Ballerina

I'm really pleased with Ballerina and I think you will be too. A simple, classic colour scheme certainly suits it.

DESIGN MAESTRO PETER MILLER IS BACK WITH A SUPERB, CLASSICALLY STYLED SPORSTER

Some years ago I designed a nice shoulder wing model for a.40 four-stroke, this was called Harlequin. A little while ago there was a posting on *RCM&E's* modelflying.co.uk forum asking if there might be a low wing Harlequin. As this is the type of model that I enjoy flying most I thought 'good idea!' and started drawing the model up.

Now I will admit that Harlequin was fairly plain, just a shoulder wing with a bubble canopy on top of the wing. This time I made the model a little less Spartan with an open cockpit and stringer-clad turtle deck. I also added a wing-mounted undercarriage - well, you get bored doing the same things all the time and this certainly looks more realistic.

Simple and sturdy u/c make it a practical machine.

FLYING

Things did not go too well at first due to an engine that kept going sick. My fault - I had fitted a new looking O.S. FS40 Surpass bought on eBay and, for various reasons including weather, I had not run it up in the model beforehand.

Anyway, take offs are straight and smooth and do not even need rudder to correct a swing. Climb out is rapid and, apart from some up trim being needed, no other adjustments were made. Loops and rolls are simple and easy. Inverted flight needs very little down elevator to hold the model level. Flick rolls are sluggish but the model will spin fast. Recovery is instant as soon as the sticks are released. Four-point rolls are beautifully crisp and precise.

Stuart Pickett (who flies my models while I take the photos) loved it and said that it would make an ideal first low-wing model. He did his usual best to tie it in knots and could not persuade it to bite. On one flight I proved just how forgiving the model

The basic fuselage construction, nothing complicated here.

is - the engine went very sick while I was low over the wheat. To get it back onto the strip I made a very tight circle at low level and very slow speed. Quite frankly most models would have dropped in the wheat or dipped a wing and gone in, but Ballerina simply carried on turning and made a safe landing. On another flight I had to hand over to another friend as my trousers tried to fall down. I must be losing weight!

Mick King carried on for the rest of the flight and thought that it was a great model; so two independent opinions favoured Ballerina. Landings are as straight and as smooth as the take offs. All in all it's a very worthy companion to Harlequin

CONSTRUCTION

Anyone who has built a few of my designs can probably build Ballerina with their eyes shut, however it's best to run through the sequence for those who haven't.

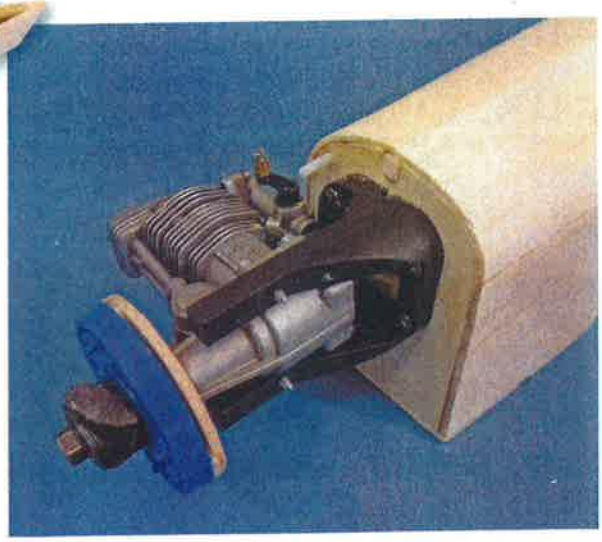
I always like to cut out a full set of parts before I start. This allows me to assemble one component while the glue on another is drying.

Glue the 1/32" ply doublers to the fuselage sides. This includes the doublers at the tail. I use impact adhesive for this. Don't use water-based Evostick. I've found that Ever Build Stick2 spray adhesive is great but do mask off the areas where you do not want the adhesive - other glues do not adhere very well to impact adhesive.

Lay one side down and glue on formers F1, F2, F4 and F6, making sure that they are vertical. When the glue has dried glue on the other side and leave to dry.

