
ZK-BVU

PHOTOGRAPHY: ARTHUR HEENAN

Fletcher FU 24-950

By Arthur Heenan

The most popular of New Zealand's agricultural planes lends itself well to R/C Sport Scale.

The Fletcher Fu 24 was designed by John Thorp, of the Fletcher Aviation Corp. of California, and was developed to meet the requirements of the New Zealand agricultural industry. The first Fletcher arrived in N.Z. in 1954, and this aircraft is still in operation today, after many years of accident free service. In 1965, all manufacturing rights were purchased by Air Parts (N.Z.) Ltd. and production has continued ever since, subsequently by N.Z. Aerospace Inds., and now by The Pacific Aerospace Corp.

The Fletcher is a low wing monoplane of all metal, semi-monocoque construction, built on the "stressed skin" principle. Original power was a 225 HP Continental but the Lycoming IO-720 400 HP is now standard on the Fu-24-950. Wingspan is 42 feet; length 31 feet, 10 inches; height 9 feet, 4 inches; and wing area, 294 square feet. Maximum payload is 2320 pounds.

The Fletcher is the predominant type in use by aerial application companies in New Zealand, and currently outnumbers all other types combined. Fletchers have also been exported to such countries as Australia and Pakistan. Its exceptionally good flying qualities and short strip handling ability contribute greatly to its outstanding success as an agricultural aircraft. A utility, cargo/passenger version has also been produced.

A recent development has been the "Cresco", powered by the Avco Lycoming LTP 101 turbo-prop of 600 HP performance and payload having been increased dramatically.

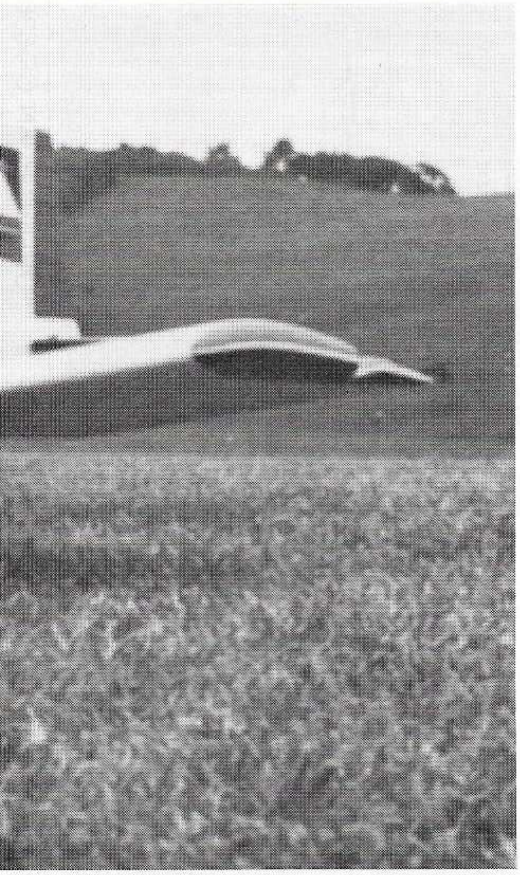
The model

After getting past the basic learning stage of flying a four channel R/C trainer type, my thoughts soon turned to building a scale model. But what to build? I resisted the temptation to build an AT-6 Harvard — not a suitable subject at my level of piloting proficiency. The other subject that came to mind was the Fletcher Fu-24, which I recognized as being a very suitable subject with its big wing to keep the wing loading down for easy flying. The flight characteristics proved to be outstanding, and it looks just like the real thing in the air.

The Fletcher was the author's choice for a first attempt at scale. The large wing area keeps wing loading down and thus keeps flight characteristics within the scope of a "low" time R/C pilot.

Working from 3-views in "Australian Modeller" magazine, a scale of 1½ inch = 1 foot (⅛ scale) was decided on to suit my OS .40. This yielded quite a large 63 inch span model, with plenty of wing area. I duplicated the rigging angles of the full-size with right thrust plus lots of down thrust and two degrees positive wing incidence. This worked perfectly. I had quite a few firsts when building this model, including first time at molding in fiberglass, my first molded canopy, and my first attempt at putting a really good finish on a model. All were very successful.

