Halifax MkIII Heavy Bomber

For every decorated hero there are always the un-sung heroes and for every wartime aircraft there those that are remembered and those which are forgotten about and never really received the accolade they deserved. The comparison between Lancaster and Halifax is a fitting example of this. Its true to say the Halifax was always in the shadow of the Lancaster even though it was bigger, heaver, and more powerful than the Lancaster its down side was it didn't have the bomb carrying capacity and had almost a 1000miles less range than the Lancaster.

The early marks of Halifax did prove troublesome but by the time the Mk3 came along with bigger fins and the more powerful Bristol Hercules engines, the Halifax became a much loved and respected bomber by the crews that flew them. Maybe if the tables were turn today and all we had in the Battle of Britain Memorial flight was a Halifax, spitfire and hurricane, I think its standing in the 'Bomber Hall of Fame' would be much higher. Of course the very sad thing today is there are no Halifax's left flying and apart from a very small number in museums, there really doesn't seem much chance we will ever be privileged to see a Halifax flying again. What a shame

This is the second Halifax I have designed and from my earlier ramblings you may have guessed I'm a bit of a fan. The first design was back in 1988 when I designed and built a 75" electric powered Halifax. As you may have gathered by the date electric flight was in its infancy. Achieving sustained flight with Mabushi 540 size motors and 1.2a/h Saft cells was very difficult but my philosophy at the time was to build a big light model and use four of them. What I ended up with was a four engined glider and although the eight Saft cells lasted barely 2 minutes, the model did take off from the ground and did fly. The life expectancy of the model was unfortunately short lived when radio interference, I suspect from the rather crude speed controller at the time, caused the model to return to the earth in a near vertical fashion. I always vowed to build another version but I must admit I didn't think it would take 20years to get round to it!

So why another 4-engined bomber, well having built seven Lancasters, two Boeing B-17s, a Boeing B-29 and a Sunderland, I think you can guess I'm pretty smitten with them. And the best thing is there are still a long list of war time bomber I haven't touched yet…oh happy days.

As you may have noticed from the exhaust pipes hanging from the cowls that this is and IC powered model, which is a bit of a deviation from the usual electric powered 4-engined bombers I have designed in the recent past. Although I am a great fan of electric power, I do miss the sound of 4-stroke engines, especially four of them in a scale WW2 bomber. It is an impressive sound and one that electric motors just can't emanate…..

The scale the Halifax is exactly 1/12th of full size and span at 104" (2625mm) and weighs in at around the 30lb mark (14kg). To achieve the profile, I used my trusted Autocad and imported some 3-veiw drawing which were sourced from original Handley Page drawings and as a result the model is very near true scale.

Now normally with smaller models of say 50" (1250mm) span I tend to increase tail plane sizes and rudder area in order to give the model more stability and control authority plus it also reduces the effect of 'fish tailing'. However as the model becomes bigger these issues become less of a problem and so as you design bigger,

you can achieve a truer scale model. Consequently I have to say I'm very pleased with the model both in terms of detail, ground handling and flight performance.

I decided that operational bomb bay doors and undercarriage doors were a must on this model and I have to say both were far less problematic to design and have operated faultlessly to date. The 'boxy' straight sided fuselage allows the bomb doors to be smoothly hinged along their complete length and the design of the inner nacelle and undercarriage legs, allow the doors to closed using a simple rubber band method…..more details are shown on the plan.

The design of the Halifax follows a similar style to that of my 134" Lancaster plan which has a two-piece wing that plugs neatly into the fuselage. The tailplane is removable also which means the fuselage can be stored and transported very easily. In fact breaking the model down into it's four components, mean that this model can be easily transport in small hatch back (ok so not Smart car or a G-Wiz)

Building the Halifax when compared to the Lancaster, is slightly easier with the fuselage being nothing more than a slab sided box shaped with a razor plane. The wings are very similar to the Lancaster wings although the radial engines means the nacelles are in part cylindrical, and this means 'strip planking' is required; the only real tedious bit of the build.

