By Thomas H. Rosling

40 CRACKER BOX

A Sport Scale Model For One Design Racing

The 40 Cracker Box, as a "one class design" gives the novice driver a chance at building some confidence, while learning the skills necessary for competition in the high performance classes. The Capitol RC'ers have been running the 40 Cracker Box for a couple of years and have found that the boat is a very good "trainer."

The Cracker Box design is a natural for R/C boating. The hull is easy to build, has a ton of room, and it's a real kick to drive. After running some pretty quick deep-vees for the last 10 years, I didn't expect much from a flat bottom boat with a living antique for an engine. However, the stock K&B .40 Marine gives the 40 Cracker Box all the power it can handle.

Our club rules take the liberty of deviating from scale by putting the engine up where you can see it. Also, the builder can design his own fantasy engine. I have always thought the appeal of the old style Unlimited Class was that big Allison or Rolls Royce up front. The big "visible V-8" and drivers give the boat a whole different look than your standard Twincraft.

The engine sketch provided is a make-

Sofia Miller holding boat by Bill Mc'Cay; lower boat by Tom Rosling.

believe, twin-cam, big block V-8 with ram injector stacks. Add a blower hood, use multicarbs, different valve covers, more detail. Your boat, your engine, your choice — build that V-8 you always dreamed of and your Cracker Box will put on a Capital Performance.

Other changes from scale include the use of the Octura Strudder, to simplify building for the novice; one color paint or natural wood plus one color paint — to make painting easier; 3" racing numbers, large enough so that even old CD's can see which boat was the offender.

Initially, I rather expected the flat bottom to be almost too bouncy to drive. However, these boats can handle heavy water and are surprisingly stable, risk of blow over is minimal, once you get the trim and strut angles dialed in. If you're looking for that first boat, the 40 Cracker Box would be my choice. It's much easier to drive than a tunnel hull outboard and the cost is about as low as you can get — under $300.00. That includes engine, radio, hull, and hardware.

Regardless of your experience level, you can't beat the excitement of watching the Williams Bros. thrash it out. The 40 Cracker Box has resulted in so much fun, three-fourths of our club members are building one. I guess the antics and looks of a Cracker Box must affect a lot of people that way. I just read in the newsletter that the IMPBA will have a Weed Eater Cracker Box class this year. How about an IMPBA/NAMBA 40 Cracker Box class next year?

CONSTRUCTION

Cut out frames and planking as a "kit" starting on the hull. The boat assembles quite quickly and you'll hate to stop when you're on a roll.

"The Cracker Box design is a natural for R/C boating. The hull is easy to build, has a ton of room, and it's a real kick to drive."

Cut deck, sides, and bottom planking from 1/8" luan (swamp mahogany) plywood (local lumberyard — about $8.50 per 4' x 8' sheet, enough for two+ boats). If you can't find the 1/8" (may be carried as 3 millimeter) luan ply, use 1/8" x 12" x 48" lite ply (see Balsa USA ad) — birch ply is pretty stiff to bend on the jig.

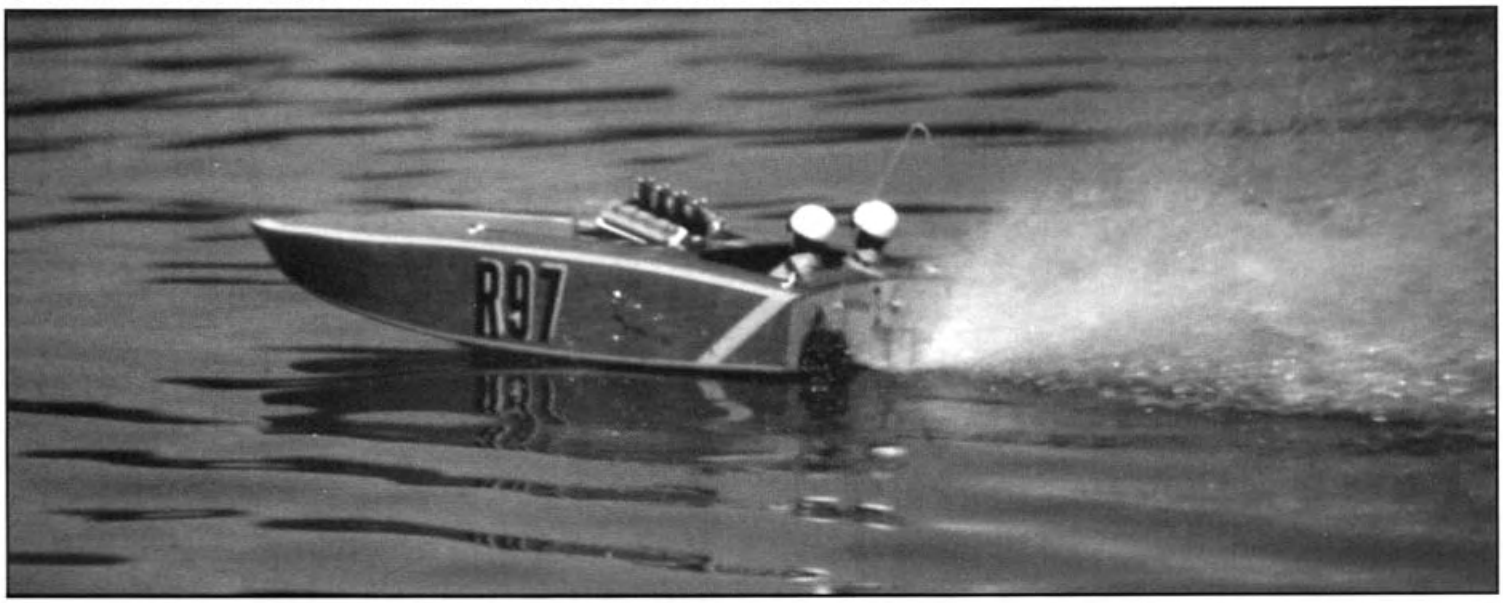
Use 1/4" luan plywood for frames 2, 3, 4, the boat stand, and the assembly jig. Use 1/4" birch aircraft plywood for the transom; 1/4" lite ply for the keel, shears, and chines. You can substitute luan for lite ply parts. The lite ply is just a bit easier to sand.

Building The Boat Stand:

You won't need this for a while, but while they're handy, use frames 2 and 3 as templates for the angles on the front and rear stand supports. Use 1/4" luan ply and cut as indicated. Glue with epoxy or carpenters glue (not white glue). Cut 1" foam pipe insulation to fit over the bow and transom support areas; staple edges to stand. Finish with polyurethane. Set aside until you have finished planking the bottom.

Frames And Assembly Jig:

The 40 Cracker Box must be built on a jig to be sure that the bottom is straight. A simple jig can be made along the lines of the RCM Wing Jig, using 1/4" x 36" steel rods and support blocks on a flat base (see photos/sketch). The jig is reuseable, pass it around the club.



40 CRACKER BOX

Designed by:
Thomas H. Rosling

TYPE OF BOAT
Stand-Off Scale

LENGTH
37 Inches

BEAM
13-1/2 Inches

HULL TYPE
Flat Bottom, Hard Chine

RADIO COMPARTMENT SIZE
12-1/2" Wide, 6" Long, 4" Deep

RADIO BOX
6" Sq. Plastic Food Box

REC. ENGINE
Stock K&B 40 Marine Req.