Great care was taken in preparing the model for its first flight, everything being checked and double checked. At the last minute 2 ounces of lead was put in the nose to be certain it would not be tail heavy. After quite a long run, the Fletcher lifted off and climbed out smoothly. It was soon apparent that it was nose heavy, the precaution of the extra nose weight being unnecessary. After several circuits, a safe landing was accomplished, although rather fast and a little heavy. After removing the lead from the nose the model flew perfectly. The only other change neces-



sary being a slight alteration to the aileron trim. This model was damaged beyond repair on its 28th flight when radio contact was lost with it — possibly interference. Of course the radio functioned perfectly afterwards.

A second model was soon started, using the undamaged tail surfaces from the first one. This is the one in the photographs, and is now five years old and still flying perfectly. Just recently I built a hopper into it so I can "spray" with it, using talcum powder for the "dust". This is detailed on the plans and is well worth the little added effort.

Construction

This is a model for the experienced builder so the following notes will cover the basic building sequences and special areas of interest. There is quite a lot of construction time in this model, mine being built over a period of 7 months. Take the time to make a kit of all ribs, formers, etc. before starting to build. Select your wood carefully; lighter models fly better.

Wings

Build the outer tip panels first, which have dihedral on the completed wing. The ailerons are built as part of the wing, and separated later. Pin down the lower spars then glue in the ribs, top spars, dihedral braces and false leading edge, also the 3/16 sheet vertically between R2 and R4 in front of the balanced aileron tip. Sheet the top surface with 1/16 balsa after first cutting slightly to allow the sheeting to be glued down onto the front of the R5 ribs.

Next, construct the main wing panel, which is flat, joining in the tip panels with their correct dihedral. If using 36 inch long stock, splicing of the spars and sheeting for the main panel will be necessary. Stagger the spar splices out toward the tips, for strength. The sheeting is best spliced near the center section where the fuselage will hide any poor joints.

The landing gear mount is one piece, going right across the center section. I made this from a 5/32 × 3/4 inch ply strip, with 1/8 × 1/4 inch hardwood strips glued on to form the channel for the torsion bar type main landing gear struts. Don't omit the ply riblets, R1a, which hold the landing gear mount securely. After sheeting the top of the main panel, the aileron linkages can be installed. Slots must be cut in the ribs for the bellcranks to fit through. Sheet the bottom of the wings next, taking care that no warps are being built in. When gluing on the 3/8 inch leading edge, these can be overlapped at the dihedral break for extra strength.

Mark the ailerons onto the wings, top and bottom; probing with a pin will confirm the spar positions. Cut the ailerons free and face wing and ailerons with 1/16 sheet. Glue on the 3/8 inch aileron tip leading edge and the wing and aileron tip blocks. Carve and sand all to shape.

Finish off the wing construction by completing the servo wells, the hole through the center section for the hopper, and drilling the holes for the wing mounting bolts. A strip of 1/16 × 1 inch ply is glued onto the bottom of the wing at the wing bolt positions for reinforcement. The main landing gear struts are bent from 5/32 inch wire and are retained in the wing with aluminum straps and self tapping screws. Cut the slots for the aileron hinges, but don't glue in yet.

