

Peter Saunders scales down, to one third, Harald Penrose's unique glider project. Designed for three function radio, the model spans 136in. and weighs under ten pounds.



Penrose Pegasus

HAVING BUILT A MINIMO A followed by an O/D 10'6" span J.S. Weihe I started thinking what next. Well, it turned out to be a workshop as my much better half gave clear indications that a state of "Lysistrata" would exist if the dining room table became the work place for another machine. I didn't need too much prompting for anyone who has struggled in this way knows that it only comes down to having the ready after the flat roof, hot water cylinder renewal, carpets, microwave, freezer and other quite unnecessary items have been attended to.

For various reasons the workshop (it was called that, can't think why they don't build them in balsa - might be stronger!) had to be 10ft x 8ft. Visions of weird extensions to accept fully rigged gliders. After erection the workshop was fully insulated to meet the banishment, benches fitted & electric supply run up the garden. Completion was September 1987 so all was set to move on to the next project.

You would think having spent some £850 on the place of work the

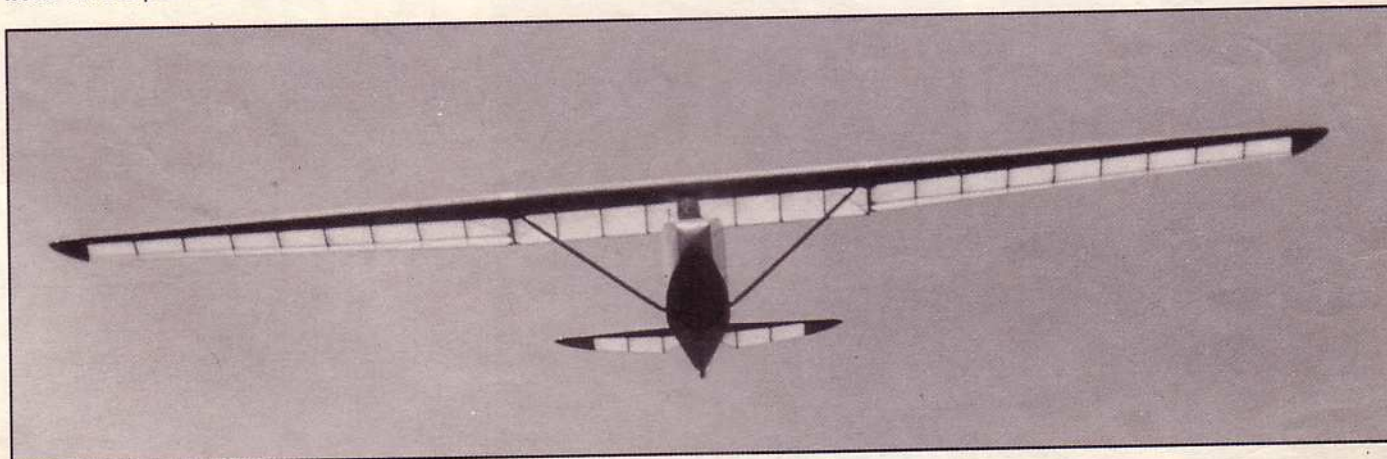
machine would need to be some exotic, carbon, teflar, fibreglass, job, but no, what had been laying dormant was in fact very much a spruce, ply, fabric glider. I first noticed the Penrose 'Pegasus' in Janes World Gliders and it seemed to me unique in that only one was built and flown only by H.P. - as larger people couldn't get in the cockpit! The original was burned and the only plans loaned out never returned.

Harald Penrose very kindly agreed that I met up with him, this was May 1987, and he gave me a useful article he had written for Flight Magazine published October 17 1935. This had a small three view drawing and basic dimensions enabling me to scale off. He also gave me some sketches for a proposed full size replica which has been shelved, but who knows, the model may stir someone - hell, why didn't I - I might have been the Barry Bucknall of gliders - remember the Mirror Sailing Dinghy. I built one of those years ago and I recall final varnishing was in the lounge! I should point out here that I was not made aware that another modeller, by name

Barrie Shore, had already researched the subject in depth. This only came to light when my model was ready to fly. Some accounts of flights in 'Pegasus' are delightfully described by Harald Penrose in his very readable books.

To the model - what scale should it be? Size of carrying vehicle, launching method, slope or thermal flying, extra body to launch model, over/under 5kg, original wing span are all parameters. I played quarter to one third and decided one third scale to a span of 136ins with original wing section for slowish high lift characteristics. It is not likely to be a model for anything beyond a moderate breeze as general shape and wing section will give limited penetration. From the root to No 4 rib of outer wing sections I have in fact changed from Gö 535 to flat bottom. This should effectively give me built in wash out and a wing without vices and easily controlled.

