

# SOPWITH PUP 1/3 SCALE INSTRUMENT PANEL



Cockpit detail  
in the 1/3 scale  
Sopwith Pup.

In this new series of Airborne articles, Scale Matters uncovers and explains the techniques I've developed to generate the instrument panel detail on my most recent completed project, a 1/3 scale Sopwith Pup. This aircraft was presented in my introductory article in the previous edition of Airborne.

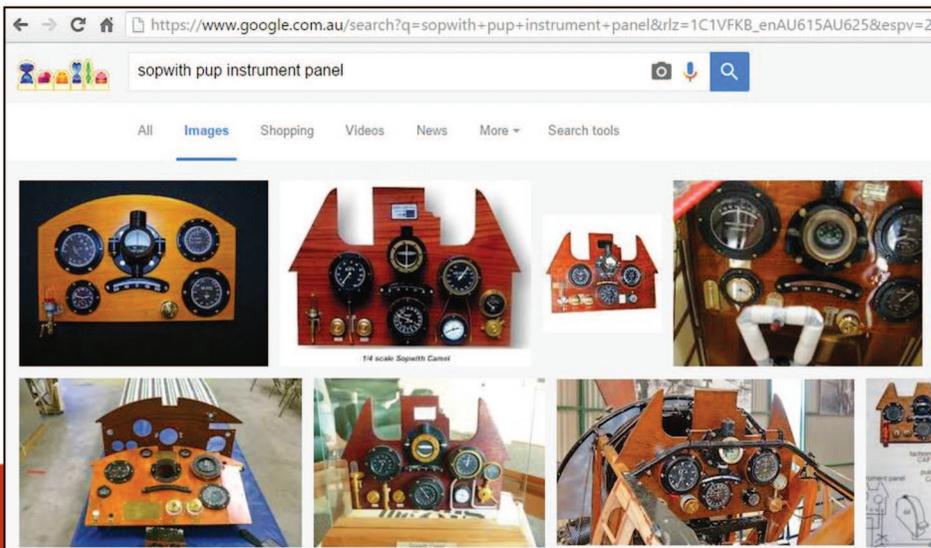
## Documentation

When building a new model aircraft, I start by collecting as much detailed information as possible and the internet helps immensely with this task. The initial process I follow is to make a master directory on my computer and name the directory af-

ter the aircraft. I then make as many sub directories as I will need and label them as follows, cockpit, engine, landing gear, colour schemes, et cetera. I then connect to the internet and use a search engine such as Google. I enter key search descriptions relating to the aircraft and the area of interest. For example 'Sopwith Pup Cockpit'. I then select Images instead of All which is the default.

This search setting then only displays image and pictures of the requested search results. I look through the images and save the images that I think will be useful. I save them for future reference by using a single clicking on the left mouse button, the image is then displayed in the centre of the screen. I then use the right mouse button and click on the image, this brings up the menu that allows me to select Save pictures as... I can then save the image to the directory structure that I previously had set up.

I spend several hours doing this until I get a good sense of the details that I want to invest my time on. During the build, I will repeat this process and continually add images as I find the need for additional detail. This is a very useful process and it ends up saving me a lot of time.



This is a screen dump of my computer showing Google Search being used to find only images of the desired search request.

Other very good internet sources of information I use, particularly for WW1 aircraft, are as follows:

## Profile Publications

[www.hippoketaeronautics.com/hpa\\_plans/categories.php?cat\\_id=75](http://www.hippoketaeronautics.com/hpa_plans/categories.php?cat_id=75)

All these are also available on a CD from ebay

[www.ebay.com/bhp/profile-publications](http://www.ebay.com/bhp/profile-publications)

## Windsock Data Files

[www.windsockdatafilespecials.co.uk](http://www.windsockdatafilespecials.co.uk)

## Instrument Panel

The first step in constructing the instrument panel is to look at all the images that have been previously collected that show the instrument detail that I have decided to replicate. There are usually several layout options and I decide which parts I am going to fabricate and which parts I can purchase that will be sufficient, maybe with modification, to replicate the original item in the scale required.