FUEL TANK SIZE
10 Oz. Main Tank, 2 Oz. Sump Tank

REC. FUEL
25% Nitro; 20% Castor Oil

REC. PROPELLER
Prather 220 S.S.

REC. SHAFT DEPTH
5/16" Top of Shaft Log to Hull

NUMBER OF CHANNELS
2 Ch. Surface

BASIC MATERIALS
Luan (Mahogany) Ply, Lite Ply, Birch Aircraft Ply, & Spruce

Weight ..... 5-6 Lbs.

On a flat surface, glue 1/4" sq. x 36" spruce stringer to notch in lite ply keel. Make sure keel assembly is straight. Mark frame, shear, and chine locations on keel.

I have built six Cracker Boxes with this keel design, which works fine. However, the center joint of the bottom planking has minimal support. After I laid this one up, it occurred to me that it might be worthwhile to double the forward lite ply section and use 1/4" x 1/2", laid flat, for the aft section. If your experience permits, I believe I would modify the keel notch in the frames to accept the wider keel and go that way. I don't see any problems, I just have not tried it myself.

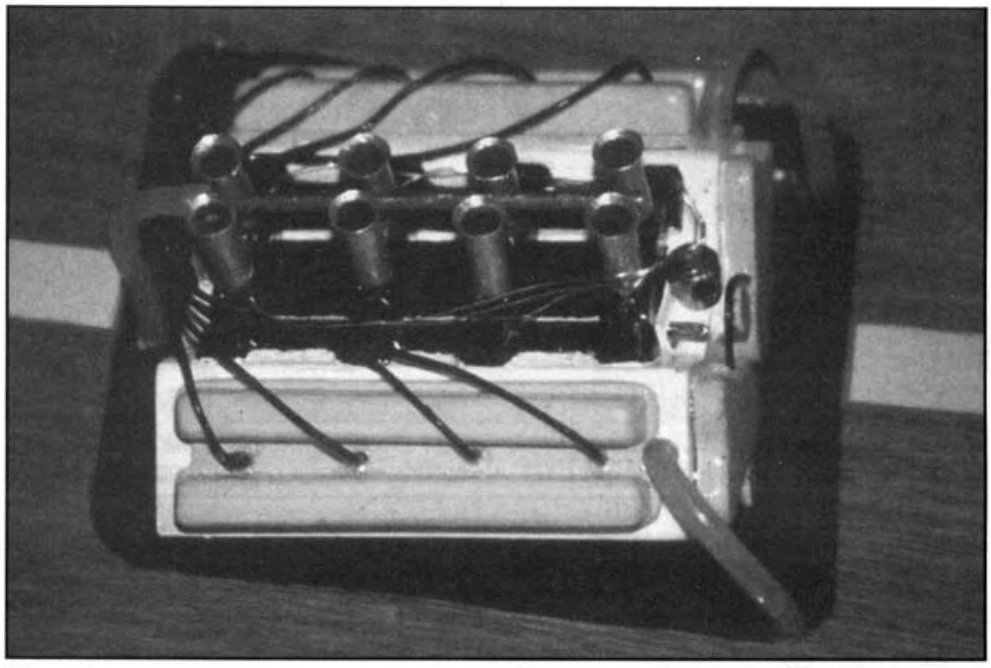
Mark transom for location of jig rod holes. Clamp the frames and transom together so the keel notches align and the

ABOUT THE AUTHOR

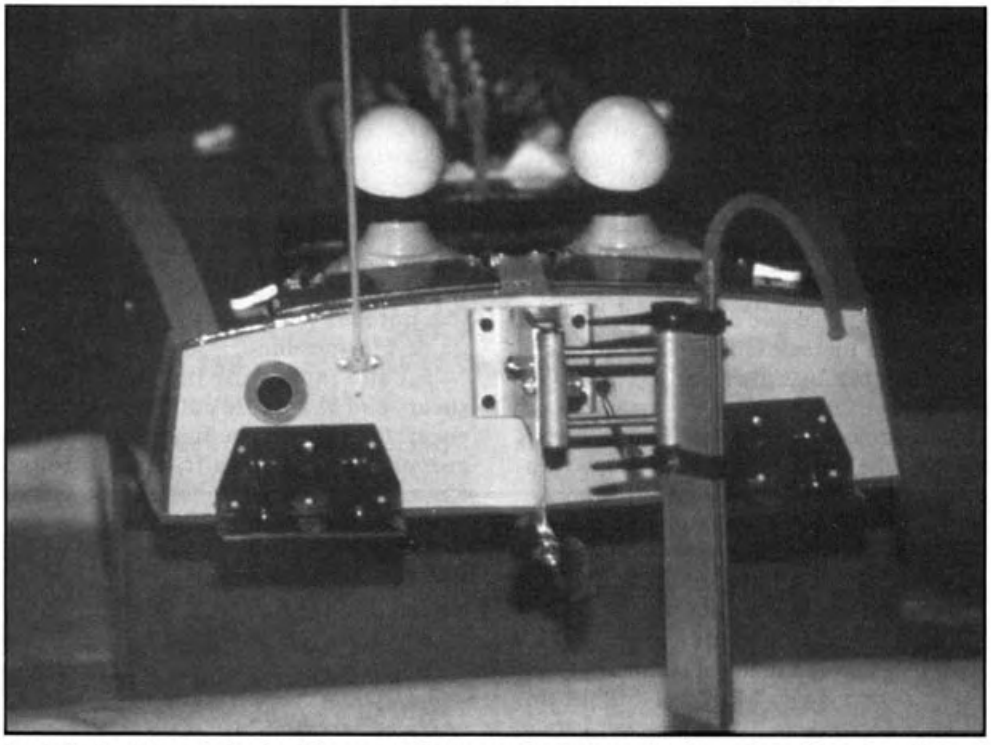
Tom Rosling was born in Greeley, Colorado, and built his first gas model in 1946, a Magician U-Control, with an Ohlsson & Rice 23. He designed and flew control-line stunt and combat planes until the mid 50's, and still has a couple of the K&B Torpedo 29's (an older brother of the 40 Marine in the Cracker Box) that he flew in the early 50's. During 1953-54 Tom and a friend started racing free running balsa wood 1/2A outboards. For 30 years after college, he dropped out of modeling, but then in 1985 he built a boat based on drawings in *R/C Modeler* for Fred Reese's 45 outboard "Ski-Vee." He was hooked ... again.

Over the past 10 years he has designed, molded, and raced 20, or so, fiberglass Deep-Vee prototypes. The 40 Cracker Box is his first attempt at a wooden hull (since 1954). Included during this time were a series of expensive learning experiences, concerning limitations on the effectiveness of engine modification.

Over the years, he has been the Capitol RC'er CD for quite a few IMPBA and NAMBA races. In 1990, he was the CD for the Deep-Vee and Off-Shore segments of the NAMBA Nationals. Tom is still an active participate in local and nearby IMPBA/NAMBA heat races.