Looking every inch a thoroughbred, the model Pegasus truly emulates the prototype.



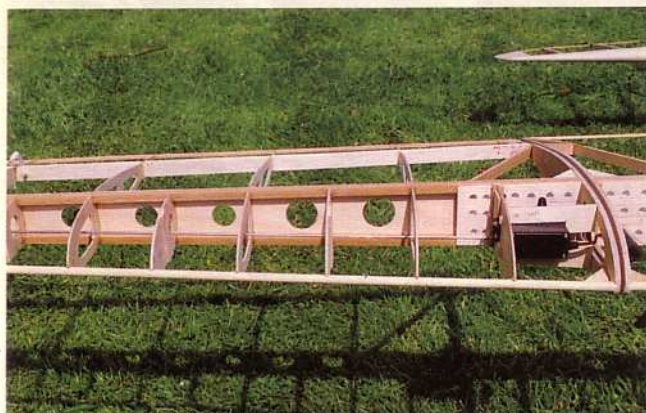
The construction is as close as practically possible to the original with the amount of information I had to hand. I commenced with the fuselage making four longerons splicing and splinting at junction of $\frac{1}{4}$ in sq to $\frac{3}{16}$ in sq. Make up both side frames jointing with epoxy. Reverse the plan to ensure flat outer sides. Cut and PVA glue $\frac{1}{32}$ & $\frac{1}{64}$ in ply to sides. Cut all holes, fit sleeves, etc, to

formers 2 and 3. Epoxy formers 2 and 3 to one side at 90° . Make partial saw cuts into $\frac{1}{4}$ sq longerons forward of cockpit area to make bending easier. Join two sides together to form $4 \times 90^\circ$. Some form of jig is required to complete drawing fuselage sides together particularly at the nose. To rear of former 3 joining is not difficult once former 4 and rudder post epoxied.

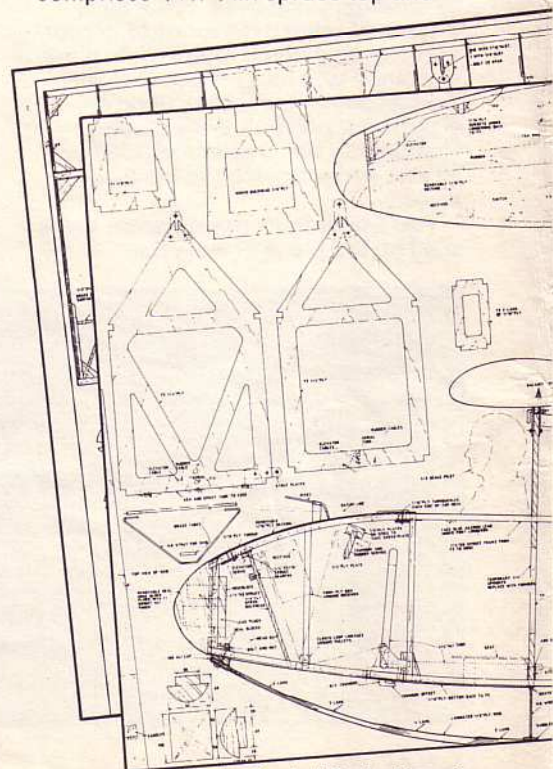
The nose block is shaped and carved out of deal and drilled out to receive maximum weight of lead plugs. Two screws secure it and make it removable for forward access to battery and trim weight compartment. The skid is made up from $5 \times \frac{1}{16}$ in ply laminations to curved shape. As you need plenty of nose weight you could use ash to be absolutely authentic. Nose end fixed by bolt through deal block. For springing at rear end I made up a V shaped compression out of piano wire with inward turned legs running under fuselage into a length of brass tubing. This method allows for direct compression and some rearward movement of the skid. If you can find the right size compression to form a 'V' you have the original method. I made & fitted a tailwheel but prior to Pegasus flying in National Championships at Sutton Bank August 1935 it had a simple tail skid which was found to be too weak.

The all moving elevator and rudder are straightforward. Rudder hinges made out of nylon, the moving parts located inboard of the static parts to prevent vertical movement the whole being secured with a point threaded steel pin fed in from underside. For the all moving tailplane I found a nylon door hinge and cut it down to the right size. The hinge secured with bolts to spar and screws to fuselage. The hinge pin is removable. Rudder and elevator are easily removed, if desired, for transportation or repair.