The thermometer shown is an example of one of the parts that I purchased and used to replicate the original item.

Melody Jane Dolls Houses is a fantastic web site that has a range of items that can be used for all sorts of future projects.

[www.melodyjane.com/dolls-house-miniature-garden-accessory-thermometer-017](http://www.melodyjane.com/dolls-house-miniature-garden-accessory-thermometer-017)

The working clock in the instrument panel is another part that I purchased and used to replicate the original item.

Mega-Quartz UK Ltd has a vast range of quartz clock movements, clock inserts, barometer inserts, mini watch clock inserts for wood turners and crafters.

[www.megaquartz.co.uk/contents/en-uk/d8\\_httpwww.megaquartz.co.ukcontentsen-ukd8.html](http://www.megaquartz.co.uk/contents/en-uk/d8_httpwww.megaquartz.co.ukcontentsen-ukd8.html)

These are battery operated and are good quality, they have a mounting frame that allows the clock to be easily withdrawn to change the time (day light saving) and to replace the battery (every 2-3 years).

The compass in the instrument panel is another part that I purchased. While it is not to scale it is a working compass and is fitted inside the scale compass housing that I made.

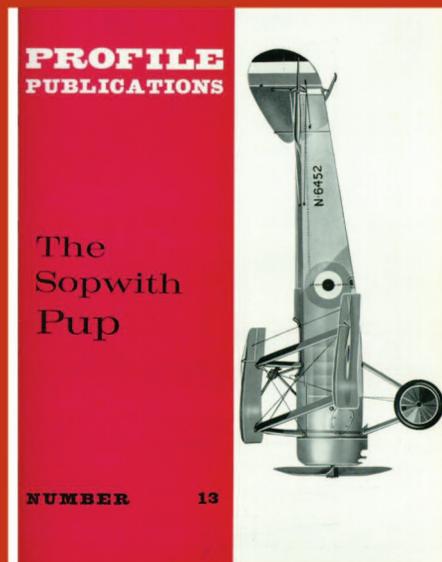
[www.aliexpress.com/cheap/cheap-liquid-compass.html](http://www.aliexpress.com/cheap/cheap-liquid-compass.html)

Also see this link for compass ideas:

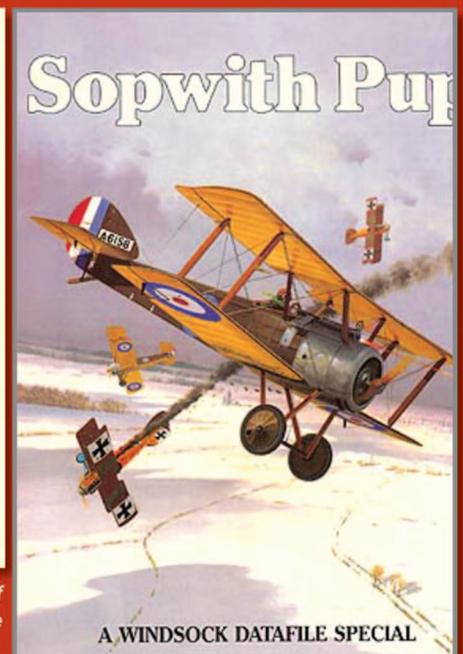
[www.trademarklondon.com/Compass-Shop](http://www.trademarklondon.com/Compass-Shop)

The fuel level gauge is another example of a part that I purchased. This is actually a part used in live model steam engines. It's a water gauge and I cut the part down to the required length for the Sopwith Pup.

