De Havilland 100 FB9Vampire

Well this is a first you maybe thinking, finally a model plan specifically designed for turbine. Your next question might be, why it has taken so long for this to happen. Well I can honestly say that after 2 years of working on this project, more off than on I might add, I can understand why no other designer has taken the mantle and invested the time a model like this will take.
For the uninitiated, turbine models can appear to be incredibly complicated both in there construction and setup. I would hazard a guess that most of the modelling fraternity out there who are regular plan builders, have not built a turbine model before. There may be a very good and obvious reason for this, and that is there are simply no tradition 'scratch built' kits or plans for turbine power out there to build from.
So why did I decide to design a turbine powered model? Well the simple answer, I was asked; by so many modellers who would love to build a traditional jet model suitable for a turbine but haven't the funds or the inclination to build one from the array of expensive ARTF kits out there. There is no doubt that most traditional modellers who build from plan are on fixed budget, and building from plans allow them to fore fill their ambition.
With the launch of the Vampire in plan form mean one more ambition can now be realised by a large number of traditional builder out there.

So setting back to the earlier question of why has it taken so long to produce; well with most of my designs, the time frame from design concept to publication is around 4 months. With bigger and more complicated designs, which of course take longer, there will be a period of layoff while other projects take centre stage. The other reason it took longer than originally anticipated is the learning curve surrounding jets and turbines in general, so part of this time was spent researching that subject too.

Now undertaking a design project such as this does require some thought as to the model that will cover most of the requirements for being a popular subject. Firstly a scale model will always appeal far more than a sports model but the flying performance should also include both sport aerobatic, coupled with the stability of a training aircraft. So a scale trainer with 'fighter' capabilities coupled with an uncomplicated airframe design, points to a very small band of subject! However there was an obvious answer and that had to be a de Havilland 'Vampire'.

The Vampire was one of the first British jet fighter to enter serve with the RAF and managed to see some action in the later stages of World War II. Being a de Havilland design, its pedigree came from the DH Mosquito and employed a similar construct techniques; that being balsa and plywood in the construction for the fuselage. The huge number of Vampire variant saw the aircraft span three decades of service life with the RAF and with many other air forces throughout the world. It not only distinguished itself as a intercept fighter on front line patrol but also as a forgiving jet trainer which made it one of the most popular training aircraft in the early jet era. With that pedigree it really was an obvious choice for my first jet project.

Now with most of my scale design I do like to use commercial hardware and nothing bespoke. For this model, the retracts were the only problem I had sourcing but Unitracts International provided me with a set of retracts designed specifically for the Vampire. Needless to say they will be available as a 'made to order' set from Unitracts International when you come to order them.
The tail pipe was made to suit but once again when you come to build your model, Mick Reeves Models will be able to supply you with the correct size from details on the plan.

Once again a CNC pack is available should you wish to make building a little easier and of course a VAC set which includes a clear canopy and nose cone.
So on with the build

Fuselage

Now the fuselage is the most difficult part of the build and just looking at the shape it isn't difficult to appreciate there will be quite a bit of 'balsa bending' so make sure you only select soft pliable balsa for the sheeted areas. Start of by cutting out the main central fuselage sides from 6mm balsa. If you are not using the cnc pack it maybe easier to not at this stage cut out the air intake hole in order to keep the strength in the fuselage during construction. Now glue into position formers F4, F5 & F6. To one side of the fuselage and then enclose with the other fuselage side. At this point the use of a fuselage jig will aid the building process by keeping the fuselage straight and true. Now begin to add the remaining formers plus the engine bearers EM1, double checking the former heights against each other as you proceed. Note that F4 will require a temporary bracing piece of 6mm sq hard balsa across the top opening to avoid crushing F4 when the fuselage sides are pulled in at F1. The front fuselage sides will require some wetting in order to achieve the 'curve' required.

Now cut out from 3mm lite ply the air intake doubler and glue this into position. If you didn't remove the air intake hole in the fuselage side, the plywood doubler will act as a template.

