PIPER PA-22 TRIPACER

Richard Crossley presents his Indoor Scale 1/17th scale design for radio control or free flight

Although my main modelling interest is indoor free flight scale, I have grown up flying radio control too, so when I learnt that a radio control class was to be flown at the annual Indoor Scale Nationals at Nottingham University I just had to have a go. The new class will consist of a flying section and a static section - to be judged to the same static rules as the free flight event.

The flying section will consist of a number of manoeuvres that are performed in front of judges, and although the manoeuvres are not particularly demanding on their own, its a real challenge to string them all together smoothly without making any mistakes, especially when the judges are watching.

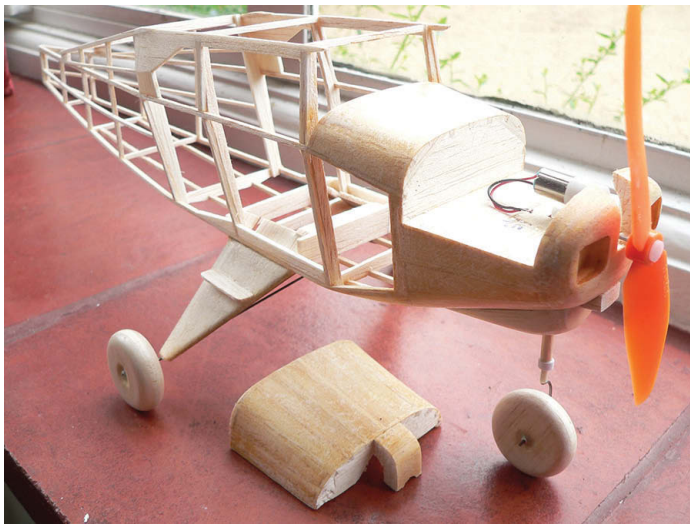
So I set about looking for an ideal model for the new class. My main consideration was to build something that I liked but that would also have enough wing area to carry the extra weight of a radio system and still be stable, yet easy to control with rudder and elevator. The Piper Tri-Pacer is ideal - it has an unusually low aspect ratio wing of very generous area, which is helpful in keeping the wing loading and flying speed low. Also, many survive, which is great for the static documentation as there

The finished colour scheme is Daytona White and Cadilac Red, and represents a 1956 aircraft that is in restored condition. The colours are airbrushed Humbol Enamels, and all masking is done with yellow low-tack 'Frog Tape' available from DIY outlets in the UK.

are lots of colour schemes and photos to choose from on the internet. Some of the original 1950s colour schemes are superb.

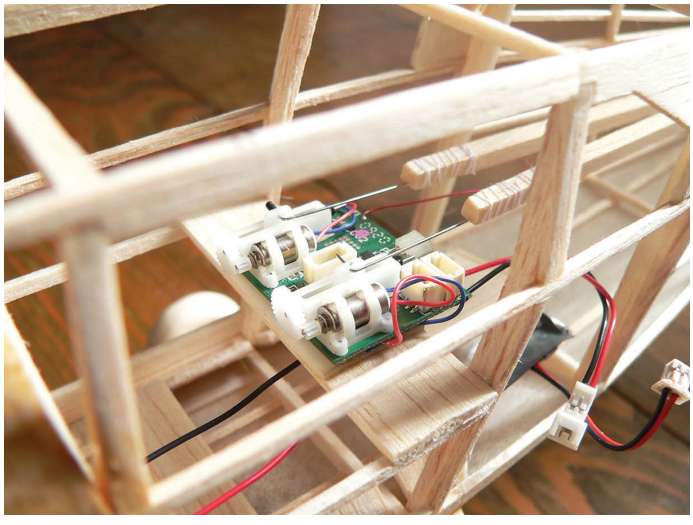
BUILDING

This is an easy model to build. It is conventional in layout and the structure will not prove taxing for the average modeller. I have set it up with a generous 3 degrees of incidence, which makes it a lovely stable performer with dihedral slightly increased from scale, mainly to improve the effectiveness of the rudder. Much information is listed on the plan, but I will run you through the build just in case anything is not clear. You may choose to make a copy of the plan and printwood patterns at your local copy shop. If you do this, do check to make sure there is no distortion on the printouts. Using spraymount or similar adhesive, glue the paper templates to suitable lightweight balsa sheet. Careful wood selection is the key to keep the weight down. If you are building this model for radio control, don't fall into the trap of thinking you can afford to be less fussy about weight control than a free flight model. Things like pushrods and receiver mounting plates can be very light balsa, there is no need to build extra strength into the model. Cut out all of the parts before starting construction. For the wing ribs, I usually make a simple ply