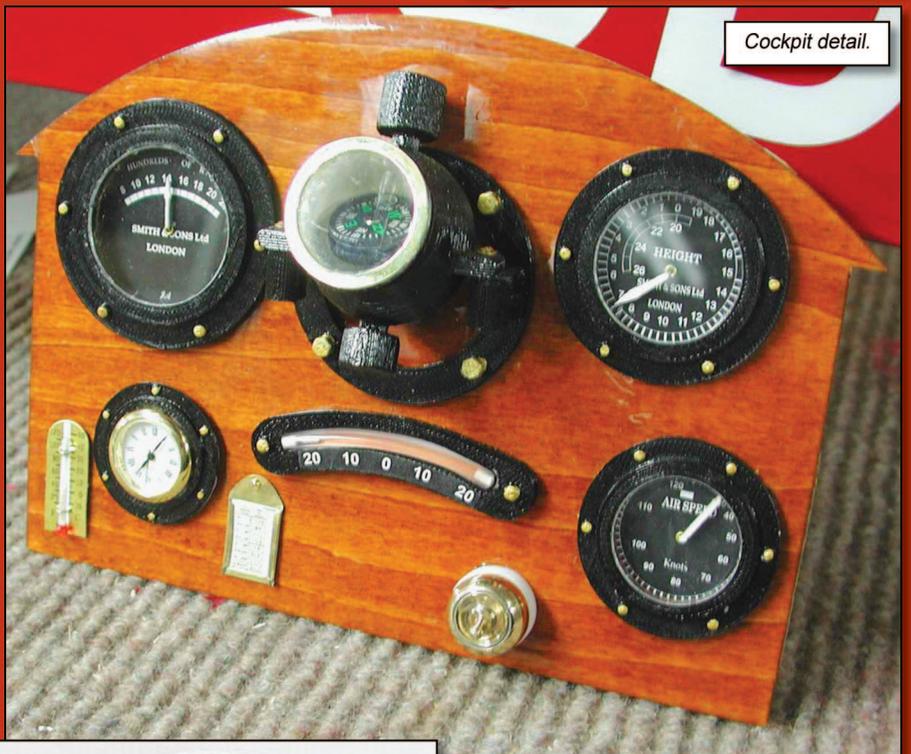
[www.steamfittings.co.uk/asp/index.asp](http://www.steamfittings.co.uk/asp/index.asp)



Front cover of Profile publications number 13 The Sopwith Pup.



Front cover of Windsock data file on the Sopwith pup.



Cockpit thermometer bought from dolls house suppliers.



Cockpit compass bought from compass supplier.



Cockpit watch bought from watch suppliers.

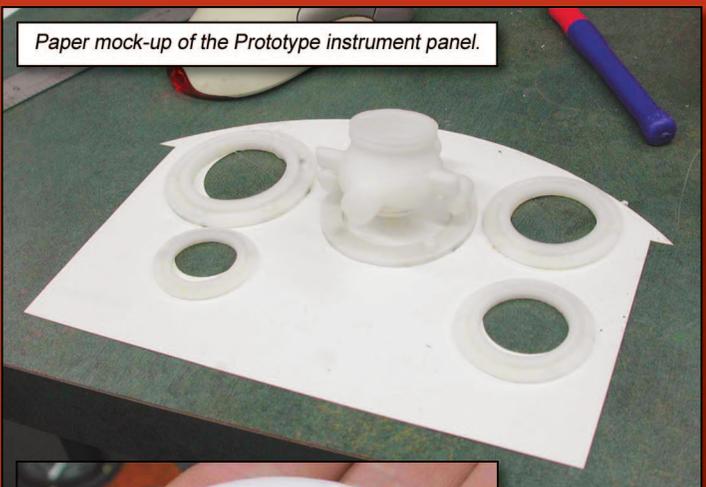


Above: Sopwith Pup fuel level instrument mounted in the cockpit also note the map case on the right hand side of the cockpit.

Cut down model steam engine water gauge used to replicate the Sopwith Pup fuel level instrument purchased from model steam train supplier.

The instrument panel is drawn using a computer drawing package and then printed out on paper until the correct scale and fit is obtained. CorelDraw Home and Student Suite X7 are suitable packages. The key here is to draw using vector graphics not bitmaps. This template can then be used to start designing the layout of the panel. If you have access to a laser cutter you can use this file to directly cut the panel on paper and once you are happy with the design you can cut the final layout on the required material, in this case light ply wood.

I draw up the instrument surrounds and the compass housing to full scale using a 3D cad package that will generate STL files. STL files can be directly loaded into 3D printer software to print the parts in ABS plastic. I select the scale I require to print the part in and then print the required number of each item. In future Scale Matters articles I will present a full section on how to use 3D printers to manufacture scale parts. The printed parts are made from ABS plastic which can be glued very effectively using EFD Simple Glues TETRA or Revell Contacta Professional liquid glue.



