GRUMMAN AMERICAN COUGAR

A beautiful 1/6 Stand-Off Scale version of Grumman's light twin for .20 or .25 cu. in. engines designed by Dennis Tapsfield, one of England's top scale designers.

Multi engined models have always proved something of a fascination to me, so that I'm always on the lookout for a prototype that has those features, which I think, could contribute to a successful R/C model. When I first saw the photos of the prototype Cougar, I lost no time in writing to Grumman in the U.S.A. who very kindly sent me a copy of the factory 3-view drawings (you can't do better than that!) and the area agents in the U.K. were also very helpful when they supplied colour brochures of the aircraft. The colour scheme, and registration on this model are authentic, see the cover on Flight International of the 5th August 1978.

The main requirements, in my opinion, are: Adequate wing area, engines fairly close to the fuselage, to minimize the assymetric power/drag which occurs if one engine fails, lots of side area behind the Centre of Gravity, engines well forward of the Centre of Gravity also helps with single engine performance.

Simple lines also make it possible to produce a lighter airframe, and weight is always a prime consideration with multi engined models. I always find it difficult to keep to planned, or should I say, hoped for, weights, as there is always an odd 8 or 12 ounces that sneak in when your back is turned, and the Cougar was no exception. I aimed for an all-up finished weight of 8½ pounds, the resulting 9¼ pounds speaks for itself!

Do select your wood with loving care, do not accept without question, any material which might be pushed at you in the model emporium, since you could finish up with a guided missile and not a model aeroplane! The wing loading on the Cougar is around

28 oz. per square ft., a very fair figure for a scale twin. I shall be very pleased to hear from anyone who builds the model, and how they made out. The wing area of this model has been increased by 15% and the engines moved in towards the fuselage by 1''. Neither of these changes detracts from the overall appearance of the model, indeed one would have to take measurements to find them, and they do contribute favorably to

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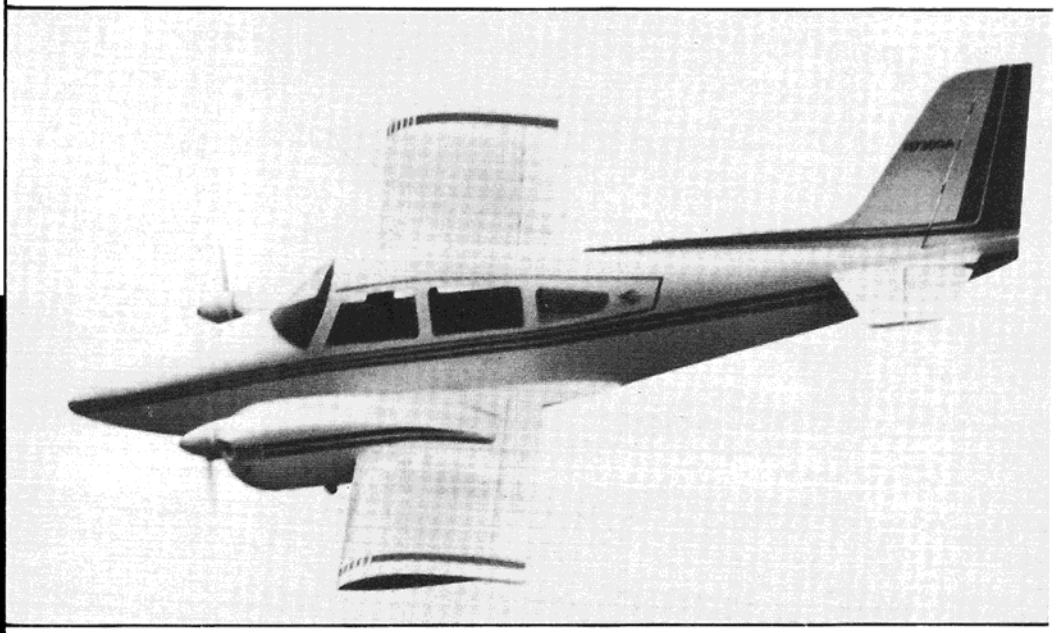
Designed By:
Dennis Tapsfield
TYPE AIRCRAFT
Stand-Off Scale (1/6 Scale)
WINGSPAN
76 Inches
WING CHORD
10⅝ Inches
TOTAL WING AREA
815 Sq. In.
WING LOCATION
Bottom of Fuselage
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
3¼ Inches
O.A. FUSELAGE LENGTH
59⅝ Inches
RADIO COMPARTMENT AREA
(L) 17'' x (W)6⅝'' x (H)3'' min.
STABILIZER SPAN
28 Inches
STABILIZER CHORD (incl. Elev.)
6⅝'' (Avg.)
STABILIZER AREA
185 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
11½ Inches
VERTICAL FIN WIDTH (incl. rudder)
8⅛'' (Avg.)
Rec. ENGINE SIZE
(two) .20-.25 Cu. In.
FUEL TANK SIZE
(two) 6 Oz.
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
6
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.,
Optional Retracts & Flaps
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Ply & Hardwood
Wing ..... Balsa, Ply & Hardwood
Empennage ..... Balsa
Wt. Ready To Fly ..... 148 Oz.
Wing Loading ..... 26.15 Oz./Sq. Ft.