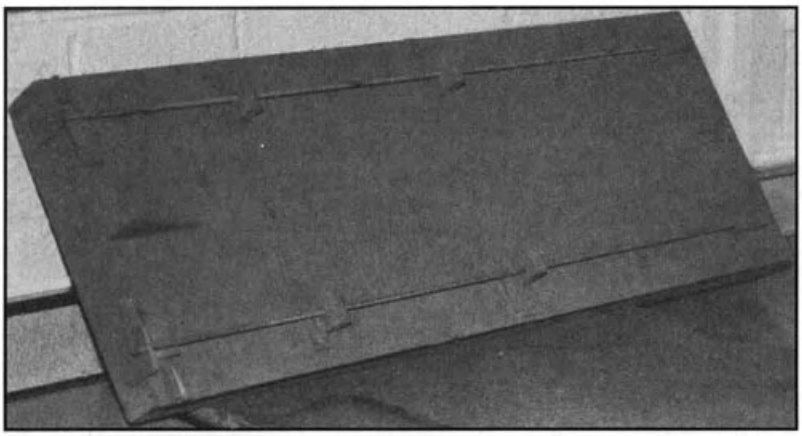


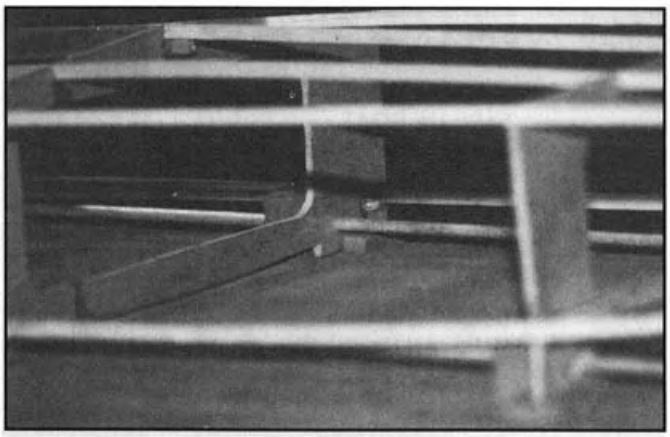
The twin cam special.



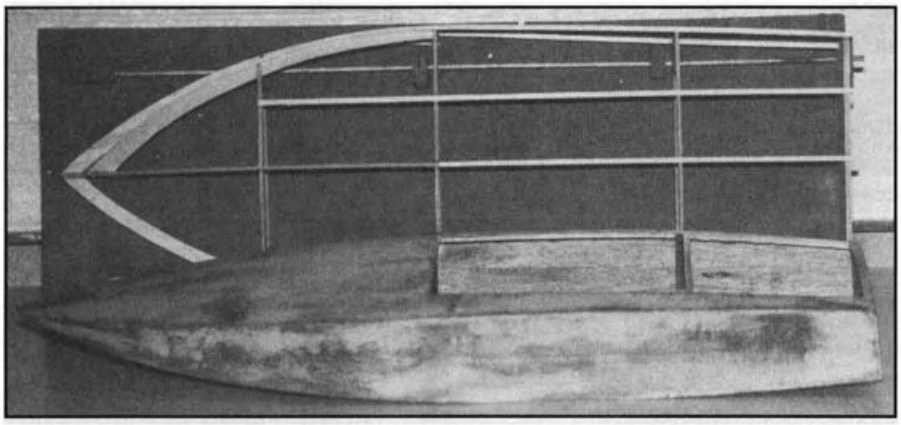
Install aluminum tube in silicone rubber coupler tube to lock in place. Note location of trim tabs — no turn fin on transom.

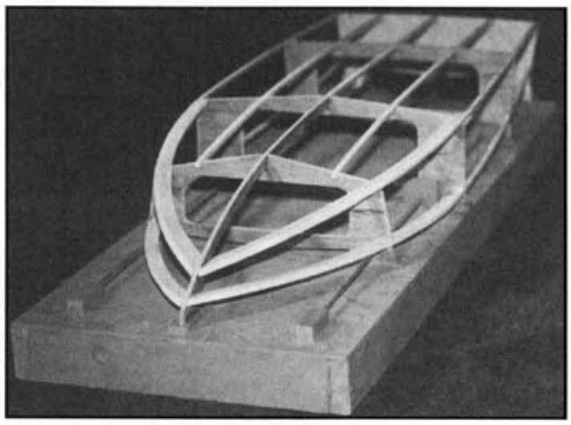
Inner tube straps are used for driver hold-down.





Cracker Box building jig constructed of 1/4" ply on 1" x 2" frame. 1/4" steel rods through 1" x 2" blocks clamp frames to jig. RIGHT: Drill holes in frame ears for steel rods. Use 1/4" sq. spruce to locate rear of frame on jig surface.





LEFT: Frames on jig show location compared to completed hull. RIGHT: Mark frame locations on keel and jig surface. Locate chine and shear locations on keel stem. Glue stringers in place.

ears are flush at the top; drill all frame ears at one time; make sure drill is perpendicular.

Build a jig base from 1" x 2" pine and 1/4" luan ply, as shown in the sketch. Set the keel stem in place on the jig and locate the frames on the keel. Double check spacing dimensions and mark frame location on the jig base. You may want to glue a small piece of 1/4" at each end of each frame, as a positive locator.

Place a 1" x 2" pine block in front of each frame; slide rods through frame and mark block; drill and glue in place with slow CA, one at a time but cumulative (use rods for alignment). Mark and drill the two rod tip blocks; glue. When all blocks are in place, slide rods through frames and blocks to clamp frame ears tight against jig; check to ensure frames are square to jig and keel; glue keel to frames.

Glue 1/4" sq. spruce stringers into the two notches outboard of the keel, from frame 4 to transom.

Fit and install lite ply shears. Both shears and chines are cut oversized. The shears/chines will be fared into smooth curves, flowing from frame 3, through frame 4 to the stem, when the frame assembly is block sanded.

Fit and glue a 1/4" sq. stringer to the shear, from about 1" forward of frame 3, extending to the transom. Sand to match shear outline.

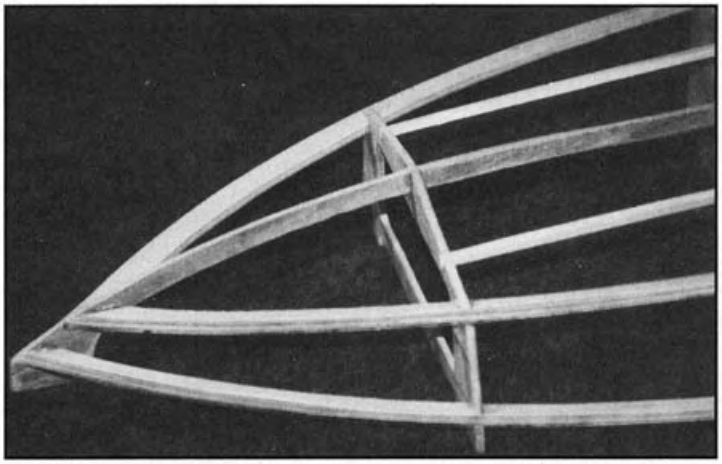
Butt join chines to stem, as marked, and to the front of frame 3. Glue a 1/4" stringer to chine, about 1" forward of frame 3; same as on the shears. When glue joints are solid, pull the rods and remove keel-frame assembly from jig.

