

MATERIALS LIST FOR BUCCANEER 28

Design by Lock Crowther

Mainhull

Plywood Marine grade - density 28 to 34 lbs./cu.ft.

$\frac{5}{8}$ "	2 - 10 x 4	cabin roof
	10 - 8 x 4	decking, cabin, cockpit, underwing catwalk and hatches
	2 - 7 x 4	centrecase and hull frame 8B
	2 - 6 x 4	hull frames 4B and 4A
	1 - 7 x 3	hull frame 8A
$\frac{1}{4}$ "	4 - 8 x 4	hull frames
	9 - 8 x 4	hull skin and accommodations

Timber Spruce, Canadian Redwood, Douglas Fir (Oregon), Hoop Pine, etc.
All sizes finished dimensions.
Centreboard to be Western Red Cedar for lightness.

$2\frac{5}{8}$ x $\frac{1}{2}$	2/8'	cabin front
$3\frac{1}{2}$ x 9/16	3'	centrecase
$1\frac{3}{16}$ x $\frac{5}{8}$	17/15', 3/12'	hull, deck and cockpit stringers, shelf risers
$1\frac{5}{8}$ x $\frac{5}{8}$	4/10', 3/8', 24'	cabin roof stringers, centrecase, frames
$2\frac{5}{8}$ x $\frac{5}{8}$	160'	frames
$3\frac{5}{8}$ x $\frac{5}{8}$	50'	frames
$1\frac{3}{16}$ x $1\frac{3}{16}$	1/9'	foredeck
$1\frac{3}{8}$ x $1\frac{3}{16}$	4/15', 3/12', 2/14'	hull clamp, underwing stringer, centrecase, frame 7
$2\frac{5}{8}$ x $1\frac{3}{16}$	4/15', 4/12', 3/10'	gunnel, catwalk, cabin side
$3\frac{5}{8}$ x $1\frac{3}{16}$	2/8'	cabin front, tiller
$5\frac{1}{2}$ x $1\frac{3}{16}$	1/12'	frames
$2\frac{5}{8}$ x $1\frac{5}{8}$	1/11', 1/10', 1/6', 4/7', 3'	keel, frames, cabin front
2 x $1\frac{5}{8}$	4'	centrecase
$2\frac{5}{8}$ x $1\frac{5}{8}$	10'	headsail track backing
$3\frac{1}{2}$ x $1\frac{5}{8}$	3'	stem
$4\frac{1}{2}$ x $1\frac{5}{8}$	2/8'	centrecase
$5\frac{1}{2}$ x $1\frac{5}{8}$	8'	stem, aft deck
$5\frac{1}{2}$ x $2\frac{1}{4}$	4/6'	western red cedar for centreboard
$5\frac{1}{2}$ x $1\frac{3}{16}$	14'	western red cedar for rudder
6 x 2 rough sawn	24'	crossarm joint plugs

Fittings including crossarms

All aluminium, type 6061 T6 (ALCOA spec.) or equivalent.

$5\frac{1}{2}$ " dia x .188" extruded tube - crossarms	2/10'-8", 2/10'-5"
$\frac{1}{2}$ " I.D. clearance x .062" tubing	1/10'
2" x 3/16" bar - cut into square washers to be used against wood on all crossarm bolts	
9" x 1" x $\frac{1}{8}$ " - 4 off	catwalk

All stainless steel, type 316

2" x $\frac{1}{2}$ "	1/3'-7", 1/3'-0", 2/2'-5", 2/1'-11"	crossarm braces
$1\frac{1}{4}$ x $\frac{1}{4}$	1/2'-0", 2/1'-6"	forestay, lower shroud, chainplates
$1\frac{1}{4}$ x 3/16	2/1'-7" (4)	crossarms
$1\frac{1}{2}$ x $\frac{1}{8}$	8/11 $\frac{1}{2}$ "	crossarms
$1\frac{1}{4}$ x $\frac{1}{8}$	2/1'-10"	inner forestay tongs
6" x 6" x $\frac{3}{8}$ "		bow fitting
1'-2" x $5\frac{1}{2}$ " x $\frac{3}{8}$ "	2 off	crossarm
4" x 5" x $\frac{1}{8}$ "	2 off	rudder
4" x 2" x $\frac{1}{8}$ "	1 off	rudder

