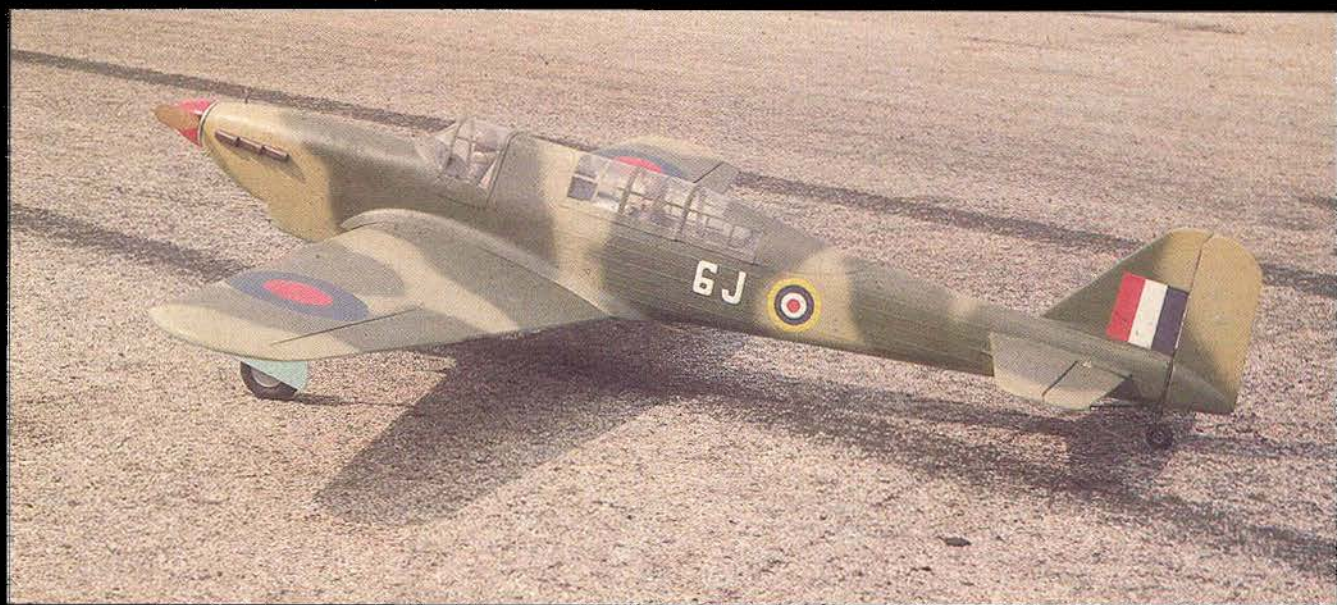


For an unusual and seldom modeled Stand-Off Scale project, try this superb performing WW II Royal Navy fighter which showed a very impressive record despite its being designed and produced in extreme haste. By Don Williams.



FAIREY FULMAR



As a WW II aircraft enthusiast, I build miniature replicas from all over the world. As far back as I can remember I have loved the sky and all things therein. The first aircraft I can recall seeing (or at least it has stuck in my mind) was an Autogyro. I couldn't have been over four or five years old. As the years rolled by I don't think I missed a single aircraft that flew over our home. I became very good at telling which aircraft was which just by the sound of the engines. At times I would hassle my parents, or anyone who would listen, to go out and look at a plane flying over and, without looking, I would tell them what it was and described it to them --- 99% of the time I was correct. I can't do that these days as most jets sound alike to me.

There is not enough time in my life, I



FAIREY FULMAR

Designed By : Don Williams

TYPE AIRCRAFT

Stand-Off Scale WWII Fighter

WINGSPAN

60 Inches

WING CHORD

14" root — 6½" tip

TOTAL WING AREA

615 Square Inches

WING LOCATION

Low Wing

AIRFOIL

Semi-Symmetrical

WING PLANFORM

Double Taper

DIHEDRAL, EACH TIP

2-7/16" (tip rib)

OVERALL FUSELAGE LENGTH

53¼ Inches

RADIO COMPARTMENT AREA

(L) 10" x (W) 3¾" x (H) 2½"

STABILIZER SPAN

23 Inches

STABILIZER CHORD (incl. elev.)

8½" root — 5" tip

STABILIZER AREA

155 Square Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Mid-Fuselage

VERTICAL FIN HEIGHT

6 Inches

VERTICAL FIN WIDTH (incl. rud.)

9½" root — 5" tip

REC. ENGINE SIZE

.40-.61 Cu. In.

