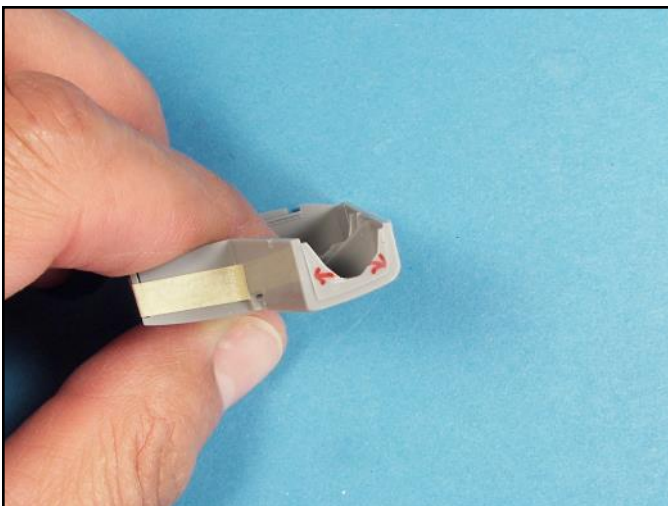
The wheels were sandwiched between two lengths of balsa wood and then placed in a Dremel vice. The tread was cut across the plastic using a jeweler's saw. Only one pass with the blade was necessary to restore the tread.



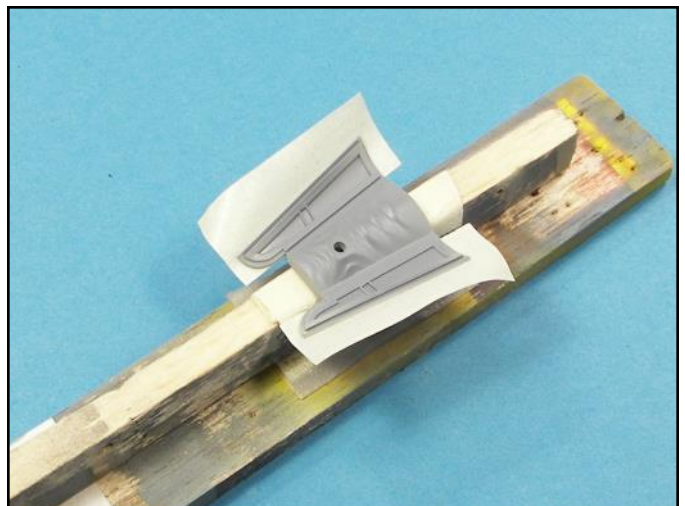
The P-47 landing gear were assembled and they are now ready to be attached. Note the invasion strip colors that were applied to the surface of the covers to match the painted surface of the lower wing.



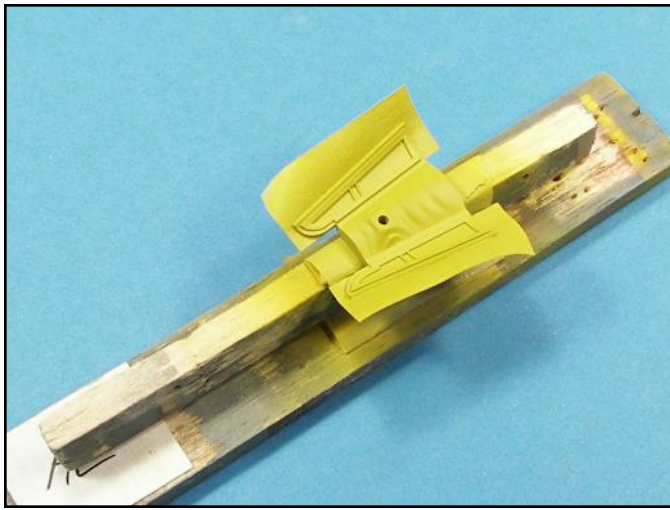
The multi-piece landing gear bays on this P-47 were carefully taped together, checked for proper fit inside the wing and then tiny beads of super glue were applied along the edges.



