



*Paul Winter describes in words and pictures his latest modelling project – the Rabe Bearcat.
Graphic layout by John Benzing.*

As a boy I had always loved the look of the military style of aeroplane, so when I had the chance to go to the 1978 World Champs at Woodvale near Liverpool, off I went, back pack in hand to watch the best aerobatic flyers in the world competing for the right to be World Champion. No mean feat, as the top 20 were separated by a mere few hundred points and the final two by only 3 points in a total of 6000 points.

Sitting watching in the rain (nothing changes) one flyer really stuck out among the crowd. His name was Al Rabe, an American flying a semi-scale P51D Mustang that looked so superb in the air I was taken. Al of course subsequently became famous for his 'Rabe Rudder' – a device for increasing the line tension in certain manoeuvres – and also the adjustable lead-out guide together with several other innovative items. In 1978 the *Aeromodeller* published 'Evolution of a Thoroughbred', a great piece showing how he got to be so good. Al later designed the Bearcat which was a model that really caught my eye, but no one at the time was kitting either Al's Mustang or Bearcat (I think) until now.....

Enter Kyle of Tanks Hanger, a firm that makes laser cut kits and any parts that you want – at a price of course. They now produce the Bearcat laser cut kit that costs with postage about £150. You may think this is a lot, but when you see the general quality of the kit you would probably pay double and still be happy. There is a hardware pack needed for the model and Tom Morris does it online.

When you lay out the kit and study it you will probably think 'Help' as it comes with a plan that has lost of dimensions on and that's about all. So you will need the video that Al has prepared to help you with the construction. These need to be watched before the construction is started unless you are a very experienced builder. I won't say it's impossible, but lack of some important info makes it very hard to build. You start by making two jigs that the fus and wing are built on – this enables a truly straight model. The wing is built using the rod method. Note, the rods you should use are 3/8" aluminium light tube as the lightness will allow the rods to move if the wing twists (*see photo, top of next page*). The wing has dihedral, and as you build you will see what I mean.



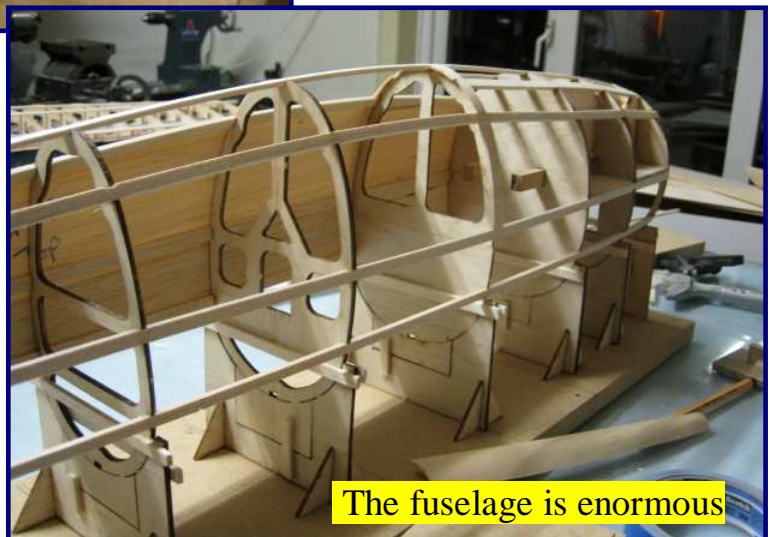
The wing under construction using the rod method



