WOODEN WONDER

Simon Johnston's refreshing approach to the art of training helicopter design.

I had spent several years flying radio-controlled model aircraft before I first saw an R/C helicopter at our local flying club site. I was amazed by the performance of the model and the control exercised by the pilot. The helicopter was a Heim Star Ranger and the pilot was Vago Nordigian.

I was determined to have a go and the following year bought a second-hand Graupner 212 and began learning to fly an R/C helicopter. As I slowly gained experience in how to hover and subsequently

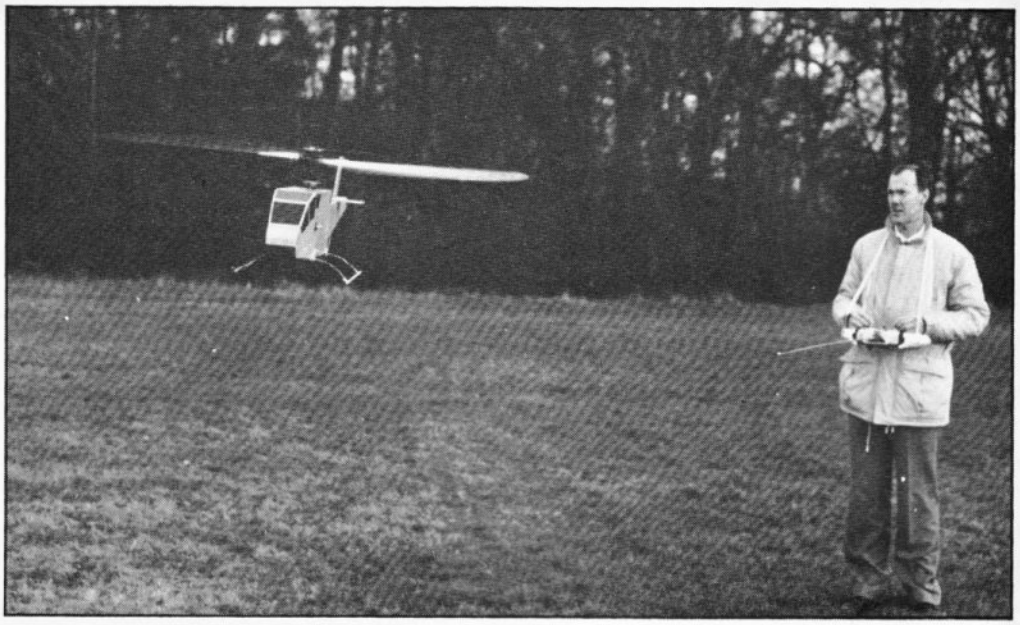
fly circuits, my fixed wing models gradually disappeared from the workroom wall.

My initial impression of the Star Ranger was such that it remained the 'ultimate' helicopter to fly. When the Star Trainer was introduced it appeared to be the perfect solution — I could continue the learning process, and, when I felt reasonably confident, transfer the Heim mechanics to a Star Ranger fuselage.

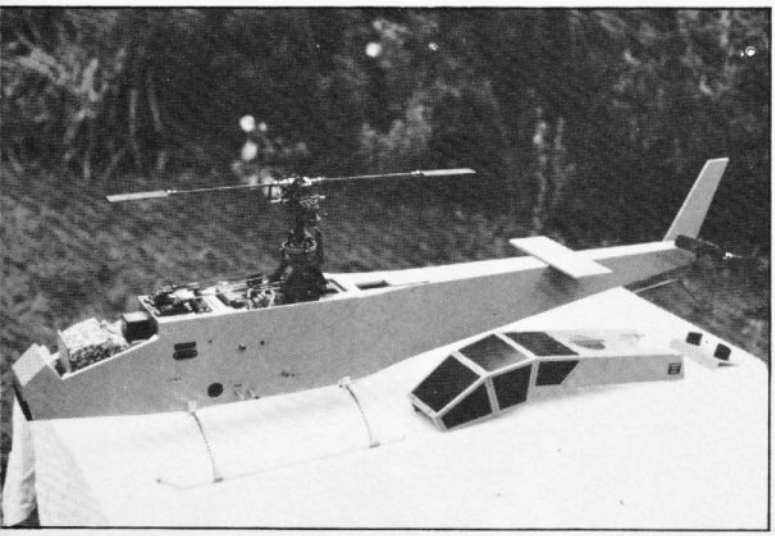
So I liked the Heim helicopter — why the wooden fuselage? Building the kit, the first job I attempted was to glue the canopy together. I made such a mess of this task, that the only solution was to buy another and start again! Luckily my local friendly helicopter shop stocked (indeed imported) the necessary bits. However, I was dismayed to learn that a new canopy would be £15; it occurred to me that I had been building model aircraft fuselages for that price.