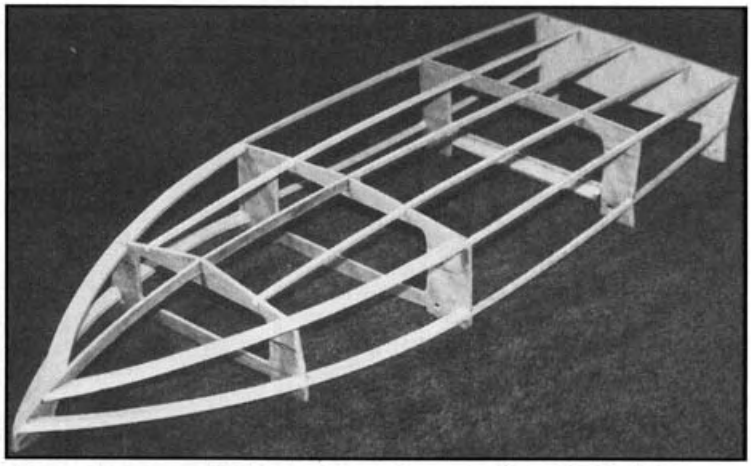
Use a long sanding block (1" x 2" x 10") and #60 coarse sandpaper; sand the keel, shears, chines, and stringers to match frames. Sand shears and chines to develop smooth curving flow from frame 3 to stem. Put assembly back on jig.

Side Planking:

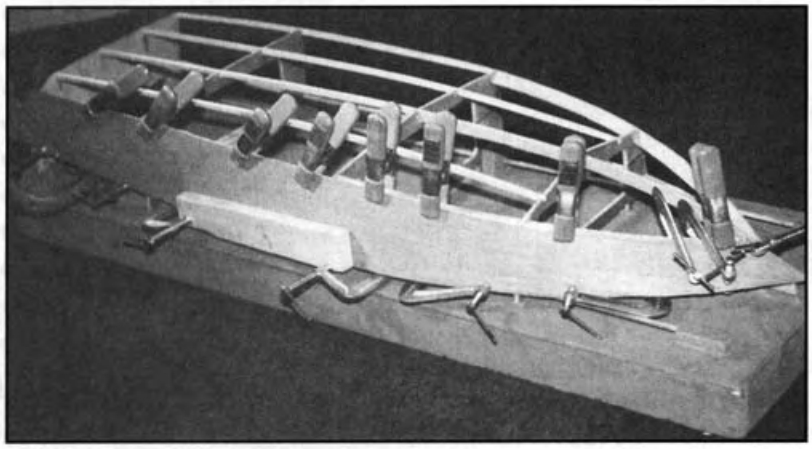
Put paper over exposed rods so epoxy won't drip on them. Spread a lot of 12 to 15-minute epoxy on the left side shear, chine, frames; clamp planking as needed. When the epoxy is hard, sand planking, overlapping the right side of the stem to match shear-chine.

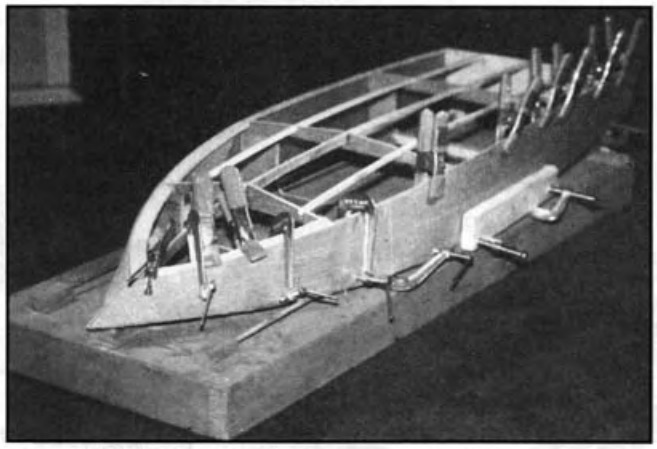
Spread epoxy on the right side shear, chine, frames (use a bunch). Clamp as required. You can use slow CA on the stem; spray kicker on the joint and hold until the CA hardens. If a section pulls loose, lay in some slow CA, hand clamp in place and hit with kicker.





LEFT: Sand shear and chine to match stem. RIGHT: Sand stringers, shear, chine to match frame. Use a long sanding block with coarse (#60) paper and much care.





LEFT: Clamp side to stem, shears, stringers, and chine. Use plenty of glue. RIGHT: Sand off-side to match stem and glue — clamp near side in place.

I have built hulls using just slow CA and a combination of clamps and hand clamping, spraying kicker on the joint as I went along. It's quicker, messy, and some risk if you don't get the planking properly aligned.

When the glue is hard, carefully sand planking to align with frame bottoms and chine. Check with a straightedge from keel to chine.

Bottom Planking:

Putting on the bottom requires building four strongbacks over the jig (see photos). The idea is to clamp wooden wedges to the strongbacks, to hold the bottom planking in place until the epoxy cures.

Carefully fit the edge of the planking to the center of the keel. Coat frames and stringers with epoxy. Use clamps at the bow and wedges between strongback and planking to hold the bottom in place. Do one side and let epoxy harden. Repeat the process on the other side. Take some time while you're fitting the planking along the center of the keel, there is not a lot of wood to support the joint.

When epoxy has cured, remove hull from jig and place on stand. Go over **all** joints on the inside of the hull and lay in a generous fillet of slow CA and kicker. Make sure CA flows under edge of shears/chines from the stem to frame 3. Adding the fillet of CA seals the hull and makes a stronger boat.

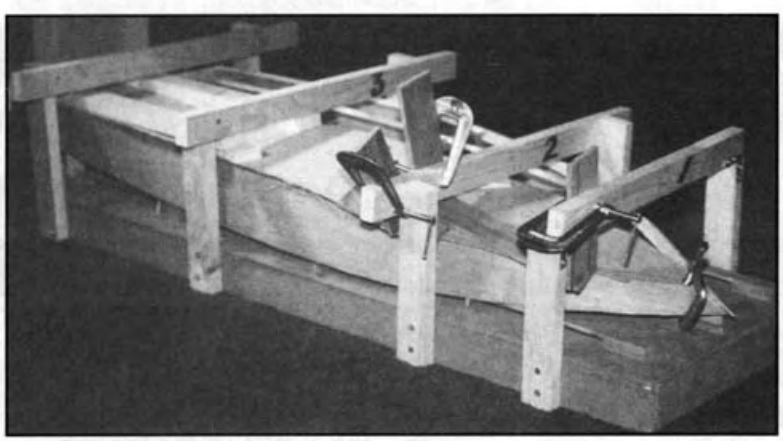
Use a Dremel Tool with a burr on it to cut drain holes in frames 3 and 4. Clean-up will be easier if you don't cut drain holes in frame 2.