The wing centre section and bellcrank mounting

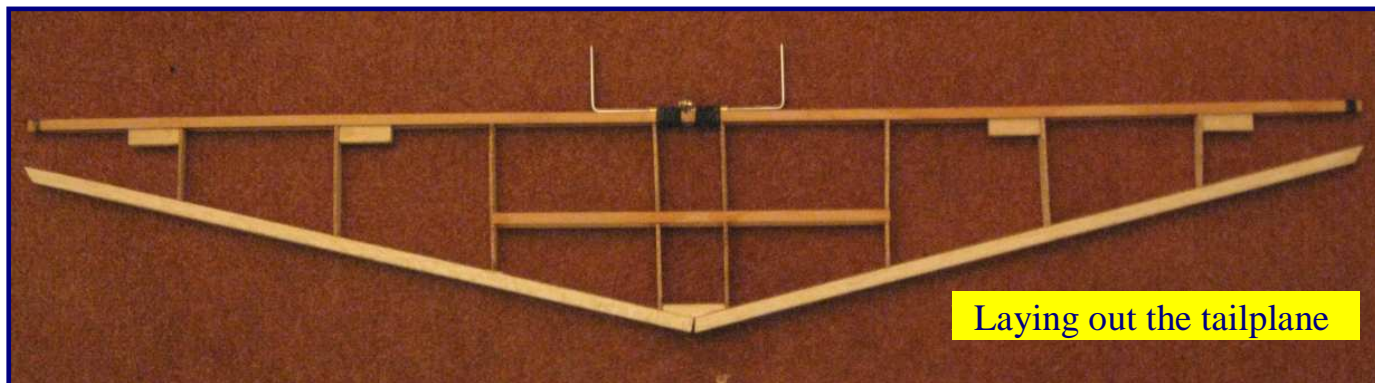
Before you can start building the wing you have to make up the centre section that carries the bellcrank mounting. Now this is fun, as two pairs of hands are needed to get it all aligned. The video suggests that you build the wing then put the bellcrank in and glue the main pivot pin in afterwards, but I wasn't convinced that was the best approach. You will have to decide for yourself.

Drawing out the fus jig takes some skill. You must use the dimensions on the plan to get the spacing on the jig right, otherwise the sheeting that you get with the kit won't fit. This is very important. Also, the two jigs lock into each other for final assembly – more about this later. As you carry on with construction, making the tailplane and the tail fin, you will realise how much thought has gone into the whole design concept.



The fuselage is enormous

The tailplane is easy to build because the trailing edge is the main construction that gives it all the strength – very basic but very strong when covered with 1/16” sheet. The tail fin has a template on the plan that you trace. Just cut it out in 1/16” balsa, top half vertical grain, bottom half horizontal grain.

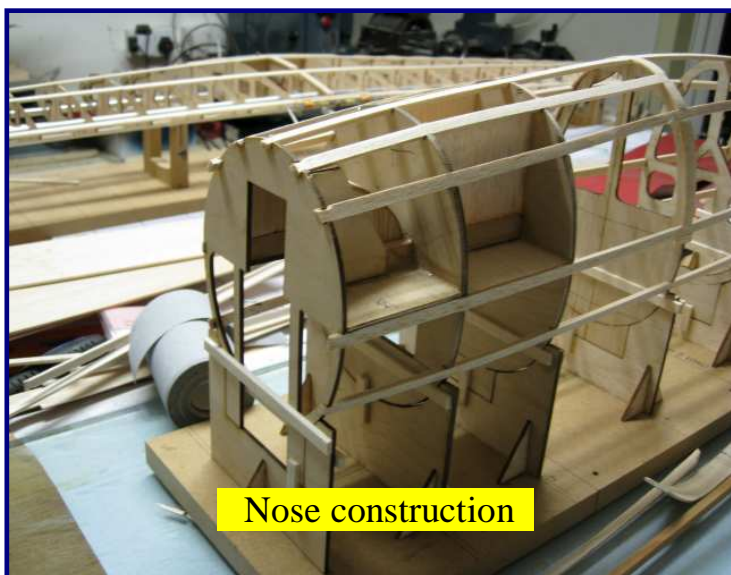


A triangular insert is put into the base of the fin to give it a contour to fit the rear sheeting of the top decking as you can see from the picture at left.

Nowhere on the plan or video does Al tell you about The Rabe rudder set-up, but there is info on the internet, you just have to search for it.