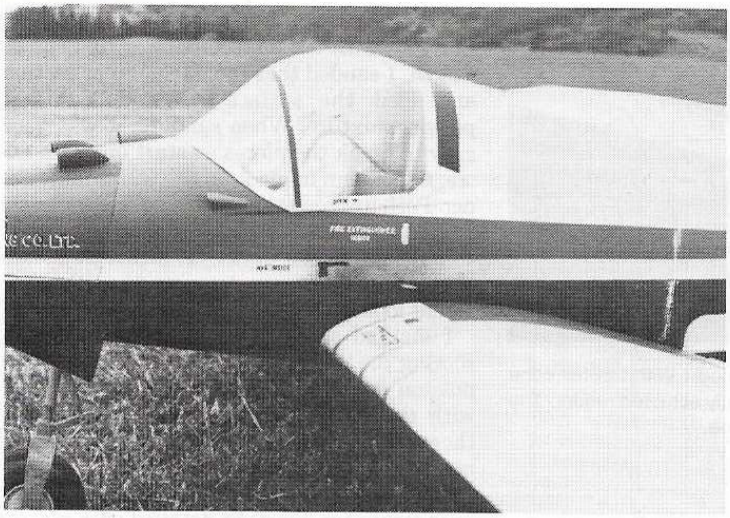
Stabilator

This was my first model to feature an all-flying tailplane and a great deal of thought was put into deciding what would be used for the stabilator bearings. In the end I used plywood plates, as shown on the plan. I had my doubts about using plywood as I expected that in time these would wear, however the original bearings in my Fletcher are still in perfect condition. On another model, I have used steerable nose gear bearings for the stabilator bearings, quite satisfactorily. Whatever method is used, however, good slop free bearings are necessary to prevent the stabilator from vibrating. When the model is completed and painted, the ply stab bearings are glued into the fuselage. Wheel collars on the pivot wire prevent sideways movement of the stab in the bearings.

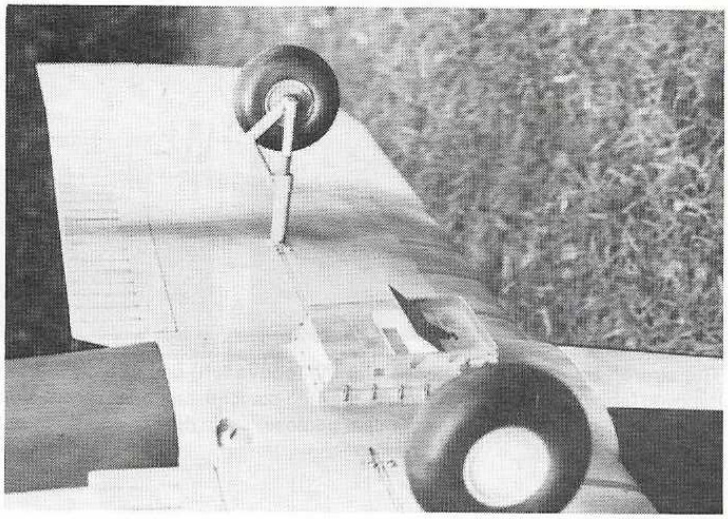
The stab is a simple structure. The ribs are slipped into place on the pivot wire before gluing in place. The pivot wire should already have the bearings and wheel collars in place, of course. Note that the spars go right through the fuselage, and the leading edge is cut away when the stab is complete. Scrap balsa fill is required to fill the gap between the top and bottom sheeting around the fuselage cut-out. Epoxy the pivot wire into the stab, with scrap balsa between it and the spars.

The stab horn is glued to the main spars, and I reinforced this joint with a scrap of 1/16 inch wire bent to a right angle and epoxied to the horn and along the spar. Because this is an all-moving stab, do not use a

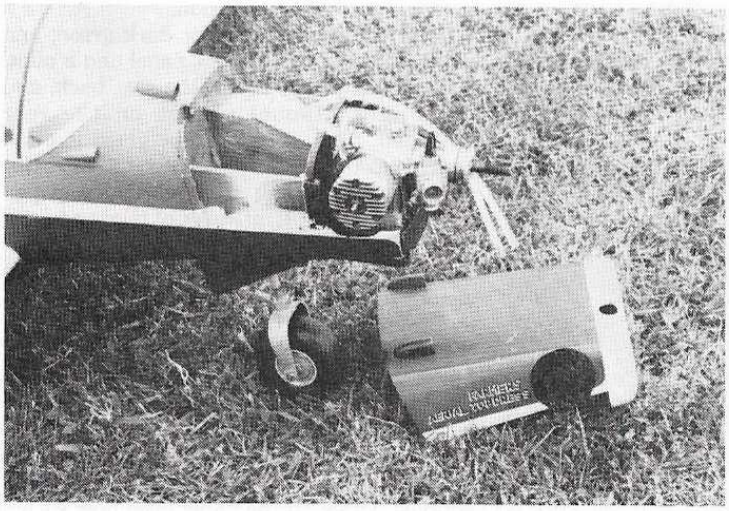
Only the dirt and the spray booms give away the fact that this is the real thing. Art's version is very true to scale outline.