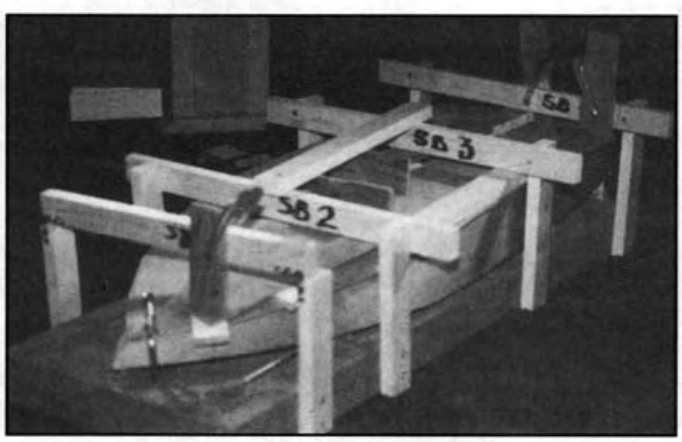
Installing The Engine:

Cut and epoxy together, two pair (four pieces) 1/4" ply engine mount rails. Place engine (without muffler) on Octura 4-40 mount: mark mounting hole locations; drill and tap for 4-40 bolts; check installation; remove engine.

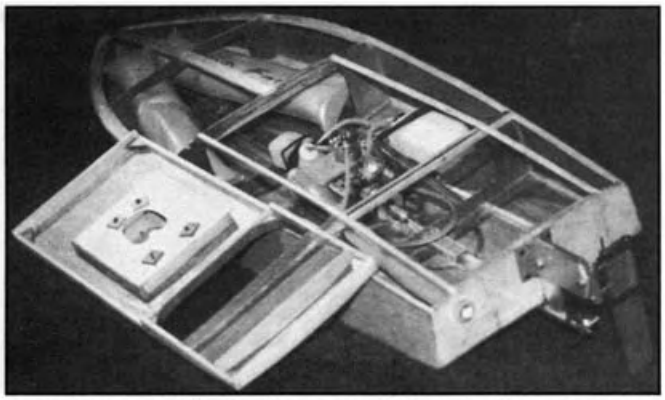
One side at a time — clamp front (bow end) of mount even with front of rails and level with rail tops; mark mounting holes on rails. Remove mount and drill rails for 6-32 socket head bolts; bolt mount to rails using blind nuts (once front of blind nut enters rail, put a drop of slow CA between rail and nut plate); tighten.

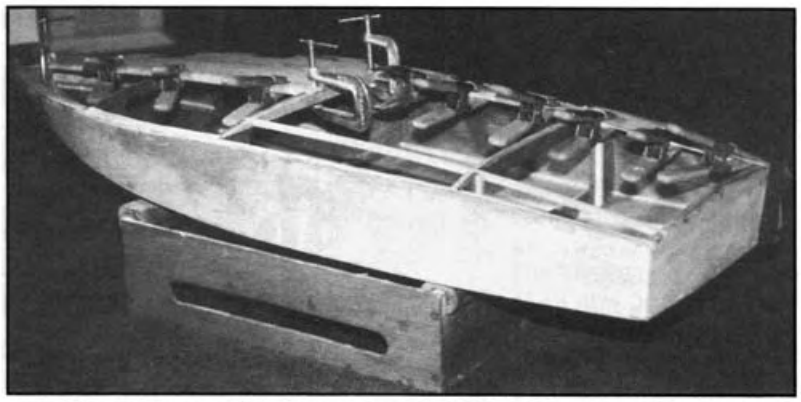
Install mount between rails; install engine; fit assembly against frame 2; make sure starter belt will just slip between keel and flywheel (you may have to cut away some of the keel). Align flex-hex assembly with center of keel (make sure mount is





LEFT: Jig with addition of strongbacks to aid in clamping bottom in place. Note use of wedges under strongback as well as with clamps. Stem can be clamped, if you're careful. RIGHT: Clamping other bottom section to hull. Notice the vertical wedges and clamps' locations.





LEFT: General interior layout. Hull flotation is made from Swim-Eze (floats for small swimmers) cut in half. Notice use of feeder tank. You can also see how the big V-8 was held in place. RIGHT: Clamp deck to center stringer, frame 3 and cowling stringers. You can clamp the second side of the deck to the frame and stringers but you will have to depend on duct tape to hold the center and sides down. Make sure you extend the tape across the bottom or it will pull loose.

parallel with keel). Glue rails in place. Fit and glue 1/4" spacer across rails, forward of mount.

Reinforce inside joints between rails and hull with glass cloth. Modify rails/mount, as needed, to fit muffler — check pressure fitting clearance.

Exhaust extension is made from 5/8" i.d. silicone rubber (40 sized tuned pipe coupler), clamped to the end of the muffler. Cut the coupler long enough to extend through the transom. The coupler is bigger than the end of the muffler, so use a metal radiator hose clamp to hold it in place. You may want to use a short length of 5/8" o.d. brass tube to reinforce end of coupler where it exits through the transom.

Deck Assembly:

Cut off frame ears, following the curve of the frame. Use a small plane and the long sanding block to trim/sand planking.

Cut 1/4" x 3/4" notches in top center of shears-stem, frames 3 and 4. Cut and glue a 1/4" x 3/4" stringer between the stem and frame 3. Shape to match bow and frame angles; sand end flush at frame 3.

Once you start trying to lift the boat up out of the water, you'll find that frame 2, across the front of the drivers' cockpit, makes a dandy handhold — reinforce the frame now. Glue 1/4" sq. spruce on both sides, athwartship, on frame 2; butt join ends to shear stringers.

Cut 1/4" notches in transom, frames 2 and 3, with inside edge 4" off centerline (see drawing). Glue 1/4" sq. spruce stringers to form cockpit and support deck edges. Sand stringers to match frame curve.

Constructing The Cowl:

Use 1/4" lite ply to make **cowl frames** by tracing tops of hull frames 2, 3, and transom (make two like transom). Saw **hull** frame 2 down to athwartship frame stringers, inside of deck stringers; remove section of frame above athwartship stringers.

Cowl **rails** are cut from 1/4" x 1/2" spruce. Set cowl frame 3 and one of the cowl transom frames in place, temporarily. Cut two top pieces of spruce to fit between these cowl frames. Cut two bottom pieces to fit under these rails, between hull frame 2 and transom.

Glue shorter rail sections under longer sections, so assembly fits between frame 3 and transom; mark deck profile on rails and cut to shape. Mark location of cowl frame 2 and second cowl transom frame on the rails.

Place wax paper around inside of cowl opening. Fit cowl frame 3 and cowl transom frame in place; butt join rails between frames, and glue; fit and glue cowl frame 2 and second cowl transom frame between rails. Glue two sections of drivers' seat in place; glue 1/4" ply angles to reinforce corners; glue cowl deck pieces to assembly. You can, if you like, cut scrap 1/32" ply, 1/2" wide; bend around inside of cockpit to cover edges of deck; glue in place with slow CA.

Shape and glue 1/4" x 1/2" stringers to form a box under the edges of engine compartment cut-out; glue dummy engine support plate to bottom of stringer box.

