Smooth and sleek, the Aussie Challenger makes a welcome addition to the ASP range of aerobatic aircraft.

AUSSIE CHALLENGER

A classy 66in span performer from down under by John Edmunds and Graeme Smith

The Aussie Challenger design utilizes a fully symmetrical foam core wing design with balsa leading and trailing edges for strength and durability.

Wing construction

1. Setting up Select two pieces of foam 32" long x 2" deep. Select each wing root end and measure 11in and mark. Select each wing tip end and measure 6.1/4" as measured from the straight trailing edge. Connect the two points with a straight line and remove excess foam which will give you a tapered leading edge. Draw an accurate centre line around the foam wing blank. Please note that accuracy at this stage is critical. To check the centre line at each end make up two sighting templates of 16" x 2" balsa, fix to each end of the wing blank on the centre lines and visually sight along the wing, ensuring that the two templates are aligned with each other. This will ensure that your wing halves have no twists or warps built in. You are now ready to fix the wing section cutting templates to the wing root ends and wing tip ends.

2. Wing section templates Make up wing section cutting templates out of thin aluminium sheet, as this is easy to work with. Draw a centre line on the templates and drill two sighting holes as shown on the plan. Attach templates to their respective root and tip ends ensuring that the centre lines accurately align through the sighting holes. You are now ready to cut your foam wing blanks to the correct wing section.

3. Cutting the wing section Pick out your favourite foam cutter and get your wife, girlfriend or flying buddy to help you through this next section. Place the foam wing blanks on a flat table or building board and place some weights

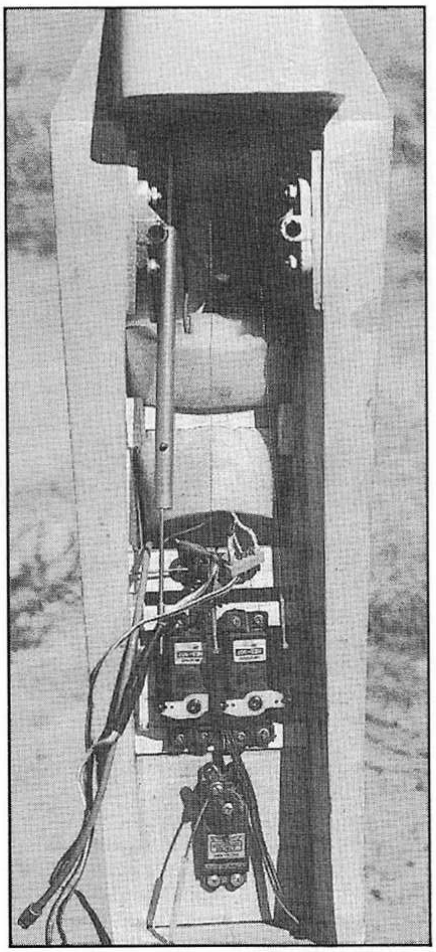
Use bright, contrasting colours to make Challenger really stand out during manoeuvres.

on top to ensure that the wing blank doesn't move and stays flat for accurate cutting. Then, with your partner holding the other end of the foam cutter, once it's switched on and hot commence cutting, carefully following the contour of the wing section templates on each end.

4. Wing skin Select three sheets of 36" x 4" x 1/16" balsa. Using masking tape carefully glue the three sheets together side by side. You will need to make four sets of these sheets.

When dry, cut each full sheet to match the wing planform, as each one will be glued to each side of the foam wing blanks. Using latex contact glue, coat each *inside* of each set and both sides of each foam wing blank. When dry, carefully and accurately align and attach to each side of the foam wing blanks. Once attached they cannot be removed as this is a contact cement and will bound instantly, so be accurate first time. When glued, trim and remove the excess balsa from the sheeting.

5. Installing the leading and trailing edges Select one length of 1/2" x 36" hard balsa and cut two leading edge strips, 1.1/8" at the wing root and tapering to 11/16" at the wing tip. Using P.V.A. glue attach the l.e. strips to the leading edge of the foam wing blanks using masking tape to locate (no pinning is necessary). For the false trailing edge select one sheet of 3/8" x 36" hard balsa and repeat as above, with 13/16" at the wing root tapering to 3/4" at the wing tip. Put aside to dry. When dry draw a centre line the full length of each false trailing edge and select two pieces of 1/2" x 1.3/8" x 36"



balsa for the t.e. and ailerons. Then draw a complete centre line around each t.e. and aileron blank – there is a good reason for this. Carefully tack glue the ailerons in place with balsa cement approx every two inches along the false trailing edge, ensuring that this is fully dry before proceeding. You are now ready to shape the wood with a balsa plane and sandpaper to the wing section template profile.

