HARVARD

So here we are one year on from the 2011 RCM&E Special and another war bird to whet your appetite. This year we decided not to got our traditional route and ask the wide modelling public through the RCM&E web site (www.modelflying.co.uk), but instead select a subject which the RCM&E team thought had more global appeal. Now I have to say there was quite a lot of head scratching and no end of subjects were thrown into the melting pot which covered all eras and types.

In the past when we had conducted an on-line vote, the popular subjects always pitched towards the world war two warbirds so it wasn't a surprise when all that head scratching selected another warbird; the Harvard,

We finally agreed on the Harvard for a number of reasons but the main one was its universal appeal across all continents.

The Harvard was the British version of the American A6 Texan and was predominately used as reconnaissance and for pilot training. The aircraft had incredibly stable flying characteristics which made it great favourite with air forces throughout the world and pilots alike.

I think the other reason for choosing the Harvard may be something to do with being a particular favourite of the Editor. How do I know? Well when the sentence end with 'so we agree to do the Harvard then Tone! and by the way, when you have finished with it, send it in my direction matey!!!.
Now the Harvard isn't a great favourite of mine so Mr Ed might get his wish! Having said that I did own a Midwest 80" Harvard for quite a few years, and although it wasn't a regular hack, when I did fly the model, I had forgotten how well it performed.

The thought however of designing and a building a model which isn't on your wish list, did create a certain lack of enthusiasm I have to say. The design it self was not as easy as I hoped for and turned out to be quite a challenging task to design a simple structure that looks like a Harvard. The retracts and wheel positioned caused no end of design headaches but when it was done I have to say I was pretty please how well it turned out and went together.

Now colour schemes can make or brake the popularity of a model so I really wanted to find a really unusual and striking colour scheme which would hopefully increase the appeal of the model and my enthusiasm to builds the model.
So trolling through the Google images, which revealed thousands of images of the A6 Texan but only handful of Harvards. However trolling through the few images that were there revealed a really striking yellow colour scheme with black diagonal strips which really suited a solar film finish. The scheme was taken from a current flying Harvard based at the Harvard Club of South Africa and I have to say it was the catalyst that got my interest reignited.

As last years RCM&E Special plan, the FW190, was electric powered, I decided for this year we would go for IC powered so ASP 91 was subsequently acquired from Just Engines. Now the model isn't large by today's standard and spanning at just over 66", fans of the Harvard will know the model has quite a short noses and as a consequence will undoubtedly requires a seemingly disproportionately amount of nose weight to achieve the C of G balance point. So the 91 size engine was selected to achieve the balance point without the need for ballast. Well that's the plan anyway so we shall see later on whether it paid off or not.

One of my main concerns with the Harvard was the rather short legs which had to crank inwards as well as retracting inwards. What I had to be careful of was not to foul the leg on either the wheel or the retract unit itself. Setting the correct crank in the piano wire leg is therefore quite important and needs to be done correctly.

For this model I used some air operated retracts which, nowadays are being taken over by the more commonly available electric powered, for which the E-flight medium size I think would work a treat.

As with all of my designs you'll be able to buy a VAC set which includes a large radial cowl and a clear canopy.

As with most of my plans, a CNC pack and VAC sets will be available so order yourself one and get cracking.

WINGS

The wing is constructed in three sections; the centre and two outer panels. Construct the centre section first. Start by pinning the lower middle spar over the plan and secure brace B1 into position. Then fit the wing ribs W1 through to W4. All ribs should be positioned using a set square.
Now fit the top forward and middle and rear spars (with brace B2) and the inner leading edge (made from 3mm birch ply) between W2-W1-W2 and the leading edge linking W3 and W4.

Make up from 12mm (1/2") solid balsa the bridging piece LE1 that links the stepped leading edge at W2.