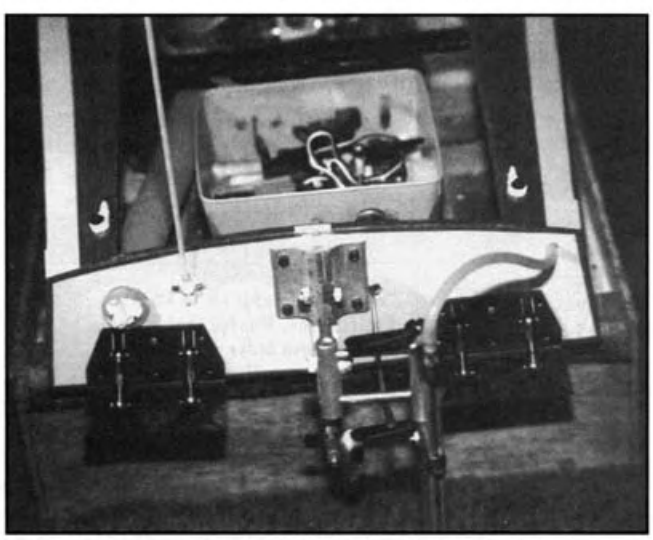
Place drivers on seat. Drill 3/16" holes about 1/4" in front of drivers' shoulders (four holes). Cut four strips of inner tube, 1/4" wide. Tie a knot in one end; thread other end up through the seat and criss-cross over drivers' chest. Anchor inner tube with plastic landing gear clamps screwed to cowl (rubber bands absorb impact and driver is not ripped out if boat flips).

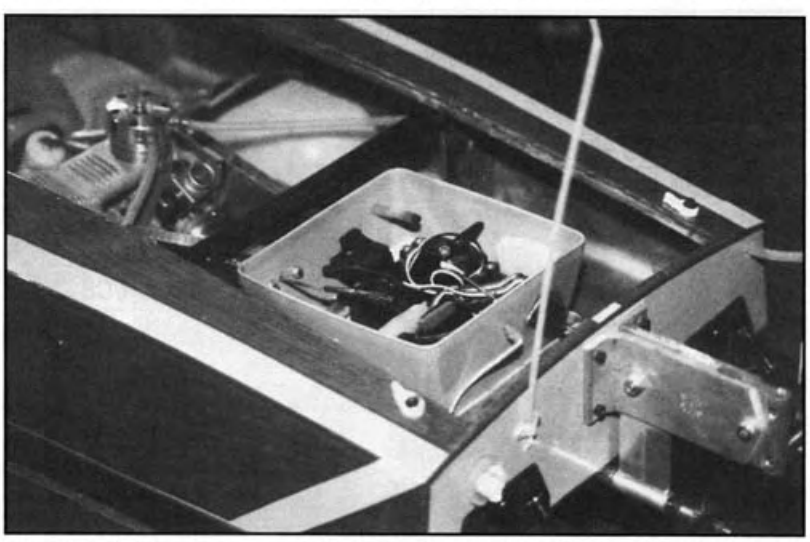
Cowl is held in place with small plastic latches, screwed to the deck.

Dummy Engine Construction:

Cut out nine pieces of 1/16" ply, as shown on dummy engine sketch, and assemble V-8 block with slow CA and kicker. Add valve covers, ram injectors, spark plugs, distributor, wiring, etc., as desired.

Cut 1/4" sq. spruce anchors to fit inside front and rear of block. Locate and mark engine position on engine support plate.





LEFT: Transom of completed hull. Plastic food box for radio (use dental adhesive to seal lid). Simple antenna clamp made from small fuel tube over end of inner pushrod tube with landing gear clamp holding assembly in place. RIGHT: To seal antenna: drill hole in box that you must force fuel tube through (about 1"); force inner pushrod tube through fuel tube; slide antenna wire through pushrod tube. Use the bellows type pushrod seals with 2-56 bolts and locknuts. Cowl locks are screen clamps for storm doors — use 4-40 bolts, washers, locknuts, small brass tube, and fuel tube to take up slack.

Lay anchors on plate and mark; drill anchors and support plate; install 4-40 blind nuts on top of anchors; glue anchors inside block. Use 1" x 4-40 bolts with washers to hold block to support plate. Fit engine support plate over the K&B .40 Marine engine, as required. Seal inside of V-8 block with dope or resin. Paint engine to match hull, as desired.

Installing The Deck:

Seal the inside of the boat, inner side of deck and cowl, with at least two coats of polyester resin (or epoxy resin, thinned to consistency with rubbing alcohol). Whatever you use to seal the wood, use the same stuff to glue the deck to the hull. Keep in mind that polyester and epoxy will not stick to each other. Use duct tape and clamps to hold the left side of the deck in place until glue hardens. Fit right side of deck at centerline; drill through deck and stringer; use 4-40 bolts with washers to pull blind nuts into bottom of stringer. Put heavy layer of glue over frames and stringers; fit deck and pull center joint down with bolts and washers (put some grease on bolt threads to keep from gluing bolts to deck); use duct tape to pull edges into place. When glue has cured, remove bolts and fill holes. Cut a cross-grain strip of 1/8" ply, 1/4" wide. Glue strip across the top of the transom, between the deck planking.

Fiberglassing Hull:

If you want a natural color, wood hull, use acrylic stain and MINWAX fast dry. Neither epoxy or polyester resin will stick to an oil base stain.

If you're going to fiberglass the hull (strongly recommend), round hull edges to a radius of about 1/4" — helps keep glass from pulling on corners. Start on bottom; cut glass to hang about 1" below sides. Paint resin on hull; center glass; start in center and work outward; paint resin over glass to seal, smoothing the glass as you

LIST OF MATERIALS:

1 — 4' x 8' sheet 1/8" Luan Plywood (makes over 2+ boats)
1 — 4' x 8' sheet 1/4" Luan plywood (frames, stand, jig floor)
4 — 1" x 2" x 8" Pine (strongback, stand)
1 — 1/4" x 6" x 24" Birch aircraft plywood (transom)
1 — 1/4" x 12" x 36" Lite ply (keel, shear, chine)
11 — 1/4" sq. x 36" Spruce (stringers)
4 — 1/4" x 1/2" x 36" Spruce (stringers)
20 — 1-1/2" #8 wood screws (strongback)
4 — #6 sheet metal panhead screws (radio box)
4 — 6-32 socket head bolts (mount to rails)
8 — 4-40 socket head screws and blind nuts (V-8 mount/deck)
4 — plastic latches (cowl hold-down)
K&B Sport 40 marine engine
Octura 4-40 mount
2 — 4-40 pushrod with threaded ends
1 — Rocket City heavy duty ball and socket clevis
2 — 4-40 threaded coupler
1 — 4-40 threaded ball
1 — nylon ball connector (from R/C car steering)
12" flex with stub shaft (.186 dia.)
1 — prop dog (for .186 dia. shaft)
3/16" locknut (prop)
1 — Prather 220 prop (BE-CU/S.S.)
Octura/Aeromarine 1/4-28 x .186 dia. flex hex assembly
Pair — double wide trim plates
1 — Octura strudder
1 — Octura offset adapter (for strudder)
4 — lead-Teflon strut bearing (1/4" o.d. x .187" i.d.)
2 — Octura bearing adapters (for above bearings)
1 — 10 oz. slant tank (main tank)
1 — 2 oz. slant tank (sump tank)
1 — 17" starter belt
12" 9/32 brass tubing (shaft log)
1 — 12" x 5/8" i.d. silicone rubber tuned pipe coupler (exhaust extension)
5/8" S.S. hose clamp (clamp for exhaust extension)
6" sq. Tupperware type plastic food container (radio box)
1 — small pushrod tube (antenna support/seal)
1 pr. — bellows-type pushrod seal
Du-Bro quick switch (mount on-off switch in radio box)
Medium Prather fuel tube
1 — pkg. Sta-Brite silver solder and flux
1 — pkg. 1" dia. foam pipe insulation (boat cradle)
2 — 1/4" x 36" steel rods (jig)
Pint Lite-N-Easy body putty
1— pkg. ea. #60 coarse, #100 medium, #320 wet/dry sandpaper
1 — tube Red Spot Lacquer Putty
1 — pint DuPont Spray and Fill Automotive Primer
1 — quart thinner
1 — pint epoxy paint or MINWAX Fast Dry
1 — roll 1/8" trim tape
1 — set 3" block letters and numbers
2 — 2-5/8" Williams Bros. drivers
4 oz. slow CA
8 oz. kicker
10 oz. epoxy resin (12-15 min.)
1 sq. yard 2 oz. glass cloth
1 quart polyester resin and hardener
1 tub phenolic micro balloons
2 Channel surface radio (transmitter, receiver, 2-servos, switch, battery pack)
Foam to shock mount receiver/batteries
Small pieces of cellulose foam for radio box (absorb loose water)
Old motorcycle inner tube (rubber bands that fuel doesn't hurt)
1 pkg. "Swim-Eze" (kids swim flotation — split in middle makes 4 bladders, or use foam package peanuts in ZipLoc sandwich bag)