I decided not bo buy the canopy but, on a budget of £15, try and build a fuselage with the comparatively cheap materials of balsa and plywood. Since the model was intended as a trainer the criteria was that it should be very robust, cheap, simple, quick to build, easily repairable and resemble a full-size helicopter.

It seemed to me that the easiest way to build a suitable fuselage was to construct four boxes and bolt/glue them together (applying John Gorham's philosphy of Keep it Simple Stupid!). The box construction dictated that only a military 'style' appearance would look acceptable.



Simon Johnston, now a competant flier, and the model he used to learn to fly with. By adopting fixed-wing building methods and skills he has come up with a unique design which has worked well for him and can now easily be duplicated by others.



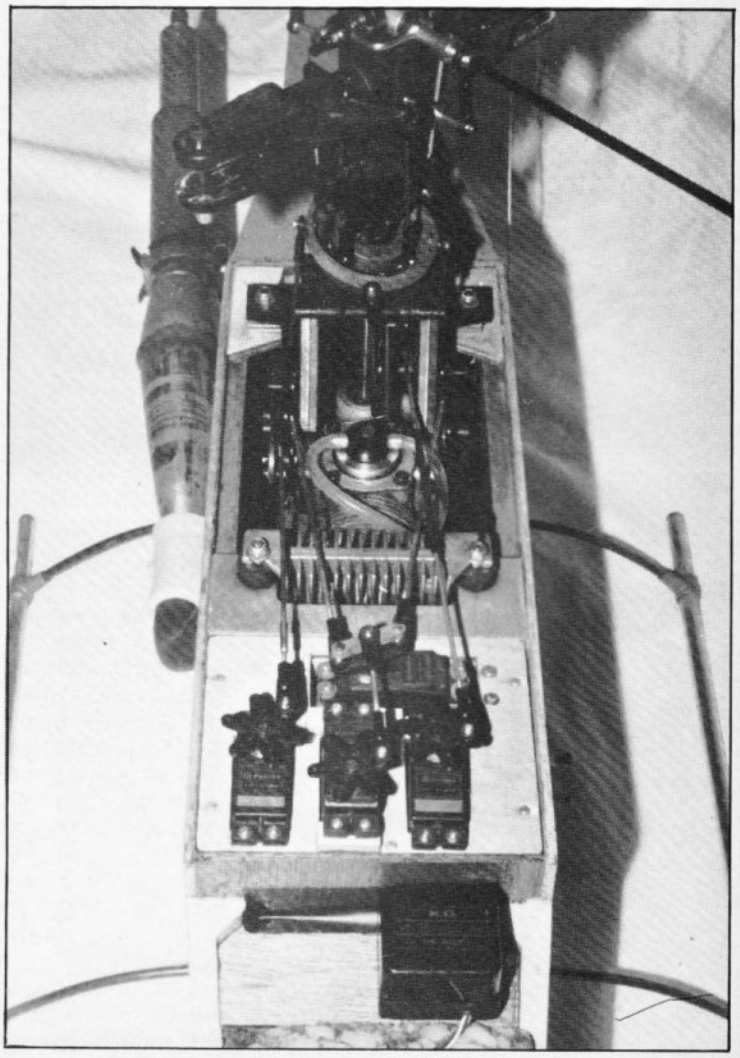
Access for maintenance was a strong influence in the design layout. Removal of the two piece top shows how well Simon has covered this aspect.