The skeletal section can now be removed from the plan and the remaining lower spars fitted along with the remaining wing braces. Now fit the wing rib doublers W2A, W3A and W4A and fit the retract mounting bearers. To make life very much easier, it may be worth installing the retracts, now and get the mechanism to work correctly with the legs and wheels attached. To bring the retracts flush with the wing, some 3mm ply wood packing pieces are used under the retract unit. When happy with this the retracts and U/C legs and wheels can be removed

Now for the two outer wing panels. Again start with pinning the middle spar over the plan. Now position the remaining wing ribs W5 through to W14. Now fit the top forward, middle and rear spars, followed by the inner leading edge and the aileron inset trailing edge between W8 and W14. Using the dihedral brace again, trim the top spars overhang at the location of W4 to take account of the wing dihedral. The wing panel can now be removed from the plan and the remaining lower spars fitted. At this stage the aileron and flap servo bearers can be cut and fitted into the wing ribs. As an alternative you could use a proprietary plastic servo mount as supplied by SLEC or similar. These fit flush into the wing with just the control arm showing and are very neat.

Offer the outer wing panels to the centre panel, taking account of the dihedral. When happy glue the protruding parts of brace 1 & 2 to the outer panel spars

At this point either install the aileron extension lead or install 'draw' strings for this to be done later. Now apply the shear webbing between the forward top and bottom main spars as shown on the plan. Now sand the inner leading edges, LE1 and trailing edges flush with the ribs and begin to sheet the top side of the wing with 2.5mm (3/32") medium sheet balsa starting with the centre section first. You can skin from W1 to W14 in one sheet length on the top wing as the dihedral is very shallow. This will give the wing a little more strength across the wing joint.

Insert pieces of soild balsa at the rear, bridging W1 & W2 to strengthen the wing where the wing bolts pass through.

Now skin the underside in three sections. The sheeting will have to stop and start again W4. Remember to keep the wing sections flat on the building board and warp free as possible. There was no washout built into the wing of the prototype nor shown on the final plan merely because the model performed well without the need for it.

At this point, cut the openings for the wheels and legs by making a template from the plan and tracing the outline on to the wing. Also cut the openings for the aileron and flap servos.

Now trim the top and bottom wing skins flush with the leading edge. Now cut and fit the outer leading edge from 9mm (3/8") sheet balsa. Make up LE2 and fit this into position.
Now shape the leading edge to the profile as shown on the plan.

Now trim the trailing edge of the top sheet flush with the rear tips of ribs W1 to W8 and flush with the inner trailing edge between W8 to W14.

Make up each individual aileron as shown on the plan in a similar fashion to that of the elevators and rudder.

Now cut out the wing tips either using 1" thick balsa or a sandwiching of two 12mm sheets together to form the correct thickness and glue these tips on to W14. Roughly shape the tips using a razor plane then finally sand to a smooth flowing profile to match the wing.

Make up the individual flaps from 3mm lite ply, as detailed on the plan. The flaps are made in four sections; two left and two right hand panels. The two panels are joined with a small piece of wire so they are linked together and operate from a single servo in each wing.

Finally a 50mm (2") wide strengthening glass fibre bandage should be applied to the under side wing joint at W4 and bonded with epoxy or PVA glue

FUSELAGE

The fuselage side mid sections S1 & S2 are constructed from two pieces of 4.5mm sheet cut to shape as depicted on the plan. Note that the pieces that go to make each fuselage side are the same and the engine side thrust is taken up by angling the engine mount on the bulkhead.

Glue the parts together to make a left and right hand panel and mark in pen, all the positions of the fuselage formers.

Make up all the fuselage formers F1 to F7 and the wing seats WS1. Mark the position of F3 on to WS1. Now fix F2, F3 and F4 to both of WS1 to form a structure.

Now glue the left & right fuselage mid sides to the structure making sure you are positioning the sides squarely. Now position F4a against F4

Formers F5-F7 can now be fitted and so can the tailpost which is constructed and shaped as shown on the plan.

F1 can now be added and the top & bottom stringers also added.

Begin by sheeting in 3mm (1/8") balsa, the rear underside in two halves between F4a and F7 and from F7 to the tail post. To aid bending the sheet should be wetted on the outside only before being applied

Now sheet the lower fuselage sides between F1 and F4a. when complete, use long hacksaw blade or similar to trim the edge against WS1. Between F1 & F2 at the underside glue into position a piece of 12mm balsa wood to bridge across.

Now sheet the upper sides from F1 to F2. F2 to F4 and F4 to F7. Again, you may need to wet the sheeting to aid bending. Trim the top sheet edges in front and behind the canopy flush with the stringers.