Paper mock-up of the Prototype instrument panel.



3D printed instrument surround, fresh of the plastic printer. These parts are made from ABS plastic which is very durable.



3D printed instrument parts being painted with Tamiya acrylic X-1 gloss black paint. The raised bolts on the instrument surrounds are then highlighted with Tamiya acrylic gold leaf X-12 dial.



Trial layout of the instrument surrounds and compass mounting on the laser cut ply instrument panel.

## Instrument Dials

I start by drawing the instrument dials. When drawing the instrument dials I use CorelDraw, but there is a range of drawing packages that will also do this. Again the key here is to draw using vector graphics, not bitmaps. The difference is that with vector graphics you can scale the drawing up or down without losing resolution. This means that once you have drawn the instrument dials you can resize them as required. I then print the instrument dial to the required scale.

## Example Of Printed Instrument Dials

### Instrument Needles

I make the instrument needles using Evergreen Styrene strips, generally available from your local hobby shop. Evergreen part number #8406 was used for the 1/3 scale instrument needles.

Evergreen web site: [www.evergreenscalemodels.com](http://www.evergreenscalemodels.com)

The instrument needles were shaped using a Stanley knife until I get the shape similar to the real instrument needle.

The instrument needle can then be glued to the instrument dials, I usually use White PVA for this as it sets clear. You can follow the next step if you want to add movement to the needles and brings a new dimension to an otherwise static cockpit!

### Instrument Movement

Having the needles on the instrument panels move as the aircraft is rocked or when the engine is running adds a nice level of detail and realism to the instrument panel and makes it come alive. The moving instrument needles are achieved by gluing a small piece of ply wood to the back of the instrument face. A small hole is then drilled into the centre of the ply to which is inserted and glued a small eyelet. The eyelet acts as a bearing for the piece of tinned copper wire that is inserted through the hole. The tinned copper wire is cut and bent to the same length as the needle on the front side of the instrument face and cut and bent on the back side. I then heat a blob of solder onto the end of the wire on the back side of the instrument face to act as a pendulum. By holding the pendulum on the back side of the instrument and rotating the needle by bending the wire on the front side of the instrument face with your fingers, the needles can be made to sit and move in different positions on the different instrument faces.

I also cut a cardboard spacer which can be seen in accompanying photograph. I then glue a thin piece of paper as a back plate to the instrument. For clarity, the back plate has been removed in the picture to clearly show the pendulum. This step is not really needed but it finishes off the back of the panel. The previously made needle can then be glued onto the tinned copper wire on the front of the gauge.

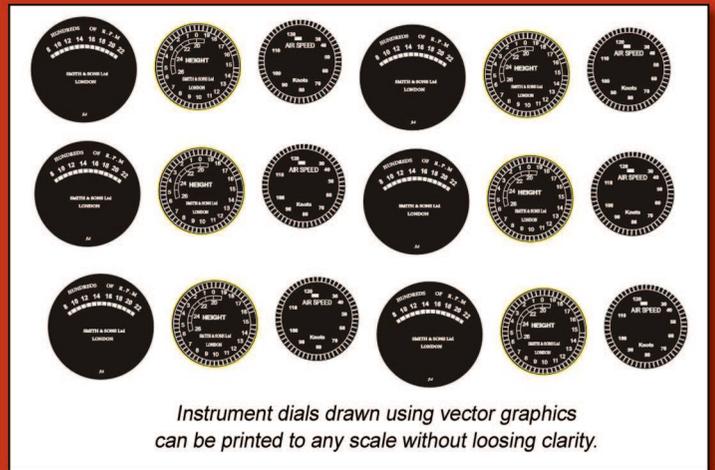
### Instrument Faces

I laser cut the instrument clear faces out of thin Perspex. It is just as effective to cut the instrument clear faces out of clear thin plastic, the type of material that shirt boxes are made out of. This can be easily cut using a small pair of scissors or hole punches available from any hardware store. The faces are then glued to the instrument surround using Pacer Formula '560' canopy glue. This canopy glue sets clear, the same as white wood glue but it does stick much better to plastic surfaces.