FUEL TANK SIZE

10 Ounces

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rud., Elev., Throt., Ail.
(retracts & flaps optional)

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply and maple
Wing	Balsa, Ply and maple
Empennage	Balsa
Wt. Ready-To-Fly	96 Ounces
Wing Loading	22 Oz./Sq. Ft.



think, to build all the aircraft I would like to. I do not like building aircraft that are modeled to death though, i.e., Mustang, P-40, FW-190, etc. Granted they have beautiful lines and fly very well but they have become very commonplace. What I try to do is model an unusual aircraft or one that has not been modeled so often. And, so comes the Fairey Fulmar.

The Royal Naval Staff requirements for the Fulmar were that it must be able to remain on patrol for six hours at 138 mph, or three hours at 175 mph, while on escort duty. The maximum speed in level flight to be 265 mph at 10,000 feet and a stalling speed of 65 mph.

Eight, forward firing, machine guns were mounted in the wings with 400 rounds of ammo per gun. The fighter would carry no gun in the rear cockpit --- to be much regretted by the crews of the aircraft. The Fulmar seated two in tandem. A pilot and an observer, wireless operator, and navigator. Shallow dive-bombing was to be a secondary role and provision was made to carry a 250 lb. bomb under each wing.

A major restriction was that the wing span could be a maximum of 46' and had

to fold to 18' or less. The folding and spreading of the wings was to be done in winds up to 30 knots by only four men.

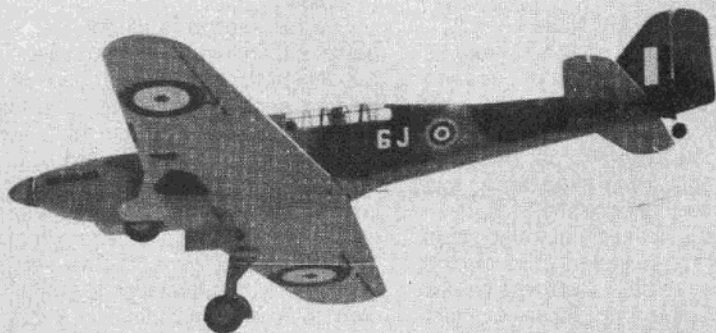
The first Fulmar flew on April 6, 1940. The Ministry pilots gave generally good reports on the Fulmar. It had no vices and was pleasant to fly. Likewise, the model has no vices and is easy and pleasant to fly. The full size plane was maneuverable at all speeds in level flight with light responsive controls. I feel that the model flies very much like the full scale aircraft as the above describes its flight characteristics very well.

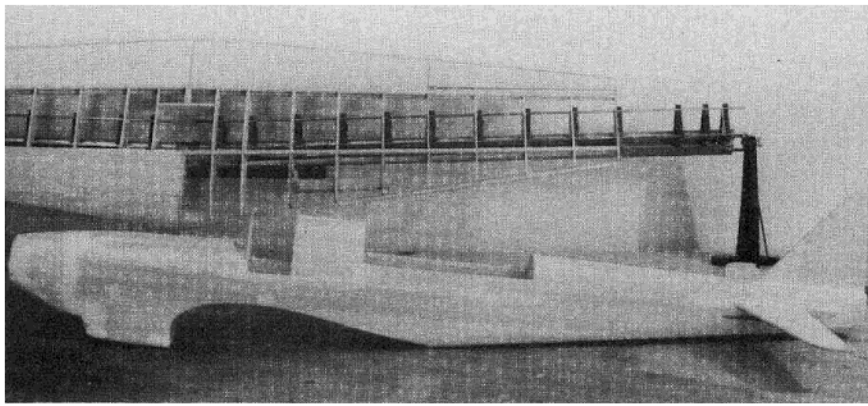
In service it was a different story. The Fulmar became only marginally stable with full equipment, particularly at low speeds, due to an aft Center of Gravity.

The Fulmar would take-off after a 280' run in a 20 knot wind. In an accelerated take-off (catapult) the distance was lowered to a mere 60'.