4" x 3" x 3/32"	4 off	crossarm brace/mainhull
16G plate		scrap for tiller etc.
1 1/4"		
1 3/4" dia x .080"	1/2'-8"	rudder tube
1 1/2" dia x .125"	1/4'-3 1/2"	rudder shaft

Bolts - various as per plan

Fiberglass cloth 6 oz. - 300 sq.ft.

Polyester resin - orthophthalic - sufficient for cloth sheathing 550 sq.ft.

Industrial talc filler - 40 lbs. OR

Phenolic microballoons - 15 lbs.

Floats

Plywood

1/4" 17 - 8' x 4'

Timber

13/16 x 5/8	6/25', 4/23'	stringers
1 5/8 x 5/8	4/25'	gunnels
2 5/8 x 5/8	110'	frames
3 5/8 x 1 3/16	4/25', 28'	chines, frames
3 3/4 x 1 3/16	3'	chainplate backing
2 x 1 3/16	4/7'	gunnel backing
1 5/8 x 1 13/16	4/7'	" "
2 5/8 x 1 5/8	1/8'	frames 4 & 8
4 x 2	1/8'	hardwood - crossbeam supports

Fittings Stainless Steel - type 316, 306 for bolts only

1 1/4 x 1/4	chainplates	2/1'-6"
1'-3" x 1/2"	bolts - crossarm attachment	8
9" x 3/8"	bolts " "	16
2 1/2" x 3/8"	bolts - chainplates	8
1 1/2 x 1/2	bolts - brace attachment	8

Fiberglass Materials

Cloth 6 oz. 400 sq.ft.

Polyester resin - orthophthalic - sufficient for cloth sheathing 450 sq.ft.

Industrial talc filler - 25 lbs. OR

Phenolic microballoons 10 lbs.

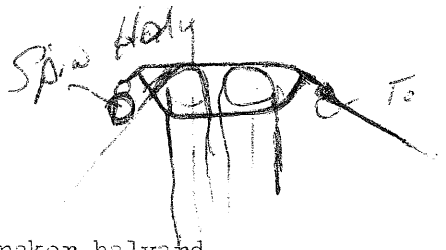
General Fastenings

Bolts	stainless steel type 306
Nails	silicon bronze or monel barbed boat nails
Staples	steel chisel edge or phosphor bronze if left in situ
Glue	rescortinol formaldehyde or epoxy resin

Deck equipment and running rigging

Blocks

1 double with becket to take	1/2" rope	- mainsheet
1 double	" " " "	" "
1 single with swivel	" " " "	- cam cleat may be fitted to block
2 single	" " " "	headsail sheets
3 single	" " " "	spinnaker sheets and downhaul
1 single with swivel	3/8" rope	spinnaker halyard



3 single to take $1\frac{1}{4}$ " rope headsail and spinnaker halyard
 3 single " " " " headsail & spinnaker halyard
 3 single " " $3/16$ " wire headsail & main halyard
 1 single " " $1\frac{1}{2}$ " rope spinnaker topping lift
 2 single " " burgee halyard & main topping lift
 4 single sheaves in cases to take $7/16$ " dia. rope - centreboard



Slide Track

$2/4$ '- 3 " with travelling cars suitable for headsails
 $1/5$ '- 6 " with traveller car and adjustable stops suitable for mainsheet

Spinn
Halyard

Winches

2 - 4 " barrel $8:1$ ratio geared sheet winches - Barlow 24
 4 - 3 " barrel snubbing ratchet winches Barlow #180-#16
 1 - halyard wire reel winch

Cleats

5 - quickrelease cam cleats - $1\frac{1}{2}$ " rope - sheets
 6 - 6 " alloy cleats halyards etc.
 1 - 10 " alloy cleats mooring
 miscellaneous cleats for mooring, outhauls, etc.

