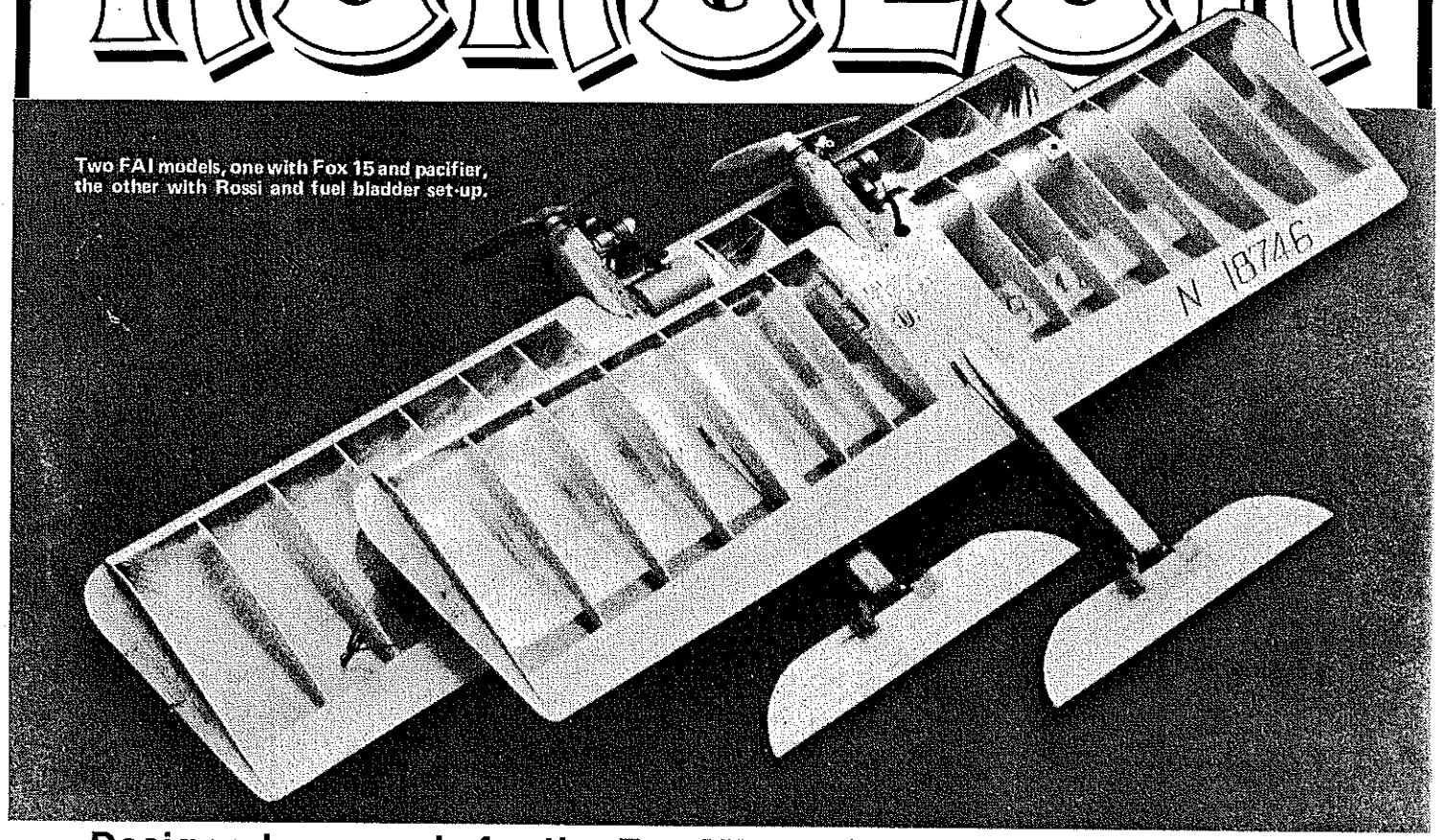
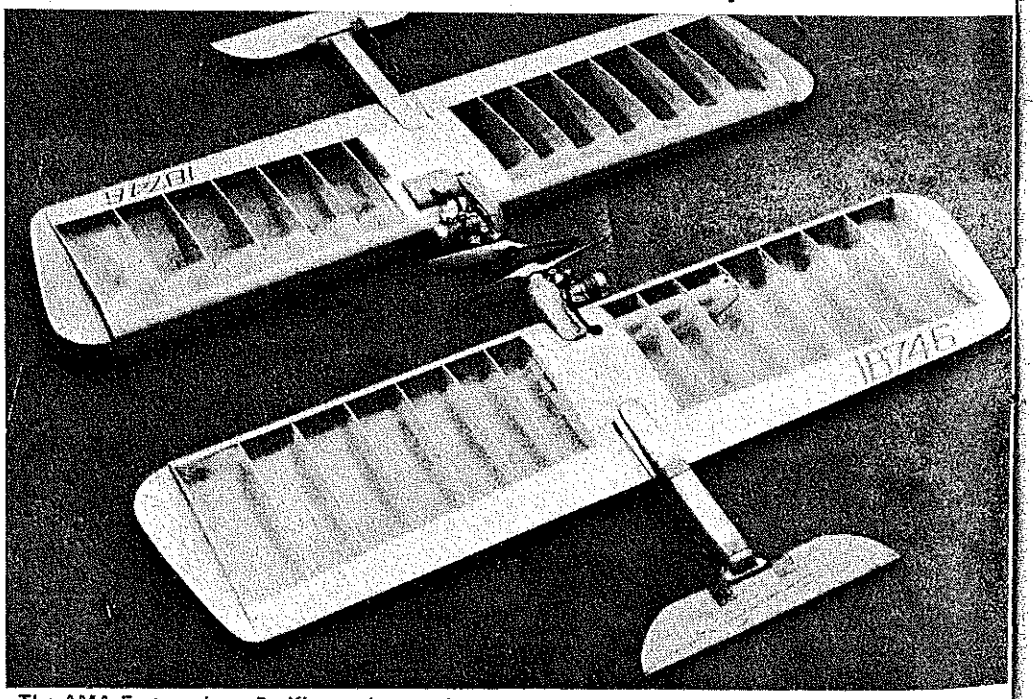
RONGEUR