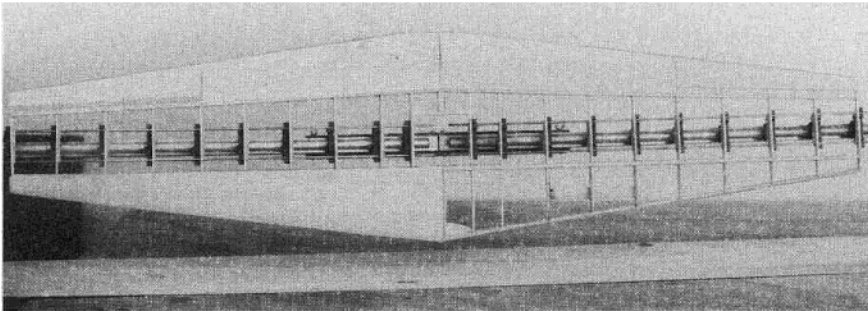
In service, the Fulmar never reached its expected maximum speed. The two seated fighters maximum speed was 238 mph at sea level and 245 mph at 15,000'. It was not the greatest but it is said to have accounted for nearly 30% of the Royal Navy's victories with no fewer than 112 enemy aircraft destroyed in the air and damage to over 80 more. That's a pretty impressive record for a slow tail heavy aircraft. To make it even more impressive the Fulmar is said to have been an emergency makeshift aircraft --- designed and produced in extreme haste.

There are reasons for building the Fulmar, other than being unusual. It's colorful and it has good aerodynamic moments for our use in R/C. There is also no need to mold a canopy. It can easily be made from flat sheet plastic and the aircraft is aerodynamically clean and streamlined. Another plus in its favor is the thick airfoil. This tells us, immediately, that the stall speed will be very low. And, as a final touch, the long tail moment assures smooth pitch control. If that isn't enough to make you want to build the Fulmar, it also has a wide track landing gear that makes

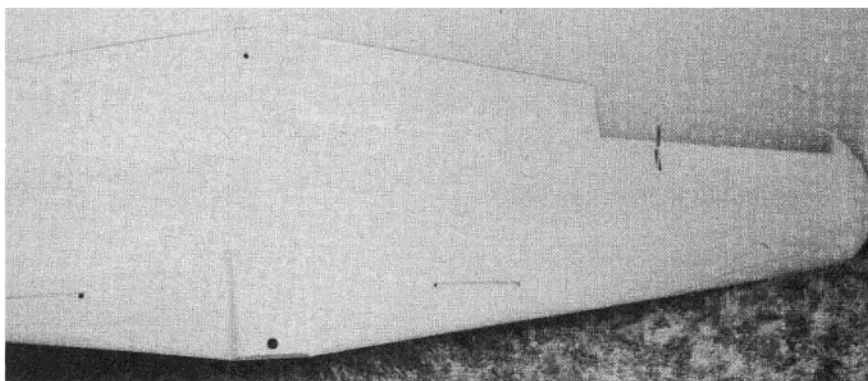




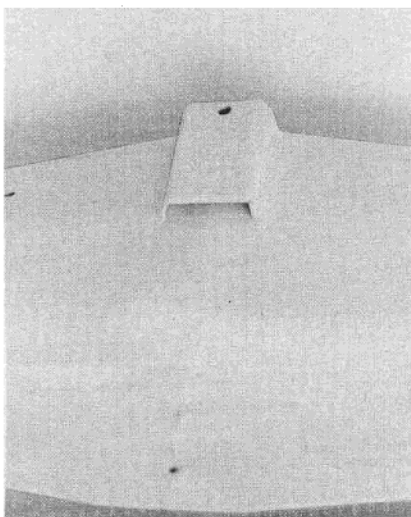
Completed fuselage with wing still on jig.



A-Justo-Jig is sure way of building a straight wing.



Completed wing ready for covering.



View of partial radiator attached to wing.

ground handling easy and a large rudder that should help tracking through maneuvers.

The overall Fairey Fulmar project has been one of fulfillment and fun and that's what this sport is all about. It has met and exceeded all of my demands --- some of which were very strict --- and you can't ask for more than that.

CONSTRUCTION

The construction of the Fulmar is straightforward and should pose no problems if you have built any multi-pattern ships at all. If you are a novice to scale type aircraft, but have had some multi flying experience, this would be a very good place to start.

The fuselage is essentially slab sided with doublers and triplers through the nose and wing section. Cut these pieces from 1/8" medium hard balsa. Contact cement the doublers and triplers to the fuselage sides. Be sure to make a right

and a left. Cut out all the fuselage bulkheads F-1 through F-10. Cut F-1 from 1/4" plywood, F-2, F-3 and F-7 from 1/8" plywood and the rest from 1/8" hard balsa. Mark the insides, where the bulkheads go, and install F-7. Pull the tail together and install F-10. Wrap both stations with masking tape. Check to make sure that the fuselage is in alignment and add F-8 and F-9 and the 1/8" x 1/4" stab doublers. Wrap with masking tape and let dry. When the bulkheads are dry, remove the tape and install the 1/2" bottom block. Wrap with tape as before. Let this dry completely before going on with the fuselage. This is necessary because the aircraft has such a long tail moment and when you pull the nose together it will tend to warp. Of course, if you have a fuselage jig this will not be necessary. Install F-1, wrap with tape, then add the remaining bulkheads F-2 through F-6 wrapping each one with tape to hold firmly to the sides.