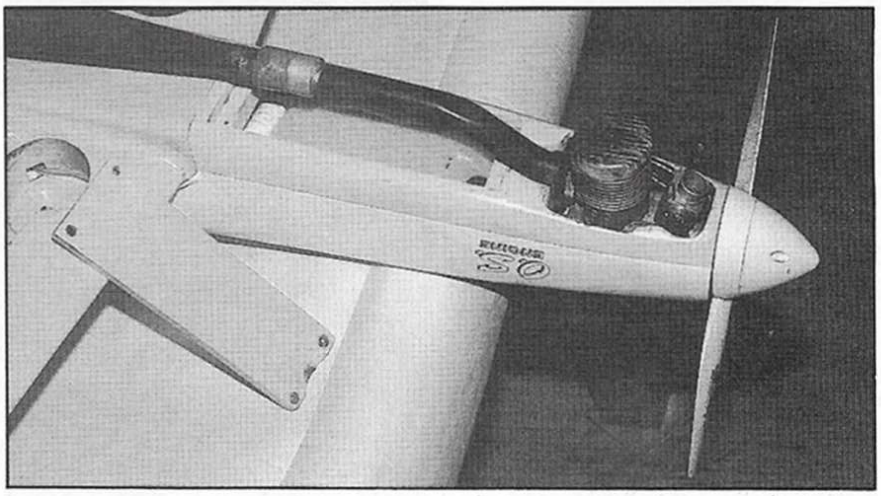
6. Shaping Carefully plane and sand the leading edge, trailing edge and ailerons to the correct wing section, then lightly sand the complete wing assemblies to a smooth finish. Carefully measure along the ailerons 26" from the wingtip then cut completely through the aileron to the false trailing edge and with great care snap/crack/break off the aileron from the false trailing edge. This has now given you a straight and accurate aileron. The centre line will still appear on the inside edge of the aileron for correct tapering and the installation of the hinges.

The long, deep R/C bay makes installation dead easy.

7. Servo bay installation Carefully mark, hollow out and line with 3/16" balsa all the way to the skin. Then carefully mark out and cut out a servo lead tract, 1/2" deep x 3/8" wide, on top of the wing only, making sure that your servo plug will fit in the tract (so it can be pulled through when the tract is covered). Fill with 1/8" strip balsa, leaving 1/2" short at wing root to allow access to your servo lead and plug when the wing is completed. Then sand the 1/8" balsa to the correct wing profile. Now decide on your undercarriage installation – retractable or fixed.

8. Fixed undercarriage The fixed undercarriage is fitted in the conventional way. Cut out and fit either a plywood plate or hardwood block into front bottom section of the wing as shown on the plan. Before forming and fitting the fixed u/c legs, ensure they are of sufficient length to give good ground clearance for the propeller used.

9. Retractable undercarriage Carefully mark out on the bottom of the



Any good .60 will ensure a good performance. Access to the tank is easy – you don't need to strip out the model to get at this one!

wing as per plan. The mounting installation shown is to suit Rhom Air retracts. Cut out the 1/4" ply plate and attach the retracts with blind nuts, then remove. At this stage slightly hollow out the foam to take the ply mounting plate. Whilst temporarily in place, cut out the wheel well and tract and hollow out to the skin. Rebolt the retract unit onto the ply mounting plate and carefully clean out the foam until both the wheel and the retract is at the desired depth. The front of the ply plate is mounted deeper than the back as this allows for the forward angle of the undercarriage leg.

Great care must be taken at this stage. When happy with the fit, epoxy each ply undercarriage mounting plate into place. Epoxy a balsa block to the top of the ply and sand to the correct wing profile.

10. Joining the wing halves Ensure you have a *flat* table. Make two templates, 10" x 2", and attach on the centreline of each wingtip. Place both wing panels top up, then place a 1.1/4" dihedral block under one wing tip. Sight along the whole wing and when the templates are in line, glue the wing roots together with epoxy.

When dry, fibreglass the wing centre area as marked on the plans. Then get your wing tip blocks and accurately mark a centre line completely around each piece. Now glue them to the centre line on each wing tip. When dry, hold each aileron in place and mark each side to the centre line on the inside of each wing tip block. Now you are ready to clean up and sand the whole wing. If you are going to use retracts, cut out an extra hole in the top of the wing for your retract servo using the same method as previously described with the aileron servo installations. We used a BND retract valve as these are excellent because they use an arm to operate the air valve, which is better than the push-pull method.

