building the **firebug**

by PETER TAIT

In issue No 30 of Australian Amateur Boatbuilder the 2.4 metre DIY Firebug was described as a family fun yacht and trainer, ideal for knocking about in at the beach, club sailing or taking camping. Performance-wise it is a notch above the basic trainer, appealing to teenagers as well as youngsters. Adults can take out a child for tuition or enjoy a sail themselves.

The type of construction makes it ideal for learning or teaching boat building skills. It is not a just-add-glue instant boat but a proper little ship with bulkheads and stringers a deck and cockpit. There are lots of bits, but most are small, simple to make and fit.

Schools and polytechs are building them in the classroom. Some schools are building themselves a fleet of boats then linking up with the local sailing club for tuition. Both school and club benefit.

The design incorporates several features which help keep the inexperienced out of trouble:

The flat deck. The datum for marking out and setting up on the jig is the flat deck. There are no complicated curves or cambers to allow for.

Rectangular bottom. Not a mother-in-law joke - the bottom piece of plywood really is a 600mm wide half sheet. The parallel sides ensure that the bulkheads etc are correctly positioned on to the jig, ie that it's all straight and square.

Minimal fairing up. The gun'ls and chines are the same cross section for their full length. There is hardly any fairing up.

Accurate assembly on the building jig. Assembly on a jig is a simple procedure.

FIREBUGS sailing

Chris and Anja paint the 'Sprite'.

Keen High School kids at the FBHQ workshop

Symmetry Starting from the centre of the cockpit, the hull shape is the same in both directions. Several items repeat, eg: both cockpit bulkheads are identical.

Read on for the abbreviated version of how to build yourself a Firebug.

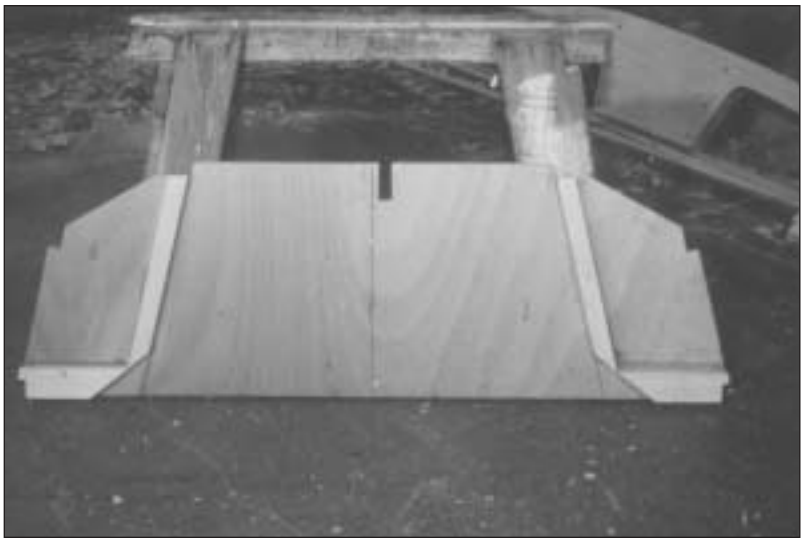
THE PLANPACK

The planpack contains all the information required to build the boat; seven sheets of plans, 24 pages of illustrated building instructions, where to source materials and supplies at friendly prices, full sized paper patterns, kits for all fittings, spars and sail etc. FBHQ offers support by phone or email.

WORKSHOP AND TOOLS

A fully equipped workshop is nice but you can get by with only a few basic tools. Space to build is handy but I know of one builder who used the dining room - "You should have seen the look on their faces when I moved out the table and chairs!" and one who built in the hallway by the back door - "I made the jig low so it could be leaned against the wall when not being worked on. My wife never complained except for the smell of the timber leaning against the wall in the bedroom!" The love of boats knows no boundaries!