the behaviour of the aeroplane. It is, nevertheless, a Stand-Off Scale model.

It is **not** recommended that you fit larger motors, since the model should not be overpowered with one engine out; too much power on one side at low speeds will produce a snap roll or spin quicker than you can blink an eye.

CONSTRUCTION

I feel sure that if you are considering

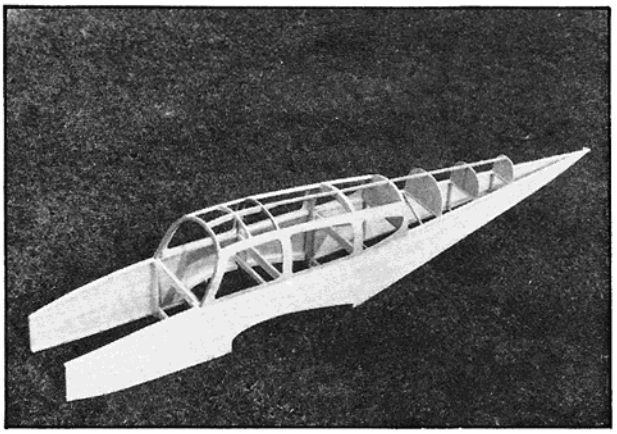


building this model, it should be after a progression of several other types; since it is not for the inexperienced modeler. I do not intend to write a ''blow by blow'' instruction sheet! What I will do, is try to set down the construction in the right order, and to bring to your attention any small but important items which might possibly be overlooked.

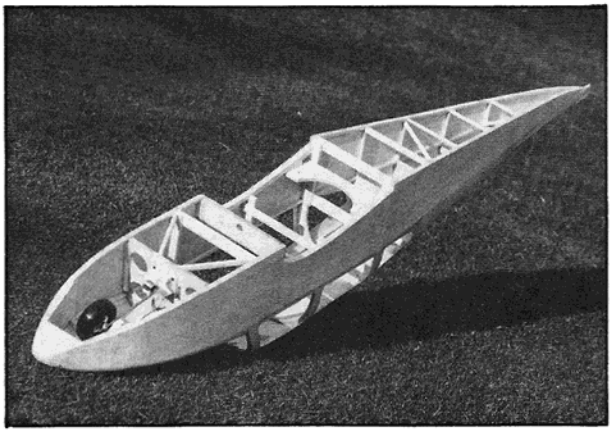
If you have ever built a multi engined model before, you are well aware that the wing is the model, well almost. It carries the engines, undercarriage, flaps, ailerons, and all the servos to drive them, so I always start with the wing.

