

JET

Simple structure and exciting modern looks produce a combination that's irresistible.

THE JET FIGHTER. Since the 50s this has been the show stopper and the basic attraction of innumerable airshows. The jet fighter has been the dream of boys of all ages, the whine and roar of its engines has followed spectators home and stayed in their imagination weeks after the show.

Even today the jet fighter will be the airplane without which no airshow is complete. Mighty 'Hercules' transports, pirouetting helicopters or aerobatic bi-planes, all will fade away when the jets come hurtling out of the skies.

Now how does all this relate to the model world? Yes we have got ducted fans and scale models which are both impressive, but oh so difficult to build, fly and service for the average modeller. Is there another way to deal with the problem? Two years ago I started thinking about solutions to this interesting conundrum.

Jet Fighter

I didn't just want to design a jet-like model — I wanted to design a model that was similar in performance, appearance and atmosphere to the jet fighters of the 80s. The best of them fly at speeds between 200km/hour and Mach 2, they have astonishing slow-flying ability as well as high top speeds. They have very advanced aerodynamics and can turn very tightly.

In a model scaled to about 1:8 this would mean a stalling speed of about 25km/hour and a top speed of 300km/hour. Could this speed spectrum be covered with a model? Could the model turn with a radius of less than 50 metres? (the F16 turns at 400 metres). Could the model be stable at very high nose up pitches?

And could this model still be built by anyone, flown by the average Sunday flyer at the cost of an ordinary aerobatic trainer?

I made a list of the modern jet fighters from Nato, the Warsaw Pact and neutral countries. I also obtained a lot of information on them from various books. Some of them were discarded at an early stage. All with swing-wings (like the 'Tornado') were impossible due to construction problems. The deltas and canards (like 'Mirage' and 'Viggen') had flying characteristics unsuited to the Sunday flyer.

A bunch of fixed wing planes were left with F15, F16, F18, 'Jaguar', MiG25 (with its successors MiG29 and MiG31) and 'Mirage F1' as the most promising examples. Close studies of the rest of the jet fighters were important for aerodynamics.

The jet fighters of the 70s were often projectiles, aimed at closing in at high speeds, firing a missile and escaping quickly. They couldn't turn close and were terrible at low speeds. The 'Starfighter' is the most notable example.

However, these aircraft were often rather good-looking, with good streamlining and round bodies. The jet fighters of the 80s are more bulky constructions, with fences, strakes, large jet intakes and double fins. But

in a way the latter are easier to model.

Their high speeds come as a result of powerful engines, often a pair. In a model this is easily done with a modern, high power 'FSR' motor, driving a conventional propeller. A modern 0.40 engine delivers up to 2bhp and with a model weighing 2-2.3 kilos there is no problem in lifting the model straight up and reaching speeds of up to 200kmh. Not as high as 300kmh — but I'm sure nobody really wants *that* speed!

The low speed problems are solved with a lot of gadgetry in the full-size.

1. Cambered or flat lower surface wingtip profiles.
2. Wing fences.
3. Washout.
4. Dogtooth or sawtooth leading edges.
5. Double fins.
6. Large area tailplanes and fins.
7. Sharp edge strakes at the wing roots or sharp edge jet intakes.
8. Flaps.

All these options were eventually included in the model. Details like swing wings, folding wing leading edges and such were abandoned for complexity.

The stall speed came close to the 20-30 km/h goal. And the turning ability was also obtained with a good margin.

The Jet Fighter Model

So, in the spring of 1983 the 'Jet Fighter' first lifted from the green and well cut surface of the club field. The prototype was built in a month after careful studies of the bodies and wings of the new jet fighter generation. As the body was created with the aim of giving the impression of two jet engines there was enormous empty space even after installing the R/C flight pack.

Below: either a hand launch or the drop-off 'dolly' shown on the plan are acceptable ways to get 'Jet Fighter' airborne — you could even fit retract.