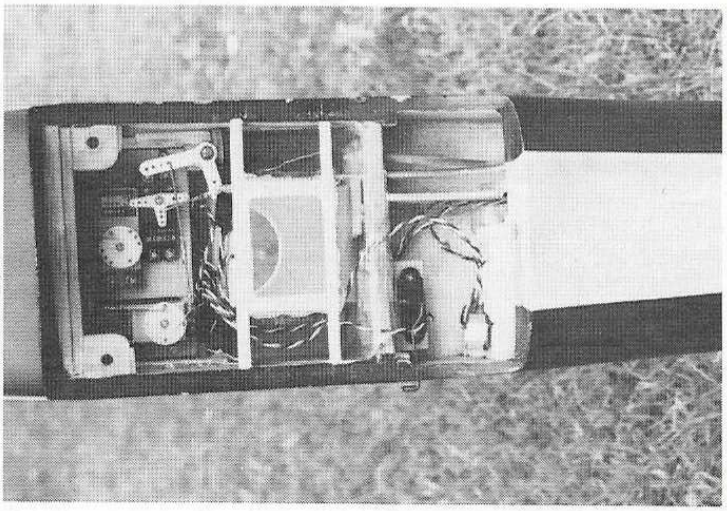


Art's first attempt at molding reveals itself in the canopy (**above**) for the Fletcher. Plug was made from a carved balsa block, filled and sanded smooth. Top cowling (**below**) is fiberglass; it can also be balsa block.



The hopper box, a nice added touch, builds easily from 3/16 stick and 3/32 sheet (**above**). Landing gear detail is also easy to do. There's ample room to fit the radio in the fuselage (**below**) along with the hopper.





shorter horn than is shown.

Fin and rudder

The fin is a simple built-up framework. When sheeting, check carefully that no twist is built in. The sheeting extends back slightly behind the tapered trailing edge, which must be hollowed to match the rounded rudder leading edge.

Build the rudder framework on one side sheeting. When sheeting the second side, view from the rear to be sure there is no twist. Make up the rudder hinges as detailed on the plan. The top hinge is 1/16 inch wire epoxied into the rudder, with a scrap of nylon hinge, drilled to suit, epoxied on the top of the fin. The bottom assembly must have the horn and a washer, above the mounting bracket, soldered to the wire. A cut down nylon horn can be used for the bracket, which will be screwed to F11 on the rear fuselage. Epoxy the hinge wires into the rudder before capping the leading edge with 1/4 inch balsa, which tapers to 5/32 inch thick at the top. This is rounded-off, and the trailing edge of the fin hollowed to match. The sketch on the plan illustrates this. The fin and rudder are finished off with the balsa top fairings.

Fuselage

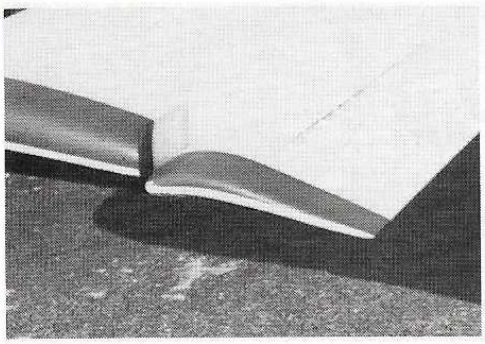
This is basically a box framework, to which are added top, bottom and side formers to form the rounded cross-section, before sheeting with 3/32 inch balsa.