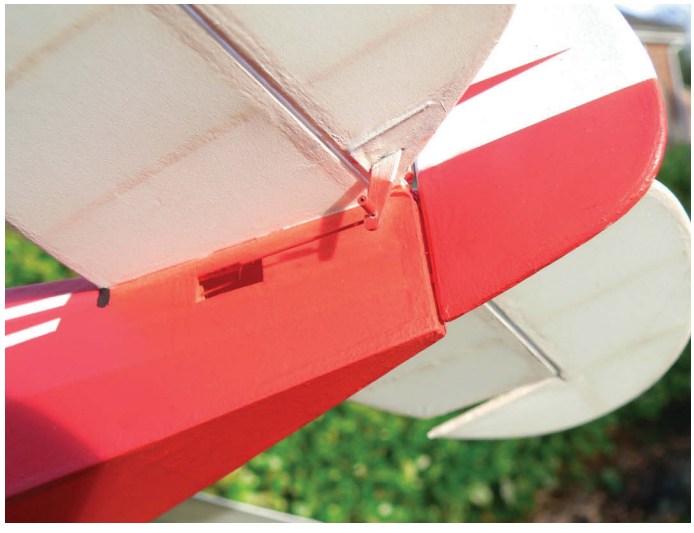


The basic fusealge after construction. Note the sheet in-fill between the stringers around the nose. You can alo just see the way the rear upper side stringer joins rear of the window. The wheels are simple, having printed paper hubs for detail.

Wings employ a scale rib spacing and slightly increased dihedral. The strut anchor plates are from light 1/16" sheet balsa. This picture was taken before I cut out the cowl hatch.



The Spektrum AR6400 combined RX/Servos/ESC unit weighs in at 4.9 grams. mounted this on a 1/16" balsa platform using servo tape. At this early stage I had the battery located behind the RX unit, (just visible in this picture). I later moved the cell forward under the cowl hatch. The pushrods are made up from your lightest 1/8" square balsa, with 0.45mm dia. piano wire ends.



The control horns are made from 1/64" ply sheet. The end of the wire pushrod is simply held in place with sleeving cut from fine electical wire, fixed with a tiny dot of cyano

template and use this as guide to cut around. This saves time, as well as ensuring all ribs are pretty much identical. You can then pin together the 'block' of ribs and cut the notches using a modellers file.

FUSELAGE

This is a basic box structure - build the fuselage sides directly over the plan (note that this structure is shown shaded grey). The cabin uprights are from slightly wider wood, and the rear window surround and wing support are from sheet balsa. Pin each side of the 1/16" strips, never through them. Glue the joints with your favourite adhesive as you go (I like good old fashioned balsa cement). Once dry remove from the plan and build the other identical fuselage side. Make up the two formers 'F1' and 'F2' directly over the plan. When dry, remove from the plan and glue into position on one of the fuselage sides. Note that you will have to crack the joints slightly at the window sill level to form the correct angle. Cut another pair of 'F1'uprights and glue these into the position in the fuselage sides as noted on the plan (between F1 and F2). Crack the longerons inwards at the F2 position (see top view). Now join the sides together, and when dry, pull the rear of the fuselage sides together, glue and hold together with a clothes peg whilst the glue dries. Check that everything is nice and square and that the fuselage is not curved when viewed from above. Make up the nose section from parts N1 - N4, this can be done in the hand as the parts interlock. Again, crack the longerons (at the F1 position, see top view) and pull the nose together slightly, gluing the longeron extensions into the notches in N3, before adding the dash at the correct angle..

Cut all of the 1/16" square cross members to length, using the plan top-view as a guide and glue in place. Undercarriage next - cut to shape and sand the main 1/16" balsa U/C legs and glue into position to the inside of the lower fuselage longerons. Note that you will need to chamfer the lower corners of the longerons where the legs touch. It is a good idea to temporarily brace the legs whilst the glue dries. Now glue in place the two 1/16" balsa 'webs' as shown on the plan. This will form a strong assembly. The wire axle can be bent to shape now and epoxied into position. Note that it is best to cut a notch at the end of the balsa legs for the wire to engage before gluing firmly.

The nose leg is bent up as shown on the plan, with a dog-leg at the top so that it can be fixed to a 1/16" sheet balsa platform that is offset to one side of N4, I would recommend that this unit is 'torsion sprung', with the wire running in thin aluminium tubes.

If you are building your model to fly using radio control, now is the time to install the RX unit. I made a couple of 1/16" balsa bearers and mounted the unit to a sheet of 1/16" sheet with servo tape. Lightly wrap some cling film around the unit to protect it from balsa dust as you progress the build.