Additional support components for new boaters (operators of R/C Aero-Do-Hickeys may already have similar equipment on hand)

Pit box (actually two, one for pit, one for parts)
12 volt power panel
12 volt battery (Gel cell)
Extra AA batteries (radio)
Extras of things that break and get lost (mostly small)
12 volt starter (with pulley)
Fuel pump (Dave Brown Six Shooter)
1 Gal. fuel (25% nitro, 20% castor)
Du-Bro Fueler Kit
Extra glow plugs (standard long)
Glow plug wrench (the ones with the plastic handle)
Glow plug connector for power panel
2 — 9/16 open end wrenches for flex hex asy. (Aeromarine needs 9/16" + 5/8" wrench)
1 lb. can waterproof trailer wheel bearing grease (5 year flex cable grease supply)
Quart Marvel Mystery Oil + quart automatic transmission fluid (mix 1:1, add to engines after run)
Small screwdrivers
Needle nose pliers
Small wire clippers
At least one 6" Hemostat (fuel shut off)
1 — 1994 pickup or van (transportation to lake only)
1 to 5 assorted helpers, experts, pit crew (experts are much easier to find than helpers or pit crew)
1 Scenic lake (for CA residents — this assumes water)

go; a couple of coats will seal the hull. Do the transom, deck, and cowl the same way. Use automotive body putty to square hull edges and as a filler (keel/deck joints), if required. Block sand (this is a bunch easier to say than do). Be careful not to sand through the cloth. Paint hull as desired.

Main And Sump Tank Installation:

Mount 10 oz. main tank on **starboard side**. It helps to hold the corner down in turns and is away from the muffler. Install a 2 oz. sump tank on a plate between the rail spacer and frame 3.

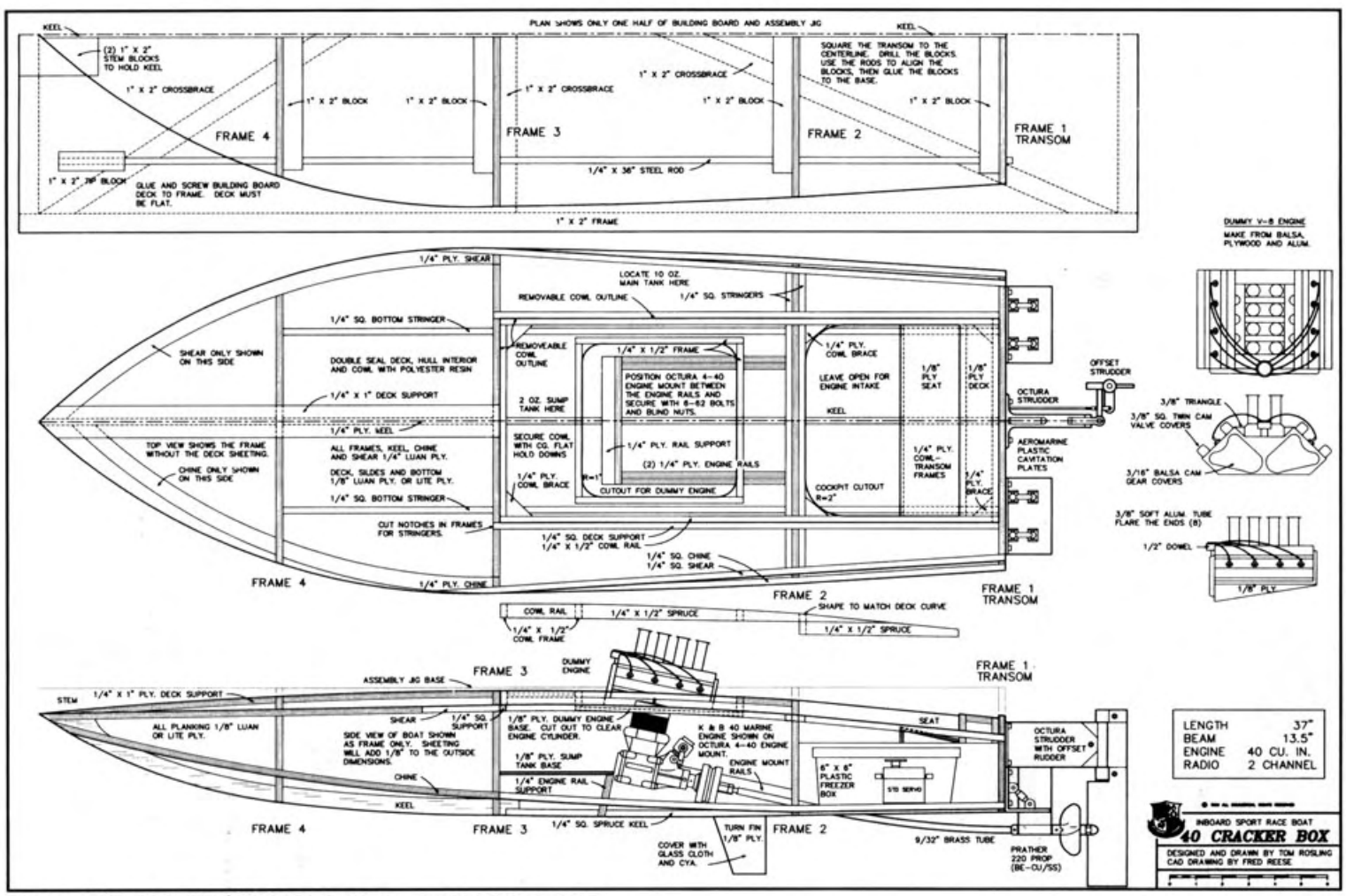
Installing Shaft Log And Transom Hardware:

Use the offset version of the Octura strudder (combination strut and rudder; offset version requires additional components — see dealer). Install according to directions. Top of bearing carrier should be about 1/4" below bottom. Install 1/4" o.d. Lead-Teflon bearings in Octura bearing adapters for strudder.