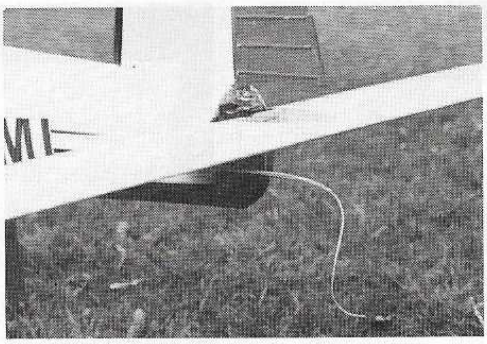
Build the side frames over the plan, but do not include the 1/4 inch forward sides at this time. Assemble the framework over the bottom view plan. Cut the side frames part way through at the rear F5 position, squeeze glue in, and pin bottom side up on the plan. Glue in the 3/16 inch square cross-pieces top and bottom, followed by the side and bottom formers, and bottom stringers. Sheet the sides and bottom with 3/32 inch balsa. I planked around the sharper curves, and sheeted the remainder.

The 1/4 inch sheet forward sides, complete with ply doublers, are now attached. The temporary keys hold the sides up from the building board in their correct position. Note that the right side-thrust appears reversed on the bottom view plan. Join at the front with 1/4 × 1 1/4 stick . The fuselage can now be removed from the plan, and formers F1 - F4, and the cockpit "floor" glued in. F1 is installed at the angle to build in the correct side and down-thrust. Install the nose gear bearings next. There isn't much room for them to fit under the tank so plan carefully. I used belly mounted "Micro-mold" (English) N-65 bearings, which were bolted to a ply plate installed between F1 and F2. Bulkhead type bearings could be mounted to F2. Box in the tank with 3/32 sheet, bottom and side, between formers F1 - F3. The tank can be made removable through a hole in F3. Install the nose gear and throttle cables before sheeting the nose. The F13 formers are glued on the top of the 1/4 inch sides, and then the 1/32 ply cockpit coaming. Develop a template on thin card first to get the correct shape for the coaming, which can be finally shaped at the rear when trial fitting the cockpit canopy.

Now would be a good time to trial fit the wings to the fuselage. Carefully sand the fuselage for a neat fit, ensuring that the correct two degrees positive incidence is maintained. The stabilator can also be trial fitted, but do not mount permanently.

Add the top rear formers now. Before sheeting the top, some of the formers near the rear of the fuselage will have to be trimmed to allow clearance for the rudder and stab pushrods. The engine cowling may be made from balsa, or molded in fiberglass as I did on my second model. For this I carved and sanded a polystyrene foam block to shape, but about 1/16 inch undersize to allow for the thickness of the molding. Coat the polystyrene pattern with five minute epoxy to protect it from the polyester resin, and then lay up the cowling over it. Three layers of seven ounce glass cloth should do it. When it has cured, fill the surface with a mixture of resin and micro-balloons and sand smooth. I epoxied aluminum brackets to the inside of the cowl, and attached it to the fuselage with hidden self tapping screws: two into F2 with screw-driver access through the top air-scoops, and one in the front. Likewise, I molded the rear fuselage fairing in fiberglass, and attached it in a similar manner with screw-driver access through the vertical slot in the rear of the fairing. Alternatively, it can be carved from balsa, but should be made re-





The aireron tip shape is achieved with the (**above left**) use of a carved balsa block. With the tail cone removed (**above right**), it's easy to see the lead-out for the antenna, and the internally actuated rudder. The three bladed prop (**below**) serves a dual purpose; static display and flying the plane.

movable for access to the rudder and stab horns.

A very realistic front landing gear strut can be made as detailed on the plan. Sweat solder the 5/32 inch wire into the top of the brass tube, after drilling out to suit. Tap the bottom end for the 3/16 inch counter-sunk brass screw, and bend the wheel fork from hard aluminum. Run a bolt through 5/32 inch O.D. brass tubing for the axle, with plastic tubing spacers on each side to center the wheel. The lower cowling is built onto the fuselage with triangular formers, and covered with 1/32 ply. When gluing the fin to the fuselage, scrap packing will be required to fill the gap between the fin and the curvature of the fuselage top. A good strong joint is required here. Finalize the rudder hinging now.

The hopper can be built into the completed fuselage. Use 3/16 square stick for framing at the wing/fuselage junction, and 3/32 sheet for the rest. To seal the joint, when the wing is fitted to the fuselage, I used silicone rubber. Tape a piece of thin plastic across the wing, apply silicone rubber to the fuselage hopper opening, and bolt the wings in place till it sets. This works well. Build the under wing fuselage fairing onto the bottom of the wing, while mounted to the fuselage. The hopper outlet box is built from 1/16 ply and scrap balsa. The slot in the bottom limits the flow rate of the "dust". The door, hinged at the front, is worked from the retract switch on the transmitter, and has two positions — open or closed.