Now comes the fus. After gluing all the formers onto their ply counterparts, I found that the ply formers and the balsa formers were slightly different in size, but only millimetres, so a bit of attention with a sanding block is needed. (see photo at right)



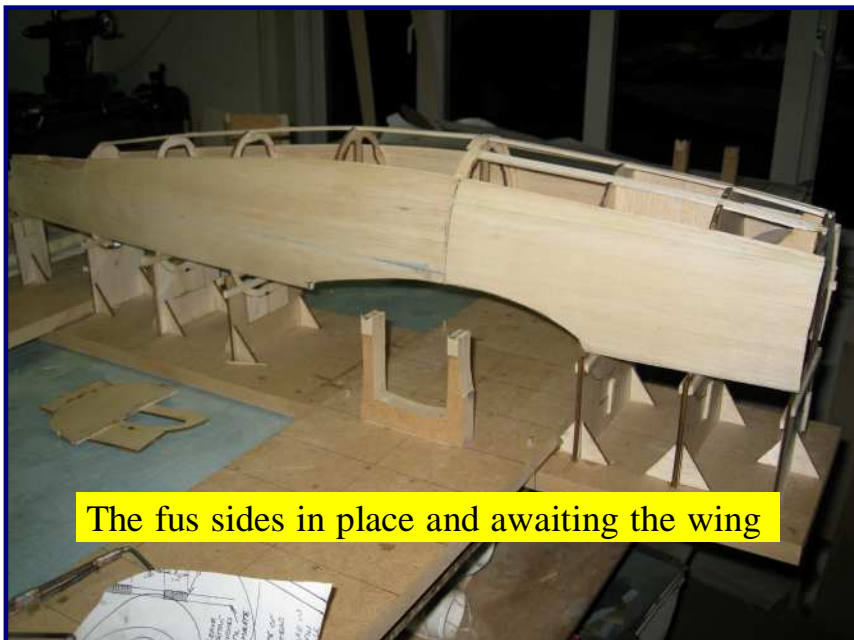
When you discover that this model is intended for a 72 four-stroke (or bigger) and is mounted on only 3/8” x 1/2” bearers only 6” long you think not enough, but believe me it’s plenty – all to do with surface area I’m told!. Drill the bearers to suite the engine you decide to use and allow the 2 degrees offset the ply plate is already cut for. The nose construction comes first, the first three formers are mated with the ply engine mounting plate and bearers put into the jig and glued.

(The photo at left shows the nose construction well under way, with the wing progressing nicely in the background).

If your bench is big enough it will help to speed things up by building on two jigs as you can glue on one and let it dry while you are working on the other. The rest of the formers and longerons are put in place and glued at this time. I found the quality of the moulded sheets that come with the kit to be a bit a bit questionable, but with a little cutting and gluing of new bits here and there I managed to get over the problem. You can start putting on the sheet sides making sure that the wing aligning longeron is only half covered, as this is a factor later on in the final construction

So you now have the entire wing constructed and covered with balsa sheet but still with the rods in place. Now it's like that Clint Eastwood film "do I feel lucky", because now comes the time to remove the rods and see if the wing is straight or not. It has to be appreciated that the wing has to be in the jig to be aligned with the fus and once it's stuck in position it's almost impossible to 'unwarp', so very carefully pull and twist the rods so they slowly come out of the wing. Yes you will break a few ribs, but don't worry because it's only around the rod mountings, an area easily repaired. And now the moment of truth – a straight wing or not. If it's not to your liking carefully dampen and gently untwist. Sorry now photos of this stage as my wing was perfect! Now clean the rods and put them back in the wing and the whole assembly onto the jig.

