28" JET PROVOST

So it's been a year or so since the last of my offerings; the EDF dog fight double of the MiG 15 and F86 Sabre. When we (it's the royal 'we' don't you know as our Editor did make the suggestion and rightfully wants all the credit) decided to put together the dog fight double for you RCM&E Special pleasure last year, they really did hit the sweet spot. Not to put too finer point on it, they were pretty darn successful .
One of the key drivers for the models success I think was down to the small handy size and the frugal cost to knock one of these models up. With a cheap fan, economy servos, lipos and speed controller, it really was maximum fun for minimal bucks.

In recent years ducted fan design has offered the inlet bell-mouth as a standard feature and this effectively does away with the need for a smooth moulded air intake to the fan. As a consequence it allowed for a simpler installation of the EDF unit into the fuselage and only requires the fitting of the discharge tail pipe to the back end of the EDF.

Now I will admit that the smooth intake ducts with a non-bell mouth entry, is still generally found on most ARTF designs as they do provide a more efficient installation. But when it comes to designing a traditional balsa wood design, the intakes have always been something that makes the design over complicated and adds a level of additional weight that could be avoided.

The simple analogy is; as long as you make enough holes in the front of the fuselage to allow the fan to breathe, you will have a ducted fan model that will work without the faffing about of trying to make smooth intake ducts.

In recent years, the fans and in particular the fan blade technology has improved immeasurably. The motors are incredibly powerful and the invent of high discharge Lipo batteries has been a revelation. Put this all together and suddenly we have ducted fan set ups which delivers almost turbine power performance.

So when I decided to develop the MiG15 and Sabre last year, the idea was to keep them relatively small and light and plumb for a really cheap 50mm fan unit. At the time, the only real cheap punchy fan was in the form of an AEO 50mm plastic EDF unit from Hobbyking. The stated thrust was around the 380g or around the 14oz mark so there wasn't a great amount of performance so keeping the AUW to around the 16oz mark, made the performance acceptable.

What a difference a Year makes

So having enjoyed the MiG 15 and Sabre, I thought it might be nice to try another design and a particular favourite of mine; the Hawker Hunter. I had a few of the AEO 50mm fans in my spares draw, so in January 2019, I knocked up a design, following the same principles as the MiG and Sabre. The Hunter had a similar wing span but when the model was finished, I struggled to achieve the target weight of 16oz and somehow it was approaching 19oz. In the Scheme of things, 3oz was not a great deal but early testing didn't prove that successful and the flying lacked that jet like 'sparkle'
So the model was consigned to the corner of the workshop and put on dust collection

duty. By the time March had come along, I had noticed that certain builders of the MiG and Sabre on the Model Flying forum were trying some new fans from FMS with excellent results. The stated performance for these EDF units were just over 620g of thrust for the 3S version and 750g of thrust for the 4S version….that nearly double the AEO unit.

If these figures were to be believed, this was really going to make a difference to the Hunter. So a couple units were duly purchased and one installed into the Hunter. The FMS unit I have to say is an excellent piece of kit and beautifully engineered. Super smooth with no vibration, it really is a class way above the AEO fan.

So with the fan duly installed and a larger 40amp esc fitted and another 2oz added, the model was retried……What a transformation….there was sparkle and more! Performance was fantastic and although the weight had creped up another couple of ounces, due to the heavier EDF unit, it made no impact what so ever. Subsequent testing and introducing a larger 2200mah 3S lipo instead of the 1500mah size and a larger intake hole in the underside, the model just got better. Being some 6oz heavier than the MiG and Sabre, give the Hunter better poise in the air, 5-6min flight duration, but still light enough to hand launch.

Well I was so impressed with the whole concept it got me fired up to do a couple more designs….well five more actually!

If you saw the August issue of RCM&E, the four we have lined up for you are the Jet Provost, Folland Gnat, Hawker Hunter and the F4 Phantom. The final two will be the BAE Hawk and EE Lightning, both of which are still prototyping but please to report are working very well.

So having decided on the six subjects, we decided to go with the Jet Provost first as it really did seem to be the Model Flying forum's favourite……and mine too. If any of the other in the range are your favourites, don't despair, there'll be along soon enough as a free plan in the coming months.

To assist the builder, I have once again made available a canopy along with a pair on ducted air intakes. To complete the package, a CNC/wood pack is also available for those who wish to make the building process a little easier and quicker. These will ONLY be available though Tony Nijhuis Designs Ltd (TND) and not Myhobbystores. The plan itself will only be available in this edition of the magazine with future copies again only being available again through TND Ltd.

A few other points to note, the FMS fan units can be sourced either from 4-MAX.co.uk in the UK. The battery was a 3s-2200mah 30c Lipo and
servos were cheap and cheerfully 4.5-6g 0.5kg/cm torque nano servos. For the ESC, buy a 40amp ESC.

