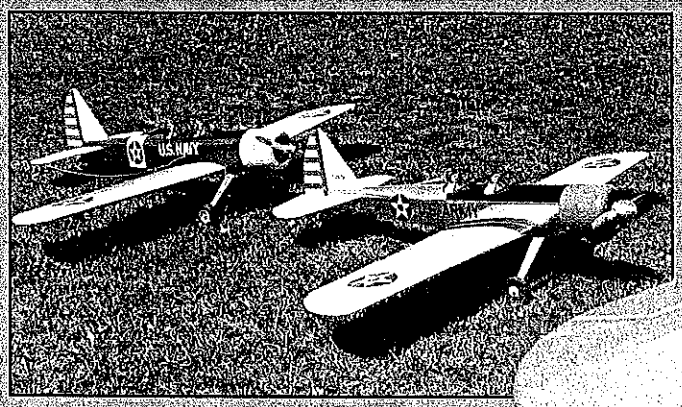
PT

Dick Sarpolus

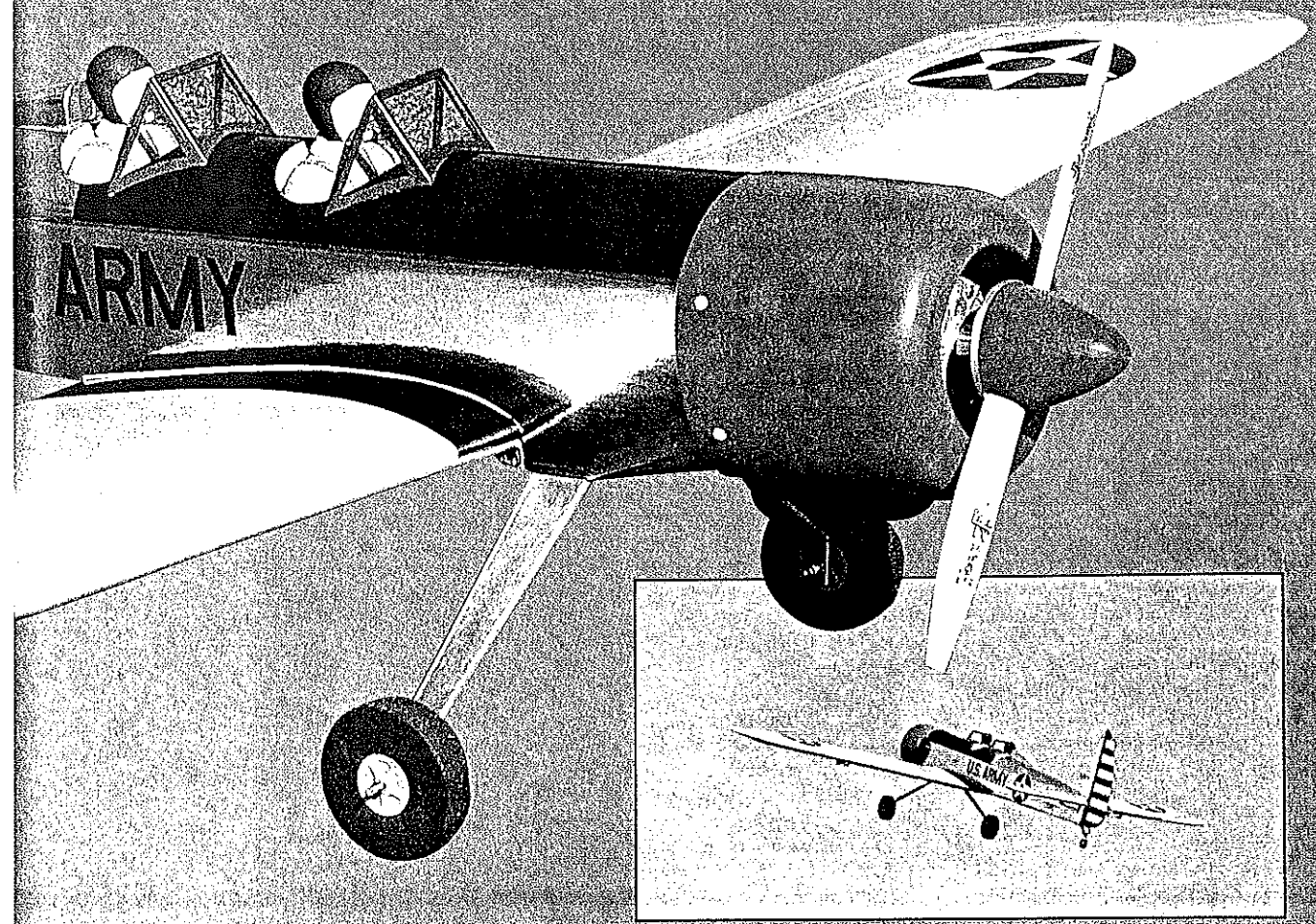


PT is a generic fun replica of a 1930s military trainer. The 1300-square-inch model is easy to build and fly.

Full-scale training aircraft have always been popular modeling subjects. Kits are available for PT-19s, Chipmunks, T-6s, T-28s, etc. The models aren't just suitable for training or mild flying; like the full-scale versions, they can be very aerobatic if desired.

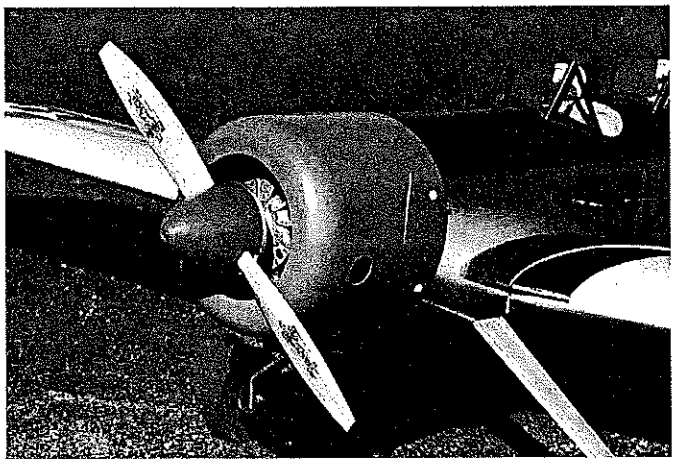