As per normal with most of my plans and to make the builders life as easy as possible, CNC cut part are available which include all the necessary fuselage formers, wing ribs, tail ribs plus the skeletal framework of the nacelles. A very detailed set of VAC forms are available including the canopy and three main turrets, the four radial cowls and the under fuselage radome.
Both the CNC and VAC form set are available through the RCM&E plan service.

Building the Halifax

The model has a traditional built up construction, the fuselage being a box type structure with slab sides and sheeted top and bottom.
The wings are built in four sections and sheeted fully across the top and bottom. The nacelles are constructed on the wing and removable cowls allow access to the engines/motors. The wings as mentioned earlier are in two pieces with structural 'tongues' that slide into two fixed box tubes in the fuselage.
The tailplane and elevators are fully sheeted over rib construction. The fins are made from solid sheet balsa, planed and sanded to shape.

Fuselage

Start by making up fuselage sides from sheets of 4.5mm (3/16") balsa You will have to splice sheets of 900mm (36") balsa to make these sides. Note the 'cut' outline is slightly larger than the fuselage profile. This takes into account the curvature of the fuselage and the trimming required to level the triangle flush with the tops of the fuselage formers.
Now mark the positions of all the formers.
Glue and fix the 18mm (3/4") triangle stock along the bottom inside edge and along the top inside edge as shown on the plan.

Make saw cuts in the triangle stock where shown on the plan to allow them to bend to the profile of the fuselage.

Make up the fuselage formers and glue F4 to F7 into position on one side of the fuselage only. At this point only glue the lower part of the formers (about 100 mm length). This allows the upper part of the fuselage side to spring out and allow the top stringers to be installed. While doing this, insert and glue the bomb door framing stringers from 6mm (1/4") sq obechi. Note; the gap between F4 and F4A and F7 and F7A should be a hacksaw blade width to allow the removal of the 'bomb bay' section. Glue the other fuselage side into position, then fit the remaining formers F1 through to F11. Fit the fuselage box doubler WL1 between former F5 & F6. Now fit the single side stringer to each side of the fuselage formers. Now glue and carefully pull the top sides of the fuselage in to meet the top parts of the formers. You may want to use a fuselage jig at this point to avoid inducing any distortion. As the fuselage sides are now angled in you will notice they over sail the tops of the fuselage formers. Using a razor plane, reduce this overhang so the sides are flush with the tops of each former. When happy apply the top decking using 9mm (3/8") balsa over the full length on the model including the tailplane seat (it makes shaping so much easier if this is in one piece).

Next make a 25mm cut from the bottom between F4 and F4A and F7 and F7A on both sides of the fuselage. This avoids the guess work in finding the ends of the bomb doors after the bottom is sheeted. Fit the lower bomb door stringers and begin to cross sheet the fuselage underside using 6mm balsa

Trim and finish the tail end of the fuselage using solid balas made from a sandwich of 12mm sheet and begin to profile using a razor plane and sanding block, to the shape and profile shown on the plan.

Now cut out the bomb doors using the saw slots made earlier and cutting between the 6mm sq obechi stringers. To split the doors in half you will need to cut through from F4A to F7A. The doors can then be separately hung using conventional model hinges (flat pin type). The door can either be fastened shut with a hatch retainer (SLEC type) or be servo operated.

Finish by cutting to reveal the tailplane seat and insert the seat doublers. Trim the seat doublers flush with the fuselage sides and add the two tailplane retaining plates P2 & P3. Add the real turret fairing and trim cockpit opening to suit the canopy.

Finally cut the hole in the top of the fuselage for the top turret

<u>Wings</u>

Each wing half is constructed over the plan in two section; an inner and outer section which are joined at the dihedral point. To aid the build process, jig tabs have been added to the ribs to help keep the wing twist free while building.

Begin by making the outer panels first. Pin the 9mm (3/8") sq obechi front and main spars to the plan. The main spar will have to be packed up off the plan slightly to sit flush with the ribs. Now fit ribs W4 through to W15, remember ribs W6 and W7 are angled to offset the nacelle against the wing dihedral. Now fit the two 9mm sq obechi top spars, the 6mm sq balsa rear spar and then fit the inner leading edge made from 6mm sheet stock, and the trailing edge at the aileron. At this point the wing assembly can be removed from the plan and fit the remaining lower rear spars.