Two FAI models, one with Fox 15 and pacifier, the other with Rossi and fuel bladder set-up.

Designed expressly for the Fox MK III Combat Special for Fast and Slow Combat, or for the Fox 15 or similar engine for FAI, this state-of-the-art design is durable, cheap and easy to build and repair. It is stable enough to fly eyes-off, yet tight turning enough for any competition.

● **Chuck Rudner**

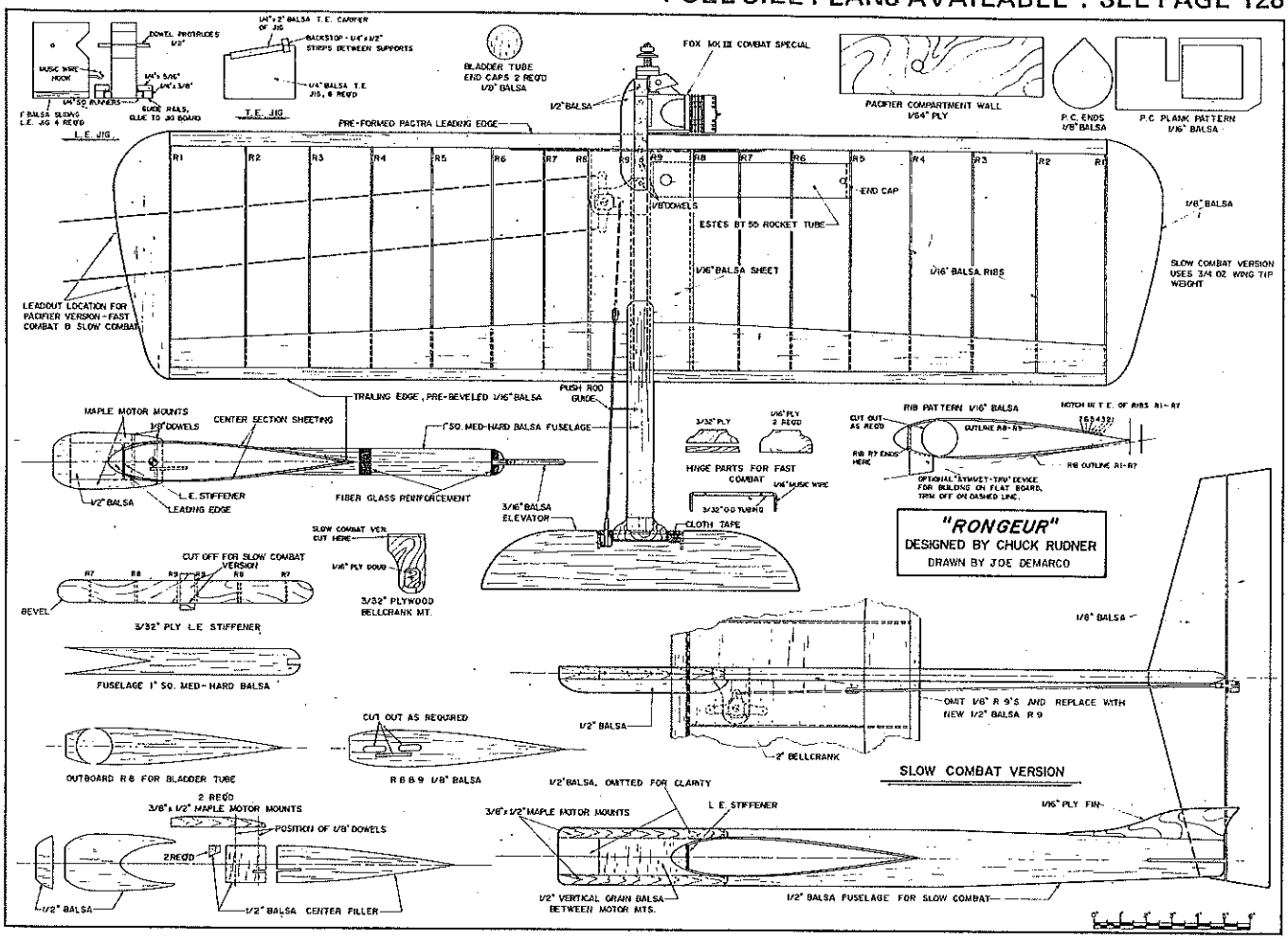


The AMA Fast versions. Pacifier version requires more rearward position of leadouts at inboard tip due to lack of outboard wing weight effect of fuel load—with bladder systems effect is present.

THE introduction of the Fox MK III Combat Special has done a lot to help the popularity of control-line combat since it is capable of 120-mph speeds in "box-stock" configuration. Due to the greater weight of this engine relative to the previously dominant Supertigre 35s, all of the currently available kits, and all but two previously published built-up balsa designs (Buckstaff and Wilkens, both in *MA*), are obsolete due to insufficient wing area to allow adequate turning capabilities.

