

# 1/32 F-4S Phantom

based on Tamiya F-4J

## PART 5: Photo Etching

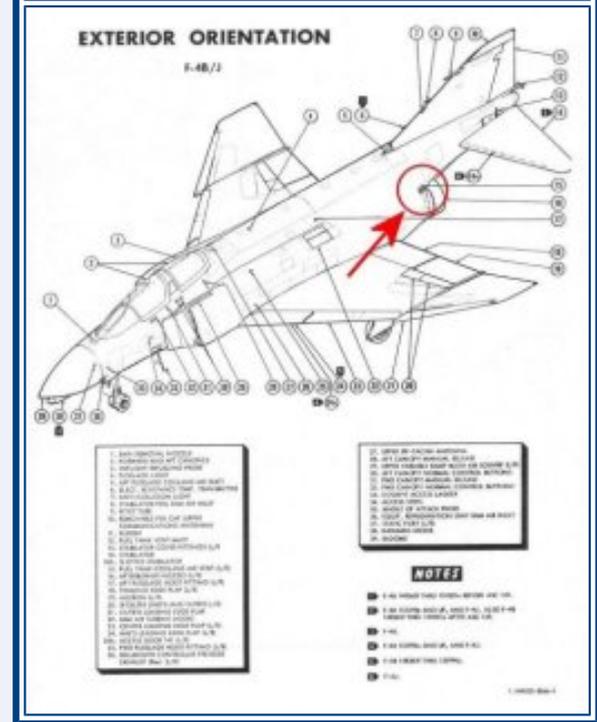
by [Pierre Greutert](#)

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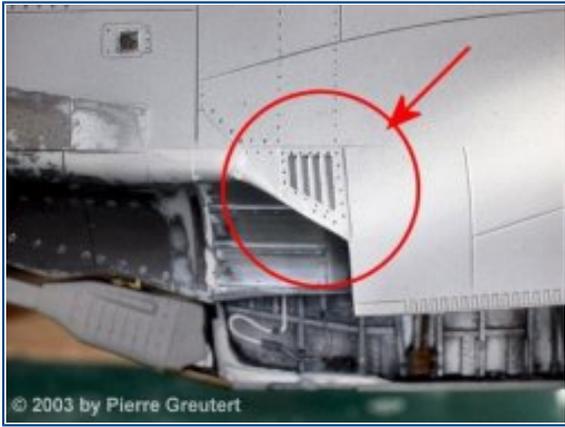
Here is the fifth article about my F-4S Phantom Odyssey. Today I will focus on making custom photo-etched parts, as requested by many readers. The article is quite extensive, and includes 36 photos.

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The orientation diagram from my Plane Captain Handbook shows the vent I will discuss in this article. The part is located on each side of the aircraft, above the exhaust nozzles. It evacuates bleed air, which enters the plane in front of the engines, runs along the spine below the center fuel tanks and keeps the JP-4 at a reasonable temperature. On the diagram, it is referenced as part no 15 "Fuel Tank Cooling Air Vent".

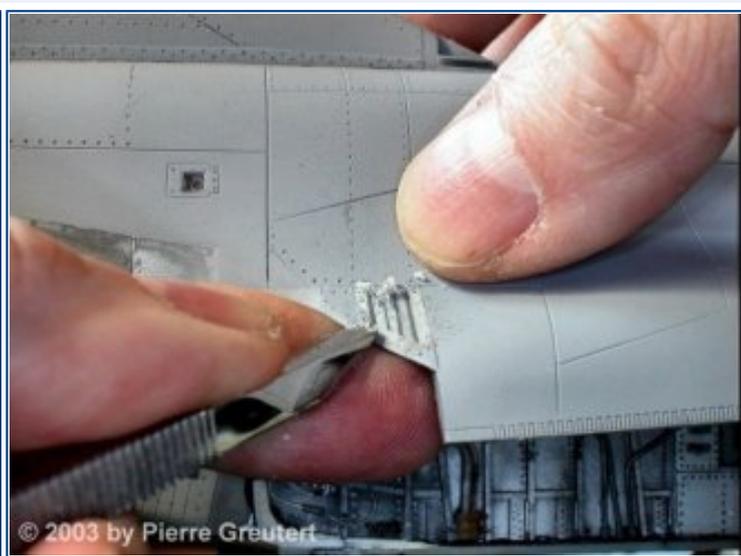
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This is the starting point on the right side. The original Tamiya mold features a raised vent, which is wrong in shape and size. It definitely needs some home surgery.