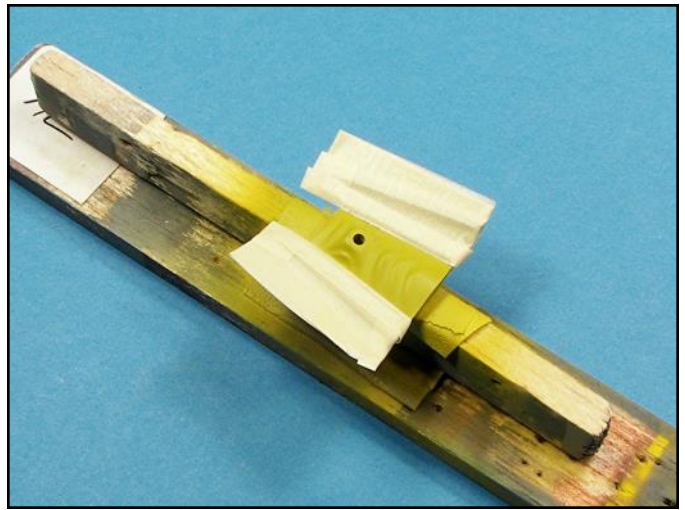
Test fitting the landing gear bays showed that this area interfered with the proper alignment of the assembly inside the wing.



The underside of the rear landing gear part was painted first with its finished colors and then masked off. The underside was then primed.



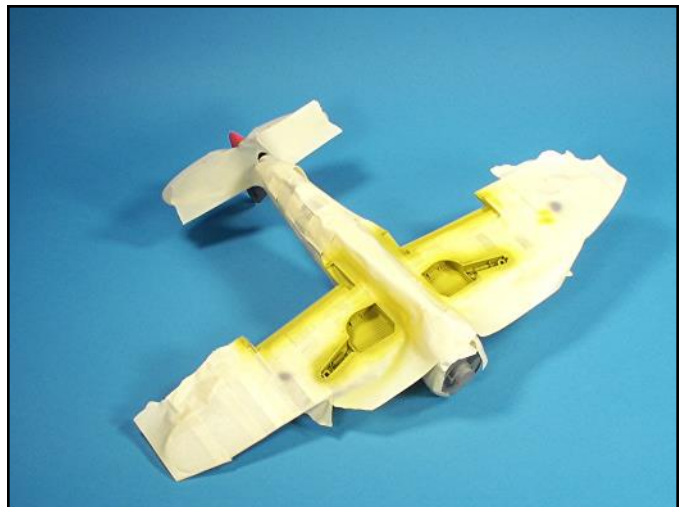
The interior color was then airbrushed.



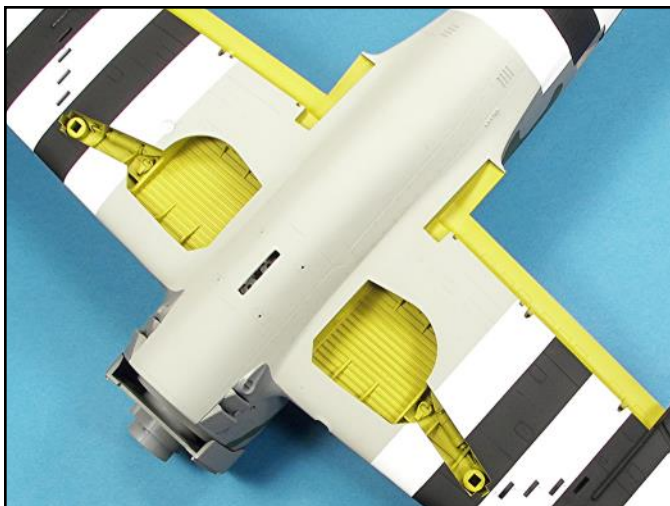
The interior of the landing gear bays were then masked off.



The olive drab color for the canvas covering was then airbrushed. This stepped painting technique of airbrushing and careful masking always gives you great results and sharp lines between the colors.



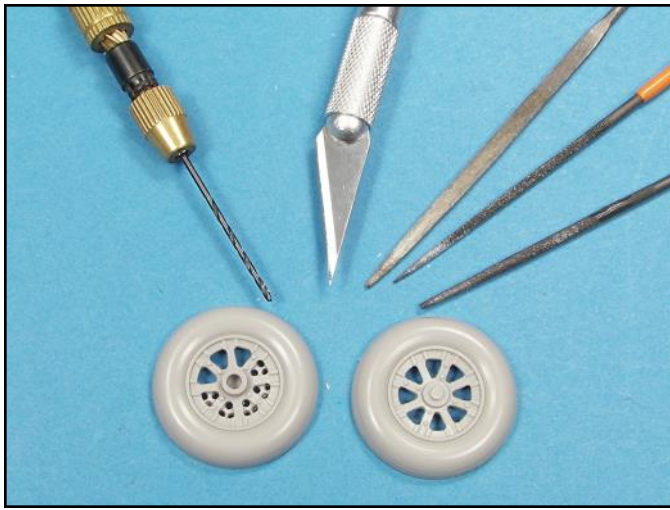
The landing gear bays on this P-47 had deep undercuts requiring a lot of turning, angling and positioning of the aircraft for airbrushing. To prevent overspray, the entire underside was masked.