Several years ago I tired of building more and more complex planes with sheeted leading edges, cap strips, etc. At that time I started to develop a simple, durable, cheap combat plane with adequate wing area for the new Fox MK III to allow competitive turning ability. I drew on the simpler construction methods of the Wooten Voodoo, utilizing pre-formed Pactra leading edges and "split-vee" 1/16 sheet trailing edges. Rather than using spars, the plane makes use of pro-

FULL SIZE PLANS AVAILABLE . SEE PAGE 128



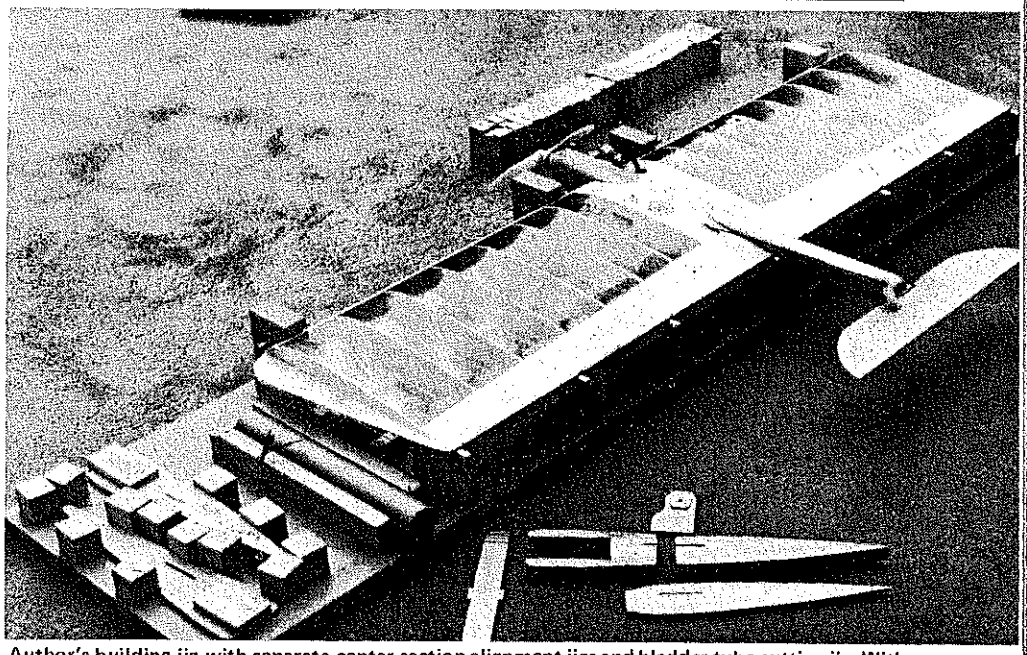
gressive rib spacing and heavy plastic film covering (Fas-Cal).

After perfecting the design as a fast combat plane I tried the same wing for Slow and FAI Combat and have been quite pleased with the results. The FAI version was the main design I used to win a place on the 1978 U.S. FAI Combat team. All three versions have placed in many local Combat events.