The cockpit canopy will have to be molded for the Fletcher, but is well worth the time involved. This was my first attempt at molding and was very successful. All the work is actually in making the pattern, which I carved from block balsa. A very smooth surface is necessary, filling with a mixture of clear dope and talcum powder works well. Several coats will be required, sanding smooth after each. I built a vacuum former from the article in the April 1976 issue of FLYING MODELS for molding the canopy. However, a canopy can also be stretch molded over the pattern after heating the plastic in front of an electric heater. Several attempts may be required if the acetate is not hot enough. I found 1 mm thick acetate to be ideal.

Finishing and detailing

The Fletcher was finished in exactly the same way as detailed for my Piper Pawnee Brave, in the July 1982 issue of FLYING MODELS. After sanding the airframe really smooth and filling all gaps, dings, etc., brush on a couple of coats of clear dope. Sand lightly, and then cover with lightweight silkspan tissue, applied damp, and doping in place. When completely dry, brush on a coat of dope thinner.

The surface was filled with a mixture of clear dope and talcum powder. Two or more coats will be required to obtain a good finish, sanding after each. Finish with a coat of clear dope and then spray on a coat of grey primer, before adding the scale detailing.

Being my first attempt at detailing a scale model, a lot of thought was required as to how to duplicate everything. By far the worst job was making the stiffening crimps which are along the trailing edge of the wing, top and bottom, and also on the rudder. Starting with 1/16 square balsa strips cut to length, I sanded these to a triangular section and filled the surface with a dope/talcum powder mixture. When sanding, it was very easy to break the pieces so start out with extra. Glue them in place on the wings and rudder. Perhaps you may be able to find a plastic molding — "Plastistruct" or similar — that would save all the work, but please duplicate the crimps in some way as the Fletcher would look very bare without them.

I marked some panel lines on by lightly scoring the surface with a sharp model knife, not too deeply though. I wasn't very happy with the result and next time would draw them onto the painted model, using a draftsman's pen. Carve the small cowling top airscoops from scrap balsa. The main landing gear struts can easily be detailed with plastic tubing, pushed on to give the thickness. Make the other detailing from thin aluminum strips, pins, and plastic tubing. Simple and very effective. Sand the tubing lightly before painting for better adhesion.

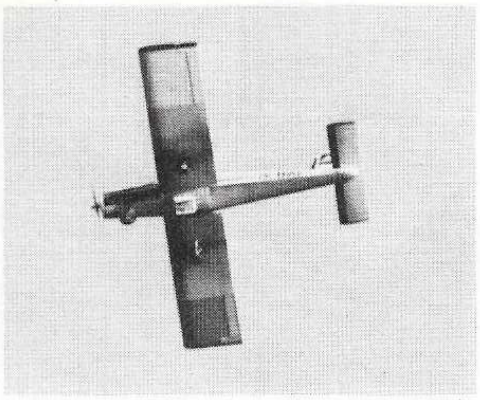
Paint the cockpit interior dark green, and add at least an instrument panel and a pilot. I also included the top of the seat back, and the Flight Manual pocket on the rear bulkhead. The canopy can be glued in place next. I used five minute epoxy for this. Cut the canopy framing from cartridge paper, and glue in place. Quite a lot of trial and error is required in developing the shapes to match the curvature of the canopy. Mask off the canopy with scotch tape and brush on several coats of clear dope to seal the surface of the paper.