Brief Description

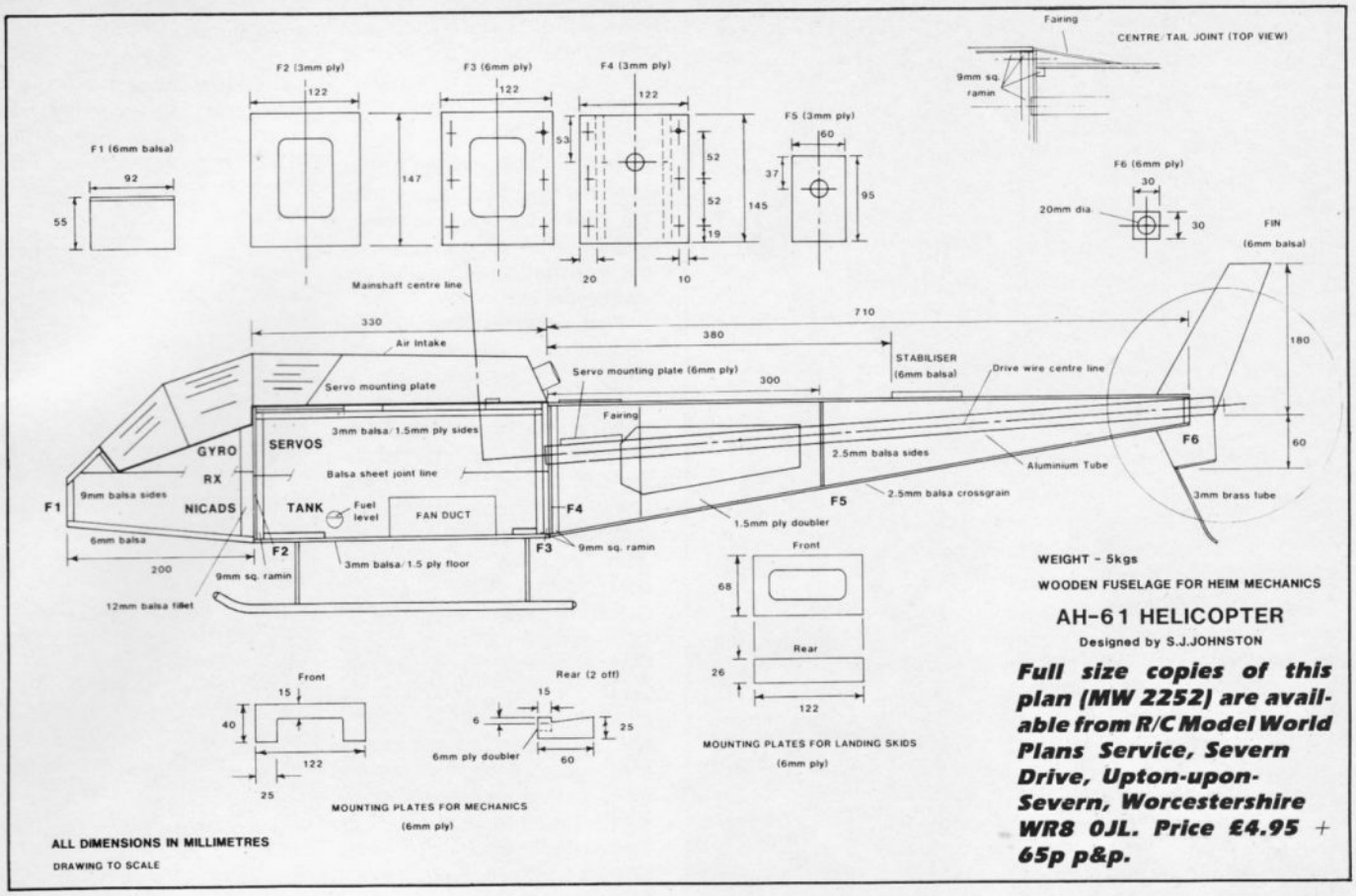
The construction of the fuselage is similar to that of a fixed wing trainer. The original model used a number of parts from the Heim Star-Trainer kit. However, I believe it would be possible (and cheaper) to build the model by just buying the Heim mechanics, nylon landing struts and a few Heim miscellaneous bits, such as the drive wire etc.