Now build the inner wing sections.

Trim to the correct length and pin down the main spar over the plan. note again that the main spar will require about 4.5mm of packing to sit flush with the ribs. Cut to length the front lower spars and glue to the bottom side face of wing brace B2.

Now fit the rear sections of W1, the four W2 and the middle section of W3, into position (note that W3 is angled slightly) Glue into position the brace B2 against ribs W1 to W3. Now glue into position the front sections of W1 to W3 against B2. Trim to the correct length and fit the top front and main spars. The wing brace B1 can now be glued into position and the rear part of W3 can now be fitted. The rear top spar can now be fitted and the inner leading edge, trimmed and glued into position. At this point the inner wing assembly can be removed from the plan and the remaining lower rear spar fitted.

The inner leading edges on all the four wing panels should now be trimmed flush with the top and bottom of each wing rib.
As directed on the plan apply the shear webbing between the top and bottom main and front spars.
The inner and outer panels can now be joined together at W3 by gluing the outer panel spars on to B1 & B2 and butt joining at the rear spars and the inner leading edges.

The top surface can now be skinned with 2.5mm (3/32") sheet balsa. The best way of sheeting large open framed wings and avoiding the ridge or step you always seem to get when butting together sheets of balsa wood, is to butt glue each planks together on a flat work bench. Splice together enough planks to cover the whole wing. Make sure you stagger the sheets so the spliced ends don't coincide with the adjacent sheets….little bit like masonry brickwork. Then use a large sanding block (300mm long) and sand the entire surface flat to removing any ridges caused by the jointing. What you will be left with is a smooth single seamless sheet of balsa ready to be glued over the ribs. Don't be too concerned if you feel the sheeting hasn't stuck to all of the ribs; once the wing is turned over, a bead of glue can be run down every rib joint.

Trim the trailing edge to the ends of all the ribs and the aileron recess.

At this point, all the power and servo wiring should be run through the wing to their respective positions and make up the aileron servo mount.

Remove the rib jig tab and skin the bottom of the wing. There in no requirements for washout so make sure as you enclose the wing, you don't inducing any twist. On the under side either leave out (or remove later) the sheeting between the last two W2 wing ribs and W6 & W7 forward of the 'main' spar for the nacelle sides to fix into

Now trim any wing sheet overhang from the leading edge and then fit the outer leading edge made up from 12mm sheet. Profile this to the shape as shown on the plan.

Next, make up the ailerons. This done by cutting the bottom sheet to size, then trimming and fitting the aileron leading edge to sit at the angle shown on the plan. This angle can be checked by test fitting one of the aileron ribs. Now mark out and fit the ribs on to the bottom sheet. When this is done trim the top edge of the aileron leading edge flush with the ribs. Now trim the trailing edge to the rear edge of all the ribs. Install the aileron horn support block before finally enclose the structure with the top sheeting and then trim to the finish shape. Test fit the aileron to the wing to make sure the trailing edge line is straight and true.

To finish apply L1 to the extended spars to create a box for insertion in the fuselage. In-fill between the extended rear spars with scrap 3mm and 6mm lite ply. Make up the extend tongue from the 3mm and 6mm TO1 pieces. Then glue this into one of the spar boxes. This detail is shown on the plan.

Nacelles

The nacelle sides and formers lock together fairly quickly so it shouldn't take too long to see each nacelle structure appear ready for skinning. It will be necessary to brace the two NI-3 formers together to avoid these moving when applying the outer skin. Before you fit the motor bulkhead you will need to decide which type of motor/engine you are going to use. On the plan is shown both the IC 4-stroke option and the electric option from 4-max.

With all the side pieces and formers in place, cut and fit the retract mounts in the position shown on the plan. You will need you preferred retract mechanism to hand to set out the mounts correctly. For the prototype I used a bespoke set of air retracts produced by Unitract Int which came with a set of oleo legs to suit.