Remove the tape and install the 1/8" sheet balsa cockpit floors cross grain. Cut F-4A and two F-7A cockpit formers from 1/8" plywood and glue in place. Locate the servo rails near the bottom of the space between the cockpits then cover the area with soft 1/8" balsa sheet.

If you use the NyRod type pushrods, install them now. Strip plank the rear deck with 1/8" x 3/8" soft balsa from F-8 to F-9. Also strip plank the top of the nose section from F-1 to F-4. Use 1/8" sheet balsa to build up the fuselage sides from the cockpit floors to the bottom of the cockpit windows. Fuel proof the tank compartment and the inside of the bottom radiator block, then install the block, holding it in place with tape. Install the 1/2" balsa block in front of the radiator under F-1.

The cowl is made from 3/4" and 1" balsa blocks. My engine was side mounted to preserve the profile as there is no way, in this aircraft, to get all of the engine under the cowl and the Super Tigre .51 fits with little room to spare. And, so it stands that you will have to cut the cowl someplace to fit the engine. Do it on the side and save that profile. After the hole has been cut, mount the engine. Center the nose ring on the engine crankshaft and epoxy it in place. Remove the engine and carve and sand the nose to shape with the rest of the fuselage.

The tail section is all flat 1/4" sheet balsa and should pose no problem. Cut out the horizontal stab, round off the leading edge and the tips, and install flush against F-9. Check to make sure it is not cocked and is square with the fuselage. Cut out the vertical fin and install flush with the trailing edge of the stab. This will leave a large gap from F-9 aft. This is taken care of with a very soft balsa block. Cut the block to length and slot it to accept the vertical fin. Tack glue and trim the block to shape and sand smooth. Remove the blocks and hollow

out as much as you can and then install them permanently. At the front of the radiator there will be a small gap on each side. Fill these gaps with scrap 3/16" balsa to form the front sides. The rear of the radiator runs out onto the bottom of the wing and will be built after the wing is sheeted and sanded as shown in the isometric drawing.

Cut out the elevators and rudder and sand to shape. The rudder will require a small, soft, balsa block at the bottom on each side to finish out the shape of the fuselage. These blocks will have to be beveled 3/16" to 1/4" at the leading edge to allow the rudder to move. Bury the rudder horn in the block, on the right side, down to the rudder itself, and run the pushrod through F-10.

The wing hold-down blocks are next and are 3/8" x 3/4" hardwood, i.e., maple motor mount stock. Glue in place, with epoxy and drill and tap for 1/4-20 nylon bolts in the center of each.

Wing:

The wing is double tapered but is simple and straightforward. The plan shows retracts and fixed landing gear. Decide now which way you are going to go. Don't change horses in the middle of the stream.

The wing should be built on a jig but does not have to be if you are careful. You don't want any built-in twists or warps. If built on a jig such as the Adjusto-Jig, the wing can be 90% finished before removing. This will assure you of a warp-free wing and trouble-free building. The jig can be turned up-side-down for working on the bottom of the wing or anywhere in-between. It's a very good tool to have around the shop.

The ailerons are of the barn door type and should not be built separately. Build in with the wing and cut loose after the wing is sheeted. This will assure you of a good fit. Be sure to cut back far enough to allow a 1/4" sheet balsa facing on the leading edge of the aileron and 1/16" sheeting on the trailing edge of the wing. But, I'm getting ahead of myself. Set the jig for the proper amount of dihedral and slip the ribs on and fasten down. Install the top and bottom spars and the main spar joiner. Next install the 1/4" square leading edge and the bellcrank platform. Locate the bellcrank on the platform and install the aileron pushrods. Sheet the top of the wing and turn it up-side-down. Now take a straight pin and push it through the top sheeting in the forward corner at each end of the ailerons. Turn the wing up-right again and lay a straight-edge against the forward side of the pins. Rule with a ballpoint pen. This is the cutting line when you cut the ailerons loose. Now remove the wing from the jig and sheet the bottom. Then add the soft balsa tip blocks. Carve and sand the wing to shape.

Screw a 1/4-20 nylon bolt into each wing hold-down block from the back side

so that it just clears the wing saddle. Now carefully center the wing in the saddle and press down gently but firmly. Remove the wing and it should be marked, by the bolts, where to drill the holes for the hold-down.