3 UNITEC School of Boatbuilding workshop



4 BULKHEAD

3a HOME workshop

The hull is constructed in three stages:

A. Cut out the 'parts', ie make yourself a kitset. No need to take up space yet. Assemble later.

B. Borrow or make a building jig and assemble the parts on it.

C. Remove from the jig, turn it up the right way up and add the deck to complete the hull.

A - GETTING STARTED

1. SHOPPING. This can be done (except for timber which is best sourced locally) from special priced deals included with the planpack. Send off a few cheques and everything turns up at your place. Start with the ply, timber, glue and fastenings pack. This is all you need to build the hull. At this stage it is easy to justify buying some new gear for the workshop. Think of all the money being saved by building yourself. Treat yourself to a new tool!

2. MARKING OUT. Marking out can be from the plans or from full sized paper patterns which are available from FBHQ. Offsets are given from centrelines and and the deck level.

3. COCKPIT BULKHEADS AND STERN. Mark out the bulkheads and stern. Cut them out with a jigsaw or better still, one of those new generation 'never get blunt' handsaws. They cut 4mm ply (and fingers - look out) like butter. Around curves too. *(see pic 4)*

4. BOW AND CENTRECASE. These are cut from 20mm timber. Mark and cut out. Assemble the centrecase without glue. Later when you are happy that it fits okay on to the jig, glue and screw it all together permanently. *(see pic 5)*

5. CHINES & GUNWALES. Cut these to the profiles shown full size on sheet 3 of the plans. The profile is the same for the entire length. Carlins and

5 CENTRECASE assembly

other sundry bits can also be cut at this stage. A bench saw does this best. The local joinery shop will soon cut these for you if you're stuck here.

6. COCKPIT BULKHEADS AND DOUBLERS. Doublers are strips of wood glued and nailed on to the bulkheads and stern. They stiffen the thin ply and/or provide a surface for the ply 'skin' to be glued on to. The doublers are fitted at this stage. Make up two identical bulkheads, then put them aside for assembly on the jig later.

B. ASSEMBLY ON THE BUILDING JIG

1. THE JIG The building jig is the 'former' that the hull is assembled around. The material used can be either timber or a 2.4m sheet of flooring board (not MDF). Take care here as the jig determines the shape for the hull. It must be set up level, free from twists and while you're about it, at a comfortable working height. *(see pic 6)*

2. TOLERANCES. John Spencer on tolerances: "Most amateur builders end up making a good job even of their first boat, for they worry about very minor inaccuracies. Even Olympic classes allow tolerances of 5mm or more and many classes allow 10 or 12mm. So if you should happen to get a couple of millmetres out I suggest you should not panic. Professionals often get rather further out than this!"

3. GLUES AND GLUING. There is no such thing as the perfect glue for all. Different people will recommend different types. The one I prefer for small boats is 2:1 or ever better, 1:1 epoxy. This glue comes in two pots premixed to the correct consistency. The parts by volume are simply mixed together on a ply offcut or similar and it is ready to use. The high strength gap filling properties can be a saviour. Glue is available from the shopping lists in the planpacks, couriered anywhere in New Zealand or Australia. Always be tidy with glue, scrape off excess and do not get it on your skin. Use only in a ventilated area.

4. EASY TO MAKE FILLER. Don't waste leftover glue, a handy filler can be made up from leftover glue mixed with saw or sander dust. Punch and fill nail holes etc as you go. *(see pic 7)*

6 THIS building jig slots together.

5. ASSEMBLY. The jig is set up true and square and free from twist. The top surface is flat as this surface forms the flat deck when the boat is turned over. Mark the centre lines clearly on each bulkhead, bow stern etc and run a centreline string down the jig for lining up. Fix the bulkheads, bow and stern in place with temporary screws into the jig uprights. *(see pic 8)*