## Cockpit Surround Turtle Decking & Cockpit Coaming

The cockpit surround turtle decking is drawn using a computer drawing package (again CorelDraw Home and Student Suite X7 is ideal), I then print out the design on paper until the correct scale and fit is obtained. Again if you have access to a laser printer, the computer generated file can be used to cut out the required shape in the required material. In this case I used good quality 0.6 mm ply wood. The ply is then stained and several coats of varnish are applied until the finish is smooth.

I made the cockpit coaming by purchasing a small child's seat made from foam and that was covered in artificial red leather. It was very cheap and now I have plenty of this nice simulated red leather!



*Instrument dials drawn using vector graphics can be printed to any scale without losing clarity.*

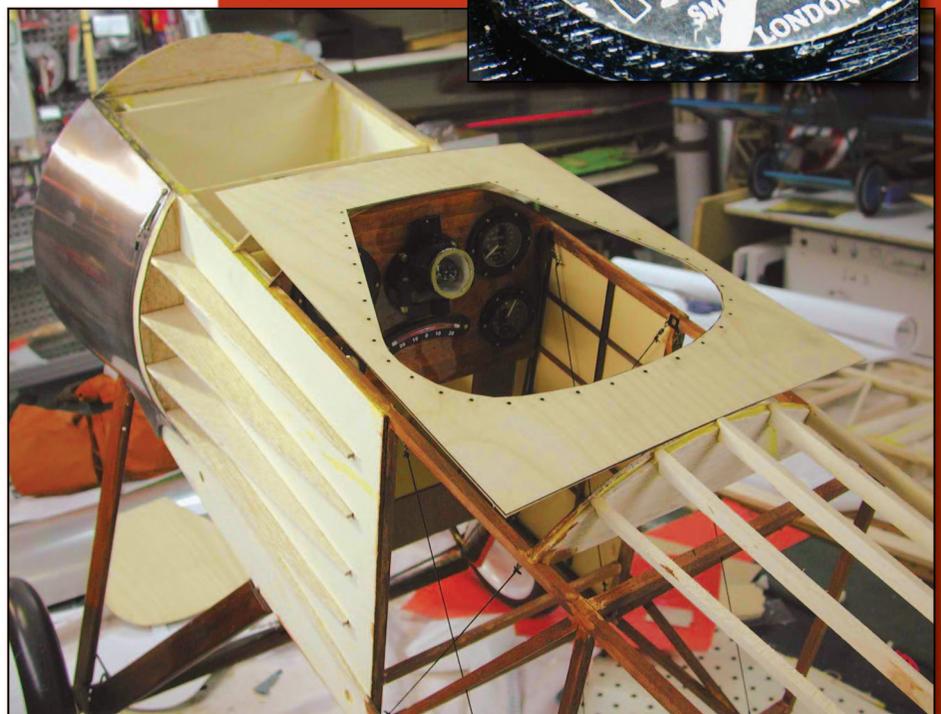


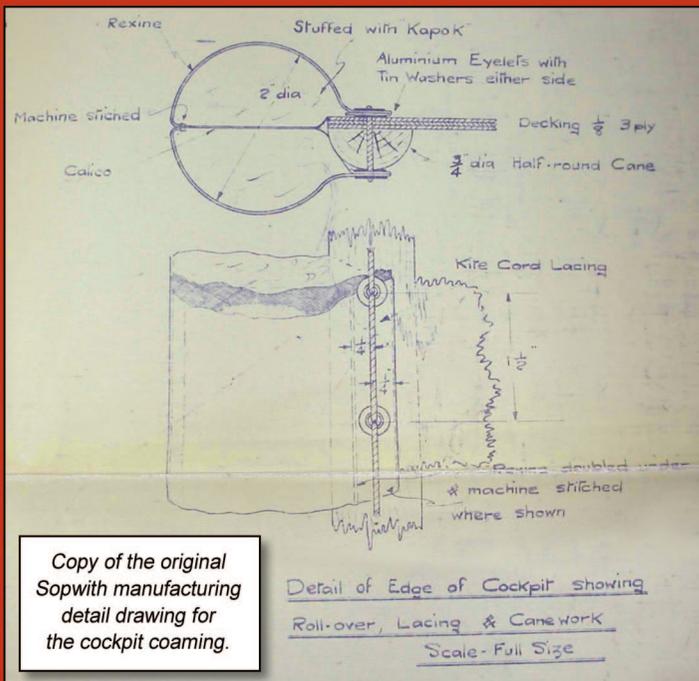
*Back of assembled instrument showing eyelet bearing mounted to ply wood and the pendulum made from a blob of solder.*