Bo. Gardstad has designed another winner for 0.40cu.in. motors, 42in. span for three-five function

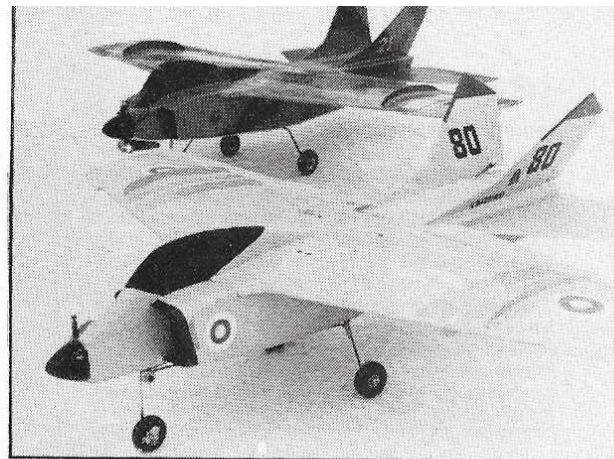
The first flights were a breathtaking success! An OS40FSR could easily zoom the model straight up into the blue and the mere sight of the plane banking round in circles around the other clubmates' planes was very encouraging. Low speed characteristics were extremely good in a straight line. But then the problems started...

From rolls the 'Jet Fighter' would come out in very strange attitudes and low speed turns were more like slalom skiing. Slow motion films of the rolls showed that the fins and stabiliser couldn't keep the plane straight on course. An enlargement of both areas by about 30% cured the disease.

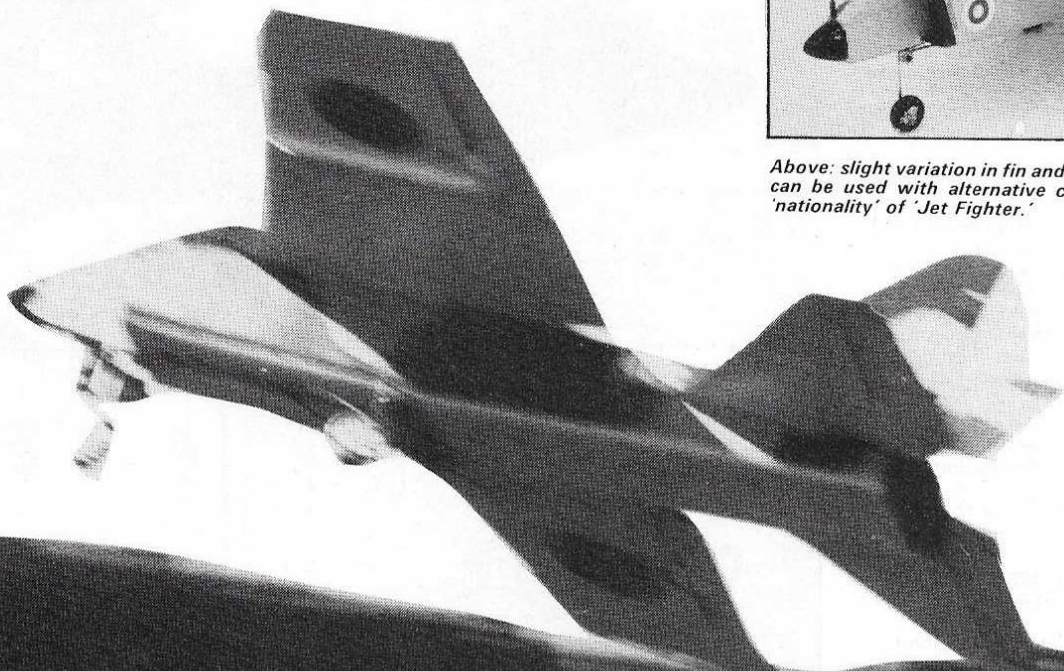
Unfortunately we crashed the prototype during the experiments — but the film and

FEBRUARY 1985

FIGHTER



Above: slight variation in fin and tip shapes plus cockpit canopy can be used with alternative colour schemes to change the 'nationality' of 'Jet Fighter.'



the video tape of the crash in slow motion has been one of the highlights on the local club Top Twenty list of flight movies during the winter...