Lightly tack in place the 2 remaining cowl formers N5 and N6 that make up the edges of the removable hatch. Add the stringers to the cowl and when dry in-fill in the gaps between the stringers with 1/16" sheet balsa. Add the two lower stringers and the 'spine' from light 1/16" sheet.

Complete the basic fuselage structure by adding the two stringers to the rear of the fuselage sides. Bear with me here, this is a little tricky to describe - The upper of the two side stringers bisects part 'FX': Cut

through 'FX' on the dashed stringer line shown on the plan, and remove the 1/16" wide strip of balsa. Glue the 1/16" sq. upper side stringer in place noting that it tapers to the rear. Now pull 'FX' up to and glue to the stringer. This will form a very shallow 'V' shape to the rear edge of the side window, giving extra rear seat shoulder room on the real aircraft. The lower of these 2 side stringers glues against the rear and front faces of the relevant fuselage uprights, this imparts a curve to the stringer. Sandpaper the entire structure, paying attention to the cowl, ensuring nice smooth curves. When dry carefully cut out the cowl hatch. I also included a small section of the nose block over the prop so that I could remove the engine if required (see photos of model). Make a 1/32" ply engine mount for the Voodoo 25 motor, and install the motor with two degrees right thrust and two degrees down thrust.

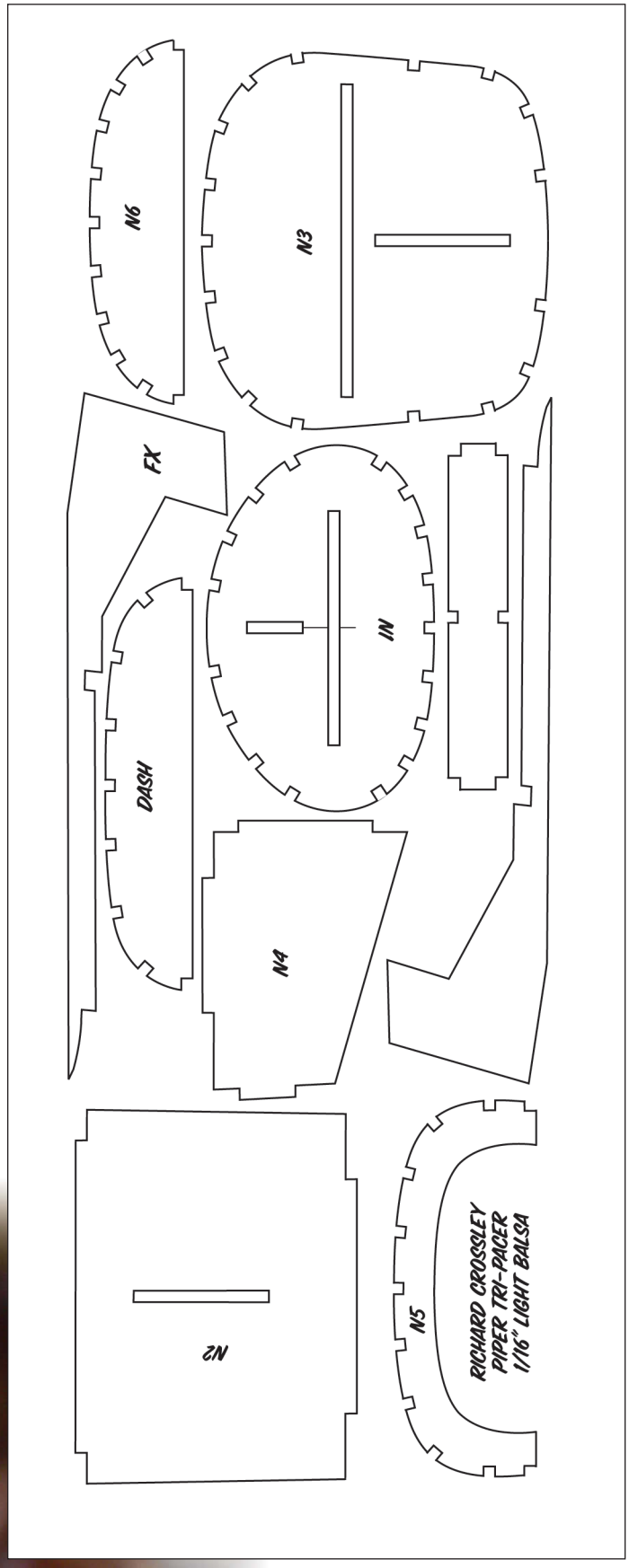
WINGS & TAILS

The wings are built directly over the plan in the normal manner. Build the right wing first. Note that the trailing edges are notched to accept the wing ribs. It is a good idea to carve and sand the trailing edge to a tapered section before building the wing, as this will prevent the risk of 'snagging' the ribs once the wing is built.