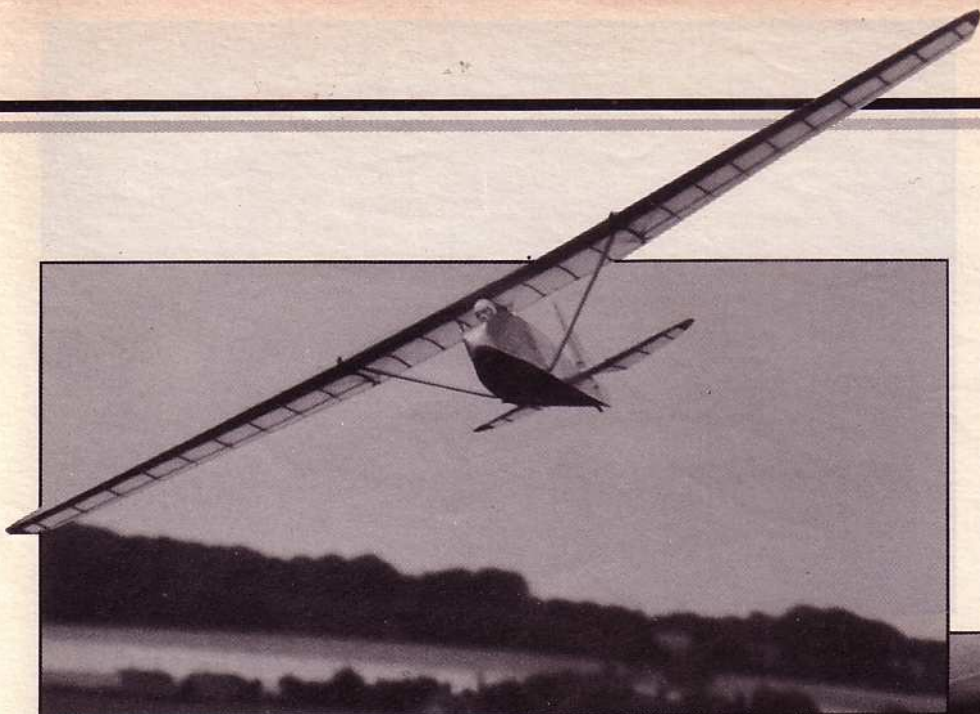
The wing construction follows quite closely the original method as the ribs are widely spaced I decided to use $\frac{1}{16}$ in ply (with cutouts) and for the centre section they are of equal chord. The centre section main spar comprises $\frac{1}{4} \times \frac{1}{4}$ in spruce top and



Pictures above are the two designers, Peter Saunders, left and Harald Penrose, the former Westland Aircraft test pilot. Construction pics show the authenticity of the structure.