Now comes the best part of the whole model and the stage where you will begin to appreciate how easy it is to build a straight model. Carefully pry out the fus from the jig, if it's stuck use some uncure zap. Next take the wing and jig all in one (this is where you need a BIG model bench) and glue the fus jig as shown



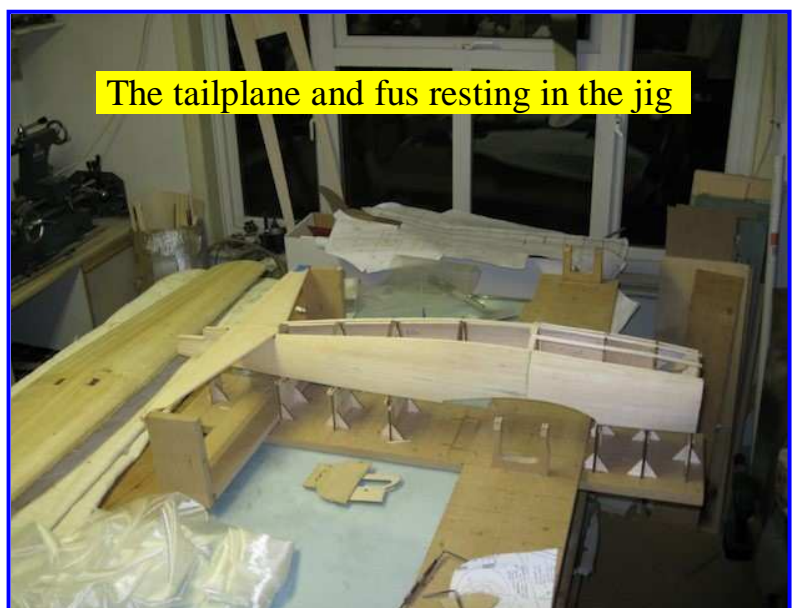
on the plan (*the picture at left shows the wing omitted so that you can see how you get the two together*). Note that there are two lines on the fus jig and one on the wing jig. Check and double check that these are 100% accurate as otherwise the wing won't be square to the fus and will lead to no end of problems. Put the wing on the jig and start cutting out the fus so that when it's put back in the jig all formers will be located in their pockets and the wing/fus a perfect

fit. The main longeron running the length of the model should then align with the centre line on the wing.

The next step will tell you how accurate you were in construction so far – making

The pushrod from the plan and testing if it fits. If all is well check that the pushrod connections are strong, because as this is a one-piece model, once it's all assembled the connections will be inaccessible.

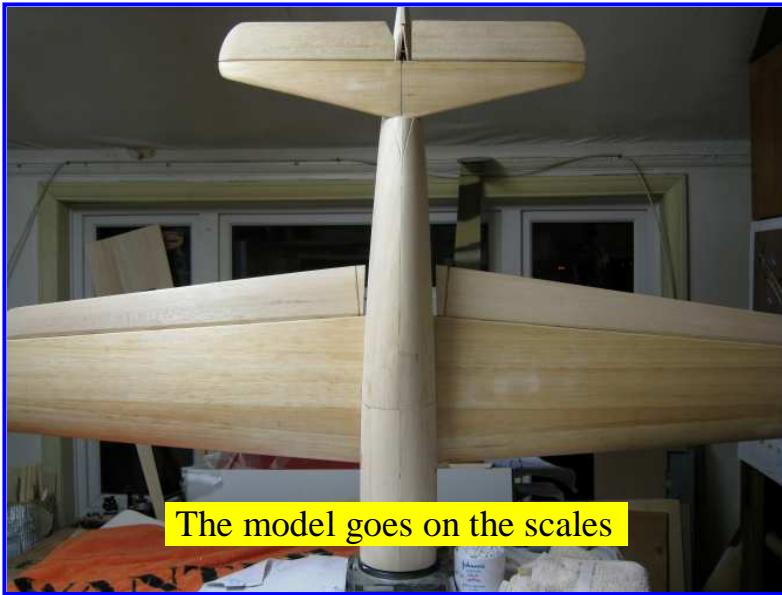
There is also a jig for the tailplane with the same concept as before to help align all the surfaces. This jig also gives the tailplane incidence of about 1/16" on the leading edge. Once the pushrod is made and connected to the flap and elevator horns glue the tailplane and wing to the fus. When dry take the whole model out of the jig and see how straight it is, if you have done it as per the plan it should be perfect.