Lastly and possibly the most important, a photographic build log is available as a free download to print out from www.tonynijhuisdesigns.co.uk. These photos will be invaluable and I would suggest downloading these so you can familiarise yourself with the build before you start.

Wings

The wing parts are made from 6.5mm (¼") medium density balsa sheet and each wing panel is made of 3 parts. Weight the individual parts and interchange them in order to achieve an equal balance wing. Now glue the wing parts together to form a left and right hand panel.

Where indicated on the plan, highlight using a pen, the location of the area of balsa to be profiled. An indicative guide to shaping the wing is shown on the plan. With the wing panels flat on the building board use a razor plane to profile the wing panels to the first stage of completion as shown on the plan. Now either continue with a plane or with a sanding block, begin the second stage of profiling. Now turn the wing over and repeat the process exactly so the wing is fully symmetrical. Use one of the fuselage sides to make sure the profile is correct at the wing root. When happy, use a medium grade abrasive paper to finish both wings panels to a smooth flowing profile.

Now cut out the ailerons remembering to mark which one fits to what wing. You may have gathered that as the wings are shaped fully symmetrical, it doesn't matter which one is the left or right.

The wings can now be joints together and the 3mm birch ply wing spar fitted. To add a little extra strength, cut a 40mm wide strip off 50g/m glass cloth and wrap the join top and bottom. Secure the cloth with PVA glue.

To finish use fine abrasive paper to round off the leading edge and the wing tips and the wings are done!

Fuselage

Begin cutting out the fuselage side pieces 5 and all formers 6/7, 8, and 9. Note the wiring and elevator push rod hole in former 6.

Mark the location of the formers onto the left and right hand side of each fuselage side. Add strips of 12.5mm triangle along the top and bottom edge of the fuselage and between the wing root leading edge and former 8. The top edge triangle will require some saw cuts at regular intervals to allow the triangle to easily follow the tight curved edge of the fuselage.

Now fit the formers 6/7 & 8 to one side of the fuselage. You will note that former 7 is slotted into former 6 to create the fan mounting former. Former 7 should only be tack glued into 6 to give easier access should the fan ever need replacing.

Now fit the other fuselage side and add the remaining former 9.

Now make up the thrust tube. I have shown on the plan a cut outline of the thrust tube, before it is rolled. The tube is made from 140micron thick acetate. You will be able to source A4 sheet of this on EBAY or from a stationary's….it basically the thin clear plastic

used on report covers etc. The easiest way to make the tube is to roll the end of the acetate around the fan unit as tight as you can making it as a straight tube. Then secure with a small piece of scotch tape at the fan.

At this point, it is advisable to fit the fan unit into former 6/7. As suggested on the plan, I used a couple of dobs of hot glue and silicone to secure; you don't need anything more than that.
Now slide the rolled tube in from the rear of former 9. You will have to fold the tube in on itself but as it slides through, it should pop round again. Gently ease the tube over the fan unit by 12mm or so making sure the motor wire is exiting smoothly through the slot you have made in the tube. If you have positioned the wiring slot, the tube seam should run along the top of the fuselage.

Finally run a piece of tape along the joint length, making sure the tube is pressed hard against the inside edge of former 9. Use a couple of dobs of hot glue; one on the top and one on the bottom to secure the thrust tube to the fan casing….again it doesn't need any more glue than that!

I would suggest at this point you loosely fit the ESC and check the fan motor rotation is okay.

Now cut out and fit he nose cheeks. If you have the CNC pack, these are made from a laminate of 6.5mm and 3.2mm balsa. If you are building off plan, you can make these out of one piece of 9.5mm balsa.

With one length of 5mm balsa sheet, add the underside decking from the front of 10/11 to the rear of the fuselage. Add the 9.5mm triangle to strengthen the edge between 10/11 and the underside decking.

Now install the elevator control cable outers. I would suggest using the 3mm orange tubes from SLEC ltd

Now sheet the top of the fuselage with 3.2mm sheet balsa at the front and 5mm sheet balsa to rear. You will have to sheet 'cross grain' where the rear of the canopy sits as the fuselage curve is quite tight at this point.

Now add the top nose section made from 12.5mm balsa and add 9.5mm triangle to strengthen the edge joint.

The cowl sides can now be cut and glued into position. Now line the top and bottom inner sides with 9.5mm triangle. Finally enclose the top and bottom with 12.5mm balsa

Sand the nose straight and make up the nose block from laminates of 12.5mm balsa. Make sure you cut to the side profile of the nose block as shown on the plan and glue this to the cowl in the exact position shown on the plan. If you do this the correct nose profile will be achieved.

Now for the 'shaping' exercise so make sure your razor plane has a new blade in it….

Please remember that there is a lot of shaping around the nose and the triangle balsa is

there to be cut into create the smooth flowing curves of the Provost, so don't scrimp on the shaping. Use a razor plane to start profiling and then progress on to using a sanding block.