The wing tips are angled upwards, so these should be assembled over the plan from 3/32" sheet parts. When dry, remove from plan. Pin in place the leading and trailing edges, then glue in place the assembled wing tips, propping them up under the extreme tip (see front view of wing on Plan 2). Now ad all of the wing ribs, noting that the root rib is angled slightly, and that the Tip Rib is raised off the building board. Glue the 1/16" square top spars into the notches in the ribs. When dry remove the wing from the building board and add the lower 1/16" square spars, the strut plates and the gussets at the root rib position.

Build the centre section over the plan in a similar manner to the wings, noting that the front piece 'CS' is cut from the pattern on the plan. Join the wing panels to the centre section, being careful to obtain the correct dihedral shown on the plan.

The tailplane and fin are built up over the plan from strips of medium density 1/16" square balsa. Note that the outlines are best (lightest) laminated up from strips of 1/32" x 1/16" balsa. This is quite easy to do, and well worth the effort. Soak the wood strips, and then glue them together with white glue, and whilst still wet, bend and pin them around a waxed balsa former. When set, pin them into position on the plan and build up the tails in the normal manner. Don't forget the wire joiner on the elevators, bent from the thinnest wire, and also the



Left: the appearance of my model was greatly enhanced with this little chap. I carved him from white extruded foam and painted him with artists oil paints.

Most Tri-Pacers do not feature wing codes. There are plenty of colour schemes to choose from, and hundreds of photographs can be found on the internet. You can see that my model flies with some 'up' trim on the elevator.

larger gussets that act as a base to glue the control horns to.

RADIO INSTALLATION

Pushrods can be made from the very lightest 1/8" sq. balsa strip. Wire ends are then bent to shape and bound to the rods with thread and balsa cement. Leave the wire ends over-length until the tails are assembled to the fuselage. Use thin wire, typically about 0.45mm dia. You can also use very thin carbon tube for the pushrods (1mm dia. external, 0.5mm dia. internal) this is very light and easy to use, and the wire can be cyanoed into the ends.

I used a 200mAh Lipo cell installed under the cowl. There is no on/off switch, the cell is simply disconnected and removed for charging. A 130mAh cell would suffice for shorter flight sand is 1.5g lighter. Make up a small pouch for the cell from 1/16" sheet balsa and fix in place under the cowl. Before covering test the radio gear to make sure everything works as it should, as you will not have direct access once the model is finished.

I printed the Piper logo on my laser printer. The paper panel was cut out and the white edges of the paper touched in with a red felt pen and glued in place with spray glue. This looks effective and the slight miss-match in the red tones does not notice once fixed in place.

COVERING AND ASSEMBLY

Carefully sandpaper the entire airframe with medium and then fine paper. When you are happy, cover the model with lightweight *Esaki* jap tissue. For tissue paste I use *'Solvite Border Adhesive'* which is obtainable from DIY shops, and the large bottle contains enough paste for dozens of models, so it is quite cost effective. At this stage, cover the top of the rear fuselage from the rear of the wing back (you may prefer to glue in place a couple of balsa supports across the fuselage at the TE position to anchor the tissue to). When covering the wings and tails, always apply tissue paste to every rib as well as around the edges, This will go a long way to preventing warps, and will greatly increase the strength. Full size fabric covered aircraft use this practice - the fabric being stitched to each rib.

Water shrink the tissue. Be especially careful to avoid warps in the tailplane and fin: I prefer to hold these parts over a steaming kettle, if you do this a couple of times the tissue will shrink just enough without warping the structure. Apply a couple of coats of thinned cellulose dope or banana oil to the tissue. Hinge the elevators and rudder using very thin strips of mylar, or short lengths of fishing line. The control surfaces need to move very freely. Glue in place the tailplane and the fin, hinging the lower part of the fin to the fuselage stern.

Study photos of Tri-Pacers and add any small details that you desire - foot step on U/C leg, exhaust pipe, aerials, nav lights etc.

Now is the time to spray the model if that is your intention. I use humbrol enamel paints, thinned with cellulose thinners. I tried a masking tape called 'Frog Tape' for the first time. This is available from DIY outlets, and gives superb results. Go for the yellow 'low tack' variety. I found the *Frog* tape gave really sharp masked edges with no bleed.

Next glue the wing into position, and when dry add the acetate side windows and windscreen. Use paper templates until you are happy with the shape and then transfer them to acetate. Add the remaining section of 'spine' that sits on top of the wing, then cover this section before painting.