Plans have been published for most of the trainers in a variety of sizes and types. And they're military—not quite as exciting and aggressive as a fighter aircraft, but still a warplane.

I like the appearance of these aircraft, with their military trim schemes. The older aircraft had a bright appearance, with yellow wings, aluminum or blue fuselages, red-and-white striped rudders,

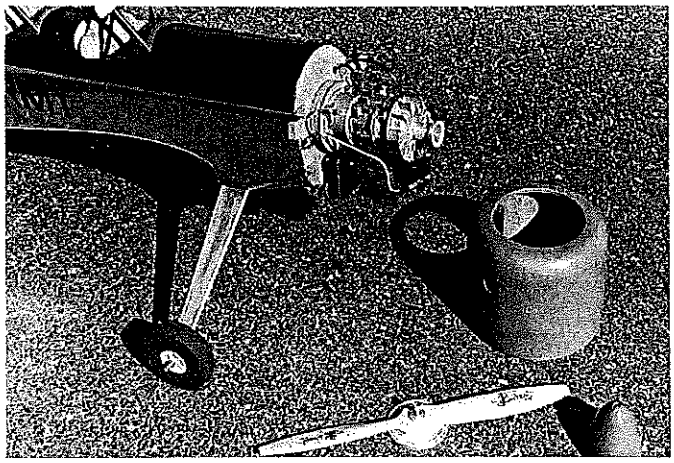


Photos by author Graphic design by Bill Thornbro

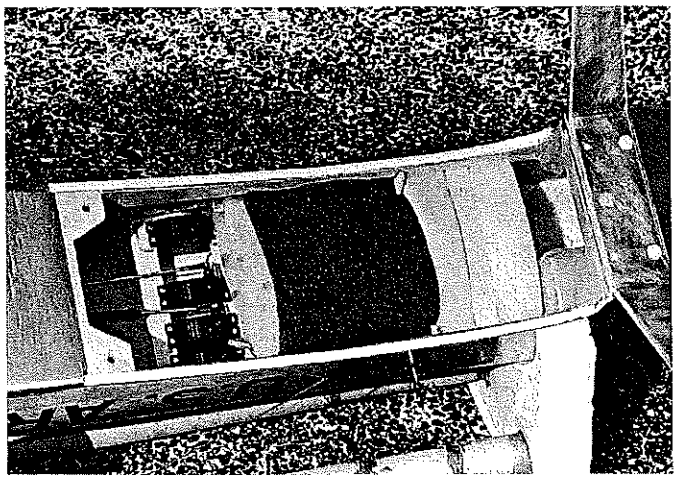
Although PT is capable of aerobatics, it's also solid and stable. Light wing loading helps.