Continue by doing as much work as possible in the jig, it gives you a platform to work on and protects the model. I left my tailfin off until the very last moment as it's so tall and prone to getting snapped off.

Now it was time for the undercarriage and I felt like being a bit adventurous so designed a pair of sprung wheels. You may think this is overkill, but at the end of construction I think you will agree it was worth the effort.

Back to the final sheeting of the top decking. I consider it wise to put a small amount of glass cloth and resin around the inside of the wing join just to add a little extra strength. After the top decking was finished the cockpit and canopy were prepared. Roy Cherry, a good friend and master builder showed me how to get a canopy to fit properly years ago. It's simple really, just stick some fine sandpaper upside down on top of the model where the canopy is going to be positioned. Then roughly cut the canopy to shape and slide it backwards and forwards on the sandpaper until a good fit is achieved. How you finish the inside of the cockpit is a personal choice. It's rather like ink lines – done well they look great, done badly, well..... If you are not confident then leave it empty and just spray the inside dark blue.



I now take the model out of the jig, remove the rods and put them to one side for use on another model. A check on the scales now to see how you are progressing – mine came out at 28 ounces which is in the ball park at this stage.

The next task is the wing tips. On this model the outboard tip is removable and forms the tip weight box, the inner one the adjustable lead-out guide, so all pretty straightforward. I went to a bit of extra trouble with the flaps and elevators by making sure that the leading edge on all the surfaces was made so that the hinge pockets were glued on afterwards hence giving a perfect hinge line.

It's worth noting that Al Rabe covers all surfaces with in layers of glass cloth put on with two pack epoxy resin. Yes this gives great strength, but with the model having such a short nose I was concerned that it could come out tail heavy, a fatal condition for a stunter. All I can say is go carefully and pick all your wood (that's not supplied in the kit) so that the lightest is at the back of the model without compromising the rigidity of the airframe.

Now comes the finishing of the model. You must decide what make and type of paint you want to use. I always use Brodak products because they are very light and durable. I decided on one layer of glass cloth to the wing and also the elevators and fus up to the back of the wing only (wary of adding weight to the rear section). I also well covered the cowl area to give protection from the heat of the large four-stroke engine that I intended to fit. The whole model was then given a careful sanding then three coats of 50/50 dope/thinners and allowed to dry for 24 hours. Another careful sanding covered before the structure was covered with medium



weight white tissue. Note, when you cover a model with fibreglass cloth and resin a further covering of tissue stops the weave of the cloth grinning through the finish.

Again, apply three more coats of 50/50 dope/thinners and allow to dry for 24 hours. Note that the longer you leave dope to dry the harder it gets and the easier it is to sand. If you only leave it for 5 to 6 hours you can sand it but you will leave very fine scratches that you won't see at this stage but which will come back to haunt you later.

When you are happy with the finish so far you now have to decide on your colour scheme. The reason I mention this now is because it's no good putting on silver primer if the model is going to be white. I decided to paint my model in USA navy colours, the same as Al Rabe did. The colour is Brodak Insignia Blue. I started by spraying three coats of silver on all surfaces and allowed 3 days for drying. Next I sanded using 600 wet and dry using it wet with M600 degreaser. Note that you must never use water as if it gets into the airframe it will cause the wood to swell and ruin your finish. After sanding look for shiny areas, this means indents so further coats of silver are required and more sanding. You are aiming for a uniform dull finish and it's no good moving on until this has been achieved.