Wheels: the wheels are made up from laminations of soft balsa sheet as shown on the plan. A 'circle cutter' is invaluable for cutting out the wheels parts. Sand to shape, apply a couple of coats of dope to seal them, then epoxy in place the aluminium tube axles. I drew up the hubs on my computer and printed them out. After cutting with the trusty circle cutter these were then applied to the black painted wheels using spray adhesive. This is a simple but effective method of getting a neat pair of wheels. Use the outer plastic stripped from thin electrical wire to hold the wheels in place.

Struts: these are all made from firm 1/16" balsa strip, cut to the right width and then sanded and sealed with dope. Fix in place to the lower fuselage and into the holes in the strut plates in the wing and then paint. Note the rigging on the tailplane/fin.

FLYING

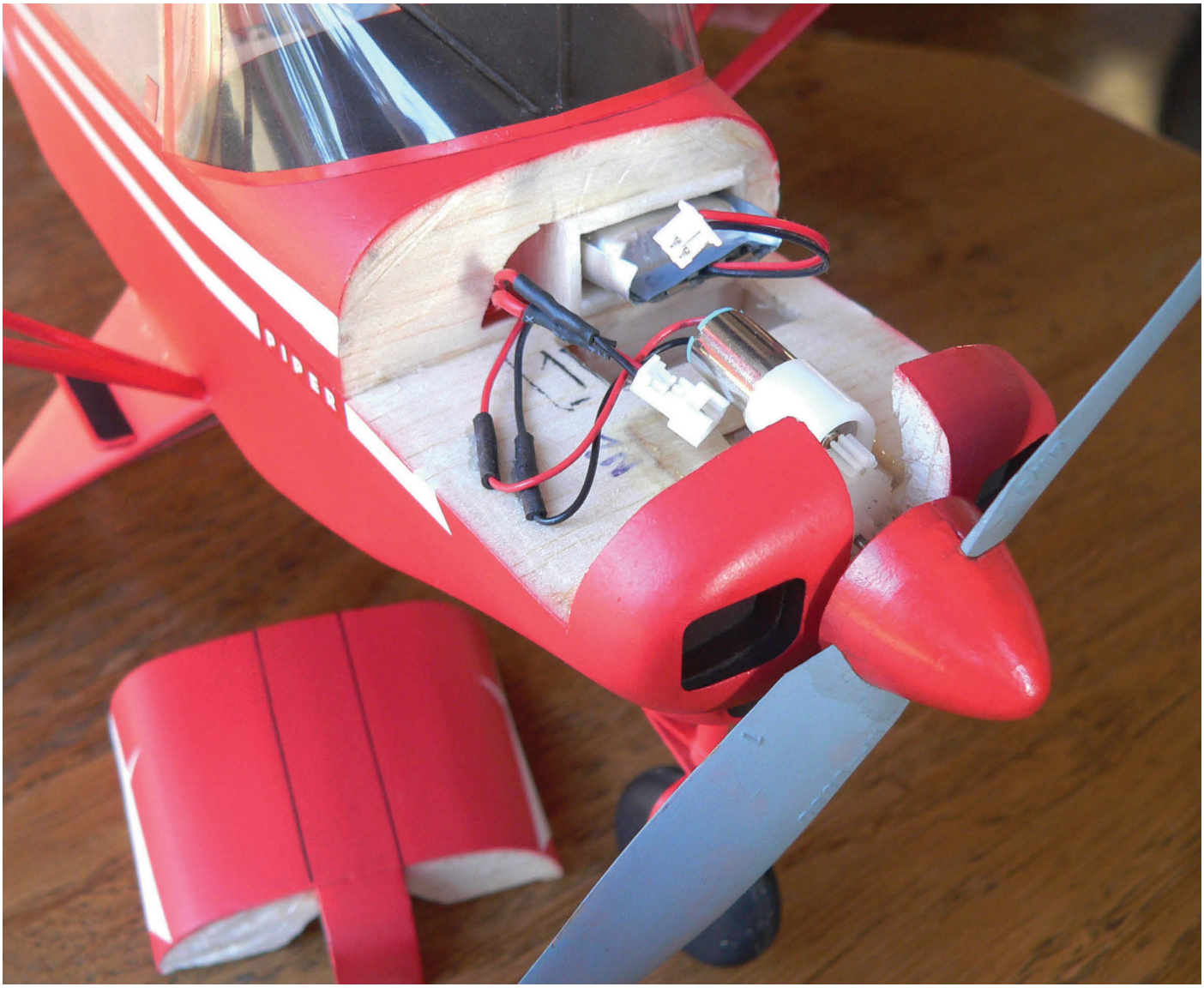
Before you start, check that the balance position is close to that shown on the plan.