Now fit the hatch formers F3a, F6a, F7a & F9a into position by pinning them to there respective formers. Because these need to be removed once the fuselage structure is complete, a gap between the hatch former and the main former should be left for a hacksaw blade to be slid through. I normally use a piece of cardboard for a spacer. When this is done the front hatch (canopy) frame side F11 can be fitted between F3 & F6. The temporary brace across the top of F4 will need to be refitted once the F11s are installed. The 6mm sq hatch edging stringers can now be fitted and the 3mm sq spruce top edge longerons from F6 back to F10.

With the fuselage still securely fixed within the jig, begin to sheet the top left and right hand fuselage sides with 3mm soft sheet balsa between the main fuselage sides and the top spruce longerons. Because the side curve horizontally as well as vertically the balsa will have to be wetted and manipulated to form the compound curves. be patient with this and make sure you fit pieces on alternate sides as you proceed to avoid any chance of the fuselage twisting.

When completed, trim the top edge of the sheeted sides flush with the top spruce stringer. At this point the pins that secured the hatch formers can now be removed.

Now remove the fuselage structure from the jig and place upside down. Fit the bottom fuselage spruce longerons and begin to sheet the lower sides in the same fashion as the top side.
When complete, trim the sheeted side flush with the longerons.
The structure should now be very solid and only requires the top and bottom sheeting to be applied . For the bottom sheeting, use a piece of soft 9mm sheet balsa from F1 to F10. You may need to wet the balsa to aid the bending.

The top sheeting is made in sections of 12mm sheet balsa as shown on the plan.

In order to achieve the smooth flowing shape, a razor plane should be used to trim the overhanging balsa. Finally finish using sanding paper.
Around where the canopy sits on the forward hatch, some additional 3mm sheeting is required to stiffen the hatch between F11 and the fuselage edge sheeting.

Booms, fins and tailplane

So now the fuselage is out of the way (and the difficult part), the rest of the build is pretty straight forward. The booms are very simple and nothing more than a square box structure shaped with a razor plane.

Start off by cutting out the four boom sides from 6mm sheet balsa and lining the inside top and bottom edges with 9mm triangle.

Make up the boom formers and fit these to one side only. Enclose the boom with the other side and repeat the process for the other boom. Now sheet the top and bottom with 4.5mm balsa and shape to a smooth flowing radius using a razor plane.

Make up two sets of fins from 12mm soft sheet balsa using piece FN1, FN2, FN4, FR1 and FR2. Note that the design requires a rudder torque rod to be made up and fitted before FN4 is glued into position Now shape to the leading edge and the rudder FN3 to the profile as shown on the plan.
When happy with the finish, glue the fin into the boom. To complete, make up from solid balsa, the tail block and glue this to the underside of FN4 and the end of the boom. Finally shape this block to match the boom profile.

The tailplane is a fully symmetrical ‘wing’ section so there should be no confusion with the ‘correct way up’. Build the tailplane over the plan to a ‘skeletal’ structure. The elevator servo is embedded into the tailplane so make up the servo bearers at this point. On the prototype I used two low profile high torque elevator servo as the tailplane depth is quite shallow.
Remove and sheet the structure top and bottom with med grade 1.5mm balsa sheet.

Finally make up the elevator at detailed on the plan. You will notice that the elevator, if you so wish, can be ‘split’ at the centre line and be driven from two elevator servos, one on each side of the tailplane. Doing this will give some ‘redundancy’ and reassurance in case one elevator servo should fail.

You may wish now add the servo wiring that feeds the elevator and rudder servos. For the elevator servo, the wire will have to be embedded into the fin and exited through FR2. This requires a little bit of ‘keyhole’ surgery and be prepared to use a little filler as appropriate.

Wings

Now if you have made a built up wing before, you should have no trouble making these. The wing tips are designed to be removable from the booms (W4) outward. To secure these, a 25mm and 12mm diameter aluminium tube is used with a phenolic outer tube sleeve. These wing joining tubes can be bought from Falcon Aviation or Fighter Ace Kit in the UK.

The wing panels are built in one section and only ‘split’ late on in the build.