The Bearcat awaiting two coats of lacquer

Next spray three coats of top colour and allow to dry for at least a week. Then sand using 1200 paper and M600 degreaser until you have a dull finish (*see photo at left*). If you sand through the colour don't panic, just touch it up and carry on. Final detail is up to the builder, but I decided on full navy details which were supplied from the USA with a crib sheet telling you where they all go. The ink lines are put on with silver gel pens – the sort you get from Ryman's. They don't dry very quickly so great care is needed to avoid smudging. The entire model was then given two coats of two-pack lacquer as it appeared to give a

harder finish than Brodaks, but there is a weight penalty of about 2 ounces. I realised however that as I was under my all-up target weight I could indulge in this little luxury. You judge for yourself from the photo below! Well there you have it. Sure I've missed some of the little bits, but this is not a beginner's model so I've assumed you know most of the basics. At the end of the day if you don't tackle a difficult model you never will get beyond the beginners stage!



The finished Bearcat

FLYING THE BEARCAT

Paul Winter puts in some flying time on the Bearcat and brings us this report.

I've spent so much time building this creation that many of you I'm sure would not blame me if I just hung it on the wall and admired it all day long. But that's not my style, I enjoy flying models as well as building them. The creator of the original design, Al Rabe, told me to build it and set it up as per his plan.

The handle spacing was therefore set at 5 inches and tip weight of 2 ounces was added. 18 thou lines were used, as the all-up model weight is 76 ounces. No point in taking silly risks, so I waited for the perfect day and then John Benzing and I travelled to Peter Jackson's private flying field near his house about 70 miles up the M1.

The first flight was a bit of a disaster.... the handle was far too wide and the model was very tail-heavy - like a bumblebee on the end of the line and basically uncontrollable. The day also started to get a bit breezy so I decided that nothing was going to be achieved by any more test flying.

On arrival home the model was completely cleaned and inspected for any cracks. The engine mounting bolts were also checked as they can often work loose as they bed in.

The next test flight proved challenging as halfway through the pattern the engine started to go hard and loose power. I also noticed that the model was still tail heavy even with an ounce of nose weight. The handle spacing was therefore reduced a little further to 4 inches and this helped, but still the model was twitchy. Back home I inspected the tank to see what had caused the engine malfunction and found that the clunk had wedged itself to the back of the tank.

I would explain that because of the limited space available for the tank in the fus I had three purpose built metal clunk units made and, unlike a plastic tank where you can see what's going on, with metal you have to open it up to see the innards. Rather than fiddle, I discarded the first tank and moved onto the second one, this time leaving both vents open. This mod cured the bad running, but the motor was still not at peak performance, so the original 13" x 6" Black Master airscrew was changed for a 14" x 6" Brian Eather carbon prop.

The difference was like putting a 90-size engine up front instead of the 72 Saito that I was running. The other effect I soon noticed was that as the prop was more efficient the fuel required for the 6 minute 30 second competition schedule went down from 145cc to 120cc. Now I was starting to get somewhere. Next problem to fix was to make the model less twitchy. As an experiment I purchased a 2-ounce spinner weight and fitted it to the prop. Back to the flying field and at last I had a flyable model. The next 15 flights were spent dialling in my personal flying preferences.

One other little problem that came to light at this stage was that the model pulled a lot and was very solid on the end of the lines, so by the time I flew it for 7 minutes my arm hurt (I don't like a wimpy model that is soft on the lines as it makes me nervous). Simply moving the adjustable leadouts slightly forward (an eighth of an inch) was just about enough.

Now it was time to unveil the model to the flying fraternity and this I decided to do at the F2B Nuneaton MAC comp held at Clipston in April 2008. Reaction?.....Rave reviews from all, but I didn't enter it in the comp as during the test flights I felt that something just wasn't right, but I couldn't put my finger on it. Someone suggested trying more tip weight, and hey presto, the problem was solved.

We were rapidly approaching the UK's premier Aerobatic control line event of the year, the 2008 CLAPA Championships, held at the National Water Sports Centre at Nottingham over the long weekend of the 30th May to 2nd June. Now it was do or die - this time I was going to enter the comp for real.

I flew in all the rounds (about 10 flights including practise) and achieved 12th place out of 26 entries, a good result as the plane has only had 40 flights. It also won the prestigious Concours Cup for the best presented model at the competition.

I'm looking forward to many more flights with this wonderful model.