The flexibility and strong center section of the Rongeur combine to give a durability which is better than many seemingly more substantial designs. The leading edge stiffener and structurally tapered trailing edge insure a structural break in a crash will occur inboard or outboard of the center section. Thus, the damaged wing is easily replaced by stripping the remaining leading edge from the center section stiffener to the midline, and adding a new wing half. This is much easier than building a whole new plane and, when done properly, does not add measurably to the plane's weight.

The fast and FAI versions can be built for either bladder or pacifier type pressurized fuel systems. The Slow Combat version conforms to the current five-inch nose rule.

I have found the Pactra leading edges to be the bluntest shape available in a pre-formed leading edge. They are consistently straight and come in a variety of weights. I use a medium-hard for the Fast and Slow versions and medium weight for the FAI version. If the leading edge is too light the wing will fold during hard maneuvering.

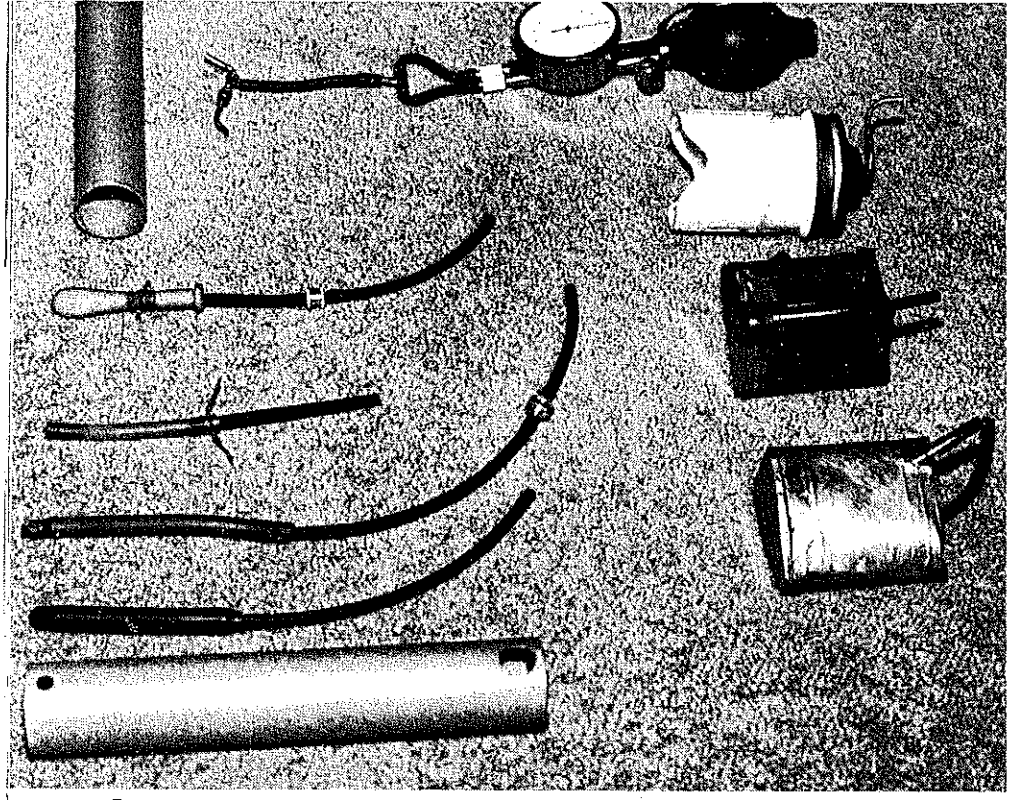


Author's building jig with separate center-section alignment jigs and bladder tube cutting jig. With rib blocks removed, covered model fits back into jig, allowing pre-flight dewarping—mild warps often accrue after ironing on films, such as Fas-Cal. Note center-section parts and leading edge stripper in foreground—also plywood and template immediate foreground. Jig for easy repairs.

