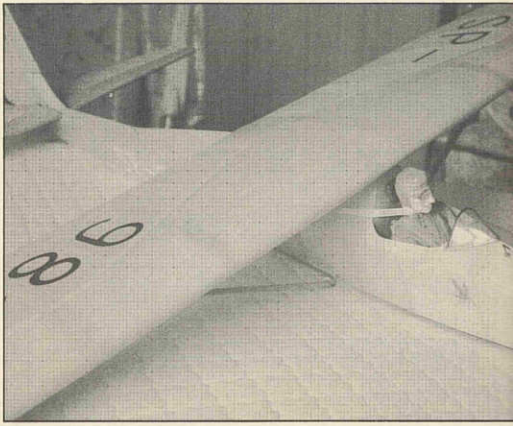
plywood skinning

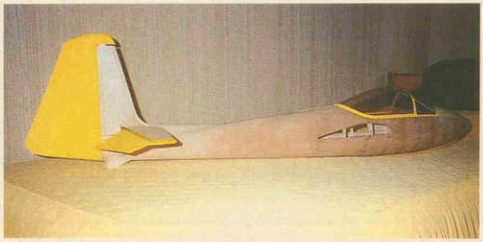
Mick Moore details his highly effective plywood skinning construction techniques

In '87 I decided to build a model of a prewar glider that was clad in plywood, linen, dope and varnish, this was the Polish "Komar". This dictated the use of lots of 1/64th (0.4mm) plywood, a material that I had never used. I considered it too brittle and easily shattered for the bracken and bilberry covered slopes of the Border Counties hills. How wrong this notion turned out to be, four years and three models later and I still haven't punctured one. Not only is it easy to work with, it has a surface so smooth that it needs no filler, sanding sealer, glasscloth or Solartex. One small word of warning, lightly sand any ply that is going to be glued, the manufacturing process can leave release agent on the surfaces, use a finishing grade of abrasive paper.



Application, the Rheinland and compound curves

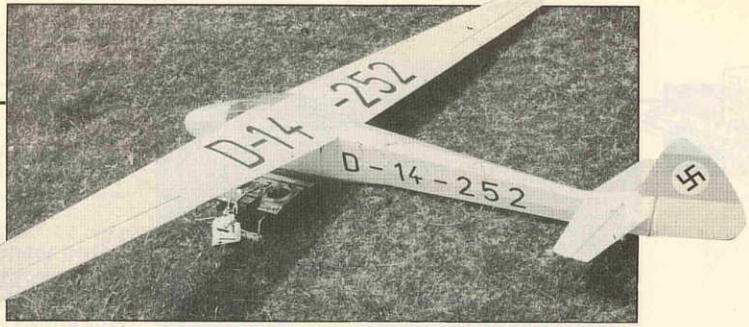
The Komar has a six sided fuselage which accepted the flat sheets of ply beautifully. I also steam bent and wrapped the ply round the leading edge of the wing, making the "D" box as per full size. This was varnished all over after removing any PVA stains with a damp cloth.



Top: The Komar that started it all off. Model uses a ply 'D' box and the flat faceted fuselage is skinned with ply. Right: Two studies of Mick's new model, the Lunak, showing extensive use of 1/64th ply. Note planked top to the nose. The Lunka may well be a Silent Flight plan feature next year.

The Rheinland was not so easy as the fuselage was monocoque with elliptical bulkheads and many compound curves. The fuselage was built in two halves on a flat board, thus avoiding the need for a jig. It is a straight tapered tube from the rudder post to the centre section, the compound curves start after that. So I used two methods, supported and unsupported ply.

The basic fuselage half has 1/4 x 1/8th inch (6 x 3 mm) balsa keels pinned to the board. Onto these go accurately positioned half



bulkheads. These are made from 1/64th ply cut out with scissors and laminated onto balsa, 3/32nd (2 mm) for the rear ones and 1/8th (3mm) up front. The centre section bulkheads are in lite ply since they are load bearing. They are notched throughout for the main longeron and at regular intervals up front for the smaller longerons. The shape of the bulkheads is to the exact height and width, less 1/64th (0.4 mm) all round, so that the bulkheads touch the outside skins.