This model flies superbly, just like a basic trainer in fact. The elevator is powerful, so its a good idea to limit the throw initially until you are familiar with the flying characteristics. The model takes off very realistically, full rudder is needed initially due to torque, until the model is moving and the rudder becomes effective. When up to take off speed a slight pull back on stick is needed to unstick. Surprisingly tight left and right turns can be effected, and the model can be made to fly quite slowly and realistically. With the *Voodoo 25* motor installed there is no chance of any aerobatics, but that's not what this model is about, its much happier stooging around in a scale-like fashion. Landings are a joy to perfect, holding the model off the deck with elevator as the speed bleeds off until the model is almost stalled at the point of touchdown will put a smile on your face when you get it right!

The final flying weight of my model is 48 grams, giving a wing loading of about 10.2g per Dm2.

I powered my model with a *Voodoo 25* electric motor, running off a single 200mAh Lipo cell, both available from A*tomic Workshop (www.atomicworkshop.co.uk)*. You could use a 130mAh cell if you fancied saving a little weight.

The RX 6ch module used is a *Spektrum AR6400*, available from Robot Birds (robotbirds.com). This works fine, but I did have trouble setting this up, as the allocated 'steering' channel is through one of the onboard plugs, and not through one of the two built-in servos. This is fine if you are flying using ailerons with a separate plug-in servo, but very annoying if you require a 3ch set-up as the rudder will be on the wrong stick on your transmitter! I did manage to get around this after a lot of head scratching by using the 'mix' function between rudder and ailerons on the TX, and allocating all of the travel to the required stick. I think an easier option may be to try the 'Vapor' unit from Micron Radio Control *(www.micronradiocontrol.co.uk)*, this is simply a 3ch unit, so should work fine, and its slightly lighter too. ■



With the engine cowl removed you have full access to the cell and engine. There is no on/off switch, the battery is just unplugged when not in use. The cut out section at the top just behind the spinner allows the engine to be withdrawn easily. The Voodoo 25 motor comes complete with prop. The spinner ins made up of balsa discs, then sanded to shape. It needs to be cut up and fitted around the prop.

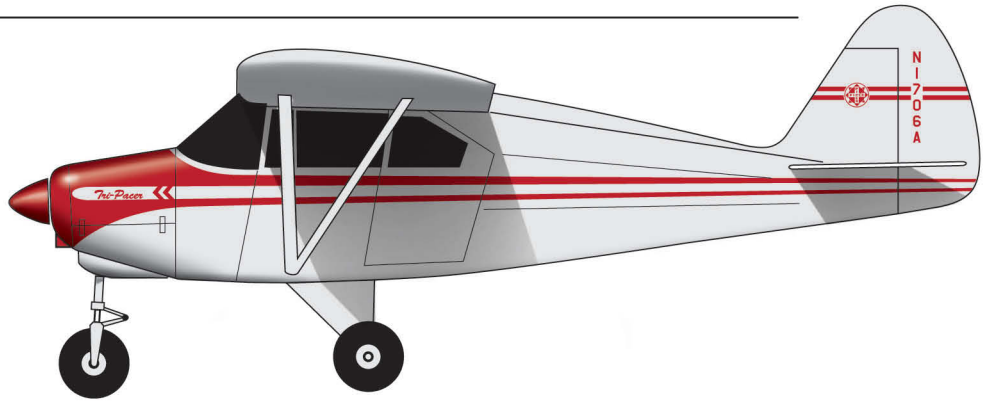
Tri-Pacer

A DECADE OF COLOUR

Factory Butyrate dope external colours and patterns used on the PA-22, 1951 to 1960