Sliding track, gooseneck and roller reefing fitting
 $\frac{1}{2}$ " shackles and swedish snap hooks to suit running rigging

Roller boom end fitting to take topping lift
 Aluminium boom claw - see sheet 6
 Anchors, compass, stem roller etc. and internal fittings to Owner's choice

Standing Rigging - Stainless Steel

$\frac{1}{4}$ " dia 1 x 19 8,200 Lbs. UTS forestay $39'-4\frac{1}{2}"$
 backstays $2/39'-2"$
 inner forestay $19'-5\frac{1}{2}"$
 lower shrouds $18'-3"$

Approx. lengths include swage turnbuckles and toggles at the lower ends and swage fork eyes at the upper ends. Lengths are given as a guide only, the completed craft and mast must be very carefully measured and all standing rigging lengths calculated to the nearest $\frac{1}{2}$ " before ordering.

Running Rigging

$3/16$ " dia. <u>114'</u>	7 x 19 stainless steel	$1/70'$ main halyard
		$1/44'$ plus $40'$ of $1\frac{1}{4}$ " rope tail - headsail halyard
$3/32$ " dia. <u>64'</u>	7 x 19 stainless steel	$1/64'$ plus rope tail - main topping lift
$1\frac{1}{2}$ " circ. rope <u>120' + 70'</u>		$1/65'$ braided terylene - headsail sheet
		$1/55'$ " polypropylene - mainsheet
$3\frac{1}{4}$ " circ. rope <u>90' + 120'</u>		$2/35'$ " terylene - spinnaker sheets
		$1/85'$ " polypropylene - spinnaker halyard
$5/16$ " circ. rope		$1/35'$ " polypropylene - spinnaker downhaul
		$1/40'$ " polypropylene - spinnaker topping lift
$7/16$ " dia. rope <u>30'</u>		$1/30'$ " terylene - centreboard

Spars

7 " x 5 " x 0.14 " extruded marine aluminium tube $1/36'-0"$ mast
 4 " dia. x 0.080 " " " " $1/13'-0"$ boom
 3 " dia. x 0.062 " " " " $1/14'-6"$ spinnaker boom

$\frac{5}{8}$ " al. bolt rope track or $\frac{7}{8}$ " slide track	$1/32"-0"$ used if no integral mast track
$\frac{5}{8}$ " al. bolt rope track	$1/12"-3"$

Note -- Due to the simple mast staying system with equal support in all directions a circular section standard tube may be used rather than the conventional oval section. Tubing is considerably cheaper than oval mast section and has negligible windage increase. $5\frac{1}{2}$ " dia. x $0.14"$ tubing is suitable.

Spar Fittings

Stainless steel type 316

$6 \times 1\frac{1}{2} \times \frac{1}{4}$	inner forestay tang
$\frac{1}{2} \times \frac{1}{4}$	$2/8\frac{1}{4}"$, $2/9\frac{1}{4}"$ tangs
$11-2" \times 4" \times \frac{1}{8}"$	mast cap
$11-1" \times 5" \times \frac{1}{8}"$	mast cap
$3\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{8}"$	mast cap
$9\frac{1}{2}" \times 6" \times \frac{1}{8}"$	lowers
$8" \times 8" \times \frac{1}{8}"$	mast step

Miscellaneous bolts, pad eyes, shackles etc.

BUILDING INSTRUCTIONS FOR BUCCANEER 28 - DEMOUNTABLE TRIMARAN

Design by Lock Crowther

Notes: Only one boat to be built from each set of plans.