Wing:

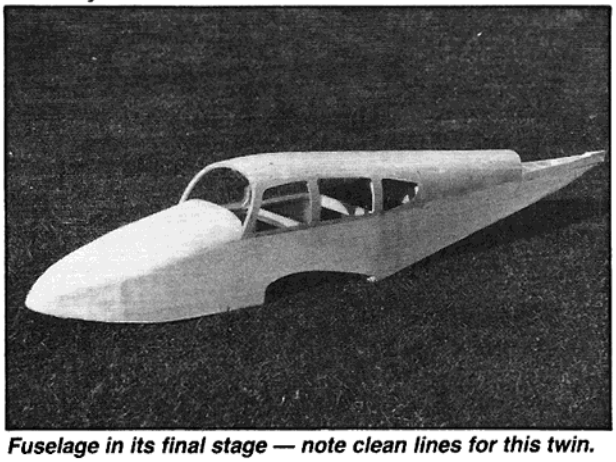
Cut out all the required ribs, and assemble the frame of the left and right wing panels over the plan. When dry you can join them together with the dihedral braces. Do not skin them yet! At this point, you must make provision for the four servos in the centre, complete with all the cables for the aileron and throttle controls. Fit the retracts (I used Goldbergs). Use 1/16'' music wire rods to operate these as anything thinner is likely to buckle in compression. I also made two brass eyes from .040 sheet, as I felt the tinplate ones supplied were inadequate. Make sure that everything is installed, blocks for the aileron and flap hinges, etc., etc. Skin the underside of the wing. When you are satisfied that the wing assembly is warp-free, you can skin the top surface of the wing. It is a big advantage to use a wing jig. I used two pieces of blockboard each 18'' x 36'' hinged in the centre; you can set the dihedral angle, pin the wing in position with small blocks in strategic places to hold it true, and skin the top, and ''presto'' you have a true wing which will only change shape if you break it! Add the balsa tips and set aside. Do not fit the wing root riblets yet. You can make the ailerons and flaps at this stage, choose a light grade of balsa for these.



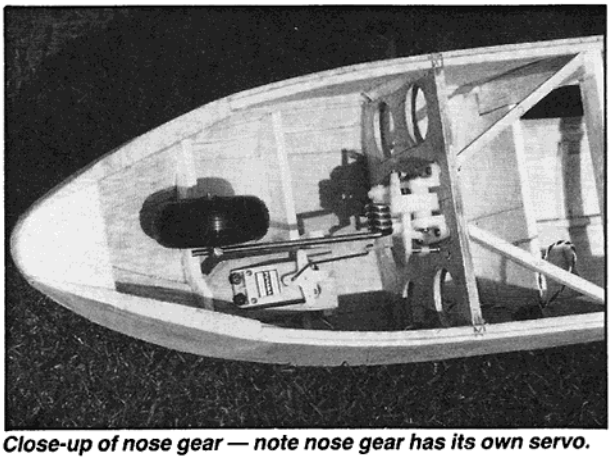
Basic fuselage completed — sides are pre-bent before assembly.



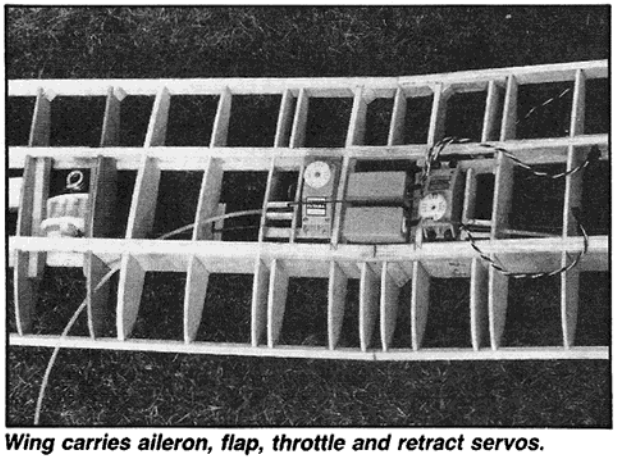
Goldberg retract nose gear installed — gear retracts forward.



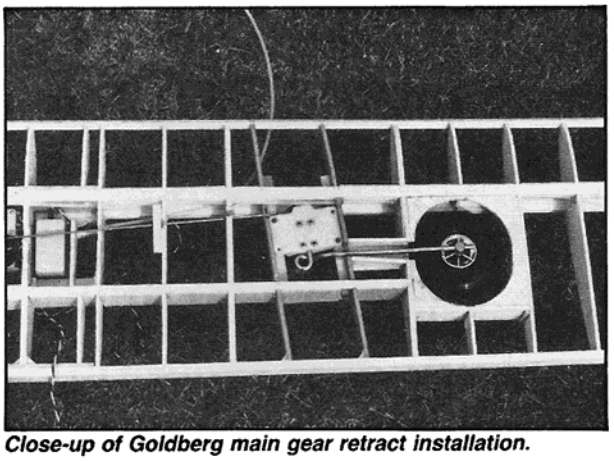
Fuselage in its final stage — note clean lines for this twin.