1951

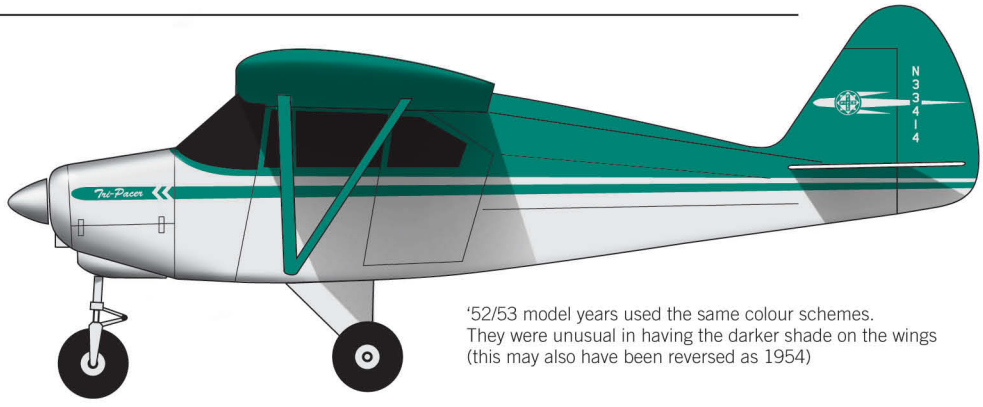
Polar Grey and Tennessee Red



1952 & 1953

Polar Grey and Tennessee Red

Polar Grey and Sacremento Green



'52/53 model years used the same colour schemes. They were unusual in having the darker shade on the wings (this may also have been reversed as 1954)

1954

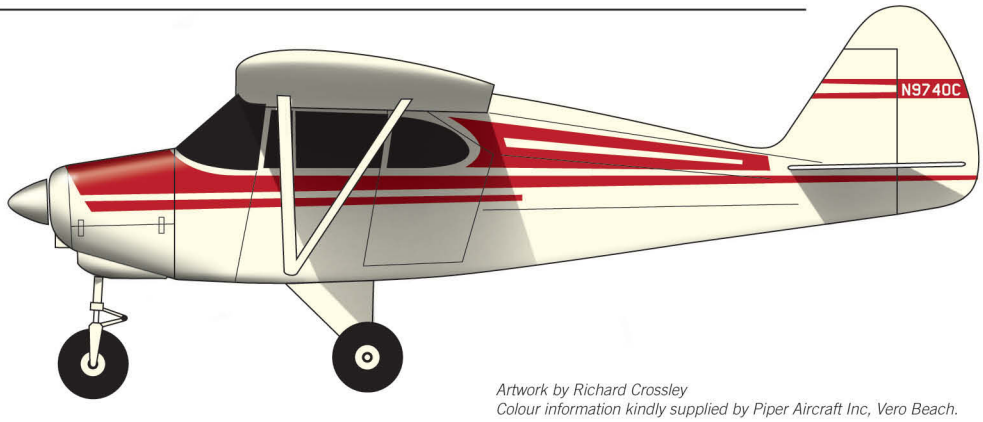
Forest City Green and Tampico Green

1955

Sun Valley Ivory and Tennessee Red

Sun Valley Ivory and Miami Blue

Sun Valley Ivory and Forest Green



Artwork by Richard Crossley
Colour information kindly supplied by Piper Aircraft Inc, Vero Beach.

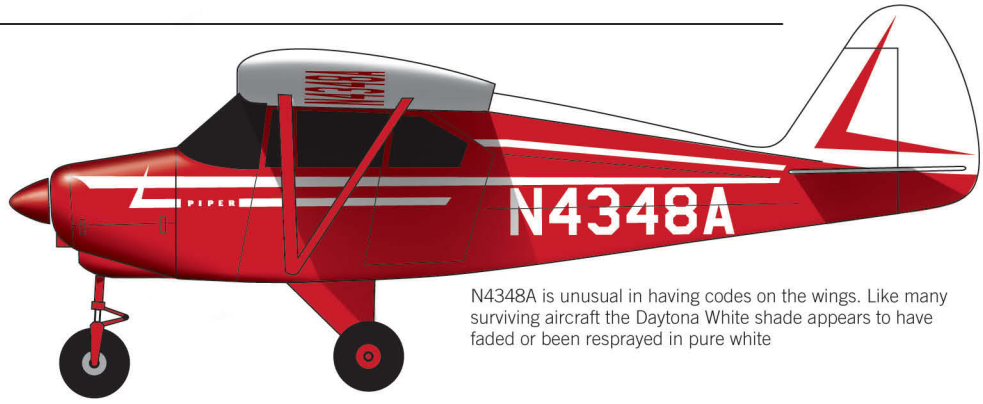
Optional colours available at extra cost over the years:

Adrondak Gray, Lock Haven Yellow, Boston Maroon, Hickory Brown, Pasadena Rose, Phoenix Tan, Portland Green, El Paso Brown (metallic), Tampa Green (metallic), Newport Blue (metallic), Juneau White, Lemon Yellow, Cream Yellow, Sportsman Biege, Tuscon Cream, Boston Maroon,