Since the fuselage halves are skinned off the building board the rear part of the fuselage has diagonals installed to prevent any twisting. Up front the spaces between the longerons and the bulkheads are filled with pieces of 1/8th (3 mm) balsa. These are trimmed to shape, wetted on the outside, bent to the curvature of the fuselage, glued, and popped into place. There are some advantages to this method. Firstly, the bulkheads take up less room because they touch the skins and can be made with a larger internal dimension, i.e. there is more room in the fuselage. Secondly, the bulkheads are gripped between the infills thus making a more solid structure.

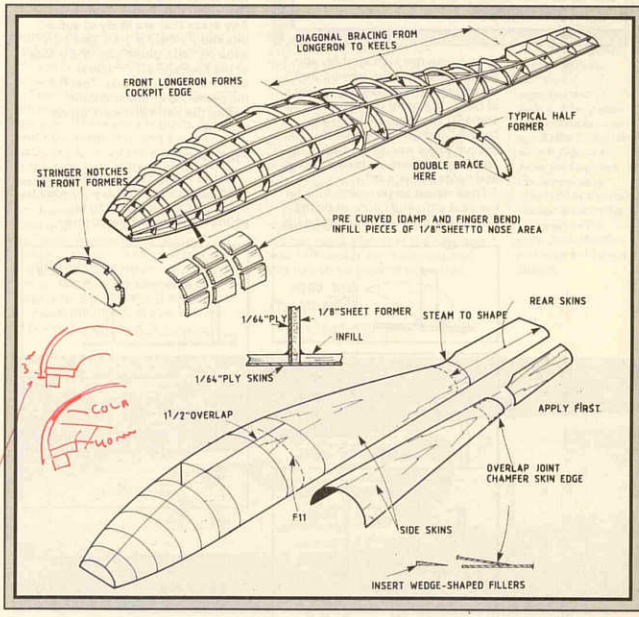
The back end of the fuselage is skinned whilst the fuselage is in two halves, the rest when it has been joined. Install a temporary packing piece of 1/4 square balsa (6 x 6 mm) onto the rear half of each keel with Sellotape. The ply sides for the rear end are then cut to extend half way over the packing piece, and 1.5 inches over the last set of infills, then taped and tied in place. White PVA glue was then applied along each side (capillary action will take it into the joint) of the longeron and the bulkheads to within 1.5 inches (40 mm) of the keel. When the glue has set the packing piece is removed and the skinning finished by glueing to the keels and the remainder of each bulkhead. The excess ply is trimmed off when the glue has cured and the two halves of the fuselage glued together.

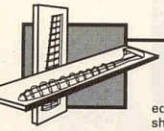
You now need to make a decision. If the model is going to be varnished like the early gliders you can duplicate the way the ply was laid onto the fuselage so that this scale detail is correct, avoid getting any PVA resin on the outside of the ply. Alternatively, if the fuselage is to be painted and the underlying detail is not important you can complete the fuselage in strips. The strip method is the key to this construction so only this will be described.

Step one – get some tracing paper. A strip of this is taped around the fuselage at the end of the rear sheeting. A pencil is now run around the end of the rear sheeting, this marks the back of the strip. Make some marks half way between the next two bulkheads. Now cut to the pencil line and make a parallel line that corresponds to the marks indicating the half way points between the bulkheads. Step two - The shape of this strip is then transferred onto 1/64th ply and the

beginning ?

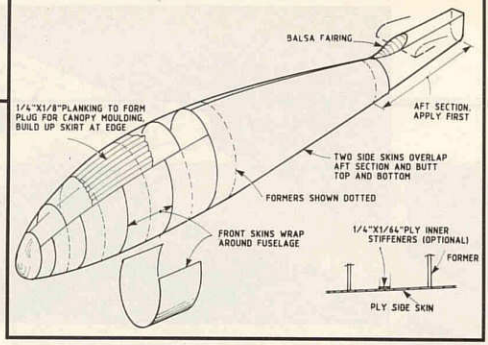
The Mu 17 above proved the finishing techniques used on the Rheinland.