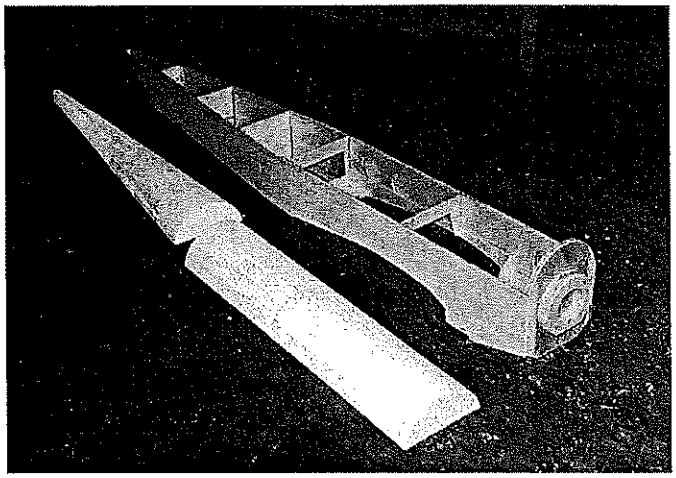
Large fiberglass cowl can easily contain almost any large engine and muffler. Hole is carburetor access for choking.



Landing gear bolts to plywood mount in fuselage. Cowl attaches with four nylon bolts; bottom cut away for clearance.



Plenty of room in this fuselage! Two servos for elevator; one each for throttle and rudder/tail wheel.



The basic balsa/plywood fuselage "box" is topped with foam blocks—not yet sheeted in this photo.

and the older military insignia. The fact that many of these trainers ended up in the hands of private owners, sometimes modified for aerobatic work, means that even more finishing schemes are available for the Scale modeler.

I looked at the Fairchild PT-19 and PT-26, with their inline engines, and figured a Quadra Q-42 just couldn't be made to fit in that narrow cowl. I just didn't want to try to duplicate the exposed cylinders of the radial engine installation in some of these aircraft. For a fun Scale model project, I decided to go with a round cowl that would easily contain a Quadra or other large gas engine.

I ended up with a stand-way-off sort-of-Scale generic copy of the PT-19, -20, -21, -22, -23, and -25. Total them, and it's a PT-146. Works for me!

At the field, modelers ask me if it's a PT-22, -23, or whatever. Obviously, this thing is not really Scale: the fuselage has slab sides; there are no rigging wires; the landing gear is mounted in the fuselage rather than the wings; etc. But it does have two pilots behind those windshields, a nice-looking round cowl, a familiar trim scheme with those old-fashioned insignia, it builds up fast and easy, and it flies great.

I wanted to keep the PT's proportions similar to other Q-42 powered aircraft I liked. I laid out the wing for a 96-inch span; a large span for a Quadra, but with the rounded wingtips the wing area is about 1,300 square inches, which is a good size to keep the wing loading reasonable.

With the Q-42 engine, stock Quadra muffler, a 1200 mAh battery pack, six standard servos, plastic film covering, and the usual building techniques, my PT weighs 15 lb. 12 oz., for a wing loading of 28 ounces per square foot. The Quadra weighs 4 lb. 4 oz., so the complete airframe and equipment is only 11 lb. 8 oz.—good, I think, for a large-size model of quick-and-easy foam core construction.