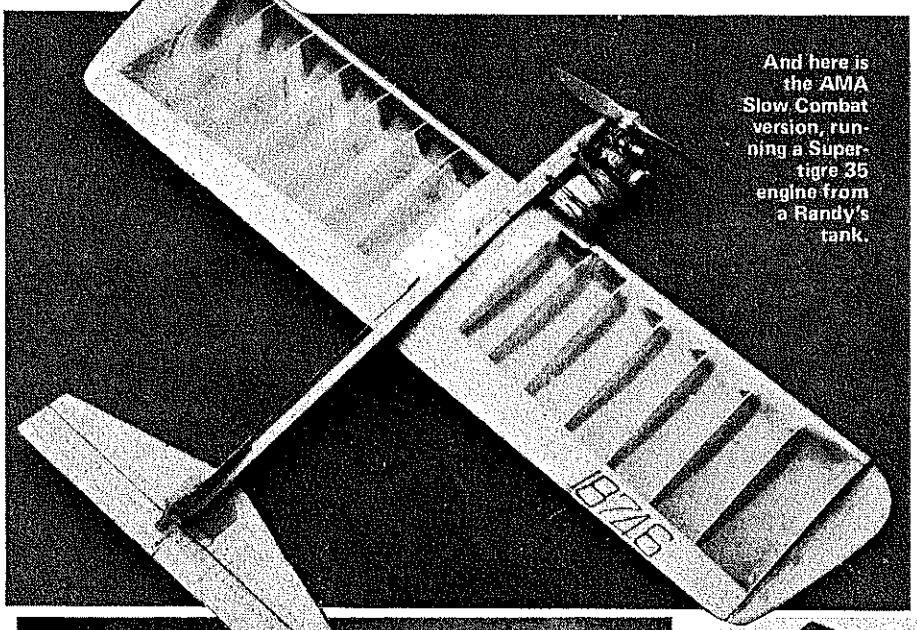
Construction: Begin by cutting the ⅜×½ maple motor mounts to shape. Also cut the ½-in. balsa vertical grain center block. Do not cut the bellcrank slot yet. Use Hobbypoxy Formula II or other slow-drying epoxy for strength. Force the epoxy into the grain of the center block before gluing and C-clamping the maple mounts to the center block. Place the whole assembly outboard face down on a flat surface covered with plastic food wrap to insure a true surface for the engine mounting flanges.

While the assembly is drying, mark out the rib spacing on the leading edge with a felt-tip marker. Do not use ball-point pen or pencil on balsa as they can cause dents which weaken the part. Cut the leading edge stiffener from 3/32 ply. Taper the ends with an electric drill sander to minimize stress concentration in this area of the leading edge.

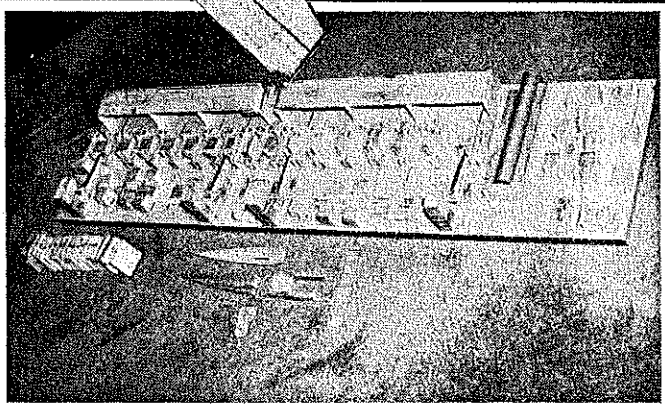
Glue the leading edge stiffener to the flat rear surface of the leading edge, lining it up with the center section rib marks you drew on the leading edge. Note that the stiffener is ⅛-in. narrower



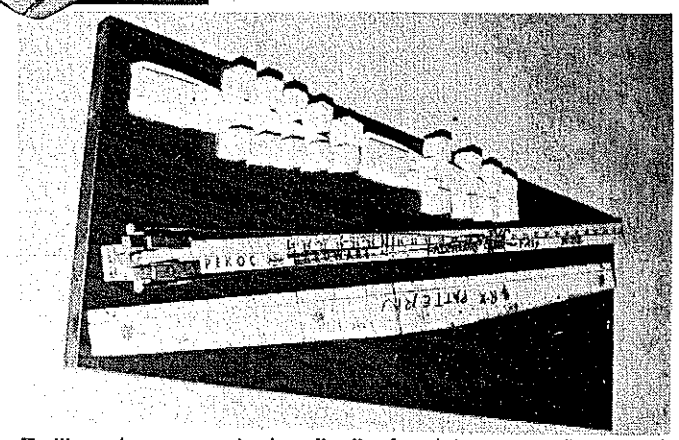
Fuel systems, Left top to B: Heavy-duty pacifier, reverse-fill surgical tube bladder, standard surgical tube bladder, double pen-bladder. Right top to B: Inboard collapsing bag tank made from Playtex nurser, chicken-hopper tank, Uniflow modification of Randy's 3½-oz. tank. At top is pressure gauge for measuring leak-down pressure of various bladders. And we thought combat so simple!



And here is the AMA Slow Combat version, running a Super-tigre 35 engine from a Randy's tank.



Jig for building all versions. In foreground, prior to assembly, sliding leading-edge holders with rubberband tensioners to hold airframe tight against T.E. jig backstops. Removable rib blocks shown in place for inboard wing, but removed for outboard.