A divider comes in handy, to report the correct size from the other side, where I already did the correction. Removing the excess plastic is best achieved with a sharp chisel.

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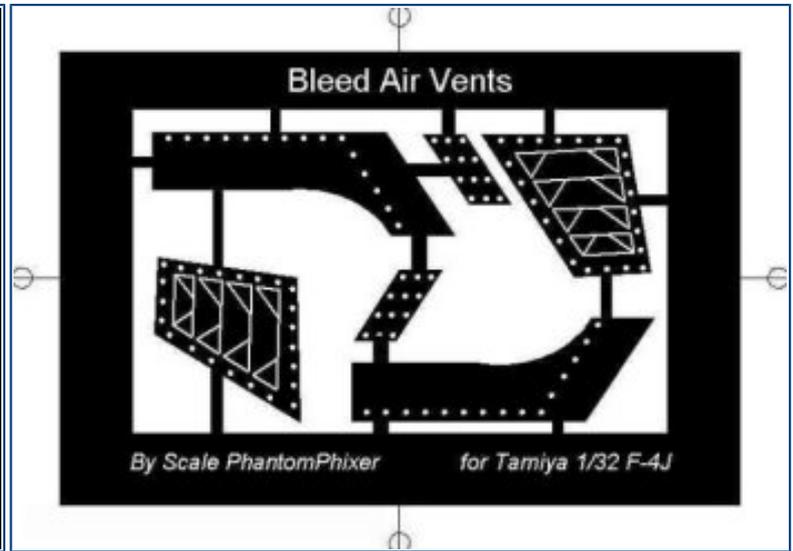
The lower angle is wrong too. I mark the plastic to be removed, and my Dremel cuts away a large chunk of plastic.

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The photo-etch session can now actually begin. As a first step I draw a positive of the parts I want. Any 2-D CAD program will be OK, mine is GraphicWorks from Micro Application ([www.microapp.com](http://www.microapp.com)). I design the parts at 4 times the actual size, and let the printer reduce them accordingly. It is an empiric iterative process: measure on the model, print a paper draft, check, correct, etc. At the very end, a positive image is printed, like the one shown here: "Bleed Air Vents".

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The final print is on a transparent ink-jet film. I got mine at Mega Electronics ([www.megaug.com](http://www.megaug.com)), part no 100-071. I print a copy for the front side, plus a copy for the back side. A lightbox allows to spot the small dots where the ink is missing: they must be blackened with a black overhead pen. Finally my sandwich is assembled, and hold together with cellotape: front drawing - brass sheet - back drawing.

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Here comes an important step in the etching process: the brass sheet must be absolutely clean: no fingerprints, no grease, no lacquer, nothing but brass. I insist on this point: wear cotton gloves, and once the sheet is scrubbed, **DON'T TOUCH IT ANYMORE** with unprotected fingers. I use a polishing block from Mega Electronics ([www.megaug.com](http://www.megaug.com)), part no 900-009 (I have no personal interest in this company, they just have a good range of products). Dust off any particle, and once again: keep away your greasy paws! In this example, I use 005 brass from K&S (0.12mm), bought at Micro-Mark ([www.micromark.com](http://www.micromark.com)).

The photoresist coating is next. I use the Seno Applicator positive resist, from Mega Electronics (got it?), part no SN100. It comes in a black plastic container, with an applicator sponge. The stuff stinks awfully :- ( Since the sponge applicator does not work well on small brass items, I prefer to open the container and pour its content into a shallow cup for dipping. This method is the best way to produce a smooth coat. Make

a short dip, let the excess run off one of the corners, and place the wet sheet as indicated under a cup to protect it from dust. Let it dry in a pre-heated oven, for 25 minutes at 70° C

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Once the coated brass sheet has cooled down, I insert it between the two film positives, and attach it with cellotape, so it won't move while I manipulate it. The exposure to UV light is done in a special lightbox. The box stems from Mega Electronics (sorry: again), part no LV202-E. Alternatively, you may expose in the bright sun too, but timing is very inaccurate, and for sure it will be raining outside every time you want to do an exposure. So I took the plunge and ordered the lightbox, which I can operate anytime. I found out that 2.5 minutes for each side is a good exposure. How does it work? The UVs impress the unshielded photoresist, and a short (20s) dip in a developer solution (Mega Electronics, part no SN111) dissolves the exposed photoresist, unveiling the positive image of the parts to be etched.