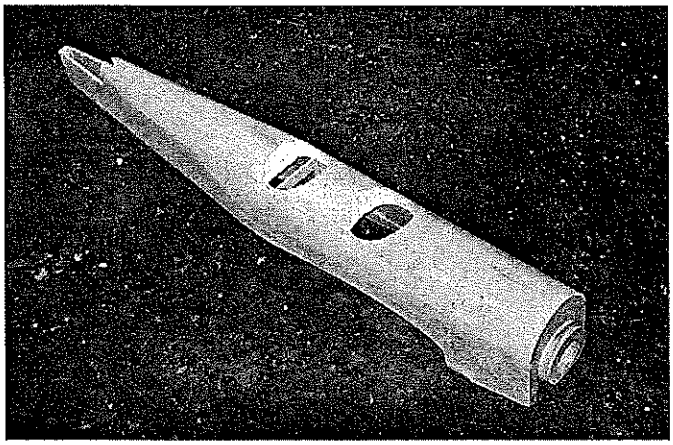
I stayed with the 16% symmetrical airfoil that I've had good luck with; it's fully aerobatic, fast enough, and slows down well.

I keep the horizontal stabilizer and vertical fin area on the large side; I think ample tail volume helps make for an easy handling aircraft.

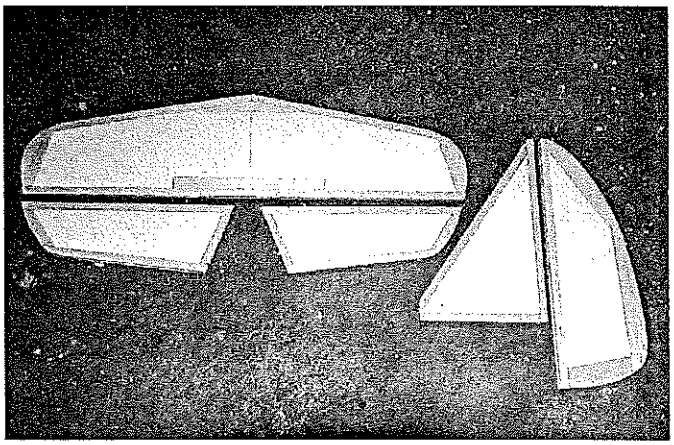
A rugged sheet aluminum landing gear is used, bolted to the fuselage bottom just ahead of the wing leading edge. That's a major deviation from scale, but the aluminum gear is so simple and easy that I went with it.

A round molded fiberglass cowl from Fiberglass Specialties (38624 Mt. Kisco Dr., Sterling MI 48310) is easily mounted with some hardwood blocks and plywood spacers on the firewall; it will enclose most engines suitable for this airplane, and avoids the problem of how to build exposed radial-engine cylinders.

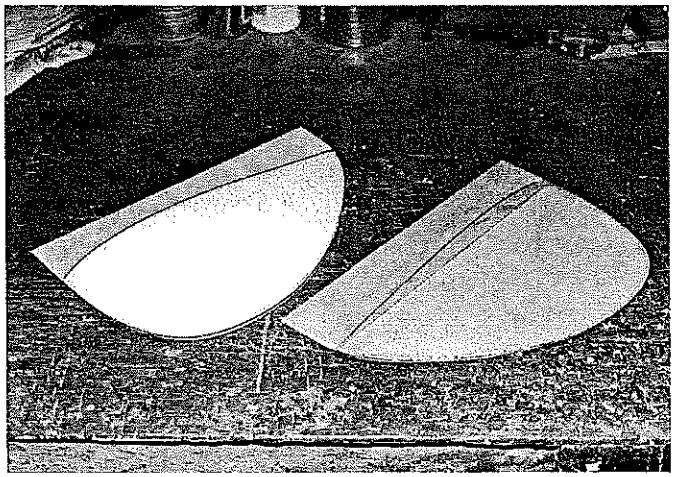
My friend Lou McGuire built a PT along with me, with the only differences being the trim schemes. I went with an aluminum (chrome MonoKote) fuselage and yellow wings and tail surfaces. Lou's has a blue