Trailing edge pattern, leadout jig, jigs for gluing center rib mount in perfect alignment—helps prevent unwanted up- or down-thrust in motor mount. FAI versions shown.

than the rear surface of the leading edge so leave an equal 1/16-in. space at the top and bottom edge. This allows the center planking to fit down flush at the leading edge. Take time in evenly aligning the stiffener onto the leading edge because the center tabs on the stiffener will later fit between the mounts to insure zero angle of incidence. I use epoxy here also.

While waiting for the epoxy to dry cut the trailing edge pieces from medium-hard 1/16 sheet. Full length 36-in. balsa is used. The center section is offset slightly toward the outboard wing to provide a longer inboard than outboard panel. Thus, the top and bottom trailing edges are not interchangeable once the inner bevel is created at the rear of the trailing edge.

To pre-bevel the trailing edges, begin by placing a long, straight piece of glass or steel (36-in. steel rule) along the edge of the workbench. Lay the rear edge of the trailing edge even with this guide. Use masking tape to cover all but the rearward-most 7/16-in. The tape should secure the balsa to the glass or steel guide with the rear edges of each being flush. Then use the electric drill sander to run the length of the trailing edge, sanding between the tape and the glass or steel edge. I have used this technique since the 1960s and find that it only takes a minute. Pre-beveling increases the strength of the structure and gives a sharp trailing edge which is theoretically an aerodynamic advantage.

Mark the rib spacing on the lower trailing edge with a fine tip-felt pen.

Cut out the main ribs from 1/16 sheet balsa. Use the scrap created from cutting out the trailing edges for the two tip ribs and then begin with the root ribs until the medium-hard scrap runs out. Cut the remaining ribs from lighter weight 1/16 balsa. All main ribs are basically the same shape, however, the trailing edge notches get progressively wider toward the root. All ribs can be cut in a stack using a band saw. Then separately make the differential trailing edge notches. I find it easier to use a 1/16 plywood pattern with individually numbered notches to hand cut the ribs with a #11 blade. The ribs are a simple shape with no spar hole so this can be done as fast as stacking the balsa to cut them all at once. My plywood pattern has the leadout hole positions drilled and numbered for inboard ribs #1 through #7 and the bladder tube hole cut for outboard ribs #6 and #7. I use a regular paper punch to cut the leadout holes after marking the hole positions from the pattern.

Now cut the four center ribs #8 and #9 and wing tips from ⅛ sheet balsa. Cut the slot in the mount assembly for the bellcrank mount. Glue the inboard center rib #9 to the engine mount

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Rongeur/Rudner

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assembly on its inboard side. It is very important to position this rib parallel to the axis of the motor mount to insure there will be no up- or down-thrust in the motor mount. I use a small balsa jig fixture for aligning these parts and 5-minute epoxy for gluing them. After this assembly is dry the horizontal grain ½" sheet center rib filler and interlocking plywood bellcrank mount are glued to the mount assembly with epoxy.

At this point the wing is built, omitting outboard ribs #'s 5, 6, 7, and 8 for bladder tube versions, or outboard rib #8 for pacifier versions. I use Hot Stuff and microballoons to fix the two tip ribs, outboard rib #9, and inboard rib #7 to the leading and trailing edges. Ambroid will suffice for cementing the remaining ribs in place.

Included on the template for the 1/16 sheet main ribs is a "Symmet-tru" device as in the Carl Goldberg Voodoo kits. This small tab can be included on inboard and outboard ribs #1 and #7. These ribs should be pre-perforated to snap off at the junction between the tab and the rib after construction. This allows the wing to be built warp-free on a flat surface.

I use a specially constructed jig for building these planes. This eliminates the need for the tabs. Building with a jig allows for ease of both initial construction and repairing. It also allows for detection and correction of warps which can be created even in a warp-free structure when covering and shrinking the Fas-Cal. The essential parts for the jig are shown on the plans.

The next step is mounting the engine to the motor mounts at the location shown on the plans. To align the motor for zero thrust, remove the glow plug and use a junk prop bolted onto the crankshaft. Attach a heavy thread to the tip of the prop. On the string, attach a clamp-type paper clip which can slide along it. Adjust the up- and down-thrust of the engine, attempting to equalize the distance from the upper and lower maximums of prop arc to the trailing edge tip of the center rib. Do this by adjusting the thrust line up or down and checking the distance with the string. Rotate the prop 180° each time, checking the distance along the string with the paper clip. When zero up or down thrust is achieved, bolt the engine in with 4/40 machine screws and blind mounts.

Remove the engine from the center section and hook up the 2-in. bellcrank with leadouts and 1/16 music wire pushrod to the bellcrank mount. I use a 125-pound-test Perfect braided leadout bushed at the bellcrank with brass tubing. The same control system can be reused numerous times. The pushrod goes in the outer hole of the bellcrank arm. The holes for ⅛ hardwood dowels are drilled into the mount with a 5/32 drill. They are cemented in place with epoxy.

