'KAMAN'

Helicopter

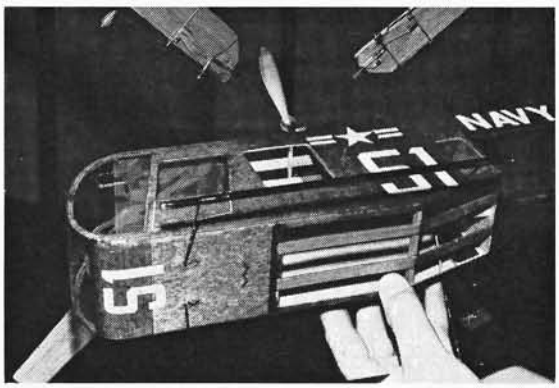
designed by J. Bishop

DESPITE THEIR SIMPLICITY, the free-flight, power-driven helicopter has always been something of a mystery to aeromodellers – the designer included! However, 'nothing ventured – nothing gained', it was decided to press on with this design three years ago. After it was built, the question arose, 'How does one trim it for flight?' – you cannot test glide the thing! The engine was adjusted to peak revs, and the model allowed to fly out of the designer's hand. No one could have been more surprised to see it climb in a large, left hand spiral until it disappeared O.O.S. into cloud! The engine cut and after a short time it reappeared out of the clouds on an auto-rotation descent. From that day to this it has always performed to the satisfaction of the many modellers who have seen it fly, especially those at the last two Scale meetings at Old Warden. What more could one ask of a simple helicopter design?

Construction of the fuselage is straightforward, but the rotor-head may give some trouble if one is not careful with the wire bending. The fuselage sides are cut from 1/16 in. sheet balsa, 6 in. wide – if your local shop does not stock this width, change your model shop or glue smaller sheets edge-to-edge. It is framed with 1/16 in. x 1/8 in. where shown. The cross-grain laminations at the front are essential to give it rigidity prior to fixing the celluloid cabin windows.

It is important to note the anti-rotation chute opening is on the port side only. Cut formers F.1 and F.2 from 1/8 in. sheet balsa. The rotor-mast support beams may be made out of engine bearer material or even obechi. Holes are drilled and 14 s.w.g. brass tubes are epoxied in where shown. The formers are glued to the two support beams and then the sides are glued to the formers. The 1/8 in. square cross pieces are now added, so forming a basic box to which the rest of the components are added. The front landing gear support wire is bound and glued to the 1/8 in. sheet which is then glued into the basic fuselage before the bottom sheeting is added. The top and bottom of the fuselage is largely left open except for the strips as shown, so that the prop-wash can pass through the fuselage rather than round it, thereby causing less drag. The booms are completed as per drawing by adding the 3/16 in. wide spacers, top and bottom followed by the soft 3/16 in. sheet ends. The two fins are cut from 1/16 in. sheet balsa, edges sanded round, and glued on the outside of the booms. The rear 1/8 in. sheet spacer at the tail end is sanded to an airfoil section before it is glued between the booms. The rear landing gear support wire is fixed with a small woodscrew and washer to the bottom rotor-mast support beam. The two 3/16 in. diameter dowels are then bound and glued to the landing gear support wires. At this stage, with the cabin window material still to be fitted, put in whatever type of cockpit detail you wish, but keep it light. When this is done the celluloid can be inserted. The last and the most important item is now fitted – the anti-rotation chute. This is made out of thin card (Bristol Board) and is cut to the width shown – the length can be obtained from the cross-section A–A. Take a piece of 1/16in. square balsa and glue to one end of the card and when dry, it is glued and pinned to the bottom edge of the anti-rotation chute opening. The other end is glued and pinned to the side of the top rotor-mast support beam, once again refer to cross-section A–A for details. The whole of the airframe is now sanded and the corners rounded off. As there is a weight limit of .11 oz., coloured tissue doped on will give the best and lightest finish to the airframe. If you must use coloured dope, apply it sparingly.

The construction of the rotor-head is started by making the rotor-mast. This is a length of 14 s.w.g. piano wire cut to the length shown on the plan with a small length of 14 s.w.g. brass tube soldered on the end. The next parts are the blade support wires. Four are required all made out of 16 s.w.g. piano wire. These are bent to the shape shown on the plan but note, only bend them up to and including the 3rd bend, and make sure they are all identical. The rotor-shaft bearing is made from a length of 14 s.w.g. brass tube and two brass washers which have four holes drilled in them (see plan) to take the four blade support wires. A washer is placed at each end of the brass tube and the blade support wires are inserted into the holes, then the whole assembly is soldered together. so forming a complete unit. If spirit flux is used, wash the bearing after soldering to get rid of any spirits, otherwise you will end up with a corroded rotor-shaft. The engine mounting discs can now be cut from 1/16 in. plywood. R.3 and R.2 are glued together, and then epoxied to the blade support wires, but R.1 is not glued at all – this is



View of underside shows the open structure and the anti-rotation chute on the left hand side only.

so that it can be removed at intervals to lubricate the rotor-shaft bearing. The rotor-head in its present state can now be laid aside whilst the blade-holders and their fittings are made. The blade-holders are cut from 2 mm. or 3/32 in. plywood to the shape on the plan. The saw-cuts are to allow one to bind the various components to it.

Referring to the exploded view of the blade-holding means you will see all the components that are required. As this only shows one blade, and there are four blades on the model, it means you have to make four of everything that is shown in this view. How many of you have given up now and gone back to the simple life of T.V. watching? For those of you who are still with it, each component is described in turn.

There are two blade stops and one is cut to the shape shown and epoxied to the top of the blade-holders. A piece of 16 s.w.g. brass tube is glued and bound to the underside of the blade-holder. The 18 s.w.g. blade retaining wire and 20 s.w.g. weight arm link are bent to shape, bound together with fuse wire, and soldered. The blade retaining wire with the weight arm link attached is then bound and glued to the blade-holder. The 18 s.w.g. weight arm is bent to shape and then the lead balance weight is made. You may be able to buy a weight of the correct shape from a fishing tackle dealer, but if not, you will have to cast your own from a simple mould. The weights are attached by a small piece of 18 s.w.g. brass tube soldered to the end of the weight arm. The hinge is made out of a small length of 1/8 in. diameter brass – 1/8 in. square brass would do, but 1/8 in. diameter brass is just that bit lighter. It has two holes drilled through it, at right angles to each other – one is to take the weight arm, the other the blade-support wire. The hinge is retained by a small piece of brass tube soldered to the end of the weight arm. Cut the blade from 3/32 in. medium hard balsa and let in the 3/32 in. spruce sheet reinforcement.

Note the wash-out in the blade. This is carved-in first before the blade is shaped to an airfoil section. The blades can be covered in Jap Tissue, Modelspan or nylon. The original used Jap Tissue and a new set have only just been made after three years' use. An 8 B.A. bolt complete with washers and nut is used to hold the blades

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