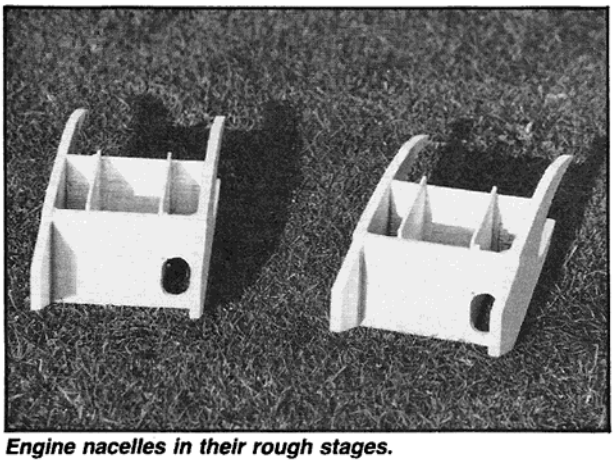
Close-up of nose gear — note nose gear has its own servo.



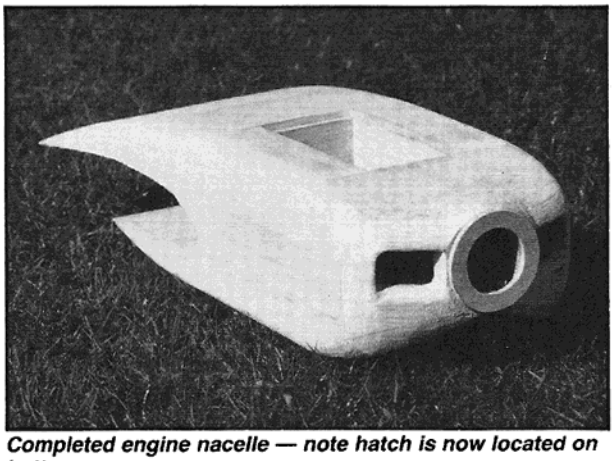
Wing carries aileron, flap, throttle and retract servos.



Close-up of Goldberg main gear retract installation.

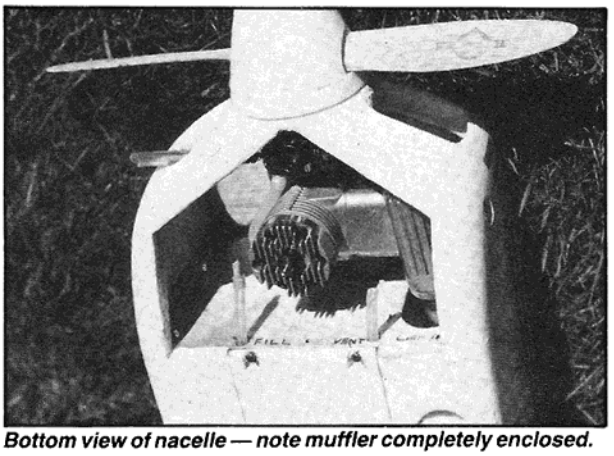


Engine nacelles in their rough stages.

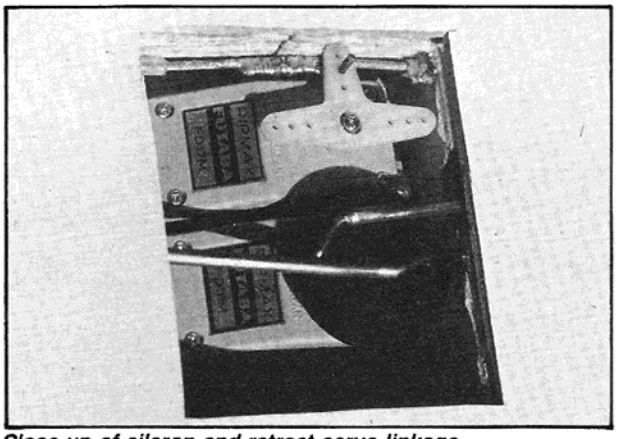


Completed engine nacelle — note hatch is now located on bottom.