Using Hobbypoxy II, glue the center section unit against outboard rib #9. The tabs on the leading edge stiffener assure zero angle of incidence.

The upper trailing edge half is now glued in place. I use Ambroid for all but the joint between the center section and the trailing edge which is glued with 5-minute epoxy.

At this point, the bladder tube or pacifier pod is inserted. If using a bladder tube, cut it to length from Estes BT 55 rocket body tube to fit between outboard ribs #9 and #5. Use a paper punch to punch upper and lower vent holes and a large bladder exit hole. Cap with vertical grain ⅛ balsa caps. Cement the bladder tube in place with ribs #5, #6, and #7, then add the parts of outboard

rib #8. Use 1/16-in. scrap filler at the vent holes to provide anchorage for the Fas-Cal.

If a pacifier pod is used, fashion it from a 1/64 plywood wall with ⅛ balsa end caps and a small vent hole in the bottom outboard corner, as shown. Glue it to outboard rib #9 and glue outboard rib #8 to it, sandwiching it in place.

Sheet the center section with 1/16 sheet. Make sure you glue the sheeting to the center rib unit with epoxy.

If you have followed instructions, the whole center rib unit and the sheeting over it are glued together with epoxy. This is the technique I have arrived at after years of crashes and rough flying. I feel a fairly massive center section helps damp engine vibration. It also prevents loosening at the monoboom-wing junction from repeated hard maneuvering or crashes.

The wing tips are now glued in place and the leadout guides glued and sewn in the inboard tip.

Construction of the tail section begins with the hinge. I have shown the hinge piece on the plans as four separate plywood parts sandwiching a 3/32 o. d. brass tube. It can be built this way if desired. I actually make up 12-in. strips of brass tubing sandwiched between plywood and cut each hinge out of this strip with a jig saw. Epoxy is used to fabricate the hinge.

After the hinge is made, the wire axle with brass tubing spacers is added and bent to shape. It is cemented to the pre-airfoiled stabilator and cloth tape is epoxied over the tubing spacers and stabilator leading edge. I pre-airfoil the stabilator by drawing a ball-point pen midline around the perimeter and free-hand sanding it to shape with an electric drill sander. This takes about two minutes to do and beats hand sanding the stab to shape with a sanding block.

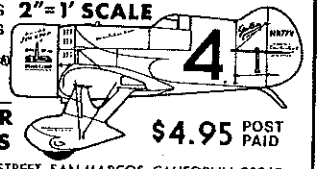
The medium-hard 1-in. sq. balsa monoboom is cut to shape with a jig saw. The hinge is cemented into it, aligning the trailing edge of the stab to be perpendicular to the monoboom with a drafting triangle. Add a large nylon control horn and finish the tail assembly with epoxy paint. Reinforce the monoboom with a circumferencial loop of fiberglass tape just aft of the wing slot and at the rear where the hinge is glued.

Cover the wing carefully with Fas-Cal trying to lay the Fas-Cal on all surfaces with the same amount of tension initially. This helps prevent warps due to uneven tension in the Fas-Cal after it is shrunk. After the wing is covered and shrunk I replace it in my jig and remove any warp that has occurred during the covering process by holding pressure against the warp and re-ironing the Fas-Cal. If a jig is not used, gross warps can be detected by eyeballing along the trailing edge.

I finish the inside of the bladder tube by filling it with clear dope and pouring it out. Even though dope is not as fuel-proof as some other finishing products, such as epoxy paint, the epoxy paint can turn a small speck of sawdust into a sharp flaw on the inner surface of the bladder tube which will puncture the bladder consistently.

The motor mount nacelle and filler blocks are cemented on with epoxy and the mount sanded to shape with the drill sander. I mask off the center section while doing this to prevent a slip of the sander from ruining the plane. I use epoxy paint and fiberglass cloth to finish the mount.

Now excise the covering from the sheeting where the monoboom will be glued and perforate the sheeting many times with a pin through to the center rib. Epoxy the monoboom to the wing with Hobbypoxy Formula II to allow plenty of working time to get the tail aligned with the wing. Sight down the trailing edge of both wing and stab from the rear to align them in the roll axis. Use a ruler to equalize the distance between wing trailing edge and stabilator trailing edge for



planform alignment.

Install a large nylon control horn, a Kwik Link, and a wire pushrod guide. Do not omit the pushrod guide because the aerodynamic force on the stab during outside maneuvers will cause pushrod bowing and less effective control on outside maneuvers.

The Slow Combat version uses the same wing. It has a standard balsa fuselage and standard type nose. Two pushrod guides are required along this long fuselage.