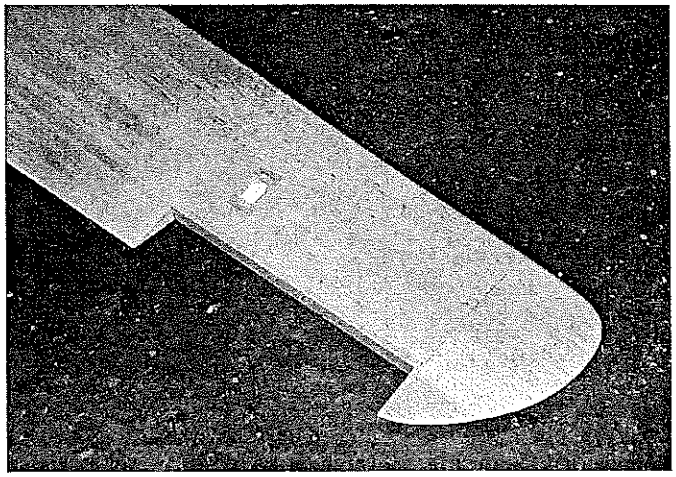
Fuselage top foam cores have been sheeted and cockpit openings have been cut out. Easy and quick!



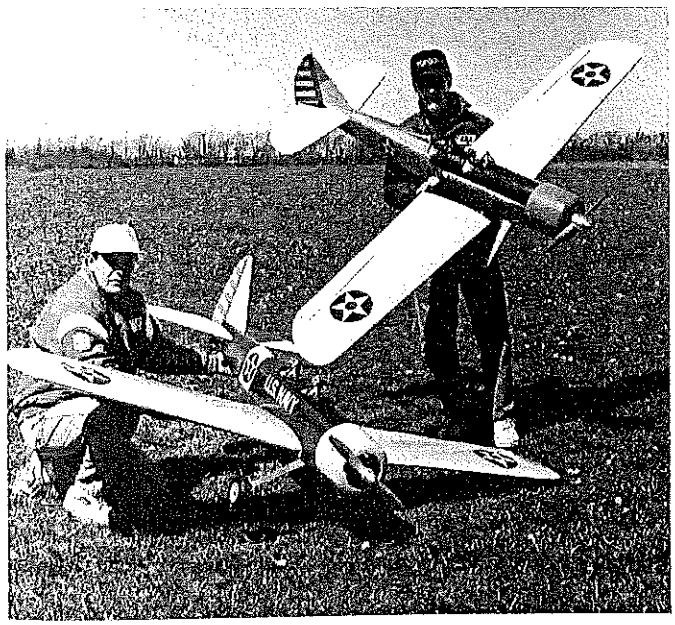
Tail surfaces are 3/8 foam with balsa edges and reinforcements, shaped and sheeted on both sides with 3/32 balsa.



Two templates are used to cut foam wingtip cores (see text). At left is foam block that has just been cut.



Wing is sheeted foam core. Aileron cutout lined with balsa. Aileron servo cutout has plywood mounts in place.



Lou McGuire (left) and the author with their PTs. Lou's model is trimmed in US Navy markings; the author's is US Army.