*Assembled altimeter instrument with surround, dial, needle and clear face plate.*

*Test fitting the plywood cockpit surround.*





Copy of the original Sopwith manufacturing detail drawing for the cockpit coaming.



Cockpit surround glued down and held with thread until the glue has adhered. Cockpit Coaming completed and ready to be applied.



Coaming mounted to the cockpit surround turtle decking by weaving the strong black thread through the eyelets.

I cut the seat up and make a strip of leather which I folded over and saw a line of thread down the length of it. The line of stitched is far enough away from the folded over side so that I could feed a length of cord down the tube that is formed. Once the cord is fed through to form the coaming the coaming then can be fitted to the cockpit.

The coaming was fitted to the cockpit surround by punching through small eyelets into the holes that were drilled & cut into the ply cockpit surround. A strong black thread was then laced around the cockpit to hold the coaming in place as per the original aircraft fitting.

### Compass Calibration Card

The compass calibration card was drawn using Microsoft excel and then printed using an inkjet printer. The compass calibration card was then filled out using a fine 0.3 mm clutch pencil. The frame for the calibration card was cut out of K&N brass sheet #252, which is 0.01" thick and then folded to the desired shape to hold the calibration card.

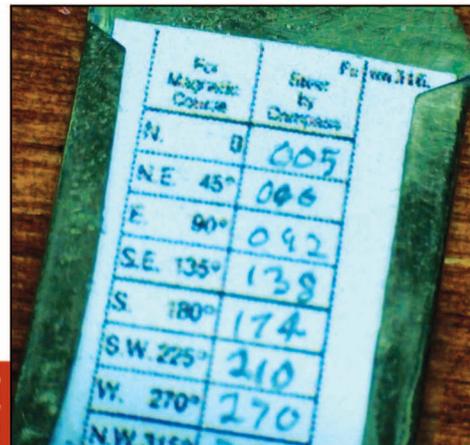
### MICRO Etched Instrument Plates

I purchased a commercially available micro etching kit from Micro-Mark. Some of the chemicals are not shipped from the USA but the basic export version kit, with no chemicals, is a very good starting point. The kit comes with good instructions. The required chemicals are readily available from Jay-car Electronics. These chemicals are used for making printed circuit boards.

For more details refer to: [www.micromark.com/micro-mark-pro-etch-photo-etch-system-export-version,8347.html](http://www.micromark.com/micro-mark-pro-etch-photo-etch-system-export-version,8347.html)

The first step is to draw the artwork for the information plates that are required. Again it is drawn using a package like CorelDraw. I print the artwork out on an inkjet printer using paper to check the size and fit against the scale instrument panel.

Once happy with the artwork it is then printed onto the clear film that is provided with the etching kit. This clear film is designed to take the ink without running and works very well. This clear film with the required artwork printed on it can be used again and again.