The demarcation lines between colors are perfect and there is no overspray. Also note how the colors compliment one another.



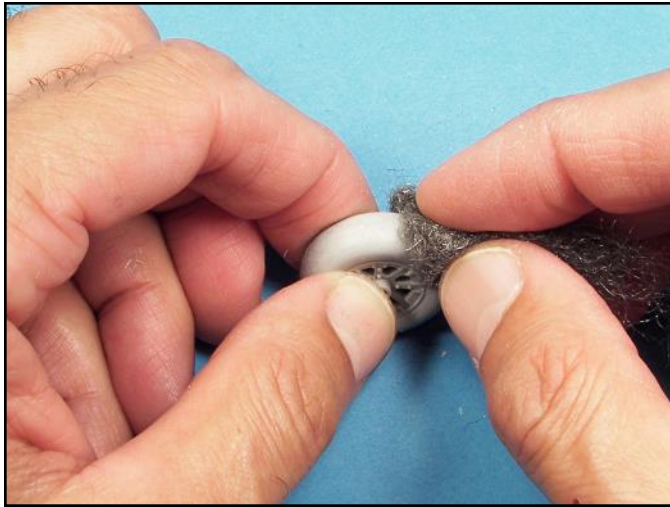
The completed P-47 looks great and the careful painting and masking of the landing gear really helps set off the appearance of the model. This is the “additive effect” of good assembly, masking and painting technique.



The plastic between the spokes on these F6F Hellcat wheels were carefully drilled out. Then the plastic between the holes was cut out and then the area between each spoke was carefully shaped with micro files.



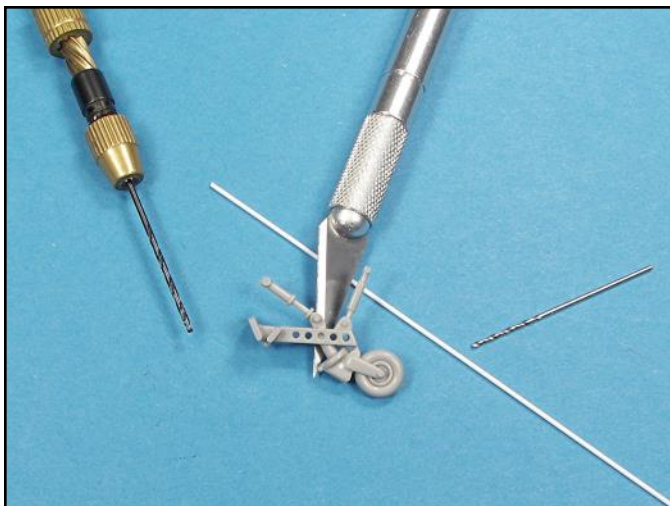
When gluing the wheels together, make sure that the spokes line up.



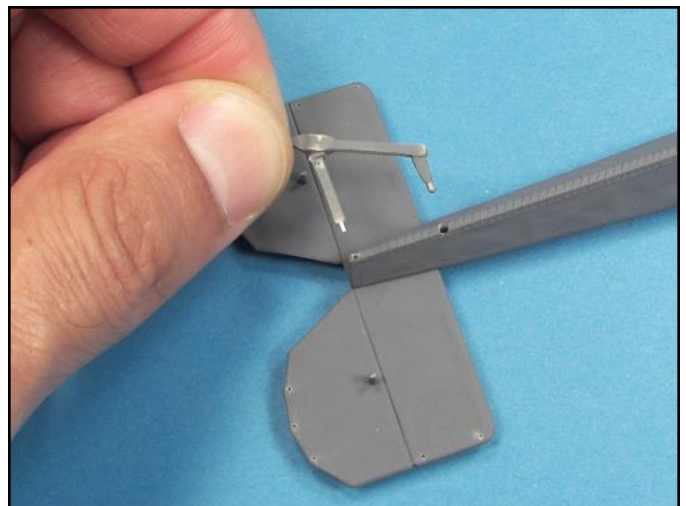
After gluing these F6F wheels together and scraping and sanding, the plastic was polished with 0000 steel wool.



The mold punch outs on this F6F were deep so they were drilled out and plastic rod super glued into place to fill the holes and add strength to the parts.



The tail landing gear on this F6F Hellcat was enhanced by drilling out the holes for the landing gear frame.



To add strength to this landing skid, a small hole was drilled and a length of plastic rod inserted. A corresponding hole was also drilled into the fuselage. The skid was much stronger once glued into place.