1956

Daytona White and Cadilac Red

Daytona White and Key West Blue

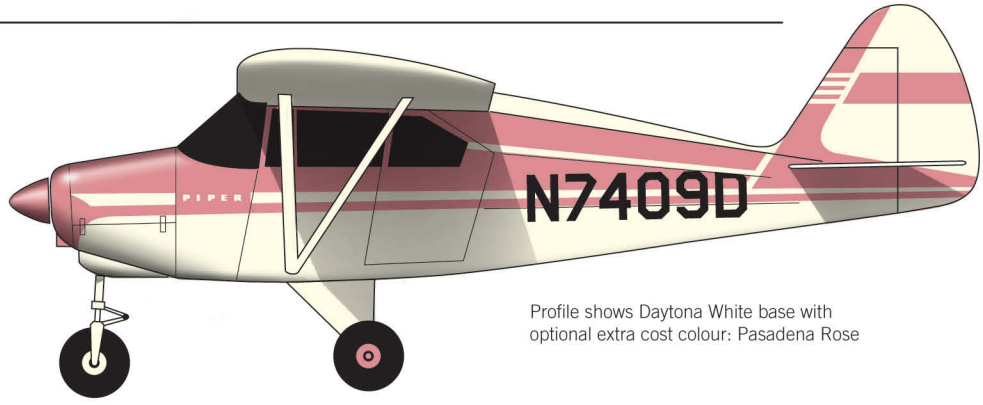


N4348A is unusual in having codes on the wings. Like many surviving aircraft the Daytona White shade appears to have faded or been resprayed in pure white

1957

Daytona White and Cadilac Red

Daytona White and Key West Blue



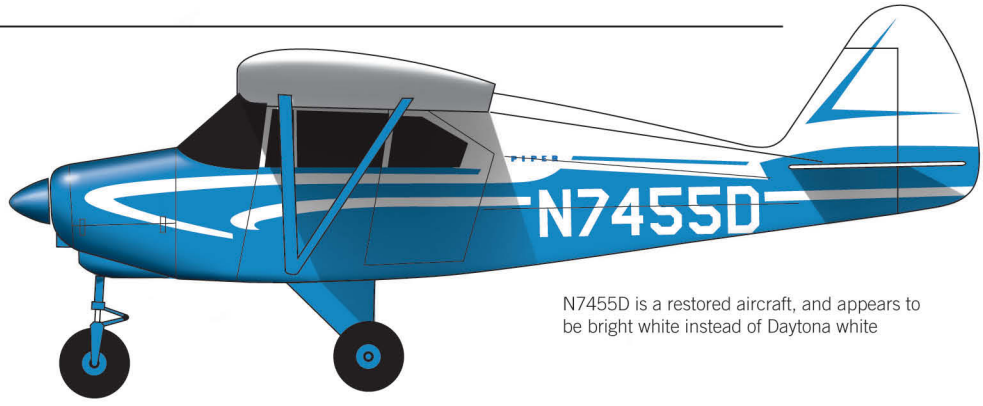
Profile shows Daytona White base with optional extra cost colour: Pasadena Rose

1958

Daytona White and Santa Fe Red

Daytona White and Bahama Blue

Daytona White and Hershey Brown



N7455D is a restored aircraft, and appears to be bright white instead of Daytona white

1959

Daytona White and Santa Fe Red

Daytona White and Bahama Blue

Daytona White and Hershey Brown

Daytona White and Montego Green

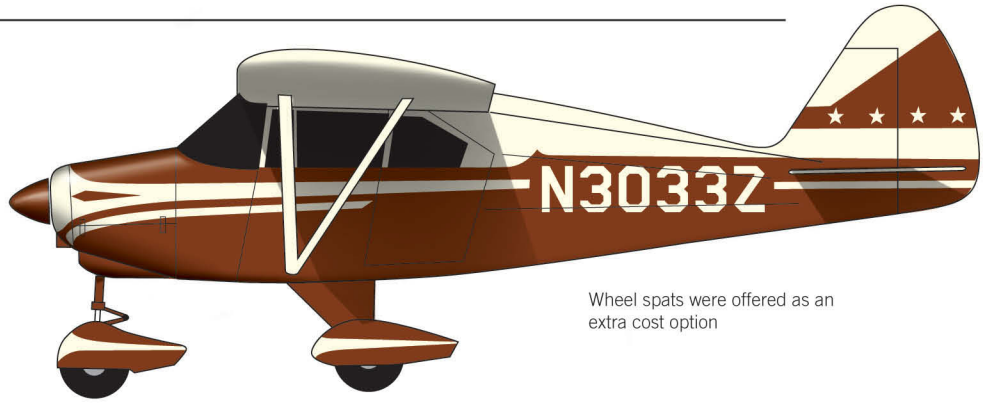
1960

Daytona White and Santa Fe Red

Daytona White and Bahama Blue

Daytona White and Hershey Brown

Daytona White and Montego Green



Wheel spats were offered as an extra cost option