The plane should balance with motor and prop installed at 18.5% of the chord which is 1¾-in. rear of the leading edge. The bladder tube is placed exactly along this line to prevent change in the center of gravity as the fuel runs out. With this center of gravity the second hole from the top of the control horn is a good starting point.

The Fast Combat version should weigh 8½ to 9 oz. without an engine and the FAI version 8 to 8½ oz. Select slightly lighter wood for the FAI version.

Power the Fast and Slow Rongeurs with an MK III Fox Combat Special with 25% nitro and the head clearance set to .019. Power the FAI version with your favorite high performance 15. I like the Fox 15.

Take a test flight to check for warps and thrust misalignment which are usually minimal if care was taken during construction. The Rongeur will provide you with a durable, cheap, easy to build, easy to repair combat plane which is stable enough to fly eyes-off, yet tight turning enough for any competition.

CL Scale/Gretz

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hundreds of others too numerous to mention. Joe's impressive model faithfully duplicates the unique features of this one of a kind aircraft. He scored 258 static points, which was tops in the Senior class. Past wins include five first places and one second, including first in Junior Precision Scale at the '75 and '77 Nats.

The B-25 is scratch-built at ⅜"=1', which gives it a wingspan of 25 5/16 inches and an overall length of 21 inches. According to Joe, "The model weighs a pound and a half with two mufflerized Cox .049 Space Hoppers. It flies on 45 feet of line and flies on either engine. It is controlled by a Stanzel ½A Stunt Master Monoline control unit. The entire model is made of balsa with solid wings, tail and rudders with a hollowed-out fuselage. I used Aero-Gloss for the finish. The entire plane is blue-tone white with blue nacelle areas."

Dale adds an interesting story relating to Joe's B-25, "The 5×4 3-bladed props were necessary to extend the flying time. I miscalculated the tank sizes as it would only fly about eight laps (on 50'×.016 line) with 5×3 props. So, we slowed the engine down with 4-in. pitch and cut the flying line down to 45 feet. It runs about 12 to 14 laps with both engines in this configuration."

In closing, I'm thrilled to be able to feature an up-close look at these two young competitors and their outstanding models because I believe they are characteristic of one of CL Scale modeling's greatest strengths. That is the continued participation of Junior and Senior age modelers in CL Scale to a degree not seen in any other mode of Scale flying. At every Nationals that I have attended, Junior and Senior age contestants accounted for between 40 and 50 percent of the total entries. It's a refreshing contrast to the trends noticeable in so many other AMA events.

Scale Model Research Photos is the name of a service recently started by Dale Willoughby to make quality color photo packs of unique full-scale aircraft available to scale modelers. Dale travels a lot and whenever possible photographs outstanding home-builts, restored antiques, and interesting airplanes of all types that he encounters at airports, fly-ins, and museums. The resulting photo packs that he offers contain numerous views of the same subject aircraft from all crucial angles. The photo list (#2) that I have just received describes packs for 57 different aircraft including a Wittman Tailwind, a "Flying Flea," a Lockheed Orion, a P-26 Peashooter, a PT-22, a Grumman Duck, P-38s, P-51s, a P-40E, and on and on. The packs vary from $5.50 to $17.50 per set and contain from 9 to 33 top quality color photos. The prints are a full 3½×5¼" size (not 3½×5), which means that you get full prints of everything on the standard 35-mm negatives—no spinners chopped off or missing wing tips, ordinarily. For your free copy of his latest list, send a stamped, self-addressed long envelope to Dale Willoughby; Scale Model Research Photos, P.O. Box 675, Orange, CA 92666.

Now that the flying season is winding down, I hope that you'll have time to send me some photos, drawings, ideas, or comments for use in this column. We need your contribution to keep this space interesting and informative. Don't forget, *Model Aviation* will pay you $5 for each item that is printed.

Mike Gretz, Box 162, Montezuma, IA 50171.

CL Navy Carrier/Perry

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slides. The feeler gage stock has the advantage of being available in any thickness desired. I use stock of 0.025 to 0.030" depending on the thickness of the saw used.

The slide is very easily shaped using a Dremel tool with tungsten-carbide bits and cut-off wheels. A cut-off wheel used with the router attachment is an excellent way to make the initial cut to reduce the slide to the approximate width desired. Final trimming in width should be done by drawing the edge of the slide along a file. Be careful to keep the sides of the slide parallel. A final polishing with 320 grit or finer paper should allow the slide to move freely and still provide a good seal.

The opening in the slide should be at least as large as the exhaust ports in the cylinder. Larger is better—within the limits imposed by the size of the exhaust stack, the amount of throttle movement available, and the need to keep the exhaust slide out of the back of the prop. The taper in the opening is necessary to provide manageable