The fuselage comprises four sections: the tail section, bolted to the centre section, the nose section, glued to the centre section and finally the top section, which is screwed to the fuselage.

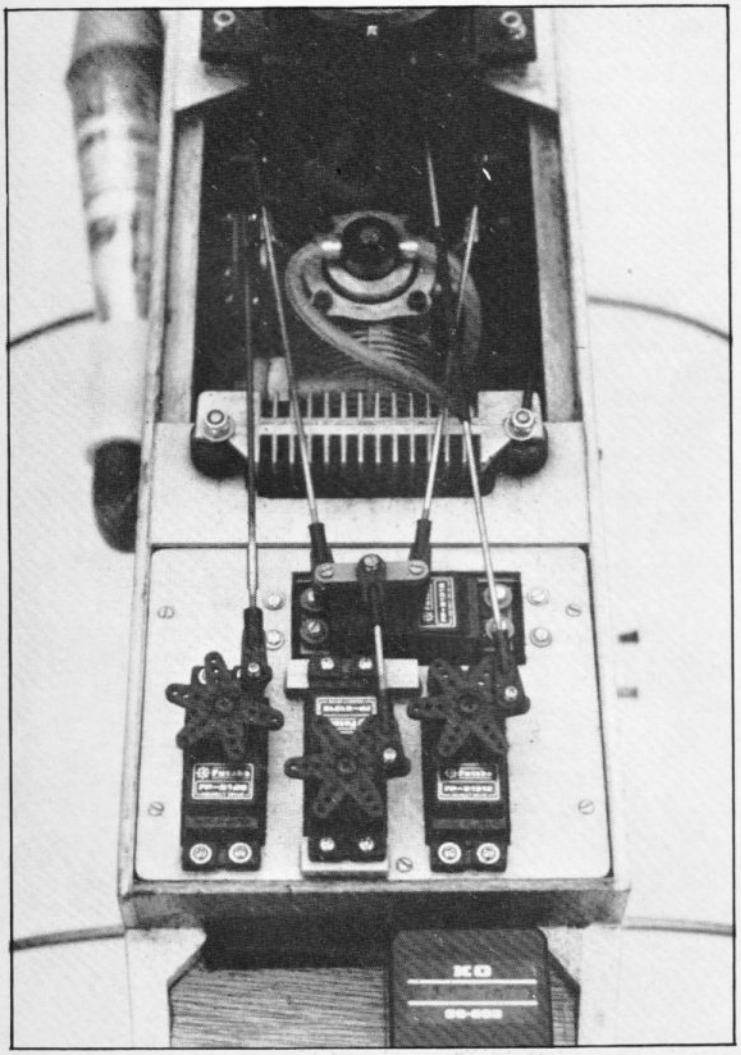
The nose section is made completely of medium/hard grade balsa and houses the Rx,



Overhead shot showing mechanical and radio layout. Simon has used a tuned pipe exhaust system but a standard silencer could easily be substituted, although with the latter an 8 or 9 to 1 gear ratio — available from Vario stockists — would give better results.



Full size copies of this plan (MW 2252) are available from R/C Model World Plans Service, Severn Drive, Upton-upon-Severn, Worcestershire WR8 0JL. Price £4.95 + 65p p&p.



