
42" DUCTED FAN HAWK BUILD GUIDE

When the design process started I very much wanted two version; a scale model with flaps, retracts, Red Arrows detailing, a more powerful fan, and larger battery capacity.

Then there was a lightened, stripped back version using a lighter fans and batteries, without retracts and flaps.

The difference between the two versions was almost a pound in weight.

The light weight version was very much designed with hand launch in mind but with a wing span of 42" and an all up weight of 4.5lbs, this was going to be a tall order. Needless to say, it proved exactly that and we did have some very unpredictable launches. As a result, the only practical way to launch the light weight version is with a bungee.

With the retract version being heavier and the wheel being generally to scale, about 35mm in diameter! we tried unsuccessfully to get this scale prototype into the air from ROG during the spring and had to wait until our grass strip had been rolled and cut finely before a successful take off was achieved. Needless to say, if do go down the route of fitting retracts, then be aware that a good quality runway will be require to avoid disappointment.

Fuselage

Now to seasoned builders, the fuselage is simplicity itself.

Begin cutting out all the fuselage side pieces and formers.

Now make up a pair of fuselage sides using FS1, 2 & 3. Now glue into position FS4, 5 & 6 to each fuselage side making sure you make up a left and right hand panel.

Trim and fit 12mm triangle to the inside bottom edge of each fuselage side.

Now mark the positions of all the fuselage formers on both fuselage sides and fit former F1, 2 & 3.

Now make up and fit the retract plate RP1

Former F6 is the 'fan wall' so make sure that your choice of fan fits through F6 comfortably.

To make the fan installation easier, cut the fan bearers to the correct length and drill the mounting holes.

Cut and fit the wing seat doublers to both fuselage sides and then fit F6

Mark the location of the fan bearers ready for these to be fitted.

Now fit the other fuselage side to enclose the airframe remembering to fit WP1 at the same time.

Now fit F7, and the fuselage under-sheeting. Cut out & fit FS7 from 12mm balsa.

Finish sheeting the top rear fuselage using 9mm & 12mm sheet balsa.

Now fit F3A and the top front decking.

At this point you'll need to decide if you are fitting retracts or not. If you are, now is the time to fit the steerable nose wheel servo and the retract unit. Make sure you check the operation of both the retract and the steering mechanism.

Once happy, enclose the fuselage bottom between F1 and F3 using 6mm balsa.

Now mark the position of formers F4 & glue into position. Now pin F5 to F4 and F7 to the rear sheeting. Tack glue F6A to F6 and fit the 4.5mm sq longerons as shown on the plan.

Now begin to 'roll' 3mm balsa sheet between F3 and F7. When done, the pin can be removed from inside the fuselage.

The rear fuselage can now be shaped using a razor plane and sandpaper. Mark out the fin slot and cut this out. Make up the fin and test fit this into the slot. Put the fin aside and only glue into position once the model is nearing completion.

The top hatch can now be removed. Use a hacksaw blade to cut between F4 and F5 and F7 and cut along the fuselage/longeron edge.

Now make up the two halves of the tail plane and test fit these into the fuselage. Trim the entry points on the fuselage and use the template shown on the plan to get the correct tail plane angle. Put the tail plane aside for the moment and only glue into position once the model is nearing completion.

Fan Fitment

Using the location marks made earlier, glue the fan bearers into position. To fit the fan unit, I found the simplest way was to remove the top half of the former F6 so the fan could drop in from above. This was especially needed for the Hobbyking 10 bladed (Dr Mad Thrust) fan unit which have angled brackets which require fitting before installation. Using a Lander fan which has a clamping ring, is a little easier to install and doesn't need F6 to be cut into.

Before fitting the fan, make up the thrust tube from an A3 sheet of 140 or 180 micron thick acetate. You can get this sheeting from craft suppliers or Ebay.

The thrust tube is rolled to shape and secured using clear 3M tape.

The fitment onto the fan unit need to be as tight as possible with no slack.

You will notice that the tube is tapered slightly, reducing in diameter by 10% at the out let. To fit the tube, you'll need to roll the tube in on itself and slide it up through F7 and

then ease the tube end over the fan unit. The tube is secured to the fan unit using clear tape. I used UHU glue to secure the thrust tube to F7 but only do this after the model is covered.

If you have bought the VAC set, trim the nose cone and fit the ply support ring NR1 to the inside edge of the opening.

When happy, glue the nose cone centrally to F1. Using a razor plane, begin to shape the front fuselage section smoothly into the nose cone.

If you have fitted retracts, cut a way a slot in the underside to allow the nose leg to retract.

The air intakes are again part of the VAC set and these require a backing plate (made from 3mm balsa) to allow rigid fitment against the fuselage sides. To assist, there is an indicative template of the backing plate shown on the plan.