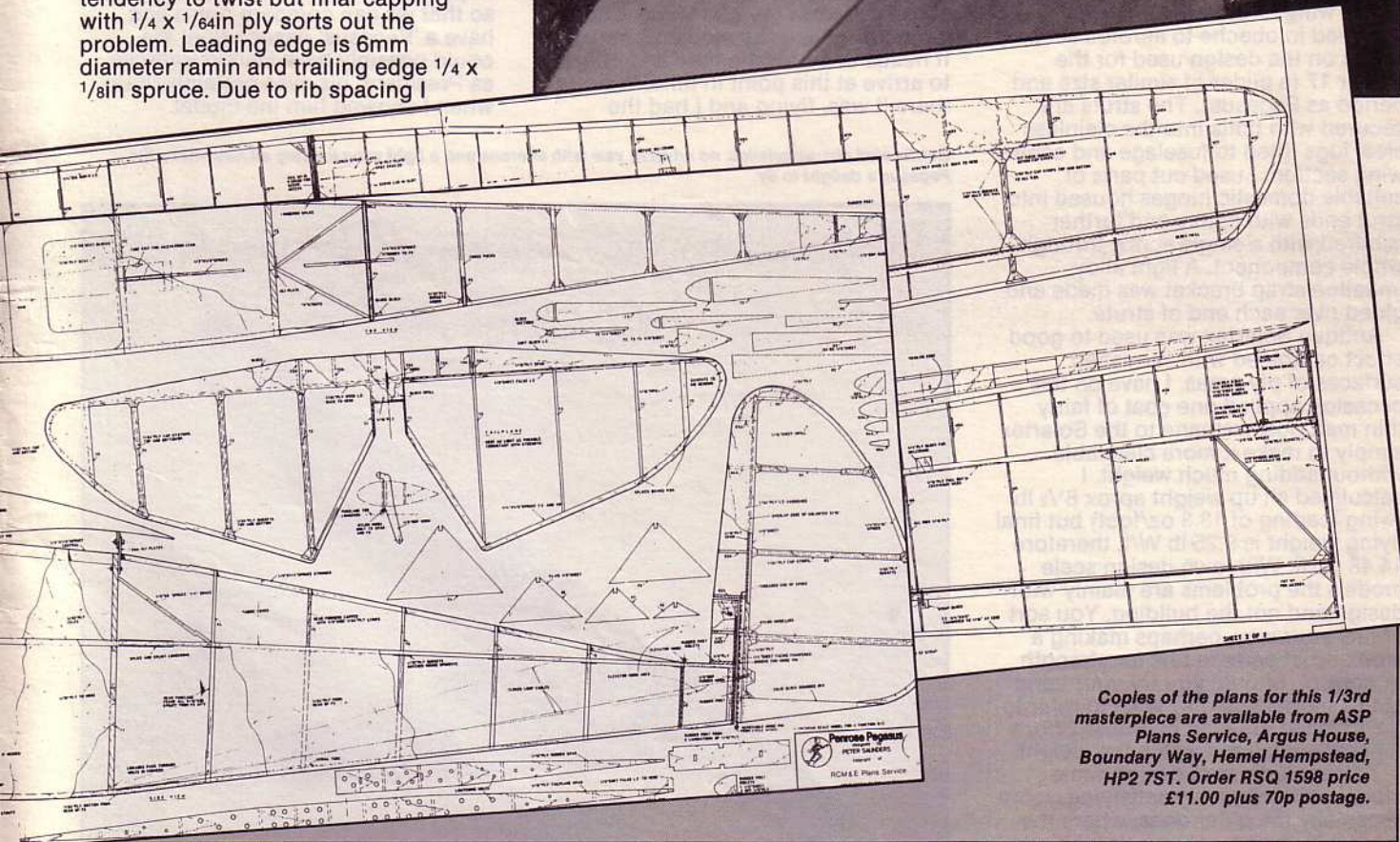
Radio Control Scale Aircraft



inserted $1/16$ in balsa riblets with a $1/16$ in balsa cross laminated strut. Fit fuselage and strut securing brackets and feed through aileron servo Y lead. Wrap forward section with $1/64$ in ply to form D box. The ply D box can be made up in as many sections as you prefer to handle but at each

Harald was delighted to see the scale replica of his 1930s design, it brought back a lot of memories which had laid dormant over the intervening 50 plus years. Scale modellers could do no better than to read some of Harald Penrose's books on flying.

bottom of a full depth $1/16$ in ply backer. At each end of spar brass tubing for wing joiners is accurately positioned and set with Isopon and capped with $1/16$ in ply to box in. You need to set up outer wing spar with centre section wing spar ($1/16$ in spacer between) and use full length brass tube. When Isopon has set saw through the brass tube, you will then have accurate alignment. Ribs are cut through to remove $1/16$ in thickness of spar backing. Forward rib section is notched over $1/4 \times 1/4$ in top and bottom. The rear section of rib cyano secured to spar for initial positioning and then strengthened with $1/8 \times 1/8$ in spruce either side. You will find the rear ribbing, being ply, has a tendency to twist but final capping with $1/4 \times 1/64$ in ply sorts out the problem. Leading edge is 6mm diameter ramin and trailing edge $1/4 \times 1/8$ in spruce. Due to rib spacing I



Copies of the plans for this 1/3rd masterpiece are available from ASP Plans Service, Argus House, Boundary Way, Hemel Hempstead, HP2 7ST. Order RSQ 1598 price £11.00 plus 70p postage.

intermediate or terminal joint you will have to treble or double the rib. Double check before finally securing the ply that you have not twisted the main spar.