6. FITTING THE CENTRECASE. The assembled centrecase assembly butts against the bow and stern and it

7 GLUE filler

8 Assembly on jig

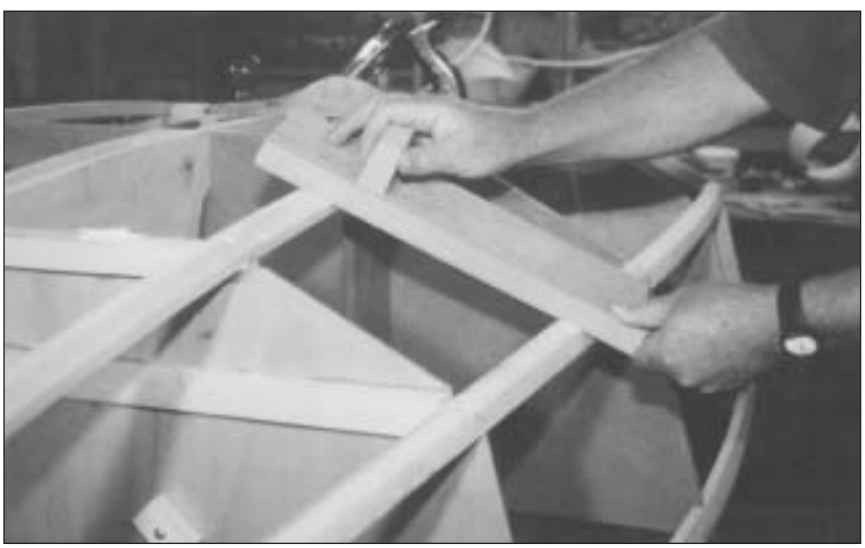
should fit flush with the bulkheads. Use sticky tape to prevent the boat from gluing onto the jig. A jig permanently attached would make the boat very slow on the wind!

7. CHINES AND GUN'LS. Fit the chines and gun'ls into the precut notches. Check that the curve of the stringers is even and fair. When you are happy that it looks okay, screw and glue these, taking care not to distort anything out of place and keeping it all tidy. Drill generous sized holes for these screws and countersink them out of the way of fairing up.

8. FAIRING UP. As the parts are assembled small irregularities will have appeared from nowhere. These now need to be faired off using a plane or sanding board. It is important to achieve fairness at this stage as after the ply is on it is too late to do much about it. If you are unsure here then ask for help from some one with experience. Essentially it involves looking from all angles (including, if necessary standing on your head) until you are positive there are no unwanted lumps or bumps in sight and the ply sits on without any gaps or wobbling. *(see pic 9)*

9. PUTTING ON THE PLYWOOD. This is rapid progress. The half sheet of 9mm ply is the bottom. The 9mm seems thick but remember it is also the cockpit floor, it supports the mast, it crunches the rocks on the beach and as well the extra weight keeps the centre of gravity low. Just a 600mm wide rectangle. That's it, no need to recut it, or shape it. Give it a try in place to check that it is a nice fit then fasten in place. It is the biggest of the gluing jobs. *(see pic 10)*

The plywood sheet for the bilges and sides needs to be cut into four



9 SANDING board in use

10 9mm ply bottom going on

equal slices. Then mark each piece to shape off the hull, cut and fix the two sides first and then the next day, the bilges. Use that handsaw again for cutting the ply to shape. Fix it on as before, trim it up the next day. When all four pieces are on, tidy it up, punch and fill all nail holes and give it a quick sanding.

11 Cutting the centrecase hole

12 Off the jig and - it's a boat!

10. CUT THE CENTRECASE HOLE. If you can work out where it goes cut out and tidy up the centrecase hole now. *(see pic 11)*

11. OFF THE JIG. It's now ready to come off the jig and be turned over. Unscrew it and congratulations, it's a boat! *(see pic 12).* Roll out the drinks trolley it's time for a party!

C - TURNING OVER AND FINISHING THE HULL

1. DECK AND MAST SUPPORTS. Fit the deck beams and supports etc as shown on the drawings. Don't cut them too long and tight fit them or they will distort the shape of the gunwale. *(see pic 13)*

2. CARLINS AND COCKPIT SIDES. Fit the carlins. The remaining sheet of 4mm ply is the deck and cockpit sides. Cut the sheet as per the sketch on sheet 7 of the plans. Fit the cockpit sides for length then scribe and cut the lower edge as shown in the sketch. *(see pic 14)*

The inside of the lower chine should already be at the correct angle for gluing the cockpit sides on to. You may have been wondering the reason for that little slope. Such are the signs of a clever design!