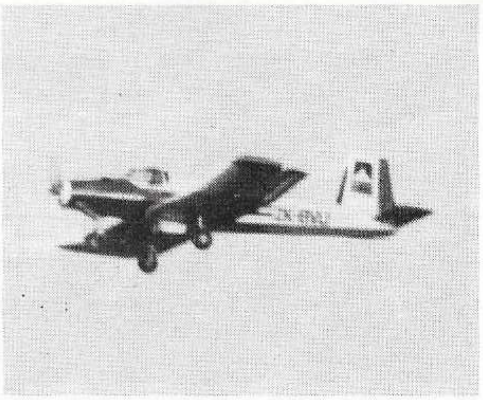
My Fletcher was painted with enamel paints, but use your own favorite method here. The lettering was all applied by hand using sable brushes, but the large registration letters would be better masked off and sprayed. Draw on the panel lines now with a draftsman's pen filled with thinned grey paint. Don't use black as it doesn't look right, except for the flap and stab trim tab outlines. Some weathering is desirable for realism. Any full-size Fletcher is always very dirty under the wings from dirt thrown up by the main wheels. Duplicate other stains, worn paint, etc. to your satisfaction. I finished off with a coat of matt polyurethane to remove all the gloss for a realistic finish. Waxing the model with a paste type car wax before flying is a good idea, as it makes the model easier to clean.

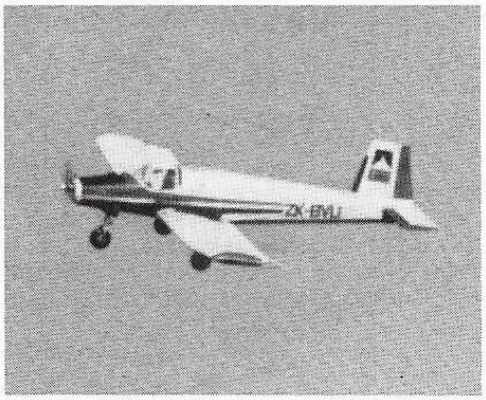
Assembly and radio installation

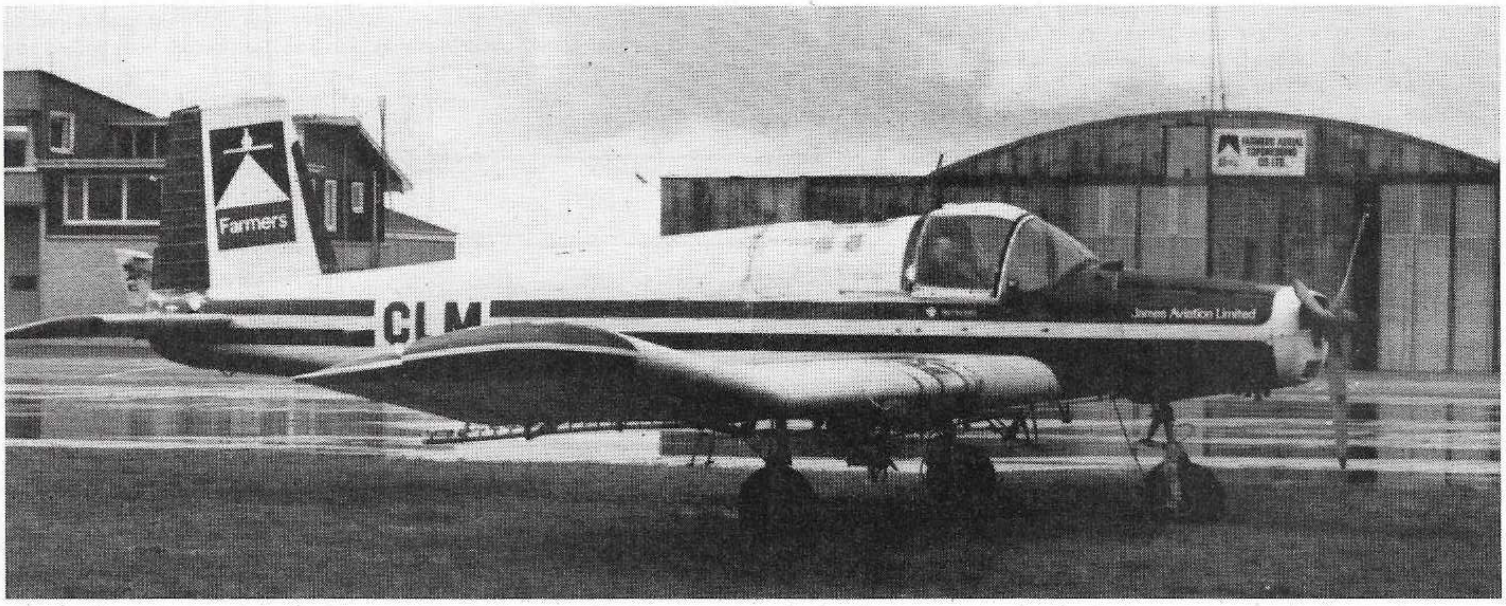
Now is the time to permanently hinge the ailerons, and glue the stabilator mounts into the fuselage. Check the stab alignment very carefully when doing so. Assemble the model, complete with fuel tank, engine, muffler, cowling, landing gear, rudder, etc. and trial fit the radio components in the fuselage to achieve the correct balance point. Balance carefully at the 30% wing chord position, which is 3 3/16 inches back from the leading edge, and your Fletcher should fly perfectly.