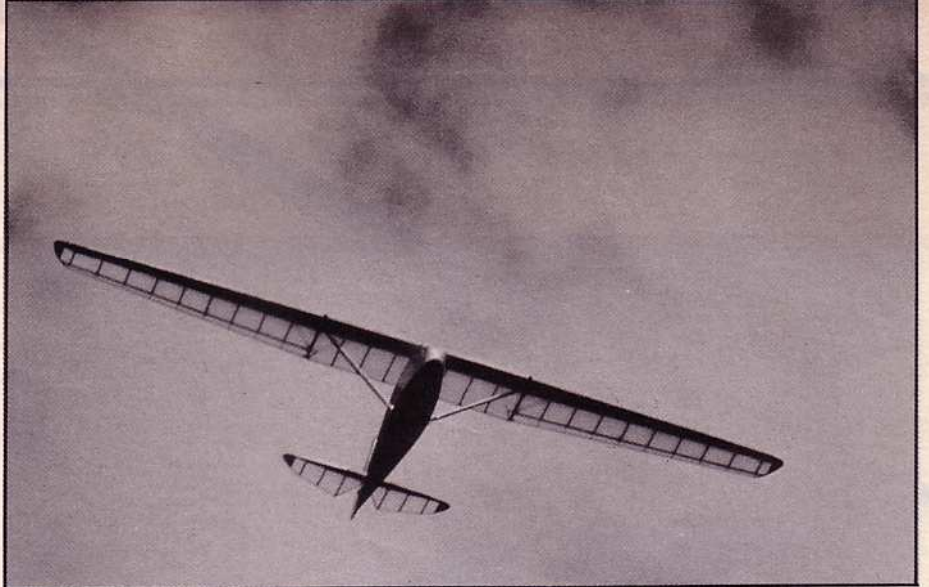
The outer wing sections have leading and trailing edge taper with full length ailerons. Due to section change, accurate shaping of aileron spar and aileron leading edge is necessary. Although I entirely agree with keeping wings accurate to plan form I do not consider it necessary or even advisable for model performance and safety to adhere strictly to original wing sections bearing in mind scale you build to and efficiency ratio. The decision hinges round the purpose model will be put to e.g. purely slope or flat field or a compromise. Most Vintage scale gliders due to loading fly unrealistically fast which greater camber to sections will reduce but perhaps restrict flying to lower wind speeds. After all, full size gliders will not attempt to get airborne above certain wind strengths due to penetration, structural, and ground handling problems.

To return to outer wings they are built in a similar manner to centre section. Aileron servo is situated in D box at root and fixed in such a way that it can be removed without too much hassle. Solid wire connection to top aileron horn via differential bell crank provides a positive slop free movement.

The wing struts were spindle moulded in obeche to aerofoil section based on the design used for the Hutter 17 (a glider of similar size and period as Pegasus). The struts are secured with bolts into the stainless steel lugs fitted to fuselage and centre wing section. I used cut parts of suitable domestic hinges housed into strut ends with epoxy and further secured with a single screw through whole component. A light alloy imitation strap bracket was made and glued over each end of struts.

Antique Solartex was used to good effect combined with varnished surfaces of ply areas. I have on this occasion applied one coat of fairly thin matt polyurethane to the Solartex simply to make it more cleanable without adding much weight. I calculated all up weight approx 8½ lb (wing loading of 13.3 oz/foot) but final flying weight is 9.25 lb W/L therefore 14.48 oz/ft. With own design scale models the problems are mainly with design and not the building. You sort of feel your way, perhaps making a mock up of parts to test for strength or control. Should you try your hand at this model you may wish to refer to the detailed drawing by Barrie Shore for scale detail but watch the weight.

To conclude, own design scale models are extremely satisfying, more especially the older ones, where the research carried out reveals all kinds



Translucent covering (Antique Solartex, or nylon and dope) plus varnished plywood fuselage skinning help to create the atmosphere of the original, both on the ground and in the air.

of interesting facets and of course leads you to the next project - who said it's a love/hate relationship. I hope there will be another Vintage glider to follow but that may take a little time as I'm not in the same category as Messrs Charlesworth & Williams. The former must have been Beaverbrook trained! I suppose it's fair to say 'Pegasus' flew 'from the board'. I took the model down to 'White Sheet' on the 6th Sept '88 by prior arrangement with Cliff Charlesworth who agreed to conduct the test flights. Cliff felt the c.g. was a trifle rearward so a chunk more lead added. So, with some 'mode' complications and no free air previously I gave 'Pegasus' a good shove out from the s.w. slope. This is generally called the moment of truth! It needs to be for the time and effort to arrive at this point in time. Well, there it was, flying and I had the

opportunity to just gaze and get busy with the camera. Cliff had a testing time of 5 min so landed and I made some adjustments. He then flew virtually on one stick elevator/aileron and began to enjoy himself. Turns were positive, no sign of adverse yaw, penetration better than expected and stall fairly gentle. Lift was on the marginal side, in fact one flight resulted in an 'out' landing in the cut cornfield below, not a mark, how does he do it! The model should make good use of thermals once located. I can recall four flights, may have been five and flying time of about 40 minutes. So there it was, the end product achieved. I suppose I felt as elated as Harald Penrose after his first flight in 'Pegasus' 1935.

You feel fifty years younger flying this glider (which in my case can only be good). So get building and hopefully we will have a fleet in the air so that we can compare notes and have a 'Pegasus' Association! We could possibly have Harald Penrose as President, his eyes certainly lit up when I showed him the model.

Gentle stall characteristics, no adverse yaw with ailerons and a light wing loading all help make the Pegasus a delight to fly.