When done, the front and rear top decking can be cut to shape and glued into position.

The fuselage can now be shaped using a razor plane and sanding block

The wing mounting bracket WB1 can now be installed

Now offer the wings into position and drill (6mm) the retaining bolt holes through the wing and the WB1. Open up the hole in WB1 to accept a 6mm captive wing nut. Now screw the wing on to the fuselage. When happy the wing is sitting flush, drill the wing dowel holes by drilling through F2 into the wing leading edge. Remove the wing and fit the wing dowels into the wing.

Now cut from 0.8mm birch ply, the fuselage to wing fairings. Replace the wings and 'sandwich' these pieces between the wing and fuselage. Take you time in adjusting these and when happy, run some thin cyano along the fuselage to fairing joint.

Now cut and fit the 3mm lit ply rear fairings FA1 which links the fuselage and the back edge of the wing fairing. When the glue is dry, the wings can be removed and the inner part of the fairing which butts WS1 can be secured with glue. The fairing should now stay in position at the correct angle.

Using soft wetted 1.5mm (1/16") balsa, cut out to the profile (shown on the plans) the rolled fairing pieces. The pieces are rolled firstly glued against the fuselage before gluing to birch and lite ply fairing. The nose piece of the fairing where it wraps around the wing leading edge, is made from solid balsa and shaped to blend in with the rolled sheeting.

To finish, FA1 must be 'blended' in to the rear fuselage. Now there is no easy way of doing this but I have put on the plan a rough template which when transferred on to soft wetted balsa, will cover in one piece per side.

The cowl is secured using 2mm screws fixed into hard wood blocks, which in turn are secured to the edge of F1. The idea is for the cowl to follow the 'oval' outline of F1 and therefore the cowl mounting blocks will overhang the edge of F1 by equal amounts. When the cowl is then offered to F1, you will have to squeeze the sides slightly to make fit. The cowl appearance from the sides will then give a tapered appearance and will match the 'rake' of the fuselage profile.

TAILPLANE & FIN

The tailplane is made over the plan and up-side down. Cut and Pin down the rear trailing edge. Now carefully fit all the tail ribs making sure they positioned at the base of the trailing edge. You will notice that the ribs taper.

The spar can now be fitted. Because there is a small amount of dihedral, the spar should be slightly 'kinked' in the centre. This can be done by steaming over a kettle for a few seconds.

The 3mm inner leading edge strip can now be applied. The structure can now be removed from the plan and the top spar fitted. Note that the spar will not need to be kinked at rib T1.

1.5mm balsa sheeting can now be applied to the structure top and bottom.

Apply the outer leading edge of the tailplane and cut out the tips from solid balsa wood

The fin is made over the plan beginning with the fin post, made from 6mm (1/4") balsa sheet

The elevators and rudder are made in a similar fashion. First cut the leading edges from 9 mm sheet balsa and then fit the ribblets to it over the plan. Plane the lead edges flush with the ribblets and apply the sheeting to one side only. Trim the sheeting to the profiles on the plan before enclosing the structure with sheeting.
Finally trim the second sheeting to match the first side.
With a razor plane, chamfer the leading edge as shown on the plan.

The rudder and elevator tips are made from solid balsa and these are cut to shape before fitting and profiling. The solid inserts at the base of the rudder and elevator should now be fitted.

Place the tailplane into the profiled slot at the rear of the fuselage and glue the tailplane into position remembering to make up and fit the elevator torque rod at the same time.

The fin can now be slotted into the tailplane and the fin post glued against the fuselage tail post. When happy, infill with scrap balsa, the gap between the tailplane and the top fuselage sheeting and sand so the fuselage flows smoothly into the fin and tailplane..

COVERING

It's up to you when you fit the canopy, but cockpit detailing and fitting could be done before cover. The Harvard is approximately 1/7th scale so there are a number of WW2 pilots available.

The type I used was rubber type available from J Perkins stockists which is bought ready to paint.

The prototype was covered using silver, black, grey and yellow Easycoat from J Perkins which gave it a very striking and scale finish.

Fit all the control surfaces with pin hinges and secured with glue and pins. Fit all the servos and the all the control horns. For the elevator and rudder pushrod control rods I used on the prototype 8mm dowel and 3mm x 200m pushrod ends.