PT

Type: RC Sport

Wingspan: 96 inches

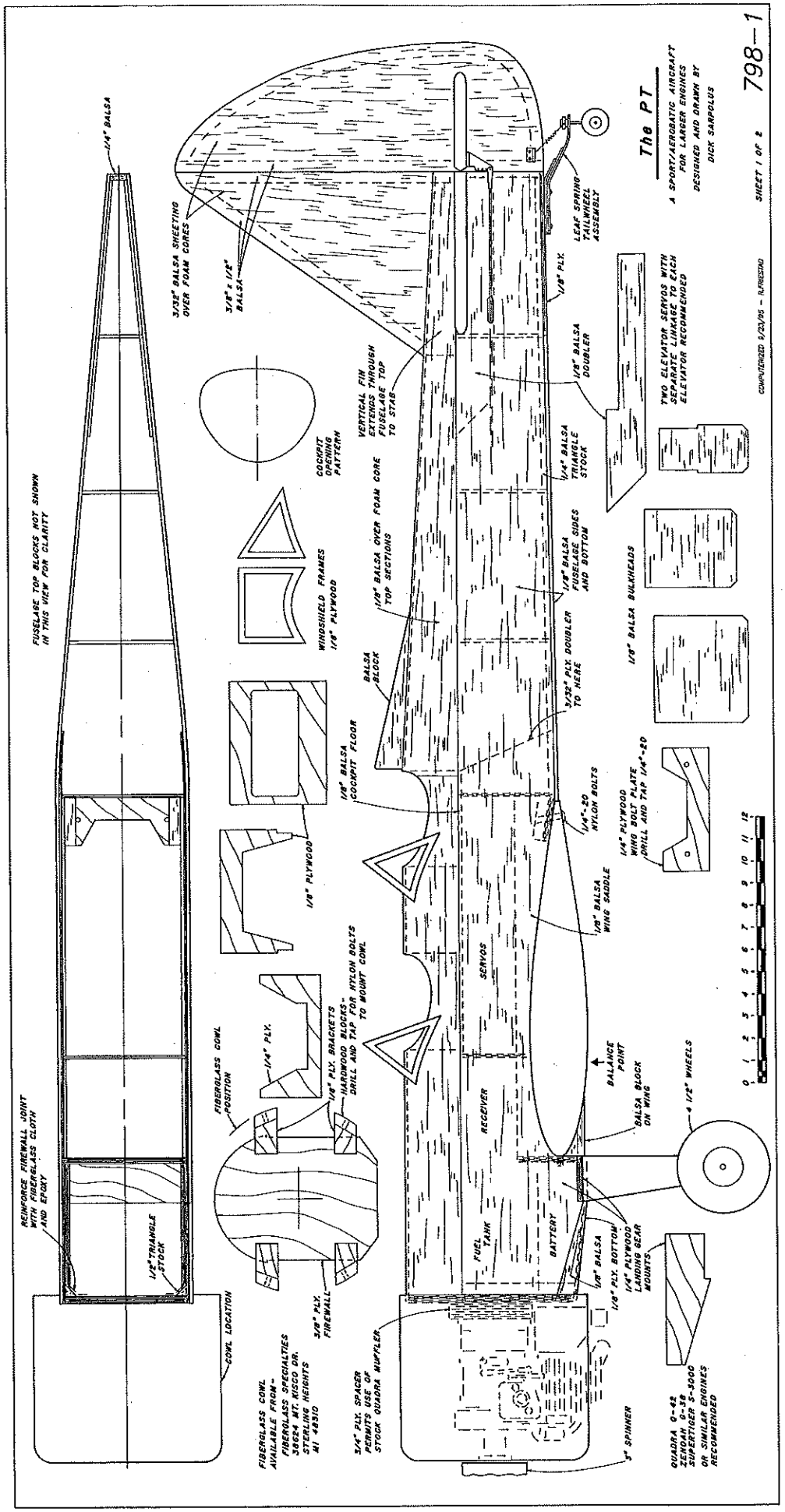
Engine: Quadra Q-42 or similar

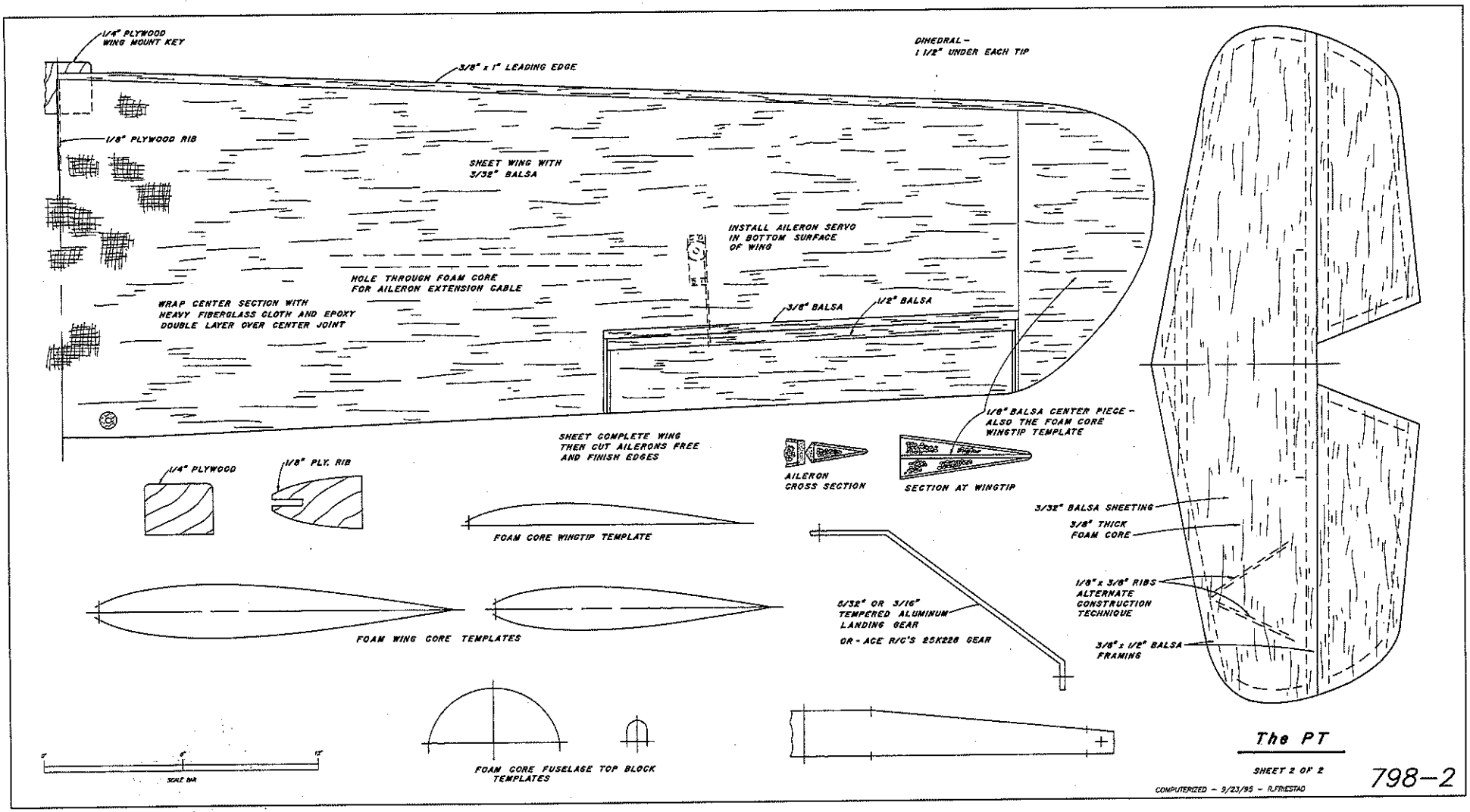
Functions: Throttle, rudder, elevator, ailerons

Flying weight: 15 lb. 12 oz.

Construction: Sheeted foam

Covering: Heat-shrink film


The PT
A SPORT/AEROBATIC AIRCRAFT FOR LARGER ENGINES
DESIGNED AND DRAWN BY DICK SARPOLIS
798-1
SHEET 1 OF 2
COMPUTERIZED 9/23/95 - R.FRIESEN
1/4" BALSA
3/32" BALSA SHEETING OVER FOAM CORES
3/8" x 1/2" BALSA
LEAF SPRING TAILWHEEL ASSEMBLY
1/8" PLY.
1/8" BALSA DOUBLER
TWO ELEVATOR SERVOS WITH SEPARATE LINKAGE TO EACH ELEVATOR RECOMMENDED
VERTICAL FIN EXTENDS THROUGH FUSELAGE TOP TO STAB
COCKPIT OPENING PATTERN
1/4" BALSA TRIANGLE STOCK
WINDSHIELD FRAMES 1/8" PLYWOOD
1/8" BALSA OVER FOAM CORE TOP SECTIONS
1/8" BALSA FUSELAGE SIDES AND BOTTOM
1/8" BALSA BULKHEADS