Begin by pinning down the low forward and rear spars. Note that packing will be required under the spars at wing rib W1 position.

Now position and glue all the wing ribs to both spars. Note that a small gap (the thickness of a hacksaw blade) should be left between F4 and F4A, Also, the spar at W11, W12 and W13 should be notched to half depth and to the width of the ribs. Fit the top spars and the inner leading edge and the rear top trailing edge spar.

When this is complete the structure can now be sheeted in soft 3mm balsa from W3 to W13.

The wing can now be removed from the plan and the shear webbing applied between the forward top and bottom spars. Now fit the phenolic outer tubes fitted along with the undercarriage support plates UD1 and UD2 and retract bearers. All the servo bearers should also now be fitted that serve the flaps and ailerons.

The underside of the wing can now be sheeted to the same standard as the top and the wing tip made using solid balsa.

Now make the other wing panel.

Finally make up the spit flap units and the ailerons.

So that pretty well the major construction now finished. Now we have to bring all the parts together.

Fitting together

The next operation is to fit the wings to the fuselage. If not already done cut four square holes in the fuselage as shown on the plan to allow the wing spars to pass through and the outer phenolic wing tube. The main spar is bonded to F6 and if cut correctly the dihedral should be approximately correct. However, the dihedral is shown on the plan (which includes the depth of fuselage) Do spend a little time making sure the wing to fuselage angles are the same and all is ‘true’
When happy glue the front spars to F6 and the rear spar through the fuselage body.

The wing sheeting between W3 and the fuselage sides can now be completed. Note that a ‘deflector’ rib should be fitted between W3 & W2 as shown on the plan to channel the turbine air into the fuselage.

When this last element of sheeting has been done, the wing leading edge can be fitted and shaped.

The wing outer panels can now be detached. The easiest way to remove these is to use a hacksaw blade and cut through the gap left between F4 and F4A. Note that you will be cutting through the spars and the outer phenolic tubing.

The aluminium tubes can now be cut and glued into the outer wing panels. The wings are secured to the body by a small self tapping screw fix into the larger aluminium tube where it exists into the fuselage. Note the detail on the plan.

The structure is albeit complete now and requires the hatches to be cut and removed. Now assuming you have left sufficient space for a hacksaw blade, cut between F3, F6, F7 and F9 and along between the hatch edge longerons which means cutting through F4, F5 & F7. If all goes well the hatches should break away cleanly and the hatches remain undistorted

As the booms and tailplane will be permanently fixed to the fuselage, it maybe worth test fitting the nose retract, the engine, and the avionic to void unnecessary ‘hanger rash’.

If not already done, trim the wing air intakes and cut away surfaces sheeting to reveal the servo mounting points.

Now is ideal time to secure the booms and tailplane to the wing structure. Make sure you route all the servo wiring to an accessible point before gluing these into position. When this is done, the front boom fairings can be shaped and glued into position.

The vac formed nose cone can now be fitted. To make life easier you may wish to make this removable so you can access more easily the nose retract and the nose weight. Nose weight of at least half a kilo will be required for this model to balance and some if not all of this weight, should be fitted in the nose cone above the retract unit. On the prototype, I decided to bond the nose cone to the fuselage to forgo an unsightly join line. The retract unit can still be accessed and removed with the cone in position.

Fitting out

Shown on the plan is an indicative layout of where generally the engine and avionic hardware needs to go. As I mentioned, nose weight will be required and all the batteries will be sighted as far forward as possible. Space is tight so place the retract servo and air valve, the air tank and the steerable nose leg servo as forward and as low down in the fuselage as possible. This will give you enough room to position a false floor above, which you can mount the RX, the engine ECU and switches on to etc.

For this model I didn’t use a Power Box system or anything too complicated other than duplicated receivers. I simply used two 2.4Ghz receivers, each with their own battery and each controlling effectively half the aircraft. So one receiver controls one aileron, one rudder, one elevator half, the engine and say the retracts and the other receiver controls the other aileron, the other rudder, the other elevator half and the flaps. It just give that little bit of extra reassurance without the expense of a PowerBox system, but ultimately the installation type is up to you.