Next fit the cockpit floor as this will hold everything square while you pull in the rear of the fuselage sides and add the rest of the formers and the triangular infill at the rear. Fit the triangular stock on the corners at the front. Add the 1/4" sq. spine and F3 and F5.

The rolled sheet turtle deck comes next. Glue 3/32" sheet pieces to the sides and leave the glue to dry. Now trim them roughly to the cockpit shape. This allows them to fit over the front formers and up the side of F5. Wet the outside of the sheet and apply heat with a heat gun or covering iron as you bend the sheet over to match the formers. Trim to the centre of the spine and glue down. I use mapping pins to hold the sheets to the spine.



Stage one of the cowl building process.

Install the snake outer tubes and then you can cover the bottom of the fuselage with 1/16" sheet. You can also make and fit the plate that holds the blind nuts for the wing bolts. Fit the 1/8" sheet tailplane platform between the sides. This and the rear 1/32" ply doublers make the tailplane mounting very strong indeed.

The stringers are 1/8" sq. spruce, glue them down with even spacing and fill in between them at the ends to help with covering later.

Mount the nose ring on the spinner back plate with 1/16" scrap spacers. Mount the engine temporarily and fit the spinner/nose ring assembly. The cowling is built up with 1/2" sheet between F1 and the nose ring. How you shape this afterwards is up to you - if you like a different shape from that shown on the plan just add some extra sheet and shape to taste. Once the glue has dried remove the engine and carve to shape, this takes care of the fuselage - nice and quick and easy.

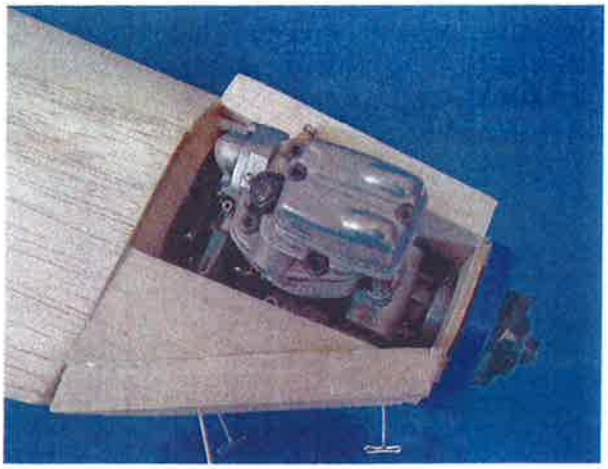
The turtle deck has been fitted. Cut away some of the cockpit opening to allow the front to bend while the rear area is glued to the former. The stringered rear turtle deck is strong and looks great.

WINGS

The wings again follow my normal sequence. I have used inset ailerons for a change as these do work well. After all, the closer inboard that you go the less effect they give so keep them out at the tip. If you are building both wings at the same time do not fit R1 or any top sheet to one wing until you join them.

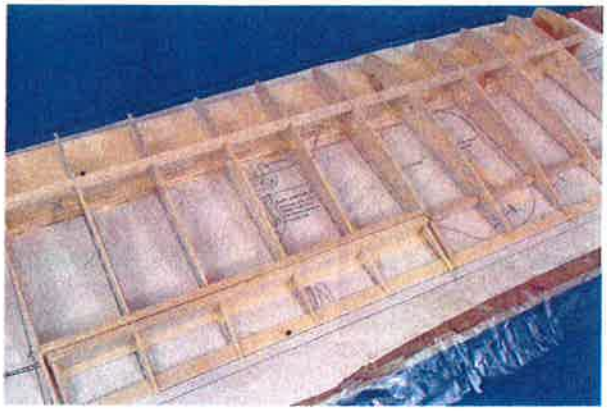
Make up the undercarriage mounts by laminating two strips of light ply to a strip of 1/8" ply to form a groove with the undercarriage wire. Laminate the liteply nose ribs to the main ribs. Note that when the two R1s are finally jcined, the slot

The model suits a variety of engines and although electric power wouldn't be out of the question, some conversion work will be necessary.



The various parts of the cowl cut and chamfered to fit between F-1 and the nose ring.

Shaping a cowl to suit your engine means your Ballerina will have a bespoke, distinctive appearance.