3. FAIRING UP. Once again fair it up with the straight edge and plane. It is easier this time as the deck is flat. Aim for a slight camber here in preference to hollows which don't look good at all.

13 READY for a deck

14 Deck supports

15 Doublers to take cockpit side and carlin

4. SEALER & PRESERVATIVE. Apply epoxy sealer inside the hull at this stage. At least two coats, more to areas where moisture might collect, ie on the bottom adjacent the cockpit bulkheads, on top of the chines, inside the centrecase, on the cockpit floor and about 100 mm up the cockpit sides. This protects the wood from rot, water penetration and the resultant weight increase. Ensure adequate ventilation.

5. BOW, MAST STEP & CENTRECASE TOP. By now you have a boat and these are the fun finishing jobs. Cut the inspection ports then the lightening holes in the bow, shape and fit the bow cap, mast step and centrecase top. *(see pic 16)*

6. THE DECK. Before you fit the deck, check that there is something to screw the chainplates into and bolt the rudder gudgeons through. Also seal around the for'd bulkhead to meet the safety requirement of two buoyancy compartments. Scribe and cut out the deck in four parts, fix it all as before. Don't be tempted to fit the deck in one piece. By now you will be feeling that you have mastered the art of putting on ply but unfortunately, as it often goes, this is the last of it. Or, you could of course do more and have a family fleet for racing! That's when the real fun starts. *(see pic 17)*

7. FILLING, COVING & SANDING. Give it all a once over. Trim up all the ply edges and radius the corners to a consistent radius. Punch and fill the nail holes and if you really want it to look smart, cove the internal corners of the cockpit with filler. Sand it smooth, go over it once more, then once more again... it's amazing what you miss each time, and you are ready for a coat of sealer.

8. PAINTING. Seal the hull with at least two coats of epoxy sealer. This seals the wood, hardens it against bumps and scrapes and acts as a primer. Then apply as many coats of undercoat as are required to achieve the desired finish, commonly two.

If the chosen colour scheme involves changing colour at the gun'l, it is a good idea to turn the deck paint over and down the side 10-12mm. For some reason this looks a lot better than colours joined at the gunwale.

12. THE NAME & GRAPHICS Choosing a name is always an interesting one. After all the work to get this far it is worth coming up with something decent. The angular hull shape of the Firebug and the options on sail colours, lends itself to striking colour schemes and graphics. Stick on names and stripes etc are readily available from any signwriter with a computer cutting service, usually at a surprisingly moderate cost. These finishing touches make the difference between a boat that looks ordinary and one that looks spectacular. *(see pic 19)*

CRITICAL CHECK POINTS

There are several stages where checks are recommended before making the next step. These are covered in the building instructions.

FIREBUG GLOSSARY

Nautical terms can be a bit daunting to the uninitiated. As someone said, "The glossary! - it's the most used page of the lot"

Aft	Towards the stern or back of the boat.
Battens	Plastic strips in pockets in the sail to keep the shape right and prevent wrinkles.
Bilge	The surface between the side and the bottom.
Block	Pulley.
Boom	The horizontal spar which holds the sail.
Bow	The front of the boat.
Bowcap	The extra, shaped piece on the bow.

16 Carlins and centrecase top fitted

17 Best tool for cutting 4mm ply - handsaw!

19 Fun sticking on the graphics

Bridle The cord which the mainsheet is attached to on the stern.

Bulkhead The front and back of the cockpit are bulkheads.

Carlin Fore and aft timber between frames or bulkheads. In this case the angled timber piece which supports the cockpit side and side deck.

Centreboard The piece of wood which when in the 'down' position projects from the underside of the hull and prevents the boat from slipping sideways through the water.

Centreboard case or centrecase The structure which creates the slot for the centreboard to go in and out of.

Chainplates The deck fittings which the wire mast stays are attached to.

Chine The external angle on the sides of the hull or the piece of timber on the inside which strengthens this part of the hull and provides a joining place for the ply.

Chop Small steep waves.

Cleat A fitting for fastening ropes to.

Clew The aft corner of the sail.