A close overhead gives a better idea of the standard Heim servo layout and also clearly shows the four mounting points for the mechanics.

gyro and nicads.

The centre section is made from a combination of plywood formers and ply/balsa laminated sides and bottom. The mechanics are bolted to ply plates which are epoxied to the ramin side-rails. The servo mounting plate is screwed to the side-rails to allow installation of the fuel tank and access to the glow-plug. The fan cooling duct was originally made from thin ply; a more rugged solution would be to use G.R.P. Either wire landing struts or nylon (recommended) landing struts can be screwed to the plywood mounting plates. Alternatively, a more realistic wheeled undercarriage could be fitted, not to mention stub wings ... rocket-launchers ... etc.

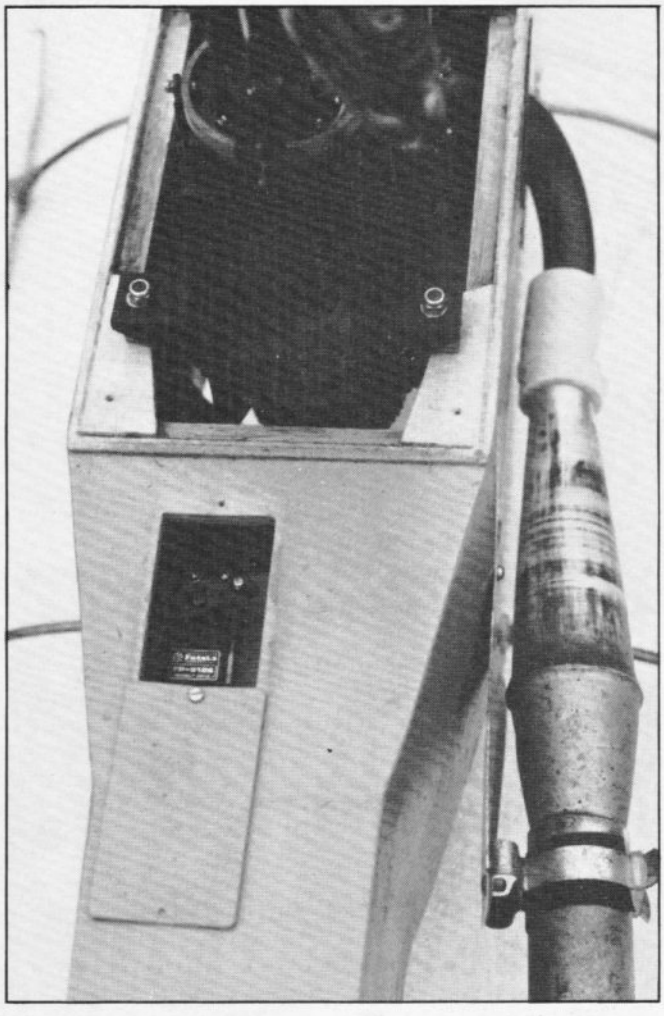
The tail section (ply/balsa) of the original model was constructed around the Star-Trainer boom, which provides both a strong mounting point for the tail gear-box and support for the tail rotor drive wire. The tube is held firmly to the centre section at the correct angle to the mechanics by the plywood doublers with the former bolted to the centre section. Alternatively, instead of using the aluminium boom, a 'golden-rod' drive tube could be substituted and the tail gear box mounted directly onto the rear former. In this case it would be necessary to lengthen the fuselage by about 30mm, extend the ply doubler to the rear former (which should be doubled in thickness).

The top section, is easily removable, providing access to the nose and centre sections, (see photo).