11. Tailplane The tailplane is built up utilising the same method as the wing. When joining the tailplane halves make sure that there is no dihedral.

Fuselage construction

1. Setting up Select some nice 1/4in sq straight grained balsa. Depending on the length of the balsa, you may have to join another piece on the tail plane end to make up the correct fuselage length. Carefully mark out and cut out the fuselage sides. On the outside of each fuselage side draw a thrust line down the full length. Then mark out accurately the positions of bulkheads F2, F3 and F4. Between F3 and F4 draw your wing section root template centreline which will be situated 1.3/8" at the leading edge and 1.1/2" at the trailing edge *below* the centre line. Now draw your tailplane section root template centreline 1/2" at the leading edge and 7/16" at the trailing edge *above* the centre line. Draw these lines in red biro so they stand out – they are important reference points so do not rub off.

2. Bulkheads Cut out F2, F3 and F4 bulkheads using good quality plywood. With the F2 bulkhead use 3/8" ply as a minimum. This is the engine firewall bulkhead and anything less than 3/8" will probably give way, as experience has shown. On F3 use 1/4" ply, and on F4 use 3/16" ply. Draw accurate centre lines on each bulkhead as shown on plan.

3. Plywood doublers Cut out two 1mm doublers and carefully glue one to the inside of each fuselage side using contact cement.

4. Triangular section Cut out four lengths of 3/8" triangular section balsa and glue onto the top and bottom inside of each fuselage side using a strong glue (white glue or contact cement).

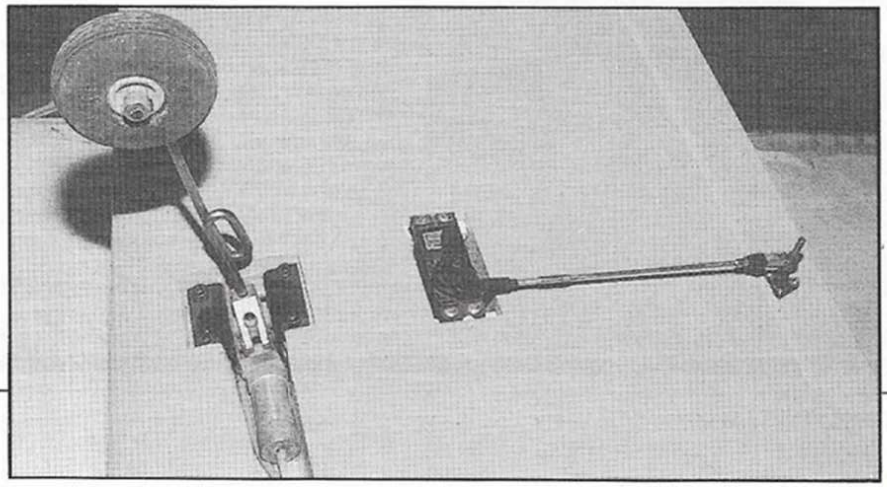
5. Fuselage assembly Now draw a nice long centreline on your *flat* building board and with all your favourite weights and clamps, pre-assemble the fuselage sides and bulkheads, checking everything is properly aligned. Chamfer the last 6" of the triangular section so the tail ends of each side come together cleanly, equal to the width of the rudder. If everything is now to your satisfaction you may now disassemble and then reassemble and glue using epoxy, making sure F2 (engine bulkhead) has the desired side and down thrust. Ensure that everything aligns correctly again before the epoxy sets.

6. Tank bay Cut out and glue 3/8" triangular section to the inside top of each fuselage side. Cut out 1/4" x 1/2" balsa strip and glue to the bottom on each side. Cut out two hardwood rails to screw the tank hatch to. These go across the fuselage at F2 and F3. Next cut out the 1/4" tank hatch cover. We used 1/4" ply as we needed some extra weight in the nose. Balsa is fine if you want.

7. Centre section Glue 1/4" sheet balsa servo bearer supports to the inside top of the fuselage (directly under the canopy). Next glue 1/2" sheet balsa from F4 to F2, on top of the fuselage. Owing to the curvature you will need to fit it in two pieces (as per the plan). When dry, mark the location of canopy formers CF1-CF3 and cut access holes to allow the Rx and retract air tank to be fitted into the canopy. Add CF1-CF3, followed by the 1/16" sheet canopy sides and the 1/2" sheet top and canopy facing, finishing flush with the forward edge of CF1. Next add soft block forward of CF1 and carve to blend in with the canopy. Then add the upper side 1/4" sheeting between F4-F6 and glue the 3/16" bottom sheet in place. When this is completely dry, razor plane the fuselage to basic section.