Clench To clench a nail is to hammer it right through then bend it over for maximum grip.

Coamings Upright pieces of timber fixed to the deck aft of the mast in a vee shape to deflect water from going in the cockpit.

Cove To cove an inside corner is to create a radius with filler.

Deck beams Small pieces of timber which support the deck.

Doubler Strip of timber glued to a bulkhead.

Fair up To fair up is to even it up. To remove all irregularities, lumps, bumps etc.

Foot The lower edge of the sail.

Forestay The forward stay.

Forw'd, (Forward) Towards the bow or front of the boat.

Girder The fore and aft 'backbone' of the boat.

Go about To change tack when sailing into the wind.

Gooseneck The fitting which allows the hinging action between the boom and the mast.

Gun'l (Gunwale) The corner at the top of the sides or the piece of timber which strengthens this part of the hull.

Gybe To change tack when travelling downwind.

Halyard The rope which pulls the sail up.

Head The top corner of the sail.

Headboard The 'board' built in to the head of the sail.

Help What you ask for if you can't work out the next move in boatbuilding.

Hounds The fitting to which the top end of the stays are attached.

Inspection Port A threaded plastic port which can be unscrewed to ventilate the hull or inspect inside.

Kicker The rope which holds the boom from 'kicking' up in the air.

Lashings Thin cord tied around to hold something on, eg: stay to chainplate.

Lanyard Cord to hold something on eg: bailer.

Leech The trailing edge of the sail.

Luff The edge of the sail nearest the mast.

Mainsheet The rope which pulls the sail in and out.

Mast step The place where the mast sits.

Popple A small system of waves in confined waters.

Roach The round in the leech of a sail.

Rudder The rudder steers the boat.

Rudder gudgeons and pintles The 'hinge' which allows the rudder to turn.

Saddle Small plastic or stainless steel half an eye. (The top half).

Self tapping Screws Screws with a thread for the full length.

Shackle A 'D' shaped fitting with a threaded pin to join rigging etc.

Sheave A wheel in a block or mast fitting.

Sheet A rope which controls a sail.

Spar Mast or boom.

Stack out Leaning out to balance the boat.

Stack straps Nylon straps to hook the feet under when stacking out.

Stays The wires which hold the mast up.

Stern Back of the boat.

Stringer Fore and aft structural member.

Swallows and Amazons One of a classic series of books for children about having fun in small boats, by Arthur Ransome.

Tack The corner of the sail at the goose neck. Also 'tacking'; to sail to windward on either the port or starboard tack.

Thimble The metal protecting piece in a rigging wire eye.

Tiller The rudder 'handle'.

Tiller Extension An extension to the tiller which allows the sailor to stack out and still be able to steer.

Transom Stern or flat end to a hull. Can also have (like the Firebug does have) a transom bow.

Wake The disturbed water which a boat leaves astern.

Wind indicator Plastic wind direction indicator normally fixed at the masthead.

Windward Towards the direction from which the wind is coming.

Next Issue: Finish off your Firebug. How to make and shape the centreboard, rudder and cockpit coamings. Options on making deck fittings, rudder gudgeons, gooseneck and putting spars together. These can be bought in kit form if metalwork isn't your thing. Then attaching all the fittings to the boat and how to rig it. Finally the launching and then how to enjoy yourself out there sailing!

FBHQ (Firebug Headquarters) looks after the class, attends boatshows, sends regular newsletters, supplies planpacks, kits, advice etc. The planpack contains 25 illustrated pages of building instructions and 7 sheets of plans. Full sized paper patterns are available, as are glue, sealer and paint packs, fastening packs, deck fittings, spars and sails. The Firebug has enjoyed excellent support from the local marine industry. Delivery in Australia is not a problem.

COST

Cost varies depending on the approach taken but here in Auckland it is normally in the range $NZ900 - $NZ1400 depending on how much you make and what you buy in kits. $NZ1 = $A0.83

PLANS AVAILABLE NOW

For those who are keen to get started, planpacks with full instructions are available now. FBHQ is funded from sales of planpacks. Only A$50 (a normal cheque works okay) to:

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