Building notes

Construction of the fuselage is quite straightforward. However, the following notes on the building sequence may be helpful:

Centre Section. After cutting out the balsa/ply parts and laminating the sides and floor, assemble the box section, making sure that the whole structure is square and true. the captive nuts should be fitted prior to gluing the ramin to the rear former. it is important to use a strong, fuel-proof glue (e.g. epoxy) for all the main joints in this highly stressed section. Glue some clear acetate sheet over the tank viewing hole to prevent dirt being sucked onto the tank, giving the impression



A view from behind the main shaft showing the tail rotor servo hatch and the plywood rear mounts for the mechanics.

it is full when it isn't. (Yes, you guessed!)

Tail section. The tail section sides and formers are assembled upside-down on the building board and the glue allowed to harden. The aluminium boom, complete with internal drive wire inserts, (or nylon drive tube/stiffener) is then threaded through the structure, and epoxied in place. If the aluminium boom has been used, the tail gearbox mounting bracket from the Star-Trainer kit should next be clamped to the boom tube, and the tail-pitch control rod installed. The tail rotor pitch control servo mounting plate (i.e. T.R.P.C.S.M.P.!) should be installed before sheeting the top and bottom of the tail section; a simple ply hatch provides access for servo installation. Insert the drive wire down the boom and then bolt the tail section to the centre section with six bolts, using plenty of Loctite! A balsa fairing hides the nuts.

The stabiliser span is 230mm.

Nose section. The nose section can be built straight onto the centre section starting with the sides and then adding the floor and nose. The gyro was mounted on a 3mm ply plate glued to the sides, (see photo). As previously suggested, the nose could be embellished with gatling guns, infra-red sensors, laser-finders etc. Since the original model was intended only as a trainer, the less that could be knocked off the better!

This view of the underside of the canopy clearly shows the typically fixed-wing approach to the balsa and ply construction. The separate rear section is necessary to allow removal of the canopy without disturbing the rotor head.

Top section. The top section can be built on the nose and centre sections by tack-glueing the sides (6mm balsa) and then adding the top sheeting (2.5mm balsa). After removing the top section, the fixing point reinforcements, cooling grille and rear panel (complete with 'jet exhausts') is added, (see photo).

Finishing. It is strongly recommended that a complete 'dry-fit' of the mechanics (including exhaust system), radio gear, tank, glow-plug connection, etc., is carried out before finishing, so that all necessary holes in the fuselage can be made prior to fuel-proofing. Even with a well-sealed exhaust system, a lot of fuel/dirt will accumulate inside the centre section; therefore apply internally at least two coats of fuel-proofer. I finished the fuselage using 'dope and tissue', followed by some grey primer (dark green might have been a more convincing choice), and finally Tufcote.

Setting-up. No particular problems arose from setting-up the model. Access, with the top section removed, was excellent. Control throws, etc., should be adjusted in accordance with the Heim instructions. If possible, have your local Heim expert check everything over.

Conclusions

Was it worth the effort? The answer must definitely be yes! The design and construction caused few headaches and any fears regarding the strength or practicality of using wood for a model helicopter were soon dispelled as I began to build up flying hours.

After three years, during which time the model has had several 'incidents', the helicopter has proved to be very sturdy and reliable. The repairability can perhaps be illustrated by one accident, which occurred whilst the model was hovering at 15 feet altitude. A faulty pitch servo (honest!) caused the model to rear onto its tail and slide-in. At first it appeared that the fuselage had completely smashed, however closer inspection showed that the tail section had broken at the glue joint between F4 and the square section ramin. The repair involved unbolting the damaged F4, making up a new former, glueing it onto the existing tail section and bolting the tail assembly back onto the centre section. This may sound complicated, but the repair was achieved in one evneing, requiring no spare parts and cost virtually nothing.

The plan incorporates a few 'mods' which, I think, are an improvement on the original design. The undercarriage mounting points have been 'beefed-up' since I initially underestimated the hammering that area can get with autorotations (like mine!).

So, if you have, or are thinking of buying some Heim mechanics, want to keep training costs low and the idea of a wooden fuselage appeals, then go for it!

Footnote: Remember to look out for woodworm in your pre-flight checks!