PEGASUS

This model by NOEL BARRETT is purpose designed for international Turn Around aerobatic competition

Anybody who expected that the 1985 World Championships for radio controlled aerobatics was going to establish a definite preference of aeroplane type for the Turn Around Schedule is by now disappointed. No clear trend emerged. Hanno Prettner flew a medium-sized model to first place with speed and precision, but the model plan form could not help creating a mild suspicion that a few inches had been chopped from the wingspan. On the other hand Wolfgang Matt's Joker was large and sleek (870 sq.in. wing area) and in his hands it flew most gracefully, clearly showing an edge over Prettner in the fly-off rounds despite the difficult crosswind. The American Team clearly tried to reflect the spirit of the Turn Around with their large, slow, realistic models; and one has to admire the honesty and integrity of their approach, but they obviously got the formula wrong. Certainly, at least, the International judges were not impressed by these honest endeavours and this U.S. team slipped out to third place having taken the team prize two years ago. The Japanese were operating at the other end of the spectrum with ultra fast models and manoeuvres of the "blink and you've missed it" variety. There was nothing resembling full size realism about this performance, yet they beat the U.S. team for second place.

In between the extremes it is quite reasonable to assume that for the foreseeable future the model most likely to succeed will be around 800 sq.in. area and will weigh about 7½lb. The necessary criteria should be seen as follows:

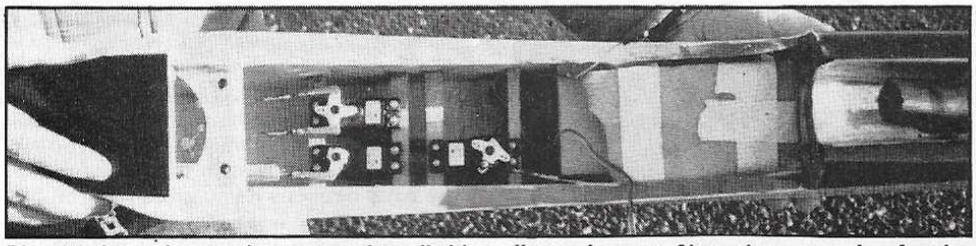
Sufficiently large to fly a slow impressive schedule, sufficiently light to enable huge manoeuvres to be performed within the constraints of the 105 dB noise limitation, useful wing loading to avoid undue buffeting in the sort of wind conditions in which we have to perform. We speak of a slow impressive schedule here, because although this virtue did not appear to gain much recognition at Flevohof, realism will eventually be rewarded.

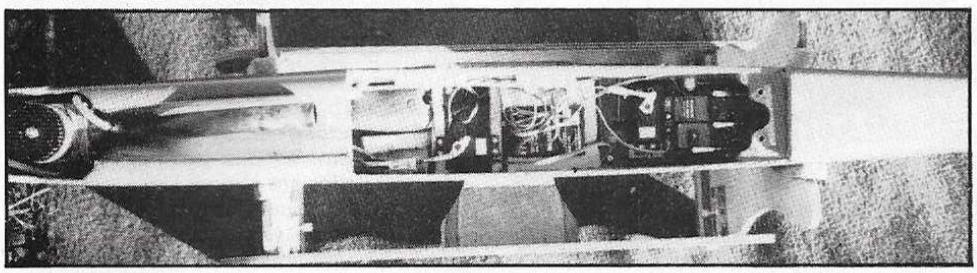
Pegasus II came about as the result of much experimentation with the basic parameters and produced a model of 795 sq.in. area with all the desirable characteristics. Fundamental to the search for the right formula was the choice of engine. There appeared to be a change of direction towards 1.20 four-strokes. We have considered from the outset that the current state of development of the four-stroke and the complications it introduces make the .60 two-stroke still the correct choice. This at least was borne out of Flevohof. The current development of the two-strokes has been moving in the direction of long stroke engines. Good power and tremendous reliability was achieved with the OS 61VF which was the engine used throughout the development phase of the plane. More recently Rossi long stroke, Webra long stroke and currently YS engines have been installed and the quest is still going on for the best power source. 11 x 10in. Bartels props are currently favoured, and this prop in combination with the YS engine is showing great promise.

Wing areas between 770 and 840 sq.in. have been tried and wing sections as thick as 17% of chord. The eventual choice of 795 sq.in. with a wing loading of 22 oz. per sq.ft. has produced a model which for us has given the best performance, with a 14% wing section. Best stability and smoothest performance has been achieved with tail plane area 27% of wing area.