Weight of timber and plywood is of the utmost importance, e.g. using a heavy marine plywood such as coachwood will increase the built weight by 20% and considerably reduce the allowable payload.

It is suggested that Klinkii pine or Gaboon plywood and Spruce or Douglas Fir scantlings be used.

Use epoxy or resorcinol formaldehyde glue.

Use monel or silicon bronze boat nails.

Because of the extreme lightness of the structure and consequent high stressing of component parts, care must be taken to achieve quality craftsmanship, particular attention being given to glue joints.

It is preferable to use epoxy rather than resorcinol glue.

Mating surfaces between metal and wood must be coated with a poly-sulphide caulking compound (such as Thiokol) before clamping together.

All bolts should be peened over to prevent loosening.

Mainhull

Mark out frame shapes on $\frac{3}{8}$ " and $\frac{1}{4}$ " ply using the dimensions on sheet 1 for the top half of the frames where necessary and pricking through the patterns on sheet 4. The plywood will have to be scarf or butt joined to make up the sizes. Scarfs are neater, use a 10:1 angle.

Nail and glue edging around each frame. All risers and supports for the interior should be nailed and glued to frames, limber holes and keel notches, etc. cut. Cut out the stem pieces (sheet 2) and glue up using epoxy and cramps. Locating pegs of $\frac{3}{8}$ " dowel may be used if desired. Cut out the centrecase sides, glue on all external timber members to each side, fasten the 2 x 1 $\frac{1}{2}$ " end pieces to one side only (sheet 3). Fiberglass the inside of the centrecase before final assembly using three layers of cloth and preferably epoxy resin. Assemble the centrecase to frames 4B, 5 and 6.

Make up the centre sections of both crossarms (sheet 5) including the centre joint and fit to frames 4B & 8B. The vertical posts for frames 4B & 8B are now made up and fitted against the crossarms using epoxy glue and filler mixture. Now fasten frames 4A and 8A in place and permanently through bolt the crossarms. The stainless steel pieces on the bottom of the vertical posts can now be fitted leaving the $\frac{1}{2}$ " dia. stainless steel bolt protruding to take the 2"x $\frac{1}{2}$ " stainless steel brace.

Set up frames on strongback as shown on sheet 2, add stem and fit keel from stem to transom over frames and fasten to stem, frames, transom and centreboard case. Make up and fasten in place the keel reinforcing around the rudder post (sheet 3). Lay stringers around frames and notch frames to suit. Add the gunnels, wingdeck clamps and chines.

Now fair off frames, stringers, chines and keel to take $\frac{1}{4}$ " ply hull skin. Start skinning the sides first marking the curve of the chine off against the sheets and move the sheet up the chine centreline. Ply joints should be scarfed 10:1 or butted with 5" wide by $\frac{1}{4}$ " ply backing blocks.

Continue sheeting the hull bottom and the underwing $\frac{3}{8}$ " ply and when complete round off all chines. A cap strip should be placed up the stem to cover the end grain of the plywood.

Before removing the hull from the strongback, fiberglass all over to within 1" of the gunnel.

Make up the centreboard and rudder and carefully carve to hydrofoil sections (sheet 3). Fiberglass all over using three layers of cloth and preferably.../2

epoxy resin. When installing the rudder tube, leave the lower end cut off square just level with the keel to take a fibre washer between the rudder top and tube. Wrap a layer of cloth and epoxy around the rudder shaft top and bottom to form bearings. Also use plenty of cloth and epoxy inside the hull to spread the rudder tube loading onto the hull skin.

Make sure the centreboard is a fairly free fit in the case. The centreboard may be installed now or later.

Cabin and Deck Construction (sheet 2)

With the mainhull sitting upright on chocks, fit all deck stringers, the cabin side timbers and cockpit floor stringers. Fit the cabin side, foredeck and cockpit floor ply in place. All plywood for cabin and decking is $\frac{3}{8}$ ".