8. Fin & rudder assembly Cut the fin and rudder from 1/2" soft sheet balsa. Glue the fin into place making sure it is absolutely vertical to your flat building board. Then cut out and glue the balsa fillets to each side of the base of the fin. Cut out carefully the tailplane slot to the correct section, ensuring that the incidence is correct as per the plan.

9. Fitting the tailplane & wing Make two 1/8" ply mounting plates and attach the wing mounting brackets. Glue these in place on the inside of the fuselage sides as shown on the plan. Now install the wing mounting dowel into the centre of the leading edge of the wing, but do not glue until it is correctly aligned. Find two steel bolts that will fit the mounting bracket bolt holes and sharpen to a point. Screw these in so that the pointed ends are protruding below the fuselage where the wing is normally located. Now put the wing in place, making sure the



Keep it simple! Installation of the retracts and aileron servos are neat and functional. Short, straight pushrods help keep control flutter at bay.

wing is correctly aligned, then push down hard so that the pointed bolts mark the surface of the wing. Drill the wing mounting bolt holes through the centre of the marks left by the bolts. Make sure the angle is correct so that the wing mounting bolts will pass correctly through the wing to align with the wing mounts. Next fit the tailplane in its slot, carefully align with the wing and fuselage and glue into place.

10. Wing fillets You may wish to make a balsa wing fillet of your own choice but we find our way easy. Cut out the two 1mm ply wing fairings as per the plan and with your wing assembled to the fuselage, slide the ply fairings between the wing and fuselage and secure by tightening the wing bolts. Then pin the ply to the wing surface and epoxy in place along the edge of the fuselage only. Leave to dry. When dry mix up some resin and Micro Balloons into a thick past so it doesn't run and fill the ply wing fairing. When dry, sand to the desired shape.

11. Engine bay & nose section Cut out a 1mm round plywood ring that will be installed behind the propeller and spinner, as shown on the plan. Install the engine mount to F2, engine bulkhead, and temporarily fit your engine. Fit the 1/4" balsa nose sides and 3/8" triangular strips to the inside of the bay, top and bottom. Now glue the ply ring onto the balsa ring and centrally locate and glue into place. Remove the engine and fill any remaining gaps with 1/2" sheet.

12. Final shaping Carefully plane and sand the entire fuselage to shape. Cut out the engine bay. Clean out excess balsa from within the engine bay to ensure easy removal and servicing of the engine. (Note: ailerons, elevators and rudder are all installed after final finish).

On finals

1. Final finish Apply two coats of epoxy finishing resin to the entire fuselage. When dry, sand smooth and spray paint to a colour scheme of your own choice. Cover the wings with Solartex and trim as desired. Ensure that your colour scheme gives you a good indication of whether the model is up or down for pattern flying as you need to be able to clearly see the aircraft at any attitude up to 150 metres away.

2. Radio & tank installation Now is the time to install your control surfaces. We use mylar strips for hinges, secured with Zap. Glue the servo rails in place as per the plan and fit your servos in place as usual. Next install a closed loop rudder cable system. Make up a rigid elevator push rod and install. If deciding to use retracts, the air tank fits neatly up inside the canopy and you will also require an additional servo fitted into the wing with the airvalve. Install the fuel tank in the usual way, setting up for either pump or pressure installation.

Installyour battery and receiver packs in the usual way making sure that they are correctly insulated from vibration. You may need to move your gear around to help position your C.G. correctly. To set up your control surfaces we suggest the following throws: Rudder 1.1/2" each way; Ailerons 3/8" each way and Elevator 1/2" each way.

3. Flying With your control surfaces set up as suggested the Aussie Challenger shouldn't be too hot or over responsive. Using full up elevator, start your take-off run on full throttle, easing the elevator off as you become airborne. You will discover that the Aussie Challenger will leap into the air within 30ft. The model has no real vices and with a correctly tuned and propped engine it will climb vertically, out of sight. The aircraft performs exceptionally well in all vertical manoeuvres and knife-edge.

The controls are light and responsive. Take care when landing, ensuring that you bleed off your airspeed as the aircraft has a great glide ratio due to the light wing loading.

We hope that you enjoy your Aussie Challenger as you take up the challenge of pattern flying.