The aircraft has fairly large wing fillets. The base of these is 1/32" plywood. In order to get a perfect fit between wing and wing fillet, re-mount the wing but leave it loose enough to slip the 1/32" plywood fillet base between the wing and wing saddle. Now tighten the wing. The fillet base should conform perfectly to the airfoil. Glue to the side of the fuselage only and let dry. Remove the wing, glue the inside, and build up the fillet with balsa blocks. Contour smoothly into the fuselage with micro-balloons and resin.

There should be at least **some** cockpit detail. An instrument panel would help, along with a couple of pilots. Naturally, the more detail you add, the better the aircraft will look.

The canopy itself is a real snap. No molding is required. Just wrap it around and glue. The templates on the plan should help a great deal. The portion of the canopy that passes aft of F-8 will be painted the same as the fuselage. Tape is used to simulate the canopy frames.

When an aircraft is left to the elements, and with age, the canopy windows will become somewhat smokey --- especially around the edges. If you would like this effect, glue the canopy on with Hot Stuff. The effect is devastatingly real.

Finishing is left up to the technique you like best. Profile Publications #254 will be a big help in this area. Mine was finished in accordance with the centerfold therein.

I also added rivets to my Fulmar and it really adds to the overall appearance of the aircraft. This was done by first drawing the rivet lines on the aircraft. A hypodermic, loaded with slightly watered down white glue, was then used to dot the rivets on. Anyone can do it but practice a little bit on something else before you try it on the aircraft. The rivets will become nearly invisible as they dry but will be prominent when painted over. Try it --- I think you will be glad you did.

Mount the servos, three abreast, in the area between the cockpits. Position the receiver just ahead of the instrument panel and the airborne battery pack inside the radiator below the fuel tank. This is the way I installed mine and the aircraft required a 2 oz. spinner weight to arrive at the correct Center of Gravity.

As you can see from the plans, the aircraft has a very long tail moment. Care **must** be taken not to overdo this area.

In order to keep the weight down, I covered my Fulmar with clear MonoKote. Two coats of color on the top and sides. One coat on the bottom and then the insignia. The whole thing was

then sprayed with clear flat for a matt finish which worked out very well.

The engine chosen for the Fulmar was a Super Tigre .51 mated to an 11/6 Top Flite prop. This worked out very well as the aircraft weighs in at six pounds ready to fly and has a 22 oz. wing loading. Although the aircraft would fly with a .40 size engine, it is highly recommended for this type that you over-power slightly. Power can get you out of a lot of trouble, yet you do not need to use all the available power unless it becomes necessary. If you use an engine with marginal power and get into trouble where more power would get you out and you don't have it --- where do you think you'd be? I'll tell you. Get a rake and a basket because that's what you're going to need to pick up the pieces.

Flying:

Once out at the flying field, turn on your radio and check the controls again and make a range check while you're at it. Do not be afraid of this aircraft because it is a taildragger. It is very easy to handle on the ground as well as in the air. If you have never flown a taildragger before because you've heard, "They'll eat your breakfast," etc., forget it. Some taildraggers exhibit poor ground handling characteristics and this is usually because the landing gear legs are very close together and it has a very short turning radius or the pilot over-controls or fights the controls during take-offs and landings.

Choose your taildragger well. Choose one such as the Fulmar with a wide track landing gear. The turning radius is much larger and it will track straight and true. Also you can over-control slightly without fear of a ground loop.

Take-off procedure with the Fulmar is this: Neutralize all controls. Advance the throttle slowly but steadily. As the aircraft starts moving, feed in a slight amount of right rudder. In about 10' the tail will lift. Keep adding power. In about 30' you should be at full throttle and really ripping along. You will probably have to ease off the rudder a bit as the speed builds up but this is a thing you will have to see and feel.

Never lift an aircraft off too soon. Let it build up a good head of steam then ease back on the stick very gently. The result is a nice fly off and not a jump off the ground. This aircraft will take a jump off. As a matter of fact it will get off in about 5' but it doesn't look good and it could be dangerous. Don't do it.

Climb out should be shallow and straight ahead followed by a shallow turn of 180 degrees still climbing to about 300'. Trim the aircraft out and land. Do not try any aerobatics on your first flight. Set the controls according to the trim you used for straight and level flight. Now fuel up and go have a ball.

The Fulmar has taken a second and a first place in contests it has flown in,

during the year I've been flying it. In the first contest it was untried (not even a test flight). It had a new radio in it --- also untried --- and the engine hadn't run in three years. But, it only missed first place by 4½ points. Beat by a hot pilot flying a hotter Mustang. You can't ask for much more than that. Could've been first, I guess.

If you have any questions, write to me care of RCM and I'll be happy to answer them.

Good Luck and Good Flying. ☐

**From
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Aug. 1979**