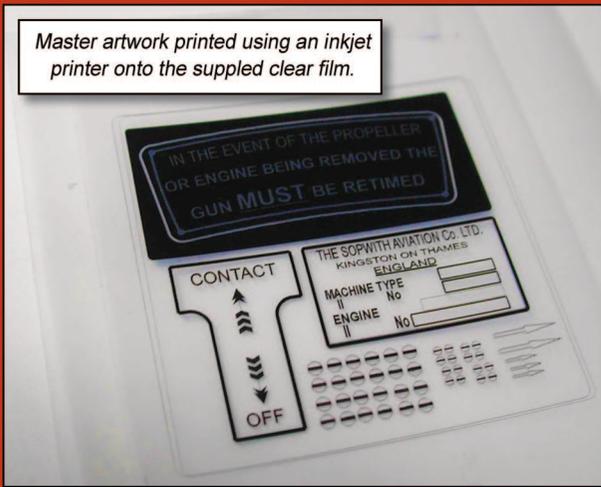
Compass calibration card finished and mounted to the instrument panel.



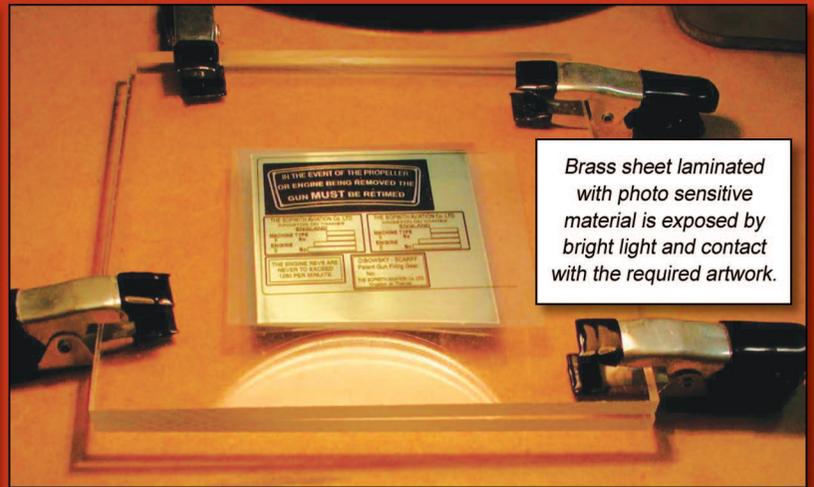
Micro\_Mark micro etching kit used to make all the brass information plates on the Sopwith Pup.

Model car not included

Master artwork printed using an inkjet printer onto the supplied clear film.



Brass sheet laminated with photo sensitive material is exposed by bright light and contact with the required artwork.



Examples of the instrument panel parts micro etched using this system.



Brass sheet having been developed in the fixing solution ready for etching. The blue areas are the hardened resist which prevents the etching in that area.



This etched plate goes on the front of the Sopwith Pup Cowling. It has been painted black and then wiped before drying, revealing the brass to give the correct effect.

The second step is to cut the brass sheet to the required size and then laminate the photo-resist material onto the brass sheet using the supplied laminator. The photo-resist material is light sensitive, so dark room procedures have to be followed. I set up a small dark room using a red LED light strip. The red LED light does not expose the photo sensitive material and provides enough light for you to see what you are doing.

The brass with the light sensitive material is then exposed using a contact technique. The artwork is placed directly onto the brass sheet which has the light sensitive material laminated on to it. The two items are then held between two sheets of Perspex also contained in the kit ready for exposure. The exposure is simply performed using an incandescent light bulb for a set period of time.

The third step is to develop the exposed brass laminated sheet by immersing it in the photo developer. The areas of the brass sheet that are exposed to the bright light cause the photo sensitive material to harden and the other areas are washed away.

The fourth step is to immerse the brass sheet into the etching bath which is also provided. The areas of the brass sheet with hardened photo resist will not be etched and all other areas will. There are several skills and techniques that have to be learnt through this process, i.e. Knowing when to stop each process for best results is the key, but with perseverance the end results are outstanding. Google knowledge is helpful but practice develops the real skills.

## Working Control Column

In the next instalment of Scale Matters, I will be uncovering and explains the techniques developed to construct the working control column and rudder controls in the Sopwith Pup cockpit. Until then happy building and plenty of flying.

Video clip showing the working controls on my 1/3 scale Sopwith Pup:  
[www.youtube.com/watch?v=WQyAin8DBLY](http://www.youtube.com/watch?v=WQyAin8DBLY)



Above and below: Examples of the fine detail that is possible with this micro etching process.