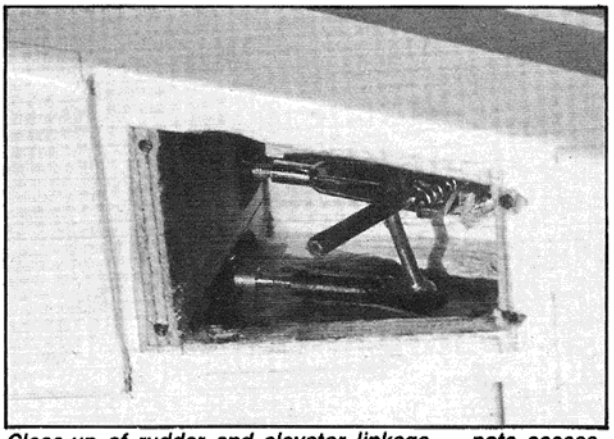
Cougar complete and ready to be covered.



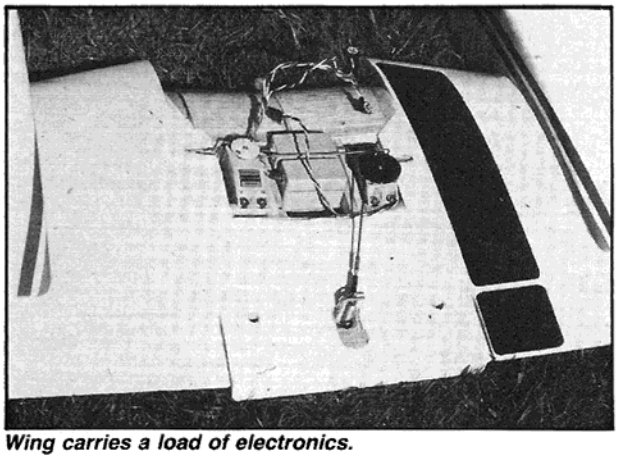
Bottom view of nacelle — note muffler completely enclosed.



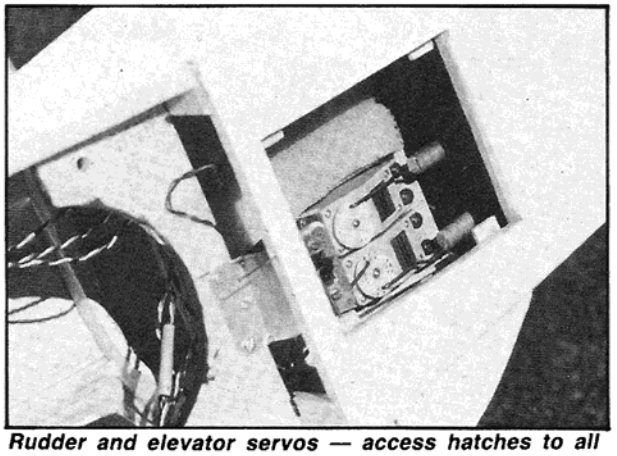
Close-up of aileron and retract servo linkage.



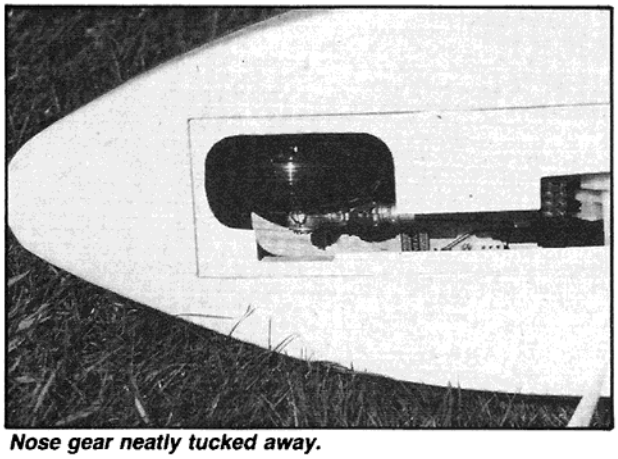
Close-up of rudder and elevator linkage — note access hatch.