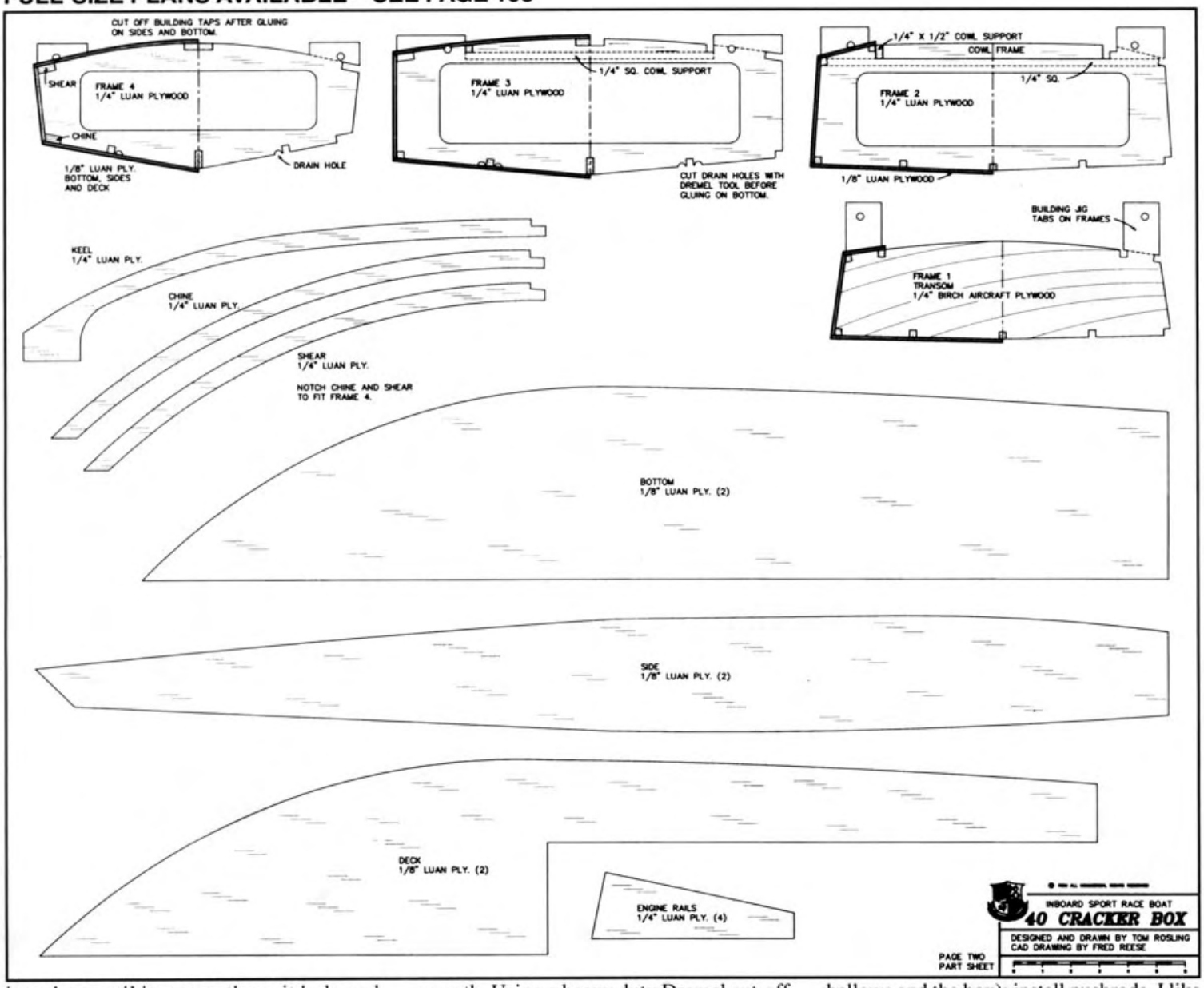
With engine in mount, mark and drill 5/16" hole through frame 2 and bottom to match shaft angle. Insert 9/32" o.d. brass tubing through hull to the end of flex-hex to compare hole angle to shaft angle. Remove tube (insert a 1/4" drill bit in each end to hold while bending tube), heat and gently bend until a smooth curve extends through hull to align with the strut. Make sure you have at least a 2" straight section forward of the strut. You may have to fiddle with the hole through the hull and the shaft log shape to end up with minimum drag on the flex shaft. Getting the shaft log bent just right will probably take several tries.

Leave room between the flex-hex and shaft log for the starter belt to slide through. Slide the flex shaft through strudder bearings, shaft log, into flex-hex; align as needed for minimum drag. I usually insert a 1/4" Lead-Teflon bearing into the end of the shaft log to help align the shaft to the center of the flex-hex collet. When you are satisfied there is minimum drag, sand shaft log with coarse sandpaper and lightly tack to hull with slow CA.

Build a dam inside hull, around shaft log, that is tight enough to hold resin; use masking tape to seal around shaft log through frame 2. Seal bottom (outside hull) at shaft log exit with masking tape. Mix resin with phenolic micro balloons to the consistency of thick cream. Double check to ensure shaft log is still aligned. Pour resin



FULL-SIZE PLANS AVAILABLE – SEE PAGE 198



into dam until it covers the exit hole and shaft log at least 1/2" deep, to seal the hull.

Installing Trim Plates:

Use double wide trim plates. Install per directions. Place outer edges of trim plates about 3/4" in from corners. Make sure plates are flush on the bottom.

Installing Turn Fin:

Cut turn fin from 1/8 ply (or .090" carbon fiber). Sand forward edge to sharp wedge shape. If using ply, cover both sides with light glass cloth and seal with CA. Sand smooth. Using a heavy duty Dremel cut-off wheel, cut a slot just forward of frame 2; glue fin in center of keel with slow CA.

We have found that a turn fin on the transom slows the boat through turns and is not required if a large fin, as shown on the drawing, is used. You may want to experiment with larger fins, as well as moving the fin slightly forward of the location indicated.

Radio Box:

For years I have put up with the mess of molding fiberglass radio boxes. On this boat, I used a 6" sq. plastic Tupperware type food box with a watertight, snap-on cover. Just squirt some dental adhesive into the lid groove; snap on the lid and it's ready to go — no screws, no tape, no leaks. The space behind frame 2 is large enough to accept almost any radio box. So, if you have a good box on hand, it will probably fit. The following assembly information is for a Tupperware type plastic box.

Use 1/4" x 1/2" spruce to support servo rails; lay silicone gasket seal between supports and box side; use panhead sheet metal screw through sides to anchor supports. Screw servo plate to supports; install quick switch, batteries, and receiver. Use 2-56 bolts to attach bellows type pushrod seals (I put some silicone gasket seal between the bellows and the box); install pushrods. I like to place several pieces of kitchen sponges in the box to absorb any loose water.

Simple antenna seal; drill hole in radio box small enough that you can just force through medium fuel tubing (center about 1"); cut 2" piece of small diameter inner pushrod tubing and force through fuel tubing; slide antenna through pushrod tube.

A simple antenna support: Cut small diameter, inner pushrod tube to match the length of antenna extending from boat. Slide a piece of small fuel tubing, about 1/2" long, over the end. Screw a landing gear bracket into transom, over the fuel tubing. Thread antenna through hole in transom and up through pushrod tube.

Build a framework of 1/8" ply between frame 2 and transom to fit radio box. Hold box in place with 1/4" wide bands cut from inner tubes (regular rubber bands are not fuel proof).