Building

There are some very important parts of the building process which I'd like to point out.

1. Be sure that the wing is straight. Instead of a symmetrical profile I have chosen a flat bottom profile which is made 'symmetric' by giving the wing a negative incidence. This will give you the advantage of building the wing flat on the table. A bent wing with a thin profile is very difficult to trim out in the air.

2. The wing fences and the two fins must be parallel!

3. The wing tip profile is important — look at the plan. You should also give the ailerons a slight negative incidence.

The fuselage

First you must decide whether you want to have the exhaust pipe in the fuselage. In that case you must cut out the dotted parts of the formers before you start setting up the body.

Cut out the sides and the formers from balsa and rig up the box-like construction that is the main part of the fuselage. Then glue the bottom to the fuselage and let all this set very thoroughly before you continue.

Now cut the engine bearers to appropriate length, put them through the holes in former F1 and glue them to former F2. Glue on the engine mount side of ply both fore and aft of former F1.

You may very well mount the stabiliser at this stage. It will stiffen up the construction and as it is now time to mount the pushrods to the elevator and decide where you want the servos it is very suitable.

Glue on the ply doublers for the wing

mounts and if you have the tunnel for the pipe incorporated then build this of 3mm balsa sheet. You may also at this stage impregnate the tunnel with 3-4 coats of dope and a paint of some kind. I used aluminium paint which is heat resistant up to 150°C and I have had no problems whatsoever with heat. The exhaust pipe is also separated from the sides of the tunnel with bearers made from piano wire.

Now cover the rear part of the fuselage, make the fins and rudders and install the pushrods for them. The rest of the mounting may be done in your own order.

Wing

Cut out the balsa sheet parts for the bottom of the wing and lay them flat on the plan. Glue on the spruce spars and the leading and trailing edges followed by the ribs.

Now you must decide whether you will incorporate flaps. If not — cut out the flap parts and glue them to the trailing edge. If you want flaps, cut out slits for the hinges and do the same for the ailerons. Also mount the control cables for the ailerons and flaps. Glue in the hinges.

Use epoxy and glue the ply doublers to the centre of the wing. Make the holes for the wing bolts. Be careful — this is an important job for flight safety!

Cut out the sheeting and cover the top of the wing. Let this dry before you go on with the work.

Last of all glue the wing fences into place and form the wing tips and leading edge with a file and sandpaper.

Cover the wing with 'Solartex' or similar material and mount the aileron and flap servos.

Decoration

The 'Jet Fighter' is not a scale or even semi-scale model of an existing aircraft. You may call it 'invented scale' or something like that. But with some slight changes in the form of the stabiliser, fins and wingtips you may very well make it look like any of the current Nato fighters.

Together with a realistic paint scheme you will have a plane that will fool many spectators and it will certainly sort out those who really know something about jet fighters of today.

I strongly advise you to cover the whole model with 'Solartex' or some other similar material. It will strengthen the construction immensely and the paintwork will be very easy. I have painted all my three prototypes with only one coat of *Humbrol* enamel.

