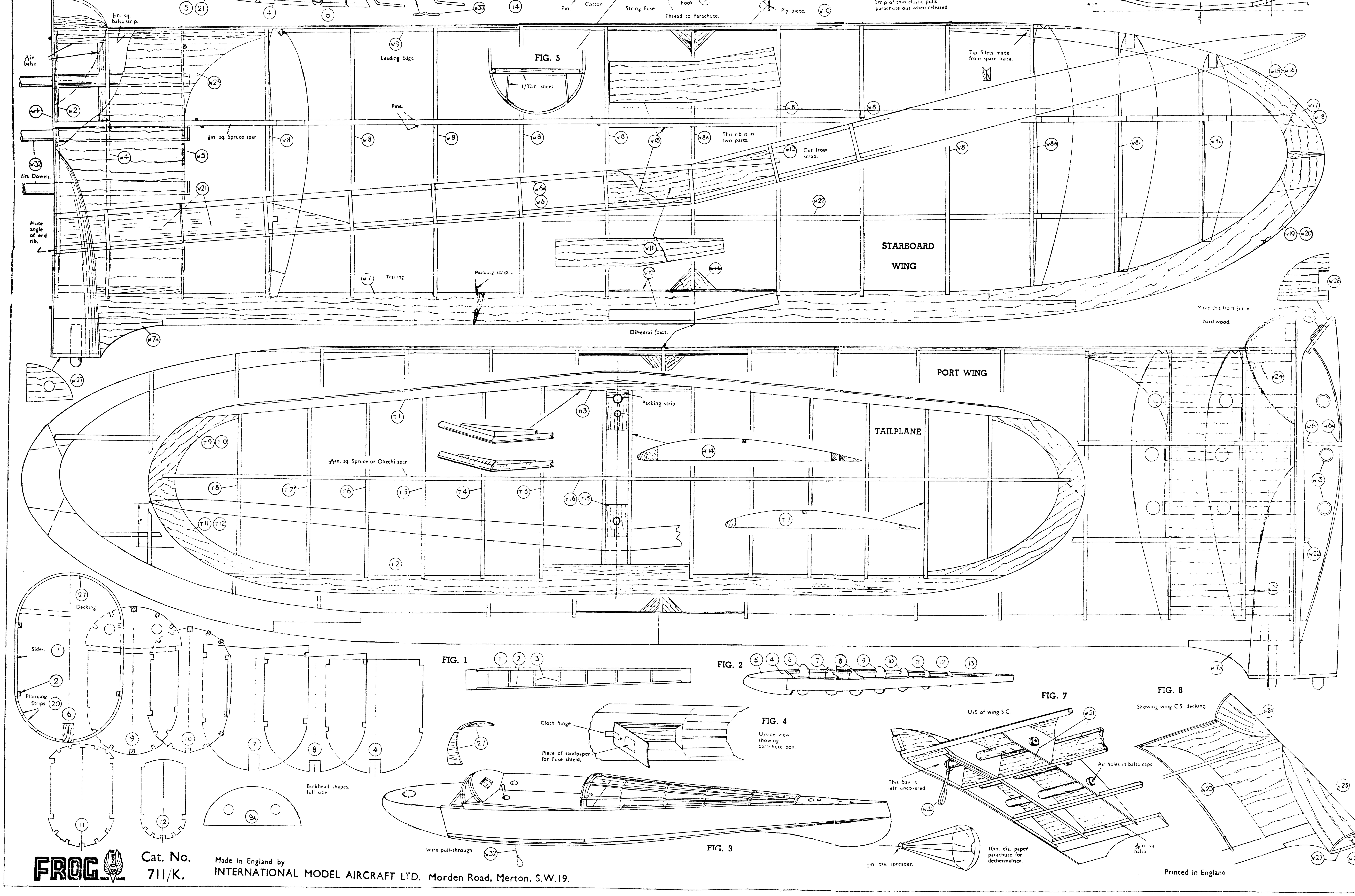
Full-size drawing of the 5ft. span "PRINCE high-performance Sailplane.

DATA.

Wing span	60in.
Length	36in.
Weight, all up	15ozs.
Wing area	375 sq. ins.
.. section	N.A.C.A. 6412.
.. incidence	+ 3½°
Tail ..	0°



INTRODUCTION.

This model has been designed to meet the requirements of a medium-sized glider suitable for competitions under * F.A.I. and S.M.A.E. rules, and possessing good looks allied with simple constructional features.

Using an airfoil section giving high lift at low speeds (N.A.C.A. 6412), coupled with a nominal wing loading of 5¼ ozs. per sq. ft. and a well-streamlined fuselage, it is capable of putting up an extremely good performance at any time.

Particular attention has been given to the wing structure to enable it to withstand winch-launching if carried out in rough weather. A form of mixed wood construction is employed, using hardwood for most of the longerons and spars, resulting in a very robust structure.

Another feature is the entire absence of external elastic bands and fittings for holding the components together, and although the wing employs a knock-off mounting, all the necessary parts have been kept within the fuselage. This not only improves the appearance, but also helps to reduce unnecessary drag. The moulded cabin also contributes to the clean lines of the fuselage, which is an important factor in obtaining a high performance.

