

Aztec Two-Step

Your Full-Size
TWIN SPORTSTER

Have some
twin fun for Cox .020s
with
Peter Miller

Twin engined models have a reputation for being tricky to fly when one engine dies. Pages have been written on the subject of how to cope with the "engine out" situation and many is the tale of woe regarding the demise of twin engined models.

My own experience with twins had been limited to a converted Super Sixty and even this stable model proved to be such a handful with one engine out that it was soon converted back to a single engine.

At the Small Model Day at Old Warden I watched Dave Wilshire's tiny little twin performing aerobatics on one engine, loops, rolls, the lot. I was amazed and the next day I had two Cox TD .020s on order.

The nice thing about small models is that they normally bounce in a crash and if they don't, all you have lost is a couple of weeks' work and a small amount of wood.

Design philosophy

The design of the model is very loosely based on an Executive aircraft; it could be converted into a military type quite easily but I felt that military colours would not be a good idea if the model crashed in grass a long way away.

The flat bottomed wing was chosen to ensure adequate lift with one engine running and a reasonable glide; it is also much easier to build.

The structure is over-strong. Originally I used spruce spars but very hard balsa would be quite strong enough. The fuselage is very tough because the 1/4 and 3/16th square in the corners not only allows for a nice rounded appearance, they also add strength.

The eagle-eyed will notice that the drawing is slightly different from the photos. The nose has been slightly lengthened and the windscreen moved forward. This has three advantages. The longer nose gives a little more protection for the engines, it also means that the 1.1/2 ounces of lead that I had to put in the nose can be omitted and



It flew, it flew! One proud designer.

moving the windscreen forward makes radio installation much easier.

I used Fleet Micro radio with three servos but as you will see, two would have been enough. It would be possible to fit two larger servos by laying them on their sides. More about this later.

In flight

I will talk about flying the model at this stage because that is what most people will want to know about before starting building.

The day chosen for test flying was warm with a breeze that varied from flat calm to about 10mph and swung through about 45 degrees.

The engines were started using my home made 'Buggy motor' starter and run in, that means running a tankful through each engine at a rich setting.

Both engines were then started and tuned and the model was launched. Away it went in a steady climb with no fuss or bother. A couple of loops and rolls, very nice. The model was not too fast and the sound of the engines was delightful, far nicer than a single engine.

Very soon the engine note changed. One had stopped but I couldn't tell which one because the model continued in a straight line. I tried a turn, no trouble, a turn the other way, still no bother, which had stopped?

I tried a roll to the right, a bit sluggish. A roll to the left was the same. Now I tried to gain some height and the model slowed down and flicked into a spin. Stop the spin with ailerons and pull out and off we go again.

Plans show a slightly longer nose than here - eliminates need for lead.



I had plenty of practice at single engined flying on the first two flights and found that as long as the speed was kept up the model performed like a single engined model. I did not need to use rudder to correct the spin when it came in, just ailerons and elevator. Putting in Coupled Ailerons and Rudder (CAR) did not make life harder or easier.

Once I had found the lump of congealed castor in the fuel line both engines ran sweetly and I had several terrific flights.

When you come to fly your 'Aztec Two-step' just make sure that you keep it fairly close to you, keep a good bit of height in hand and keep the speed up when one engine cuts. The model will gain height on one engine but it must be done cautiously, too much up elevator and you will drop into the spin but don't panic, stop the rolling and pull out. With practice you will be able to stop the roll before it has done a full turn and so the height loss will be minimal.

Don't let the model get too far away, it gets awfully small very quickly and then you may have trouble seeing exactly what it is doing.

This happened once or twice but I got it back although on one flight it was way down wind on one engine and while I was nursing it home I hit some power lines. I hit them dead on the nose and the model dropped into a wheatfield with no damage apart from the dent in the nose block.

Construction

Building the model is very easy, the whole structure was designed for quickness because I don't want to waste a lot of time on an experimental model but I did want one that looked smart if it was successful.

Start by cutting the fuselage sides from hard 1/16th sheet. Carefully glue on the longerons, 1/4sq at the top and 3/16ths square at the bottom. You will need to make a series of saw cuts to get them to bend to match the sides. Fill the saw cuts with glue. At the same time add the wingseat doubler. Don't forget to make a left and right side.

While the sides are drying make the formers up. F-2 should have a 1/8 square brace above and below the hole to stop it bowing when the nose is pulled in. Make sure that your battery will go through the hole.