Mark out the fin slot and cut this out in the top sheeting.

The top fuselage access hatch can now be marked and cut out. Use a small hacksaw blade to cut through the top sheeting to the depth shown on the plans. Then, using a straight edge, cut through the side sheeting on each side to release the hatch. The hatch will only have limited use and once the elevator servo and ESC is installed, it can be sealed closed with tape, after the model is covered.

A second hatch, to provide access to the battery, is cut in the underside just forward of former 8.

To retain this hatch I used one of the small brass spring catches from SLEC at the rear of the hatch and a locating pin at the front, as shown on the plans.

Fin & Tailplane

To make up the fin, use parts 16 to 19 and glue them together. Profile the fin leading edge. Put the fin aside and only glues into position once the model is nearing completion.

Now make up the tailplane using parts 13 & 14. Round off the tailplane leading edge and chamfer the elevator (15) leading edge ready for the hinges to be fitted.

Putting together

The wings can now be glued into position. Before doing so, the under sheeting at the wing trailing edge, needs to be cut across. The sheeting should spring down as a result and this will give better clearance for when the wings are fitted.

Now fit the wing and reposition the bottom sheeting, gluing it hard against the wing underside at the trailing edge. You may need to sand across the joint if necessary.

Now add the tailplane to the fin

Now mark out the locations of the aileron servos and 'sink' these into the under sheeting, against the wing. Because the servos are glued into position, cut the mounting tabs off to make a neater install.

Now make up the under wing hand launch grip as detailed on the plan. This grip is quite important as it not only give you a firm hand launch gripping position, it also protect the aileron servos from damage when the model 'belly lands'.

The finally and most important of all is the large cheat air intake hole in the underside. Make sure you chamfer and smooth the entry leading edge of the opening and don't be

tempted to reduce the size of the opening. It needs to be that size as a minimum.

Covering

The prototype was covered using red (Ferrari red), white and black Oracover from J Perkins. The lettering decals were supplied by www.becc.co.uk and the roundels were made from Oratrim. The paint used to paint the plastic air intakes was the matching Oracolor in Ferrari red.

Fit all the control surfaces with flat hinges and secured with glue. Fit all the servos and the all the control horns etc.

The C of G position should be achieved with a small amount of nose weight and a 3S 2800mah lipo. Do not be tempted to move the C of G back from the stated position!

The battery was secure using self-adhesive Velcro.

The canopy can either be fitted before or after covering. I prefer to detail the cock pit, fit the canopy and then cover the model around the canopy, but it's up to you. Finding a couple of small 1/15 scale pilots will be difficult, so if you are not having any luck, ask Real Pilots to make you some 3D printed ones.

Flying

So having given you a taster at the beginning of the article as to what you can expect from these little jets, I'll go into a little more depth with the quirkiness of these little ducted fan models.

The first thing to note is the wing loading is quite low for both these models; only 21oz/sq' so hand launching them is very easy. You will need a firm throw a make sure it is straight and level. I suggest for its maiden flight you get a trusted helper to launch the model for you. The model is remarkable strong and if you don't get it away first time, she'll survive.

Once the hand launch is mastered and trimmed for flight, the model will get away with little fuss and very little control input. On calmer days, except to put in a touch of elevator a second or so after hand launching.

When you get the model airborne and assuming you have cut in the fan breather holes, you will notice how nippy the model is. Once the initial climb out has been executed and the model is fully trimmed out, you can easily pull back the throttle to half stick position and enjoy what is a very scale flying performance.

You'll find the model simply groves and flies on rails especially on a calm day. However if you fly on a windy day, the model will be chucked around a bit so be prepared to fly with more throttle.

All the classic jet manoeuvres can be done with this model, but you will need full throttle and speed on some as the model doesn't have the momentum to carry through

manoeuvre such as big loops etc.……just remember to keep the routine smooth and keep what little momentum it has going.

Landings are very straightforward and generally you will run out of elevator control before the model will stall.

Don’t be tempted to adjust the C of G. both models have been thoroughly tested and where it is shown on the plan is exactly where it needs to be!

The little 3S 11 bladed FMS fan units do give an amazing punch but if you want more power, there is a 4S version which should satisfy those speed freaks amongst you.

Flight times are surprisingly good so expect a good 6-8min depending on throttle use.

So all the Provost is a cracking little models and flies so well. The ethos was to put the fun back into aero modelling at a budget that hopefully all will be able to afford

Enjoy!

Specification:

Jet Provost
Wing span- 28” (711mm)
Length- 26.5” (673mm)
Wing loading- 22.oz/sq’(6.6kg/m2)
Target Weight- 24oz (0.62kg)
Wing area- 0.1 m2

Addition Plans, VAC set, combined CNC / Wood pack are available from :
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email: sales@tonynijhuisdesigns.co.uk
Phone: 07563 518159 9am to 4pm