Stage two of the wing with all the ribs in place.

"...four point rolls are beautifully crisp and precise..."

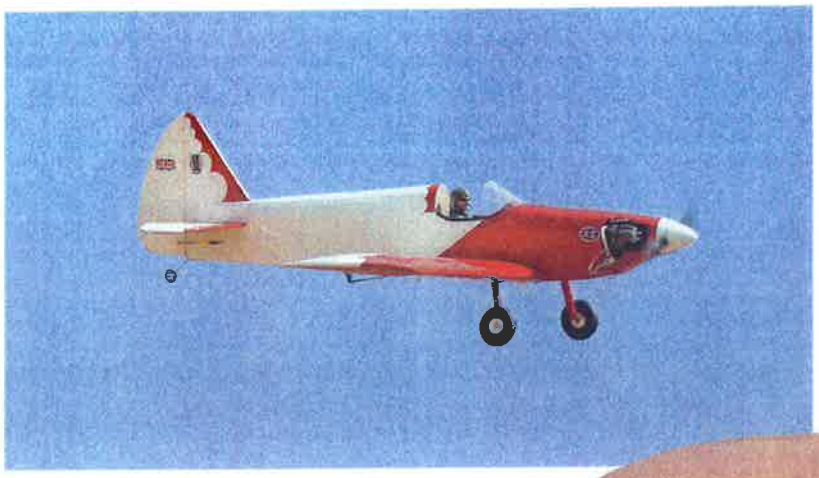
forms the hole for the wing dowel.

Start off by pinning down the lower leading edge sheet, the trailing edge sheet and the cap strips for the rear spar and aileron leading edge. Support the rear spar with scrap 1/16" sheet where there is no cap strip.

Glue on the lower front spar and then position the rear spar using a couple of ribs to get the location exact. Lay the undercarriage mounts on the sheeting but do not glue them down. Now glue on all the ribs.

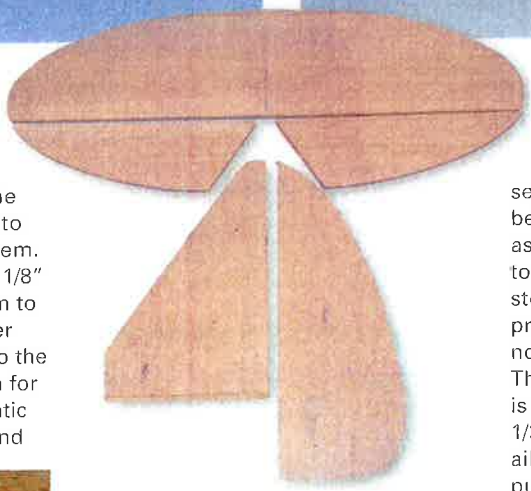
Add the top front spar. Sanding a very slight radius on two corners of the spar will make it easier to insert it into the rib slots. Build up the rear spar in the aileron sections and add the aileron leading edge. Fit the aileron ribs.

Carefully bring the undercarriage mounts up into the slots in the ribs and glue in place with the 1/2"



Pretty from any angle don't you think?

The tail surfaces are from light 1/4" sheet.



triangular stock in all the corners. Add the 1/2" x 3/4" beech blocks for the undercarriage upright prongs. Note that this is only done on the first wing to be built and added to the second wing after joining them.

Chamfer the lower edge of the 1/8" leading edge strips and glue them to the ribs. When dry bring the lower leading edge sheet up and glue to the leading edge. I use aliphatic resin for this joint and then flow Superphatic into the joints between the ribs and

Sheeting being applied to the left wing. The wing is virtually complete and can soon be lifted from the board and joined to the right wing.

sheet and also under the undercarriage mounts.

Add the spar webs and various blocks and infill plus the ply for the control horn. Fit the dihedral brace.

Now add the top sheet to the leading edge of one wing plus the various cap strips in the aileron area. Add the top trailing edge sheet. Glue on the 3/8" x 1/8" trailing edge. I use map pins to hold the sheet down to the leading edge and clamps to hold it down to the spar. When the glue has dried the wing can be lifted from the building board.