BUILDING INSTRUCTIONS.

It is advisable to read through the instructions and identify the various parts before commencing assembly.

FUSELAGE. The main structure of this is composed of two wide strips of balsa forming the sides (1) with backing strips (2) of ⅛in. x 3/32in. Obechi. First check the sides against the plan, trim them to shape, and bend the top longerons at the front as shown before assembling. Then cement them together, with the cross struts (3), of ⅛in. sq. balsa, making a left and right hand. Use pins to hold them in place. See fig. 1. Make sure the sides are exactly the same length.

Next cement the central bulkheads (6, 7 and 8) into place, checking that they are at right angles to the sides, then assemble the rest of the bulkheads (4, 9, 10, 11 and 12) together with the tailblock 13. Carefully check the alignment of the fuselage during this operation and see that the two side panels are level at the rear. The nose-block (5) can then be cemented into place against bulkhead (4), lining it up by the curved lower edge. Allow the bulkhead to project below the edge of the nose-block to form the line of the fuselage. Check this with the keel (14) in place and a strip of balsa laid alongside it corresponding to the planking (20). If the top of the block is not level with the sides, it can be built up with a piece of spare balsa sheet. Drill two holes in the keel (14), and assemble the two hooks (15), soldering the cross piece (15a) to these as shown in side view.

Cement the keel in the slot in the nose block and bulkheads. Next fix the main stringers (16) ⅛in. sq. Obechi and ply lower fin (17), which fits into the slot in the tail block. Add the rest of the stringers (18) ⅛in. x 3/32in. Obechi and fairing strips (19) and refer to the sectional views to see how they fit in at the rear. The front part of the fuselage up to bulkhead (9) is planked with strips of balsa (20) about ¼in. wide cut from sheet. These should be shaped to butt-join against each other, cemented, and afterwards rounded to a smooth surface.

The parachute box for dethermaliser can be cut out, and the bottom and sides built up as shown in figs. 4 and 5. Cement and pin or screw the hardwood skid strips (21) ⅛in. x 3/32in. to the nose block and keel, tapering them as shown.

Cut two pieces of balsa for wing platform (22), and cement into place on bulkheads (7 and 8), and against (6 and 9) supported by ⅛in. balsa strips (23). The tapered strips (24) are then cut from 1/16in. balsa sheet and fitted. Next comes the slotted former (25) and backing piece (26) cut from balsa sheet. Check the angle of this with the wing root rib, then mark on the rib the position of the square slot in 25, as a guide for the position of the locating blocks W28 on the wing, and the end caps W26, which can be shaped to fit. Level the edge of 25 before fixing decking strips (27), which are cut from 1/16 sheet crossgrained. Holes must be pierced for the paper tubes (29), which are cemented in place and trimmed afterwards.

Round off the nose block with file and sandpaper to follow the lines of the fuselage. Trim the cockpit cover (31) ... and cut the back piece (30) from ... balsa slightly smaller than the top of the nose block, and cement this inside the bottom edge of (29). Cement the ... piece (31) against bulkhead (6) to act as a guide for the cabin, which can be removable, the rear edge of (30) fitting under (31), and the front being held down by a dress snap (32).

FIN. Build this up from the cut out parts supplied, the L.E. F1, is a strip of ... balsa, and the ribs F2 and ... F3, are cut from ... sheet. Assemble and ... on the plan until the ... is set, then shape them to the sections shown. Carefully make the holes for the dowels F9, and slots for the rudder hinges F10, and cement these in place. Bend the small wire hook F11 push it through base F4, bend over the end and cement well. Fix the small snap fastener in place at the rear.

WING. First make up the double root ribs by cementing together parts W1 and W2, and carefully lining up the holes. When they are set, assemble them on the paper tubes W3 together with ribs W4 and W5, and cement them liberally, checking against the plan for position. It is advisable to make up both halves of the centre section together, inserting the dowels to ensure a good fit when finished. Cement the lower main spar W6 to the C.S. and pin the assembly down on the drawing, using pins where shown. Next fit the T.E. W7 and W7a and note that the front, or thick edge must be raised about 1/32in. to obtain the correct airfoil section. Add the rest of the ribs W8 and L.E. W9 up to the dihedral joint. Also the top spar, (W6a) which extends to the next rib, and allow these to dry.

Note that this spar should stand above the first three ribs, the decking W23 being butt-jointed to it.

When set, raise the wing until the root rib is 2¾in. above the baseboard, and build the outer half flat on the plan. Cement ply strips W10 to L. and T.E. and gussets W11 and 12 between the spars, then cement capping piece W13 into place, completing the joint with rib W8a which must be cut and fitted each side of the main spar, and the ends trimmed to fit against W10, with gussets W14. The tips are made up of two laminations of balsa (W15, 16, 17, 18, 19 and 20) ready cut to shape, together with ribs 8c and 8d. Rib 8b is a standard one, shortened at the rear.