The outer sides of the inner nacelles are constructed using 3mm sheet balsa formed around the formers. The bottom of the nacelle is sheeted with 12mm sheet balsa with 12mm triangle and 12mm sq balsa bracing the edge joint.
The out nacelles has more of a compound curve so the only particle way to this is to apply 12mm wide strips and plank the under side. Around the top of the nacelle you will get away with using wider sections of strip wood. You may need to wet the outside surface of the wood surface slightly, to aid the bending in certain areas.

At this point make sure on the outer nacelle you feed the power wiring through NO1. Make up and cut to shape the nacelle tail blocks and glue into position.

To finish, sand and profile the nacelles to smooth finish

Cowls

Firstly, trim the rear of the cowls and open up the front for the prop shaft to exit.
To secure the cowl to the nacelle cut and glue four blocks to the nacelle. Before drilling and securing with small screws, position the motor/engine so the cowl sits centrally around the prop boss and there is sufficient clearance for the prop.

Tail & Fin

The tailplane is a built up affairs and constructed over the plan. The ribs are fully symmetrical so it doesn't matter which is top or bottom. You are building the tailplane upside down over the plan and by doing this flat on the building board will allow a small amount dihedral to be included when the tailplane is remove and turned over.

Cut and pin the trailing edge to the plan, pinned down the 'top' spar and fit the ribs then the inner leading edge. Glue into position tailplane securing plate P1. It may be helpful if P1 has the hole pre-drilled before fitting. Now fit the bottom spar and the inner leading edge. Twin rudder servos are shown controlling each rudder so now is the time to install the servo mounts and wiring.

Trim the trailing and leading edges flush with the ribs and sheet the underside. The tailplane can now be removed from the board. This positive dihedral should be just

noticeable to you now. The top sheeting can now be applied and any excess sheeting overhanging the leading and trailing edges, removed. The 9mm outer leading edge, made from sheet balsa, can now be applied and the tips blocks cut to size and fitted. Finally the shape the leading edge and tips to a smooth flowing curve and the tip blocks.

The elevators are made in a similar way to the ailerons. Remember to fit reinforcement to where the control horn will be sighted. The elevator tips, made from 12mm sheet balsa, can now be cut, fitted and shaped.

The fin and rudders are made from 12mm sheet balsa and only need shaping. These can be glued in to position now or done once the model is covered and ready for painting.

Back to the Fuselage

Make up the two wing support boxes as detailed on the drawings and drill the 6mm securing holes. It may be a good ideal to make these around the wing 'tongues' to assure a smooth tight fit. Before fitting these into the fuselage, make sure again the boxes fit the wing tongues. These can now be cut into the fuselage using WL1 installed earlier as a guide. Now slide the wing support boxes into position and glue. Due to the curvature of the fuselage you may have to trim the box flush against the fuselage side. There will also be a gap along the top edge of the wing where it butts the fuselage. This gap should be in filled with scrap balsa; the scrap balsa being glued to the wing and then trimmed.

Finally to secure the wings, use the wing securing hole already drill in the boxes as a guide, drill through the wing tongues and secure with 6mm bolt and captive claw nuts

With the wing still attached position the tailplane on the fuselage and trim the seat so the wings and tailplane are parallel to each other. When happy, locate the hold pre-drilled in P1 and then proceed to drill through the securing plates P2 & P3. Captive 6mm nut should then be fitted and the tailplane secured with bolt. Using sheet balsa create the front and rear fairing that bend the tailplane in to the top of the fuselage. Using solid balsa make up the fixed elevator fairings and glue these to the fuselage. Use lightweight filler to blend these into the fuselage.

Detailed on the plan is an indicative design for a steerable tail wheel assembly. A close coupled servo which is accessed when the tailplane is removed is 'Y' leaded from the rudder output.

Turrets

There are three turrets in total and it is worth detailing these. Shown on the plan is some minimum detail but why not have a go at doing a real detailed job!

Covering

For covering on the prototype I use 25g /m2 glass cloth and epoxy resin supplies by Fibretech GB Although covering this way is time consuming, it does provide a very tough finish, impervious to glow fuel. There nothing to stop you using the old fashioned tissue and dope of even natural Solartex.