The internal hopper takes up a lot of room in the fuselage, where the radio would normally go, but there is still room. I mounted the servo tray immediately behind the hopper, with the receiver under the servos. The battery went under the cockpit with the internally mounted switch. My Fletcher has had several different radios installed over the years. At present, I am using a New Zealand made "Teletrol" set, with Futaba servos mounted on a plywood tray. Use 1/4 square









A model for the experienced builder, the Fletcher (**above**) has excellent flying characteristics using an OS .40. The Fletcher, in flight, presents a very scale appearance (**top photos**). The actual plane (**center**) was a design of Californian John Thorp and it's the most widely used duster in New Zealand.

hard balsa pushrods to the rudder and stab. A shock absorbing device of some kind in the steering linkage to the nosegear is desirable to protect the servo. I use an internal receiver aerial in my Fletcher for appearance sake. Epoxy in a nylon tube, running back to the tail, to run the aerial in. Take great care when setting up the stab with neutral incidence before the first flight.

The following control surface movements work well for me: ailerons — 9/16 inch each way, although a little differential with more up than down is a good idea; rudder — 1 inch each way; and stabilator — 3/8 inch each way. My original Fletcher weighed 5 1/2 pounds and the present one is 6 pounds. I needed about 1 ounce of lead in the tail to get it to balance just right. I used the early type of DuBro muffler on my Fletcher, and this quietens the OS .40 quite effectively as well as being quite unobtrusive.

Flying

Flying is what the Fletcher does best. Take-offs are accomplished by applying power, keeping it tracking straight with a little rudder, and when sufficient speed has been reached easing back on the stick to rotate. Keep the climb-out angle shallow for realism. Apart from the take-off, all flying is normally done at about half throttle. Scale flying speed is very good and the model looks extremely realistic in the air. People often comment on this. Sowing its load of 4-6 ounces of talcum powder "dust" really adds to the illusion. A background of blue sky, trees or hills is best, as the "dust" doesn't show up well against an overcast sky. The Fletcher flies very smoothly and is a real pleasure to fly. I am really enthusiastic about its good flying qualities.

With its low wing loading, landings are easy, but be sure to flare out sufficiently to prevent bending the nosegear. Control responses remain excellent at all times. The first flight was with a 10 × 6 two blade prop, but all subsequent flying has been with a Tornado 10 × 4 three blade prop. This works extremely well and is to be recommended.

Final comments

I have no criticisms to make of this model. The only minor problem I've had was with the nosegear being bent after driving it into the ground in the occasional heavy landing. That is the pilot's fault, of course. The nosegear should be easily removable for servicing. While there is a lot of time involved in the construction of this design, the flying makes it all worthwhile. I can thoroughly recommend it in that department. The Fletcher is exactly scale in all outlines, etc., and never fails to gain a place when flown in competitions. I have managed two, second places, and a third at the New Zealand "Nationals".

In conclusion, I hope you get as much pleasure and enjoyment from your Fletcher as I have had from mine. Don't forget to send me a photo of yours, and if I can help with documentation in any way please write. My address is A. Heenan, Fortification, No 1 R.D., Wyndham, New Zealand.