The engine mount is fit left of centre slightly and then 3deg wedges can be fitted behind the mount to give the correct side thrust. These wedges can be bought from SLEC ltd or as a simple alternative 2mm thickness of washers can be fitted between the mount and F2 on the left-hand top & bottom bolts (looking down on the plan view).

FINISHING

For the decals you could use coloured Solartrim but as normal, I asked Lee at pyramidmodels.com to make up a set based on the Harvard currently flying at the Harvard Club of South Africa.

I can almost guarantee that ballast in the form of lead will be required in the nose area to achieve the C of G position. The prototype needed almost about 4oz of lead in the cowl screwed to the fire wall even though I had hoped the ASP 91 would have provided enough weight.

FLYING

Now there's an old saying that if its looks right it will fly right and with the Harvard being used predominately as a training aircraft, you can pretty well guarantee its going to be a very stable platform; but just how good will she be?

Well the first flight occurred in July 2012 as a completed model. Normally I like to test fly all my models in bear balsa wood just in case a 'cut n carve' tweak is need, but time was pressing and the photo shoot was imminent so I took the opportunity on a still calm Sunday morning to get the model test.

The C of G was checked and found to be a little further back than I would have liked but hey lets give it a go and see what happens (the additional nose weight was added later). The engine used in the prototype was a ASP 91 4-stroke which for reasons unknown at the time, was being a right so n so…The tick over was poor and needed a high idle setting to keep going. As the model came in at just under 8lb, the 91 was likely to be a tad overpowered for the airframe. So line up on the runway, she had to be restrained to stop her rolling. Letting her go and opening up the throttle saw her leap into the sky in a very un-scale like fashion……and climb at about 45deg. The first circuit saw quite a lot of down trim put in and the rates quickly turned on….definitely over did it with the elevator movements! Even with the rates reduced, the she was still a bit lively which was in part due to the fact I couldn't really throttle back too much. When I finally did the engine unfortunately cut an she slowed down beautifully to a very controllable decent. Now with any dead stick landing I'm always a bit concerned over leaving the wheels down so my preference is to always retract the wheels and belly land the model.

However on this occasion, I thought to leave them down simply because the plane was oozing confidence and control. After scrubbing off some height, the Harvard was lined up for what proved to be a greaser of a landing.

So with the first flight out of the way, some adjustment were now needed. The reduced rates were reset to be the full rates and some additional weight was added to the nose to. Finally the engine was re-plugged, adjusted and began to run a more reliably.

The second flight was done in front of the RCME cameras on what proved to be one of the hottest days of the year so far. With a much more reliable engine, the model was taxied about the flight strip to check the ground handling. All being well the throttle was opened and she sprang forward. The throttle was kept at about half stick movement and she rose gracefully into the air and climbed with authority. If you choose a 91 installation, you really won't need all the power from the 91 and a good 65 4-stroke should be more than adequate.

Surprisingly for a short couple wing to tail dimension, the elevators are very effective and even though the rates had been reduced, she felt comfortably responsive. With the throttle reduced to around one third, the model was trimmed for level flight. One thing that did surprise me was how fast and smooth the model flew. The big bulky fuselage seemed to add very little drag and slowing the model up was not that easy to do. So deploying the flaps I had expected the model to pitch possibly nose down but to my surprise no trim change was required. The model was now reduced to almost idle and she gracefully floated around with no reluctance to stall or drop a wing.

The model I have to say installs great confidence as I guess it would have done with the pilots flew the full size aircraft. She has a lot of characteristics similar to that of my old Hurricane but much smoother on the turns with almost no rudder being required to produce a flat scale turn.

Anyone building the Harvard will not be disappointed with the flying performance, but as this is a scale model, producing a scale flying performance is the order of the day.
The model will perform most manoeuvres expected by a single engined WW2 fighter. Barrel rolls and loops are a delight, but the model excels at a low fast past, pull up into a half roll and reversal……brilliant. Landing the model feels very smooth and predicable but she will gallop on if you don't throttle right back and deployed some flap.

Once on the ground and rolling out, keep a little up elevator fed in and she will stay on her wheels with out a problem.

There are no real vices with this model…it goes where you point it and does what you ask of it…you real couldn't ask for more.