Finishing

For the paint job I used Flair Spectrum paints for the Dark Earth and Dark Green camouflage and Matt black 'Plastikot' enamel spray paint from B&Q. I have used the DIY brand of paints before and have found them very hard wearing and dare I say it…fuel proof!

For the main decals and the art work, these were all painted on by hand. An alternative source is Pyramid Models who can supply roundels and insignias to suit the scale of any model…..Just give them the sizes and they should be able to help.

Fitting out with radio is quite straight forward and is generally as shown on the drawing. For IC engines each has its own servo to control the throttle. In the outer nacelle an access hatch will need to be cut in to access the throttle servo and fuel tank

Powering Up

Now with a electric powered multi, it is simply a case of switching on and flying but not so with our IC engines If they are new you rally need to run them in so the reliability is sound and with 4-strokes that can take anything up to an hour. Also you'll need to adjust the throttle control so they all open and close at the same rate so not wanting to risk any mishap I spent a good hour of testing and tweaking before the cowls went on.

First Outing

Having finished the model towards the tail end of November 2009 and endured the coldest and wettest winter for 30years the Halifax had to wait almost 4months before some sort normally returned to the Hastings model flying site.

Having spent some 20 years around multi engined models, I do feel pretty comfortable flying them. However good you think you are with single engined models there are few rules that apply to multi engined models that you should hold dear. When running the engines always richen the leaner running one, never the other way round. Never mix the rudder with aileron, you must be able to use the rudder as a primary control. The reason for this is in down wind turns need plenty of rudder to bring the model round with little or no aileron required. In some cases opposite aileron is required to hold bank angle.

So with the engines running reliably the model was taxied out. With well balanced engines, the model will have excellent ground control and can be taxied beautifully. So lining her up on the strip in to the face of a 5knott wind the model slowly accelerated to a gentle lumbering roll.

After some 50 feet elevator was progressively applied and the model very gently crept into the air. Retracting the undercarriage the nose rose slightly. Still Holding quite a bit of up elevator, the Halifax was coxed round to an upwind pass. Just from the sluggish elevator it was obvious I could have put another few millimeters my way. Quite a few click of up trim was required before she was flying hand free, straight and level at around two thirds throttle. Aileron and rudder response were excellent and needed no correction at all….oh well two out three isn't too bad!

Comparing the flying characteristics between the Halifax and the Lancaster, I have to say the Halifax has it on the turns. Certainly the amount rudder required on the turns was very small and on a number of occasions a ‘bank and yank’ turns didn’t look too shabby.

Now I elected not to fit flap on the model mainly because WW2 bombers are very ‘draggy’ without the assistance of flap so on the land approach I was please to see the model sank nicely at a comfortable forward speed. However, I didn’t have sufficient elevator authority to flair out sufficiently and a rather heavy arrival was achieved.

The next few outing really just reiterated how nice the Halifax was. A little nose weight was removed (C of G position on the plan is corrected) to avoid a marked pitch down attitude when the throttles were ‘quickly’ cut to tick-over. The elevator movements were also increased to give better response.
The SC 32 4-strokes are a nice little engine and in terms of power, adequately fly the Halifax at the suggested weight.

When landing the Halifax, approach with quarter to third throttle and let the model descend. If you cut the engines to tick-over to early, the model is likely to slow too much and elevator authority will be reduced…… so keep some power on until the wheels have touched…..

So all in all, a cracking model that looks great and flies very well. Just remember to treat her gently and fly her as scale as possible…. you won’t be disappointed.

Words 4364

SPECIFICATION:

WING SPAN- 2625mm (104") (1/12th SCALE)
LENGTH- 1965mm (77.5")
ENGINES- 4 x 30-40 2-stroke (32-40 4-stroke) OR ELECTRIC
RADIO- 5 CHANNEL
WEIGHT- 23lb (10.45kg)
WING AREA- 0.86sqM (9.347sq')
WING LOAD- 10.46kg/sqM (34oz/sq')