FUSELAGE TOP BLOCKS NOT SHOWN IN THIS VIEW FOR CLARITY
BALSA BLOCK
3/32" PLY DOUBLER TO HERE
1/8" BALSA COCKPIT FLOOR
1/4"-20 NYLON BOLTS
1/4" PLYWOOD WING BOLT PLATE DRILL AND TAP 1/4"-20
1/8" PLYWOOD
1/8" BALSA WING SADDLE
SERVOS
1/4" PLY.
1/8" PLY. BRACKETS HARDWOOD BLOCKS - DRILL AND TAP FOR NYLON BOLTS TO MOUNT COWL
FIBERGLASS COWL POSITION
BALANCE POINT
BALSA BLOCK ON WING
4 1/2" WHEELS
REINFORCE FIREWALL JOINT WITH FIBERGLASS CLOTH AND EPOXY
1/2" TRIANGLE STOCK
RECEIVER
FUEL TANK
BATTERY
1/8" BALSA
1/8" PLY. BOTTOM
1/4" PLYWOOD LANDING GEAR MOUNTS
COWL LOCATION
3/4" PLY. SPACER PERMITS USE OF STOCK QUADRA MUFFLER
3/8" PLY. FIREWALL
FIBERGLASS COWL AVAILABLE FROM- FIBERGLASS SPECIALTIES 38624 MT. KISCO DR. STERLING HEIGHTS MI 48310
3" SPINNER
QUADRA 0-42 ZENOAH 0-38 SUPERTIGER S-3000 OR SIMILAR ENGINES RECOMMENDED
0 1 2 3 4 5 6 7 8 9 10 11 12