Flying

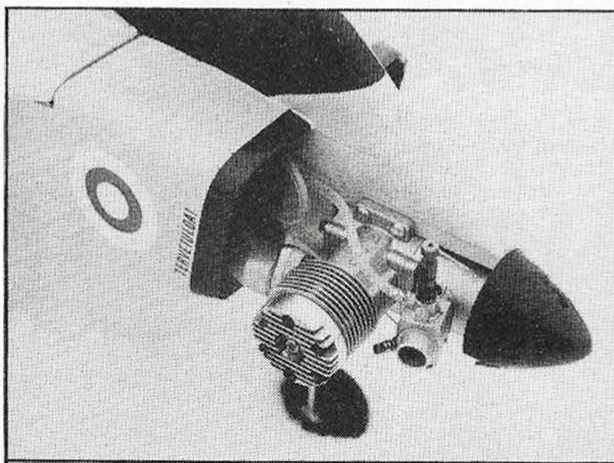
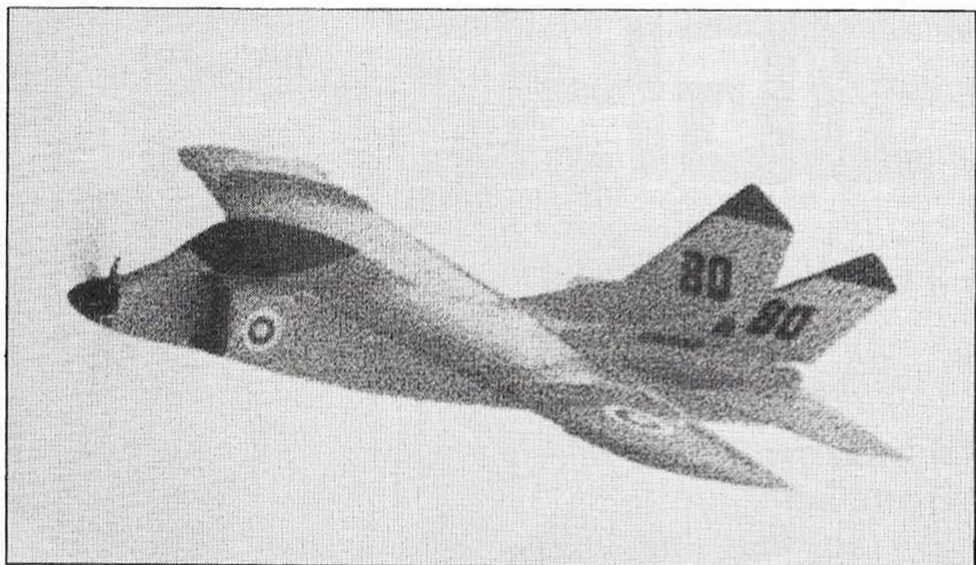
Hopefully the 'Jet Fighter' will give you some very interesting flying experiences. It has the ability to do things few other model airplanes can do and the aircraft may very well be the next show stopper of your local club display. In pairs the 'Jet Fighters' are very impressive.

There is no need for excessive caution on the first flights, in spite of the thin profile the 'Jet Fighter' is extremely stable in low speed flight. If you use the dolly, fasten it to the fuselage for the first flights and later on you may let it fall off when you want to explore the 'Mach 2' capabilities.

Try to fly the 'Jet Fighter' in a jetplane flight pattern. Jetplanes never spin, but they do wide, high speed loops, slow and fast rolls (but never quick rolls!) A high speed run followed by a low speed pass is very suitable.

In low speed flight you will experience some new patterns you perhaps have never seen before. The model is quite stable, even in nose high attitudes — but the aileron response will almost fade out at the extreme low speed spectrum. The rudders are however effective and you must *very cautiously* steer the aircraft with them.

If you don't kick the rudders the plane will not flick over, even with full up elevator but



Left: rear exhaust motors are easily accommodated, the tuned pipe runs down the inside of the fuselage exhausting through the jet tailpipe — where else?

beware of the effect 'lighting the afterburner' from low speed! Due to the torque of the engine the model will turn left, (almost in slow motion!) and you must be ready to give right rudder to keep the model straight. When you master this technique you can really put on a show!

The flaps are almost too effective. You may try some 'carrier deck landings' with full flaps eventually, but don't throttle up too abruptly without raising the flaps. If you do this the plane may raise its nose and slowly loop over on its back.

Different versions

The 'Jet Fighter' will fly even with a .25 motor, no rudders and just three channel guidance, but the aerobatic possibilities will

be limited.

The normal version is with a .40 engine and no flaps. The landing speeds are still quite low if you keep a nose up landing attitude.

With a hot .40 with rear exhaust, tuned pipe in the fuselage, flaps and an attractive colour scheme you really have got something to mess around with!

My future plans include smoke generator and a large airbrake at the back of the fuselage. If I could solve the problems structurally, it would have been fun with folding leading edges. And perhaps a .45 engine? And what about *Sidewinders* at the wing tips? And perhaps those swing wings weren't...

Try the 'Jet Fighter'.