Make the saw cuts in the longerons to allow the bends in the plan view. Glue F-2, 3 and 4 to one side and allow to dry then add the other side making sure that everything is true. When the glue has dried fill the saw cuts with glue and add the remaining formers, holding the assembly together with elastic bands.

When set, add the tailplane platform and sandpaper the longerons and sides smooth and flush. Now cover the top with 1/16th sheet with the grain across the fuselage. Medium sheet can be used for this. The snake outer can be fitted or one can use a pushrod made up from 1/8th diameter aluminium tube in which case just check that it runs freely then remove it. The rudder will have to have a snake and this cannot be fitted until the fin is in place.

Now sheet the bottom in the same way as the top. Add the nose block and windscreen block and shape the complete

fuselage as shown on the cross section. Get nice, well round corners as this saves weight and improves the appearance of the model.

Glue on the tailplane, fin and fairings at the base of the fin and that is the fuselage finished.

Wings

These are built flat on the board. Extend the location of the ribs beyond the L.E. (leading edge) and T.E. (trailing edge) with pencil lines before starting.

Pin down the main spar. On the original this was spruce but rock hard balsa will be adequate. Cut out and pin down the lower sheeting, gluing it to the spar.

Glue all the wing ribs in place and fit the top spar, T.E. and L.E. Note that, while the bottom spar only goes to the end rib, the top spar goes right out to the tip.

Cut and fit the top centre section sheeting. While this is drying you can be cutting out the engine nacelle parts, the tips and making the aileron horns.

When the wing is dry remove it from the board; you should have a completely straight wing. Cut the slots for N-2 and check that the nacelle sides fit. Pin the wing down again and glue both N-2s in place. With the wing flat on the board they should touch the board at the bottom. Fit the nacelle sides making certain that they are at right angles to the L.E. and flat on the board.

Take the wing off the board and add N-1s holding with elastic bands. You can also add the tips at this point. The nacelle bottoms are cut to size, the grain runs along the nacelle. Chamfer the rear end and glue to nacelle and wing. The rear top sheeting of the nacelle can also be added, this runs from just behind N-2 with the grain across the nacelle to allow for bending.

The aileron horns are made as shown on the drawing, 18SWG wire is thick enough. Fit them with the T.E. extension which

should be shaped as one with the ailerons. You may be able to find T.E. stock the correct size but shaping from soft sheet is lighter.

The tanks are soldered up from thin brass or tinplate. You could use the integral tanks supplied with the TD020s but this would give a rather short flight. The tanks shown provide about 4 minutes flying. If the integral tanks are used, shorten the nacelles by about 1/2in.

Fit the tanks and add the top sheet to the nacelle with the grain running lengthwise.

Cut out the hole for the servo; this will have to be cut through both skins. Glue short lengths of 1/4 square hardwood inside the top skin, this is made easier by the hole in the bottom of the wing.

You are now ready for covering. I used Fibafilm on the model but a slight saving in weight could be made with Litespan and film would be acceptable.

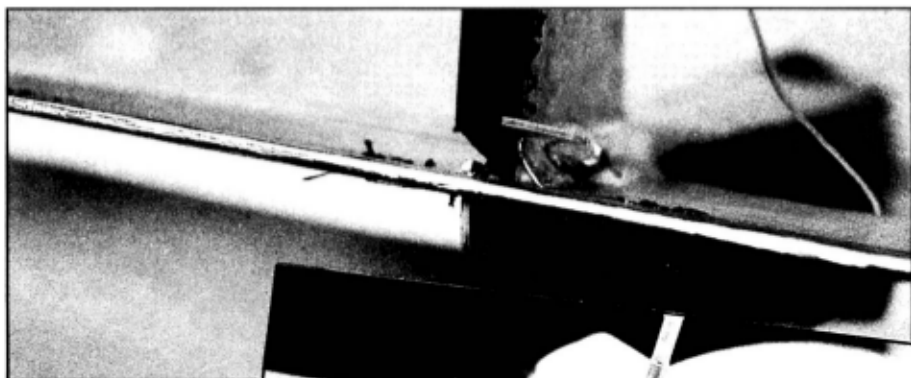
Installation

The engines are installed at an angle as shown, this reduces the effects of vibration and makes the needle valves easier to reach. The right engine will have to have the spraybar reversed but this is only a moment's work. Make sure that the self tappers do not puncture the tanks.

Fit the servo rails to F-2 and between the fuselage sides to suit the servos used. It should be possible to fit quite a large servo on its side in the cabin roof if this is necessary.