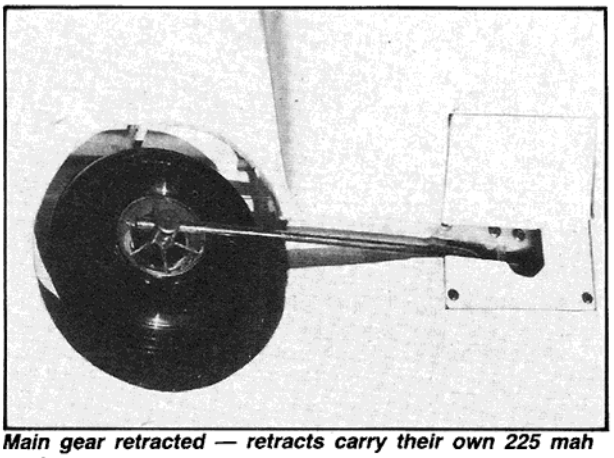
Wing carries a load of electronics.



Rudder and elevator servos — access hatches to all equipment.



Nose gear neatly tucked away.



Main gear retracted — retracts carry their own 225 mah pack.

Fuselage:

This is a simple structure, the only unusual parts are the laminated ply cabin formers, but these are no problem, you must use some balsa to compensate for the rake. You will notice that the sides are parallel for the length of the cabin, and tapered to the tail. I find it best to pre-set the bends into the balsa sides and the ply doublers by wetting them at the bend points, bending the angle, and allowing them to dry while held at that angle. When you glue the sides to the doublers (I use a contact adhesive), you will have a fuselage that will go together without stress. **Keep the tail end as light as possible.** My Cougar has 4 ounces of lead in the nose, as well as an additional 250m/a retract ni-cd battery pack, so watch it! Complete the fuselage but leave the bottom uncovered until you have installed all the control rods. Don't forget the nylon tube inside for the receiver antenna to be threaded through, neat and easy.

Tail Unit:

This is quite straightforward. Use medium soft sheet for the stabilizer and elevators, the fin and rudder are built up as shown on the drawing.

Nacelles:

These are built using 3/8'' balsa sides with 1/32'' ply doublers, the front cowl is built up with 1/2'' sheet. The nacelles just push over the leading edge of the wing, and are epoxied in position, **but not yet!** This produces a very strong structure with an uninterrupted wing skin.

Note: Check the position of the plywood engine mount formers. Be sure that they are positioned properly to accept your engines if you decide to move them, make sure that you can still get the tanks in! I used 6 ounce Sullivans (SS-6) with the slant feed. Make the tank access hatches. Slip the nacelles in place on the wing, and make small hatches for access to the retract units by cutting sections from the nacelles and wing skin, as required. **Don't** be tempted to sidewind your engines: the resultant vibration due to out of phase rocking couple has to be seen to be believed!

Getting It Together Before Covering:

Glue the 1/4'' tailplane seatings in position with the 1/4'' cross members in-between. Fit the wing in position with its L.E. dowel and hold-down bolts, add the root riblets leaving about 1/64'' gap between them and the fuselage sides, and cover with 1/16'' sheet. Sit the tailplane in position, and check that it is in line with the wing. When it is correct, temporarily tack glue it in place, and make the tailcone from a soft balsa block. The fin goes through it from the top to sit on top of the tailplane. A little care is necessary to get the whole thing right. Now is the time to install the control rods for the rudder,elevator and nosewheel. Hinge all the control surfaces, using good quality large hinges with hinge pins. I don't peg my hinges, but I do cut a 1/8'' hole through each side so that the epoxy will go right through, and I can honestly say that I've not had one come out yet. Do **not** epoxy the control surfaces in place until after covering. Make the ply plate which carries the lower bearing for rudder torque rod, and screw it in place. Be sure that all the control surfces and rods operate well before sheeting in the bottom of the fuselage. Fit the wing in place, and glue on the 1/4'' sheet pieces to continue the fuselage line across the wing together with the front and rear pieces against formers 4 and 6. Cover with 3/32'' sheet to blend with the fuselage bottom, leaving a gap of about 2'' so that the flap torque rod tubes can be epoxied into place, together with the 1/8'' ply wing bolt reinforcing plates which go over the top of the tubes. Cut an opening for access to the aileron and retract servos. This is finally covered with a patch of film.