Now build the second wing up to the stage of fitting the top leading edge sheet and, with this wing still pinned down on the board, join the first wing on to it. Prop up the tip 2" for the dihedral which will be 1" under each tip, then glue and clamp the dihedral brace to the spar. Leave it all to dry.

Now add R1 to the wing. By doing it this way there will be a perfect joint between the two R1s. Also add the beech block to the undercarriage mount.

The top of the leading edge can now be sheeted and the remaining cap strips and trailing edge added. When dry the wings can be lifted from the board. The 1/8" leading edge cap strip is glued on and shaped to match the wing.

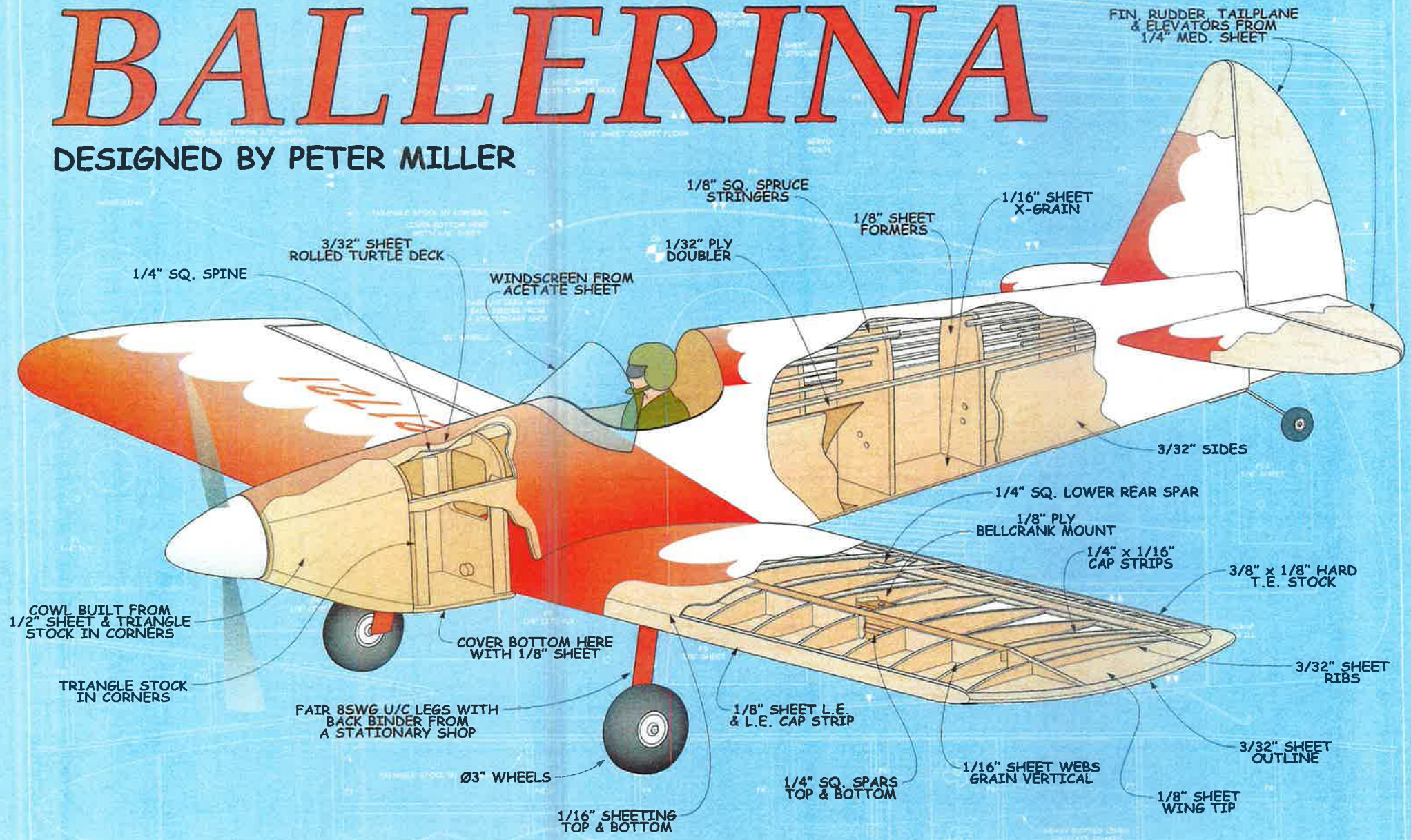
Fit the ply plate for mounting the servo and add the control runs and bell cranks. I prefer a central servo as I like to keep the wing light out towards the tips and which makes stopping and starting rolls more precise. The centre section sheet can now be added plus all the cap strips. The underside of the bell crank bay is covered with 1/16" sheet with 1/32" ply reinforcement around the aileron pushrod slots. The aileron pushrods can be fitted through the slot after covering.