Experimentation with wing dihedral has shown that the arrangement as shown, with 1in. of dehedral under each wing tip when joining the wings is correct. In this configuration the application of rudder in level flight produces yaw only and there are no undesirable side effects of rolling or pitching down. This of course, is absolutely essential for a turn around model where the use of rudder to hold the correct track is exercised continuously. Also in the correctly trimmed balance between c.g. position, engine down thrust and dihedral, there is no unwanted pitch in the knife edge position. This is probably not so critical as in the older FA1 schedule but keeps the slow roll and four point roll on a straight heading.

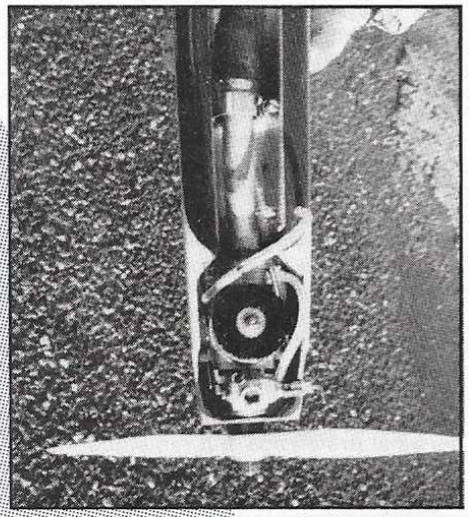
Noel Barrett (left) and Ray Keane with the two Pegasus aircraft used at the last World Champs.

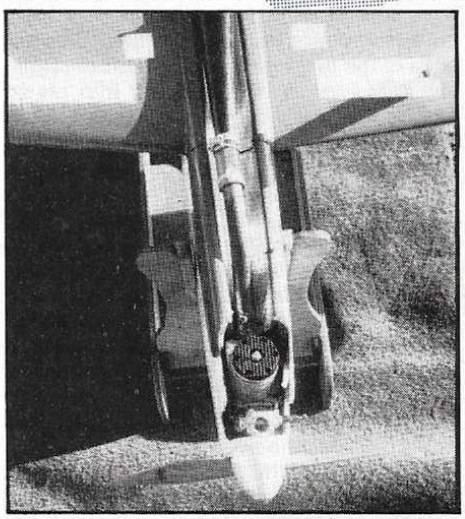




Photos show the ample room to install this radio equipment. Note the protection for the receiver and its different location in each model.

The selection of retracts or fixed undercarriage has always been a headache with us, so we examined both. Our basic premise was that fixed undercarriage would save weight, save complications, save money and would not adversely affect flying performance. All this was, in fact, the case. There is a saving of 4–5 ozs in weight and one less item to give problems. Also there was no discernable difference in flying performance. However, there is no doubt that it is nice to see those wheels tuck up after take off and the silhouette of the model is definitely improved. There is also the psychological advantage of retracts to be taken into account, for both flyer and judges, and there is no doubt that one fixed gear model among a competition entry totally sporting retracts does stand out unfavourably. So make your own decisions. You know best what you want, and we have given you the whys and wherefores.





Easy to get at motor installation, also shown is the neat tuned pipe arrangement. Pipe is disconnected when removing the wing.

Construction

The building of Pegasus II is not difficult. Almost everything is conventional so we will dispense with the blow by blow account and just highlight some of the niceties. Follow the plans which are drawn accurately and everything will fall into place smoothly. It is best to build the fuselage in a jig to give an absolutely straight model, but if you do not possess a jig mark the centrelines on each former and make these align perfectly as the work of joining up the sides proceeds. It is essential that the fuselage is dead true, or you will find it impossible to do the final assembly of the model properly. No dimensions will check out properly. Take particular care while glueing in position the crossgrain top decking as this is the stage at which twists can be irrevocably built in. Remember that you must, at all times during the construction, try to save weight. This means that the use of epoxy cement should be avoided in all but the most critical joints. Only use epoxy to join the formers to the sides and to fix the wing bolting plate in position and then don't load it on, just enough to do the job. For everything else use cyano or white glue as appropriate. The curved shape of the manifold tunnel is lined with 1.5mm balsa which in practice proves quite adequate, although it sounds delicate. Wing fairings are optional. They are shown on the drawings, but the practice of the experts is not consistent, some include them, some omit them. There is no effect either way on the flight performance of the model. However, the wider seating area does reduce the bearing stress at this contact point and the installation of the fairings may be used to create a very close contact between the wings and fuselage. In order to get this close contact take the 0.7mm ply base plates for the wing fairings and tack them temporarily in place on the top surface of the wing where they will eventually bear. Do this with several spots of cyano. Now take the wing and sit it onto its cutout on the fuselage and by trial and error sand away the fuselage until the fit is good, checking alignment of the wing with the fuselage by measuring accurately from each wing tip to the sternpost and making this measurement exactly equal on both sides. Now mark match points at leading and trailing edges. Now lift off the wing, apply a thin bead of epoxy to the fuselage cut-out and replace the wing on this. This will secure the fairing baseplates accurately to the fuselage. Now remove the wings by slipping a long flexible blade through the spot cyano fixings, and, hey presto! The wing pops off and when it goes back the match is perfect. The wing dowel and the mounting bolts can now be added. The foam wings should present no problems. The main thing to be sure of here is that the wing panels are true and do not have any warps. Also check here that both wing panels are of identical length. It is surprising how often you will find that when the wing panels arrive from your foam wing maker (if that's how you do it) that one panel is a few millimetres longer than the other. It is now standard practice to use one servo in each wing panel for the ailerons. For this cut out and for any other wing cut outs, such as retracts, it makes life infinitely easier and cleaner to procure a length of nichrome wire of a reasonably stiff variety and use this with your 12 volt battery to make the cut outs. All you need is two leads and a couple of crocodile clips. With the exercise of a small degree of ingenuity you can fashion a square U-shaped loop on the wire, of the appropriate depth, and fixed to a 3mm ply plate by trapping under the heads of four self tapping screws. It is amazing how versatile this sort of an arrangement can be. In order to cut the holes through the wing from the centre to the servo well take a length of chrome tube, as used for the rail in your wardrobe and sharpen the end with a file. Screw this down through the wing removing it every so often to get rid of the accumulated foam. Hold on to this piece of chrome tube because you will find another use for it. When you are tired trying to feed the tank fuel tubing forward through the central hole in the firewall, when it doesn't want to find the hole itself, try pushing the chrome tube