Covering:

Having seen the full size aeroplane, it was pretty obvious that to duplicate the finish would demand hours of painting and filling, resulting in an additional pound of weight, or to use iron-on film. Guess what method I chose? The covering is such, that a bit of thought before you start can save you a bit of trouble. Try to cover the fuselage top and sides (not the top of the nose) in one piece; a heat gun is a must for this job, as it is with the nacelles. The top of the nose is covered last, with the edge arranged so as to come under the trim lines. The cabin windows of plastic sheet can be installed with balsa cement. The windscreen is cut from a P.F. Economy scale Zlin canopy that is just the right size. Retain in position with 3/8'' wide strips of Fablon (same as our vinyl adhesive contact paper), which stretches quite readily and looks very neat. When covering the wing be sure that the film is firmly stuck to the areas around where the nacelles will be epoxied. When all the parts are covered, the control surfaces can be fitted using slow setting epoxy, this will give you time to line everything up correctly.

Slip the nacelles in place on the wing, and mark around them with a ballpoint pen. Remove the nacelles and clear the film away from the area where the nacelles will be epoxied on. **Do not cut it with a knife!** It is impossible to do this without scoring the wing skin, and producing a weakness that you need like a hole in the head! Instead, tear the film very carefully, close to the line by holding a steel rule flat on the surface to control the tear. **Take your time!** — ten minutes won't hurt when you've come this far. You must remove the film from all areas to be glued.

Radio:

In this model, the radio must go nominally where shown on the drawing, but you can move the ni-cds around if you need to. On the prototype, the radio ni-cd battery pack was located just forward of former F4, and the retract 250m/a ni-cd battery pack right up in the nose as far as possible. I favour a separate ni-cd pack for the retract servos wired into a ''Y'' lead, with a separate switch. This insures that, should you at any time have a stalled retract servo, it will not drain the airborne ni-cd battery pack and leave you without control. I think a weight penalty of about 3 ounces is worth that peace of mind! **Be sure** the balance point is correctly located with the fuel tanks empty.

Control Movements:

Elevators — 1'' up and 1'' down at the widest point.

Rudder — 1½'' left and 1½'' right at the widest point.

Ailerons — 3/4'' up and 1/2'' down.

Flaps — 40° max.

Flying:

Do make sure that the engines are dependable. Really, the only critical time is at take-off, since the sudden loss of one engine at slow speeds can be fatal. However, take heart, engines very rarely fail suddenly, they have the habit of sounding sick at first, so if one does sound sick at take-off, abort and try again. If during the flight, an engine stops, the safest plan is to throttle back the remaining one, and land. Remember that slow fly-bys with twins are for the brave or the foolish, because when you open the throttles to fly away, should one motor die, usually so does the model! Be warned. Once you are happy with the engines, ground run them for a couple of minutes before each flight, and taxi the model out to the take-off point. If they are both still running well by now, it is reasonable to assume that they are okay.

No flap is necessary for take-off (even on the full size Cougar). Check all the controls, ease the throttles open, keeping her straight with the rudder/nosewheel. She will fly off on her own if all is well. You will find you need very little, if any, elevator to break ground. Do not retract the landing gear at this point for the first flight, just in case you have to land in a hurry due to problems — it's one less thing to have to think about! For a normal landing, the landing gear should be lowered on the downwind leg after throttling back, and the flaps lowered on the approach; you will find that they do not produce any noticeable trim change, but do permit a steep approach without much increase in speed. The final flair-out and landing is relatively slow, retaining good aileron response. The second flight should be really good fun. Get the gear up on the climb-out, and have a ball!

She goes quite fast on full throttle, and if you must try the loop or roll or whatever, go ahead, but I don't know of any aerobatic civil light twins! On about two third throttle the scale speed is about right. If you want a model that will stop the action at your field

(it does on mine) this is one of them. The Cougar is giving me a great deal of pleasure, I'm sure it will do the same for you if you choose to build it.

Happy landings. □

Editing By Hlsat.
RCModeler
Aug.1980.