Don't be tempted to fit the intake just yet; wait until the model is finished and covered and the intakes are painted.

To add a touch of scale detailing, you may want to cockpit seating and 1/9th scale jet pilots.

WINGS

The wings are a traditional 'built up' construction and are made over the plan. The sequence detailed below should be followed closely to avoid construction difficulties.

Begin by taking the 9mm x 3mm obechi lower spar and pinning this over the plan. Now fit all of the wing ribs remembering to use the angle template against the front section of W1. Now add the lower stub spar between W1 and W3.

The top obechi spar can now be glued into position.

Now fit the inner leading edge (made from 3mm sheet) and the trailing edge where the aileron meets.

Fit the wing brace B1 and then the rear part of W1 remembering to again use the angle template.

Now add the 6mm x 1.5mm obechi rear top spar, taking note on how the spar 'feathers' into the trailing edge beyond W6.

Remove the wing from the plan and glue the bottom 6mm x 1.5mm obechi spar.

Now make up the opposite wing panel to the same standard and join the wing taking note of the dihedral under each wing.

The wings can now be top sheeted using 1.5mm medium grade balsa. Make sure the wing panel is flat on the building board while sheeting each panel.

Before sheeting the underside, remove the jig tabs from the underside of each rib and sand smooth. Make up the servo support mounts, the retract mounts, the wing bolt support blocks and fit all the wiring. When done, the wing sheeting can be done.

Using 12mm sheet balsa, make up the wing tip and glue these into position

Now make up each individual ailerons as shown on the plan. Start by cutting to shape the bottom skin. Now trim and fit the leading edges which are made from 6mm sheet balsa. Now fit the riblets and the control horn support block. Finally enclose with the top skin and trim to shape as shown on the plan.

If you decide to fit flaps, now is the time to mark and cut them away from the main wing. A leading edge will have to be added to the flap so this will require a little trimming before finishing.

Finally drill and fit the wing dowel and drill the wing securing bolt holes

To add a little more strength to the wing joint, cut a 50mm strip of wing tape and apply this to the wing joint, securing with either PVA or epoxy resin.

COVERING

The prototype was covered using red Easycoat from J Perkins and the decals were supplied via pyramidmodels.com

Fit all the control surfaces with pin hinges and secured with glue and pins. Fit all the servos and the all the control horns.

The C of G position should be achieved without any ballast

FLYING

The first thing to note is the wing loading is quite high for this model so landing speeds can be quite quick unless you use flap or bring the model in on a low trajectory. If you have a tight flying field it may be easier to operate the lightweight version. I know I was much happier landing on grass without wheels!

This model is not for hand launch (unless you are converting to PSS of course). Either way when you get the model airborne you will notice how nippy the model is. Once the initial climb out has been executed, you can easily pull back the throttle to half stick position and enjoy what is a very scale flying performance.

Once trimmed and assuming you have dialled in the recommended movements, you'll find the model simply groves and flies on rails. All the classic Hawk manoeuvres can be done with this model, but just remember to keep the routine smooth and keep the momentum up. The recommended expo settings give the Hawk a little more response at slower flying speeds and moreover assist with flaring the model on landing.

Landings are straightforward but if you do decide to use retracts, make sure you approach is a smooth decent and controlled... any mistakes, the retracts will not easily forgive!

Don't be tempted to adjust the C of G rearwards for any reason as the model will bite!

The 10 bladed Hobbyking fan unit I have to say was very impressive. The power was excellent and the sound was almost turbine like...brilliant!

Having said that the older 5 bladed Lander fan I had used in the lightened version was no slouch but the extra blades really do add to an authentic sound.

So all in all this really is a cracking little model....

This is only the second ducted fan model I have design and like all new-comers to a particular discipline, the learning curves is it still a challenge (even after 30 years of designing model aircraft). So the question is, would I have done anything different?...well yes is the answer and that would be to make the model little larger and fit a 90mm fan in. This may of course have something to do with the eyesight going and being all fingers & thumbs nowadays!

So having now mastered this ducted fan malarkey I can guarantee the next subject won't be too far behind, and fit for a nice 90mm fan unit that is needing a good home.

Enjoy!

Specification

Wing span-	42" (1067mm)
Length-	43" (1098mm)
Wing loading-	31oz/sq'(9.86kg/m2)
Weight-	4.5lbs to 5.5lbs (2.1 to 2.7kg)
Wing area-	0.22 sqM
Functions (servos)-	3-5 function (3 to 5 servos)
Power system (D/F)-	68-70mm fans (2000g thrust per fan) on 6S Lipo
Battery-	6S Lipo 3000-4000

Addition Plans, VAC set, CNC pack and Wood pack for the Hawk available from :

www.tonymijhuisdesigns.co.uk

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