Now laminate the $2\frac{5}{8}$ x $\frac{1}{2}$ bevelled to 33° over the foredeck to take the cabin front. Finish off the mast post to take the cabin roof (sheet 6), fit cabin roof stringers, winch pads and headsail track backing. Cut the $3\frac{3}{8}$ x $1\frac{3}{16}$ cabin front timbers to fit the curve of the protruding stringer and fasten in place. Fasten the $\frac{3}{8}$ " ply cabin roof in place. Note the centre stringer is lowered $\frac{3}{8}$ " so that the 6" wide $\frac{3}{8}$ " ply butt strap joining the cabin roof ply sheets fits flush with the curve of the roof framing.

Make up and fit the cabin fronts carefully fitting a $2\frac{1}{8}$ x $1\frac{5}{8}$ down the centreline joint and adding the $2\frac{3}{8}$ x $\frac{5}{8}$ piece to the mast step. Make up and fit cockpit coaming including reinforcing pads to take winches, the cockpit seats and complete the aft decking.

Now add the companion hatch top runners and water stop, the fore and aft deck hatches and surrounds. The catwalk can also be made up and fitted at this stage.

Float Construction

(Sheet 5) Mark out frames on $\frac{1}{4}$ " ply using full size patterns on sheet 3. Make two of each frame. Nail and glue edging around each frame. Cut out notches to take chines, etc. Cut out six stem pieces from $\frac{3}{8}$ " ply and laminate up two stems to $1\frac{1}{8}$ " thickness.

Set up frames for one float on strongback, except for the short half of frames 4A and 8A and run keel from transom past frame 1. Set up stem and fasten to keel. Fasten gunnels in position, also chines and stringers. Make up and fasten in place the reinforcing pieces for the gunnel. These must be tapered off at each end. (Now fit the $2\frac{5}{8}$ x $1\frac{5}{8}$ pieces in position on frames 4 and 8, paint two coats of wood preservative inside the frames before adding frames 4A and 8A.)

Fair off float and plank float sides with $\frac{1}{4}$ " ply using butt straps 5" wide. Fair off along chine and plank float bottom in the same manner. Note that 1" x 14G nails used should be placed so that the chine can be rounded right back to the timber stringer.

Remove hull from strongback, fair off gunnels. Paint two coats of wood preservative inside plus a coat of thick urethane varnish or red lead primer along the keel area where water collects. Permanently fasten down $\frac{1}{4}$ " ply deck, fair off the outside rounding corners etc. and adding a cap strip to the bow. Fiberglass all over using 6 oz. cloth, making double thickness at the keel and chines and gunnels by means of overlaps.

Place standard plastic screw down inspection ports in the float decks for access to the crossarm bolts. Make up the crossarm hardwood supports using a length of crossarm tubing as a guide for fairing each support to the correct height and angle to match the deck. It is suggested that the centre line holes only be pilot drilled and the attachment of the float to the crossarms be left until final assembly of the whole structure.

Note: It is intended that every second bulkhead in the floats be watertight except for the limber holes. Water then cannot rise above the limber holes in any compartment provided it is airtight. Inspection ports at each end of the floats which can be provided with air scoops for ventilation at moorings are required.

It is essential that all ports be completely airtight when sailing at sea except for a very small $\frac{1}{4}$ " plastic breather tube run up from the keel via the float deck to behind the crossbeam and bent over to prevent entry of water. This breather tube should be epoxy sealed through the deck. Should there be a slight leak in an inspection port, the breather will prevent water being sucked in when the float pants slightly on striking a heavy sea. It will also relieve internal pressure due to temperature change - an essential feature in most climates.

Assembly

Make up the crossarm joints and fit the outer sections of both crossarms complete with temporarily attached stainless steel brace tang to the mainhull. Also fit the stainless steel braces inside the mainhull not forgetting the hull skin support plate and backing (sheet 2).