Wing tips are built up over a core of sheet. In front of the spar they are sheeted with 1/16" balsa. Behind the spar there are 3/32" balsa edges, which are shaped to give a nice finish to the tip.

Open up the slots for the undercarriage mounting and cut away for the saddles. Add the ply plates under the trailing edge, these support the wing bolt heads. I like to fit a length of 1/4" brass tube into the leading edge to take the wing dowel. The dowel is then held in place with a

BALLERINA

DESIGNED BY PETER MILLER



Check out Peter's Ballerina forum build thread at modelflying.co.uk

My four-stroke throttle connection (see text).

CONTROL THROWS

These make good starting points but, obviously, we all have our own preferences:

- Ailerons - 3/8" +/- (low rate), 3/4" +/- (high rate)
- Elevator - 1/2" +/- (low rate), 3/4" +/- (high rate)
- Rudder - 3/4" +/- (low rate), 1.5" +/- (high rate)

DATAFILE

Name:	Ballerina
Model type:	Sport aerobat
Designed by:	Peter Miller
Wingspan:	53" (1346mm)
Fuselage length:	43" (1092mm)
Wing area:	553 sq. in.
All-up weight:	71oz (2kg)
Wing loading:	18oz / sq. ft.
Functions (servos):	Ailerons (1), elevator (1), rudder (1), throttle (1)
Engine req'd:	.40 - .48 four-stroke .32 - .35 two-stroke

very small screw. This allows the dowel to be replaced at the field if one should have a tumble on landing.

TAIL ASSEMBLY

There's little to say about this; use light sheet for all the tail parts. The elevator joiner is made from 14 SWG wire and fairing blocks each side of the fin are best made by spot gluing scrap 1/4" sheet in temporary place of the tailplane and fin. Spot glue blocks or laminated sheet into the corners. Carve the whole lot to shape on the fuselage and then sand to final finish. Separate the parts and you will have two fairing blocks that will be a perfect fit when the tail is finally assembled.

COVERING

I use Solarfilm Supershrink Polyester for my models. This material sticks well and does not sag in the sun. It's also more tolerant of an over-enthusiastic application of heat, something that I tend to be guilty of at times.

Cover the tail parts before final assembly. Needless to say leave the areas free of covering that are to be glued. The scalloped red trim is quite easy to do. Use a circle cutter to cut them out of the Supershrink and apply using cooler covering iron heat - better to have it set this way and increase the heat if you need to.

INSTALLATION

There is plenty of room for the radio and servos so installation should be simple. I used a 6oz Radio Active fuel tank, the neck goes through F1 and is sealed with silicone rubber. This holds it in place, allows easy removal and keeps oil out of the tank bay.

I fit balsa doublers to the fuselage sides to take the servo bearers. This makes sure that the servos do not come loose during a heavy landing. The throttle cable has a piece of wire soldered on which allows the cable to be inside the fuselage but still connect to the throttle arm (see diagram).

The undercarriage is clamped to its mount with flat saddles. Fairings add to the overall appearance. Bind a small L-shape of wire to the undercarriage leg with fine wire, this stops the fairing from rotating. Go to your local office supply shop and buy a back binder in a colour to match your colour scheme. The back binder will simply snap onto the undercarriage leg – cheap and very easy with a neat finish.

Once everything is in place check the C of G, I was highly chuffed when mine balanced right on the mark.