back through the firewall from the front until it appears in the radio bay. Slip the ends of the fuel tubes into the chrome tube, and move everything forward into place. The fuel tubing has got to come out in the right place now. Incidentally, I never travel to the flying field or a competition without such a length of pipe. You never know when that fuel tank has got to come out.

Enough of the handy hints — back to building. Join the wings carefully inserting the plywood central braces. It is probably easiest to cut the slots for these braces before gluing the wing panels permanently together. In order to do this first temporarily join the wings with pins or sellotape and mark the positions of the braces, top and bottom. Take the wings apart and cut a 1.5mm width of the top and bottom veneer away with your craft knife. The slot may then be cut through the foam either with the hot wire or with a hacksaw blade. The 1.5mm plywood braces will now slide smoothly into place. To make the semi-circular groove in the wing underside, wrap sandpaper around the tuned pipe or something of similar diameter and sand down to meet the semi-circular shape of the plywood braces. The fibreglass tape reinforcing the centre section joint needs only to be 50mm wide so that it does not upset the wing bearing and the fuselage. In gluing the tailplane in place on the fuselage first assemble the wings and fuselage together and then check meticulously that the tail aligns perfectly in relation to level and in check measurements from wing to tail at both tips. After the tailplane is glued in position it is easy to set up the fin so that it is perpendicular to the tailplane.

The finishing of the model is a matter of personal preference, but remember not to add too much weight, 7½lbs ready to fly, less fuel is your target. If you have the time and the patience it is nice to paint the model. Start with two coats of Smith & Gibbs SP113 Epoxy and work this down with wet paper. This is hard work, but will reward you with a glass smooth finish. One coat of K & B primer rubbed down with wet paper will prepare you for painting. Paint with an acrylic enamel paint such as Ault and Wiborg Acrylic Enamel and this is totally fuel proof. If your spraying technique is good you will probably be happy with the outcome, but see what happens if you go to work on this with 1200 grade wet paper followed by rubbing compound. It's worth the trouble.

For initial flight testing set up the engine with about 1° of downthrust and 1.75° right sidethrust. Check that the C.G. position is not aft of the location shown on the plan. This is a satisfactory C.G. position for turn around aerobatics, but if you want more docile handling move the C.G. forward about 12mm. In this position the flight characteristics are almost like a trainer.

Take the model out on a fairly calm day, get the engine working properly on the ground, hold a little up elevator to start your run, and release this as the model starts to move. Now marvel at the smoothness of the model and the beautiful crisp manoeuvres which you can perform. See how well the model responds to the rudder through all stages of any manoeuvre and see how responsive the model remains even at quite low speeds. You should find flight trimming of the model to be very satisfactory to carry out, especially because of the ease with which the engine can be moved to make thrust adjustments. Trimming is mainly to do with getting engine thrust and overall C.G. to match so that the model holds its attitude in whatever configuration it is placed. Get this right and you will be glad that you decided to build Pegasus II.

Footnote

The canopy can be cut from one of the many commercial ones available and the manifolds used were made to match the drawings by Mr Carl Roedling, 2 Westfield, Dursley, Glos. GL11 4ES.