The main spar gussets (W21), fig. 7, are cut from spare sheet balsa and must be a good fit between the ribs and spars. These extend to the fourth rib, with a half-gusset between the fourth and fifth. Cement the rear spar (W22) into place on the under-side, and make sure it lies flush with the ribs.

Cut the balsa centre-section covering (W23) to shape from strips of 1/32in. sheet, with the grain direction as shown, and cement them over ribs (W1, 4 and 5), holding them down with pins.

Sandpaper the surface smooth, and prepare the fairing pieces (W24) and W25). These are supplied cut to section and only require cutting into halves and trimming before fixing into place see Fig. 8. Final shaping can be done with the wing in place on the fuselage. Cement the capping pieces (W26 and W27) in place. W26 being oversize to allow for fitting and bevelling at the top. Then cement the hardwood locating pieces (W28) in the slot in W26. Drill the holes in rear blocks (W25) for the dowels (W29) and cement these securely into place checking with bulkhead (9) for position.

When the wing is completed, shape the tips, round off the L.E. and lightly sand all over before covering.

TAILPLANE. Although this incorporates 5 degrees dihedral, it is first built up flat on the plan, except for the spar and C.S. parts T13, 14 and 15, the tips being two layers of shaped balsa parts. The tips are then raised 1in. and the centre section completed. The T.E. is cut half-through and cemented, the L.E. being in two parts. Bend the spar carefully and cement into place in the slots. When it is set, shape the blocks T13 and T15 and tips, and sand carefully all over.

COVERING. The fuselage, wings, tailplane and fin are covered with tissue, using paste or dope for fixing. Cover each part separately, using narrow strips over the stringers. All the fuselage can be covered except the nose block. Aim at getting a uniform surface with no deep wrinkles; water shrinking and doping will ensure a good finish.

The recommended order of covering each half wing is:—

1. Bottom inner
2. Bottom outer
3. Top inner.
4. Top outer

The top inner section is the most difficult to cover, and the following procedure may help. First stick the paper to the centre of rib (W8a) and the decking (W23). Then pull it diagonally across from each corner and paste down, finishing with the L.E. and T.E. the under surface of the wing is concave, so the covering must be affixed to each rib and to the spar W22.

When the paste has dried, the whole surface except the sheet balsa parts, should be lightly sprayed with water. While the parts are drying care should be taken to see that they do not twist or warp.

The undersurfaces of the wing and tailplane should be quite flat. If a warp does occur, hold the affected parts in a jet of steam or about 2ft. from an electric fire, and straighten it, holding it until it sets.

The whole model should be given two coats of dope. The fuselage only should be painted to save weight, the whole model then being given one or two coats of lacquer. Fix the transfers in place, together with Insurance labels and your name and address.

DETHERMALISER. A dethermaliser is an optional fitting, but very desirable when flying on a warm, sunny day, and using a long line.

It is an effective means of limiting the duration of flight of a model, and preventing it from being lost in a rising air current, which can occur very often in fine weather.

This is achieved by means of a parachute attached to the model and released after a given time, which is controlled by the length of fuse used. Test this for time of burning beforehand and fix it to the loop of cotton. This holds the parachute in place against the pull of the elastic until it is burned through. When released, the parachute trails behind, causing drag to such an extent that the model assumes a steep angle of descent.

The fuse is made of white string dipped in a solution of saltpetre and allowed to dry. A short length is then cut off and attached to the cotton loop which holds the trap door shut.

ASSEMBLING. Fit the two halves of the wing together with dowels and loop two 2½in. bands W31, over each front tube, fig. 7. Form the hooks in the piece of wire W32, push it through (28), loop over the bands, pull back through tube and secure with wire clips W33. These can be recessed into the balsa to make them flush. The tailplane is held down by the fin in the same manner, using the smaller bands.

FLYING.

The completed model should balance at the point shown on the drawing, any necessary balast weight being inserted in the hole in the nose block after removing the cabin top.

Pick a calm day for the first tests, and launch it into wind, if any, and from a level position only 2 or 3 feet from the ground. If the model has a tendency to nose up and stall, add more weight to the nose, but if it is inclined to dive without any weight added, raise the tailplane T.E. about 1/32in. and try again. If the model has a natural tendency to turn, the wing is probably warped.

It is advisable to have the model turning in large circles but the trimming tab should be used for this.

Tie a piece of tissue or rag on the towing line just below the ring. This helps to disengage it from the hook on the fuselage and makes it visible on the ground.

Use the front hook for towing in windy weather and the rear for calm.

A running launch with the towline is quite effective, especially when operating from a flat field, or a winch may be preferred on a calm day, owing to the higher launching speed required. This can be made up from a hand-grinding tool, with a wooden reel about 5in. diameter in place of the grinding wheel and a handle fitted to the body. If a larger reel is used the gearing can be dispensed with.

Tow the model up to the height required, but do not release it until it has levelled out to its normal gliding angle, and the tension on the line has slackened.

* "Federation Aéronautique Internationale," the governing body responsible for the framing of rules for International competitions and world records.

"Society of Model Aeronautical Engineers," the governing body responsible for the control of contests in Great Britain.

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