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Trimming away the excess brass around the frame is best done with scissors. The etching now really starts. This is my etch tank, purchased from Conrad ([www.conrad.ch](http://www.conrad.ch), part number unknown). Any similar item will be ok, as long as it features the same specifications: a 1 liter tank, a heating system, and an air bubble generator at the bottom. The chemical is ferric chloride ( $\text{FeCl}_3$ ), 250 grams for 600 milliliters of water. Ferric chloride is an awful product, as it will stain everything. It is a nasty corrosive chemical - so wear gloves and treat the stuff with respect. Preheat the

solution at about 45-50° C.

The brass sheet is attached to the tank's holders, and dipped into the bubbling hot etchant. After a couple of seconds, remove the part to check that everything is fine. You can already see how the etchant already attacks the exposed brass, leaving the coated areas untouched. Stick it back into the etchant and start the stopwatch. Check every now and then. The etch processing time depends on heat, thickness and saturation of the etchant. Etched brass will slowly saturate the FeCl<sub>3</sub> solution, so etching times get longer. At about 7 minutes (10 or more with an old solution), you can see how the brass is progressively etched away. Remove the brass sheet when all parts have been eaten away and rinse thoroughly under fresh tap water. This stops the etch process.

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Well, the etching is almost finished, and everything went well. The Scale PhantomPhixer is happy! Time now to strip away the photoresist that protected the parts. Isopropyl alcohol is fine for the job. The piece is now somewhat dull, so a last bath in a solution of vinegar + salt turns it into a shining beauty.

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Et voilà! You might wonder how I engraved the text on the border? Remember that the etching fluid will eat brass from both sides. Since the text is only printed on the top transparent - not on the back - the etch will be only half way through when areas which are transparent on both sides are fully through. This is the way to etch folding lines, engraved or embossed panels, rivets, etc

How did I start? I learned all the basics at [www.prototrains.com](http://www.prototrains.com) I can only recommend you visit this site.



Here is the vent, cut away from the brass sheet. The vent area on the fuselage gets a coat of filler to mask the mishaps. I fold the vent blinds, by twisting delicately each blind with a surgeon scalpel. The filler can dry during this time, and it is now ready to be sanded smooth. In the middle of the vent area, I want to make some room for the blinds, and to simulate the exit duct.

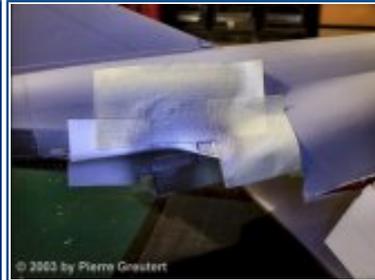
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A short grinding session with the Dremel (no need to be accurate: the well will be a

dark pit). The surgery results in a couple of misaligned panel lines, so I correct this: fill, sand, mask the line with Dymo tape (it serves as a guide for the scribe), and scribe fine panel lines. At the end, I airbrush a coat of Model Masters Metalizer (magnesium), and a couple of minutes later a subtle buff gives the shiny metallic appearance.

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This is a close up of the area, detailing the vent and exhaust fairing attached with tiny CA drops. Note the dark well behind the blinds of the vent? It adds a pretty realistic look to the model.



A "Before - After" picture says it better than many words.

Here is the final result, after a heavy painting and weathering session of the exhaust blast shields and arrestor hook. Looking at this picture, a former Phantom Phixer said "... it reminds me when I used to work on the birds. I can picture me pounding rivets in the engine bay..."

Someone else mentioned: " I didn't know they had an F-4S on display in Switzerland.  
Now how about a photo of your model?"

These kind of comments make my day :-)

Happy modeling!

Pierre "Madman"  
Scale PhantomPhixer



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