The main fuel tank must be sighted as close over the models balance point as practical. Because the weight of fuel these model carry and subsequently use, the centre of gravity during flight will change if the tank is not centrally fitted over the balance point, so make all efforts to achieve this.

When you feel comfortable that the installation is workable, its now time to plan the covering of the model. With a model such as this, it does lend itself to being glass cloth epoxied. On the prototype I used the 49g/m2 close weave glass cloth and the finishing resin supplied by Fibretech or Buck-Composites as they are now know, based in Worthing, West Sussex.

For the colour scheme on the prototype, I did search long and hard for something a little different. There are plenty of plain silver or camouflage schemes out there but as this was going to be a first jet for me, I really wanted to be able to see the model and not risk any chance of getting disorientated.

The scheme I chose we from the Swiss Air Force circa 1960 and included a striking yellow and black livery. The colours used were all sourced in the form of spary can from the local DIY store.

Before the final colour scheme was applied, the canopy was fitted first. The canopy unfortunately straddles the front hatch so it will have to be cut in two at the hatch front edge. The trick here is to cut the canopy along the frame line and then tape the joint back together. Now glue the canopy to the hatch and the forward fuselage, noting that the hatch joint should match the canopy cut join. When glued, the tape can be removed and hatch removed. A cover strip of thin plastic can then be rolled and fixed to the rear section which should overhang the front edge slightly. This overhang will help support the free standing part of the wind screen on the fuselage section.

Flying

Now with any new project there is always a sense of in trepidation for the first flight, not least because it's a new and untested model but this time there was an expensive turbine on board!

So for the first flight, I handed the model over to a safer and more experienced pair of hands in the form of Colin Hammond. Now the first flight occurred in the summer of 2011 on a rare warm and sunny day with a beautifully manicured grass runway and the excuses not to fly, becoming very limited!
Colin's plan has to carry out a few 'test hops' but I've held that one before and sure enough, as the throttle was opened progressively, the Vampire accelerated with vigor and with a matter of metres, she was airborne. Clearly the power from G Booster 80 turbine was excessive and the vampire was throttled back to about two thirds stick position, as the climb out continued with gusto. Only a small amount of trim was required before the Vampire was flying 'hands free'. After the first circuit I could see Colin was relaxing and soon began some light aerobatic manoeuvres. Because the power the turbine is smooth and progressive but not as instant as you would find with a conventional prop driven engine, a little thought as to the use of throttle will be required before each manoeuvre is carried out. I have to say watching the model perform without having to fly it was so enjoyable but at that point Colin hand the transmitter over and said "she flies Superb" have a go….So I did….the first time I had flown a turbine powered jet! Fantastic! I have heard the comment that once you fly a turbine powered model, you'll be hard pushed to go back and fly a conventional powered model, and I can see the reason why. The vampire was so precise, and she oozed confidence in all the manoeuvres. I even tried a tail slide! Brilliant!

The landing, as with most scale jets, needs to be long and flat to loose the speed. The lowering of flaps is a must to slow the model down and only a minor downwards pitch is noticeable on deployment which is easily corrected with elevator. As a result she gently sank towards the runway on barely quarter throttle and with engine trimmed to idle as she cross the runway threshold, she gently landed and stopped in about 50m of runway…… Superb!

A second flight reassured me further that this model was a real pussy cat and when the retracts failed to deploy on landing, a perfect belly landing was achieved with no damage what so ever.
Don't be tempted to move the C of G back at all from the suggested position as she will become over sensitive and the stability which make the Vampire such a great flier, will be lost.

The model remains controllable at slow speed and with the generous wing area and a pedigree for being a very forgiving full-size trainer, you can be assured that the Vampire makes the perfect scale trainer for those wishing to enter turbine modelling.

Wing Span	78.5” (1995mm)
Length	63” (1600mm)
Weight-	25lb-30lb (12kg-14kg)
Wing area-	50oz/sq’ (15kg/sqm)
Radio-	6-Function
Engine-	60-80size turbine