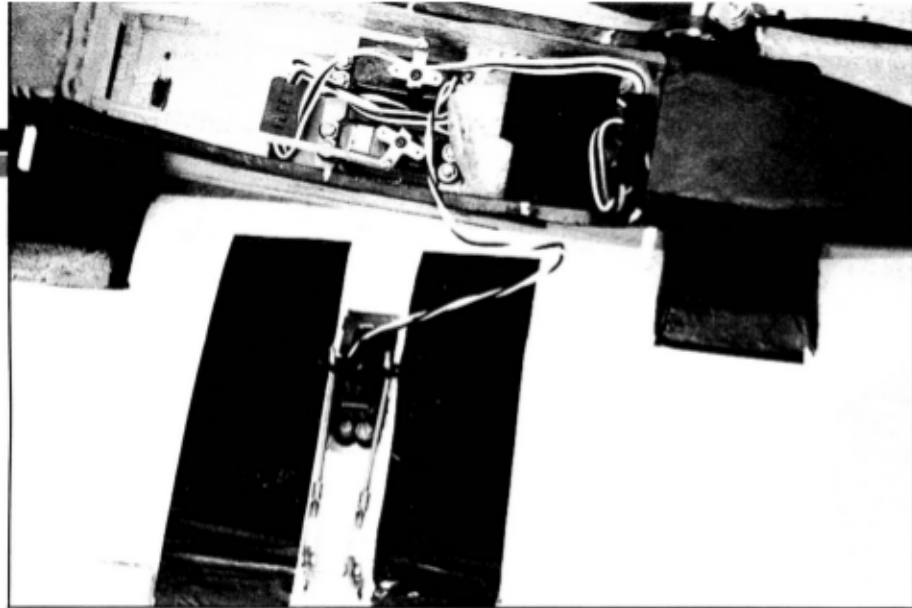
The Rx goes behind the servos. I wrap it in bubble pack and hold it in place with Velcro. The switch is fitted to the cabin roof.

The aileron servo extends below the wing. The bottom of the servo is covered with a fairing of scrap 3/8 sheet. This can be thicker or laminated if the servo extends further. This also makes a useful grip for hand launching. Simply covering this fairing



Above, the very clean tail end and simple elevator control run. At right, Miller hopes you'll do a neater job of covering the nacelles and tank vent tubes on yours! Cox TD .020 is super powerhouse.





Radio installation on the prototype was as seen here; the plan has been modified somewhat to provide more room. Turn to the centre of this issue for your pull-out drawings.

is fine for grass landings but for harder ground a layer of 1/64th ply would be a good idea.

Controls are connected with snakes or pushrods, the ailerons use very short clevis rods.

The battery should be a 150 mAh or 250 mAh unit. Stuff some foam or bubble pack in the nose and then the battery followed by more padding.

I used sewn hinges for the elevators and rudder and cut down plastic hinges for the ailerons. Control throws are given on the plan.

Radio used was one of my Fleet Micro outfits for an all up radio weight of about 3 ounces.

The great moment!

I have already talked about flying the model but there are one or two points that I want to stress.

The engines need 25% nitro. I use Model Technics GX-25. If the engines are new, run a tankful of fuel through them at a rich setting and then get them set up at just a fraction under the peak rpm.

When you made the tanks the chances are that one was a fraction bigger than the other. I hope that you made a note of this because this is the engine to start first.

For starting I have made up a starter using a buggy motor and buggy battery and this produces instant starts.

With both engines on song, get someone

to launch the model. It should climb away safely. Gain plenty of height and then try turns and rolls and loops. The sound of the two engines is not loud and is far more acceptable than a single engine.

When one engine cuts the sound will tell you but if the model is flying straight and level or in a slight dive you will not know which engine has cut. Keep turns gentle until you do know.

On one engine the model will still roll either way which is guaranteed to frighten the pants off any experienced twin pilot. If the speed is allowed to decay too much, (that is the technical term for "if you let it get too slow") the model will flick into a spin, correct with aileron and pullout, that is all that there is to it.

Providing that the tanks are about the same size and that one engine hasn't cut for any reason other than running out of fuel, the other engine should stop very soon after. Keep the model near you and with a good reserve of height. The glide isn't very good so you may have a long walk if you don't.

Conclusion

The model has been so successful that within a week of the test flight another club member has started on his own design. The model is easy to fly and safe on one engine and although you may feel like doing the Aztec Two-step after the first couple of flights, you will soon be completely at home with it.