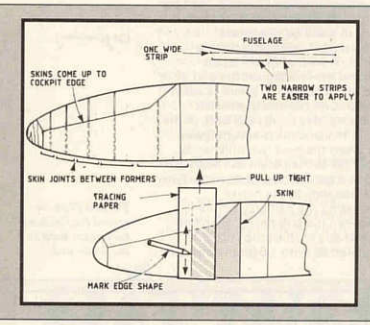




edges finished. The rear edge should be trial fitted to the fuselage and trimmed till it is perfect. Step three – Now glue it onto the fuselage with PVA and Sellotape it down as tight as possible.

Do not worry if there are any high spots on the front edge, tape the strip down as best as you can. Step four – When it is dry take your covering iron set it to hot and





hold it onto the high spot for about 20 seconds. Take the iron off and immediately replace it with a piece of balsa, maintain pressure for some 20 seconds. This usually "welds" it down permanently. Do not put more wet glue on prior to applying the heat, it steams, swells and holds the skin off.

Now repeat steps one to four for the next strip and carry on till the fuselage is finished. The bulkheads near the front are closer together to allow for the tighter compound curves. The end result is a plywood skinned fuselage, each segment butting up to the the next, smooth and ready for painting, much the same as on the real aircraft, with no unsightly sanded off high spots.

There is a limit to this construction method, this is when the double curvature is too great, this happened on the top of the nose on the Lunak. Where this happens use planking. Another problem occurs on the unsupported ply sheeting when the curvature is large and the bulkheads well separated, the skins flex when the model is gripped. Any areas that are likely to suffer this should have a 1/4 x 1/64 inch wide ply strip glued onto the inside of the fuselage skin midway between the bulkheads. Test for the presence of this problem before the two halves are glued together.

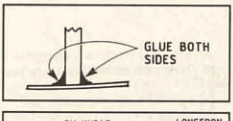
Finishing

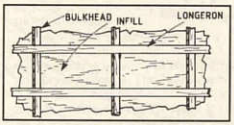
Unlike many other construction methods this method is very easy to finish. If the fuselage is to be painted it is simply given three coats of Humbrol enamel and then rubbed down with a "Green" pan scourer from the local hardware store. Do not underestimate these scourers they will scratch glass, I found that out when trying to get bugs off the windscreen. To finish, the surface is burnished with fine wire wool (silver fleece) rubbed along the length of the fuselage, and given a coating of car polish. A super finish in no time at all. Varnished finishes are susceptible to the same treatment.

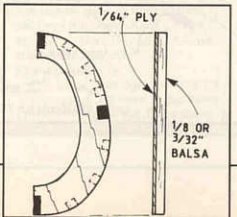
Survivability

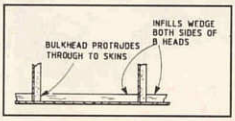
I had wondered how this method would stand up to a crash, I soon found out, I had one of my rare mishaps on the eve of a contest. The Rheinland, subject of this issue's plan feature, went in from 150 feet about 150 yards away. A plastic bag job I thought as I walked to it. But lo and behold, the front end had crumpled up like a crashed car. The loose bits up front were gathered and glued back in. New bits were needed, holes had to be filled and it had to be reskinned in places but the repair was easy and you cannot tell that it has been pranged. I do think that this form of construction saved the rest of the model. The finished fuselage has a very strong front end which will withstand hillside landings, whereas the rear end is a lightweight tubular extension that merely gives support to the tail feathers. Lightness at the rear equates to less weight in the nose.

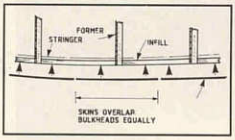
I think of 1/64th ply as being like the 20 S.W.G. dural stressed skins used on full size aircraft. When glued on it loses its brittle easily shattered character and becomes flexible and pliable. It is so easy to prepare and paint, and there is very little waste material. My Rheinland is 1/5th scale, spans 126 inches (3.2 metres), uses 4 channel radio and weighs 86 ounces (2.44 kgs). This is about 24 ounces lighter than I used to build them and it shows in the light lift performance. This is an idea that works for me, why not try it yourself.











Detail construction drawings: Top left, gluing the rear skins to the formers. Bottom left, bulkhead construction. The rest of the sketches apply to the text.