Position each float in turn and mark out and drill the crossarm and stainless steel brace tang to take the float attachment bolts. Bolt on each float adding the strap over the top and the additional bolts at each attachment point. Now fit the rigging wire crossarm braces and mildly tension the crossarm braces via the turnbuckle.

General

Special care should be taken with headsail tracks and winch mountings. These fittings will have an enormous loading. All windows, lights, etc. should be $\frac{5}{16}$ " perspex seated onto caulking compound (Thiokol) and bolted at 3" centres using $\frac{3}{16}$ " R.H. metal threads.

Fair off all decking and complete the fiberglass sheathing of the boat.

Make up and add all fittings, chainplates, etc. not already in place, rubber strips, trim strips, etc. can be added after painting.

Note:

1. Seat all metal fittings on a layer of flexible polysulphide caulking compound (Thiokol).
2. The deck must be painted with a sand sprinkled non-skid finish.
3. Folding propeller design should be based on 8 shaft H.P. at the propeller and about 7 - 8 knots in calm water using a 10 H.P. Wankel installed under the cockpit.
4. The netting decks are attached to a $\frac{3}{16}$ " dia. S.S. wire slung between the inner bolts on the float/ crossarm attachments, to the crossarms by pop rivet saddles and to the catwalk by through bolted saddles. The netting itself may be heavy duty synthetic fish netting or preferably $1\frac{1}{2}$ " wide terylene or nylon webbing sown together at all intersections.
5. Large hatches may be installed on the floats provided they bolt down onto neoprene gaskets or caulking compound and are perfectly watertight.
6. Aluminium and stainless surfaces where in contact should be etched with a phosphoric acid - solvent etch primer followed by one coat of zinc-chromate. In addition, use polysulphide caulking compound to prevent ingress of water and you should not have any corrosion problems. It is also advisable to have all aluminium components anodized or painted.

Spars and Rigging

(Sheets 6 & 7) Make up main mast. 'Pop' rivet slide tracks in place at 3" centres. Make up aluminium boom with wooden plug ends where necessary to take fittings. Minor fittings and sail track may be monel 'pop' rivetted in place. All stainless steel standing rigging must have fittings at the lower end which will allow the wire to swing if fatigue failures are to be prevented.

Sails

These should be made up from terylene by a reputable sailmaker. Dimensions and cloth weight are shown on sheet 7. Mainsail camber should be around 1:10, headsail camber 1:20. Boom goosenecks, clew outhauls and lee lines should be readily adjustable for control of sail camber. Arrangements for 'wide out' sheeting of genoa (barber hauler) is desirable for reaching performance.

Accommodation

A general accommodation plan is shown on sheets 1 and 7. As all framing has various risers to take seats, etc. built in, any alterations to the layout will require changes to the risers. Flooring can be $\frac{3}{8}$ " ply.

Hatches and Vents

Float hatches and inspection ports must be screwed down onto rubber gaskets. They must be watertight. Similarly, vents for floats should be of the mushroom type which can be screwed down onto a gasket. Permanent PVC or polythene pipes should be run from the floats and be available for connection to the cockpit mounted bilge pump.

Safety Precautions

The bow section of the mainhull could be foamed as a precaution against puncture from collision with large driftwood.

If forced to lie abeam to seas in heavy conditions, make sure the centreplate is up.

Maultihull sailing requires that a sheet watch be kept in heavy conditions. As soon as the mainhull looks like lifting, sheets must be eased and a sail change made. Cam cleats for all sheets are essential. The helmsman can help considerably in preventing a capsize by luffing up in gusts when beating and by bearing off in gusts when reaching. However, this requires considerable concentration and does not obviate the need for at least one crewman tending the sheets at all times. The helming technique described is only used sailing almost on the limit and with the hull just about to lift. This does not occur unless one is racing in winds over 25 knots and in an over canvassed condition. When cruising you should change down on 20 knot winds.