1/4" PLYWOOD WING MOUNT KEY
3/8" x 1" LEADING EDGE
DIHEDRAL - 1 1/2" UNDER EACH TIP
1/8" PLYWOOD RIB
SHEET WING WITH 3/32" BALSA
INSTALL AILERON SERVO IN BOTTOM SURFACE OF WING
HOLE THROUGH FOAM CORE FOR AILERON EXTENSION CABLE
WRAP CENTER SECTION WITH HEAVY FIBERGLASS CLOTH AND EPOXY DOUBLE LAYER OVER CENTER JOINT
3/8" BALSA
1/2" BALSA
1/8" BALSA CENTER PIECE - ALSO THE FOAM CORE WINGTIP TEMPLATE
SHEET COMPLETE WING THEN CUT AILERONS FREE AND FINISH EDGES
1/4" PLYWOOD
1/8" PLY. RIB
AILERON CROSS SECTION
SECTION AT WINGTIP
3/32" BALSA SHEETING
3/8" THICK FOAM CORE
FOAM CORE WINGTIP TEMPLATE
1/8" x 3/8" RIBS ALTERNATE CONSTRUCTION TECHNIQUE
5/32" OR 3/16" TEMPERED ALUMINUM LANDING GEAR
OR - ACE R/C'S 25K226 GEAR
3/8" x 1/2" BALSA FRAMING
FOAM WING CORE TEMPLATES
FOAM CORE FUSELAGE TOP BLOCK TEMPLATES
SCALE BAR
The PT
SHEET 2 OF 2
COMPUTERIZED - 9/23/95 - R.FRIESTAD
798-2

fuselage, yellow wings and tail surfaces. Mine has US Army on the fuselage sides; Lou's has US Navy; and of course, both have the older military insignia.

For a little more variety, rather than the round cowl, the fiberglass cowl from my Choice Cut design might simulate the inline-engine-powered aircraft; and a formed plastic canopy over the two cockpit positions would replicate the PT-26. And if you really wanted to work on the PT-22 type landing gear, install that type in the wings. Figure out how to make the exposed engine cylinders, and you could go for a PT-22.

We like PT's appearance in the air; I like the aerobatic capability, and Lou says it's about the easiest-flying big airplane he's ever had; he can even relax, at least somewhat, with it.

CONSTRUCTION

If you've scratch-built large projects like this before, you probably have your own building techniques and would be comfortable building directly from the plans. If not, don't hesitate to try a scratch-built airplane like this; find someone to cut the cores for you, order a bunch of balsa and plywood from a good supplier, get the cowl and aluminum gear, cut out the wood parts, and assemble your "kit."

PT has foam core wings, tail surfaces, and fuselage top blocks. I'm sold on foam core construction for scratch-building sport aircraft; to me, it's a lot easier than drawing up rib patterns and assembling a built-up structure.

Wing: The cores are sheeted with 3/32 medium balsa, which is edge-glued for the needed width by taping the joints together with masking tape.

The hard part of edge-gluing balsa is getting a tight fit between the individual sheets; most balsa sheets do not come with straight edges. As long as the sheets fit together well, they don't have to be straight; you may be able to get good joints without trimming or sanding the edges.

I use a long sanding straightedge made from a piece of aluminum right-angle stock, working on the edges as necessary until the sheets fit well enough to be taped and glued.

Flip the wood over, open the taped joint over the edge of the workbench, and apply the glue. I use the aliphatic-resin glues for this; they are easier to sand for a smooth joint.

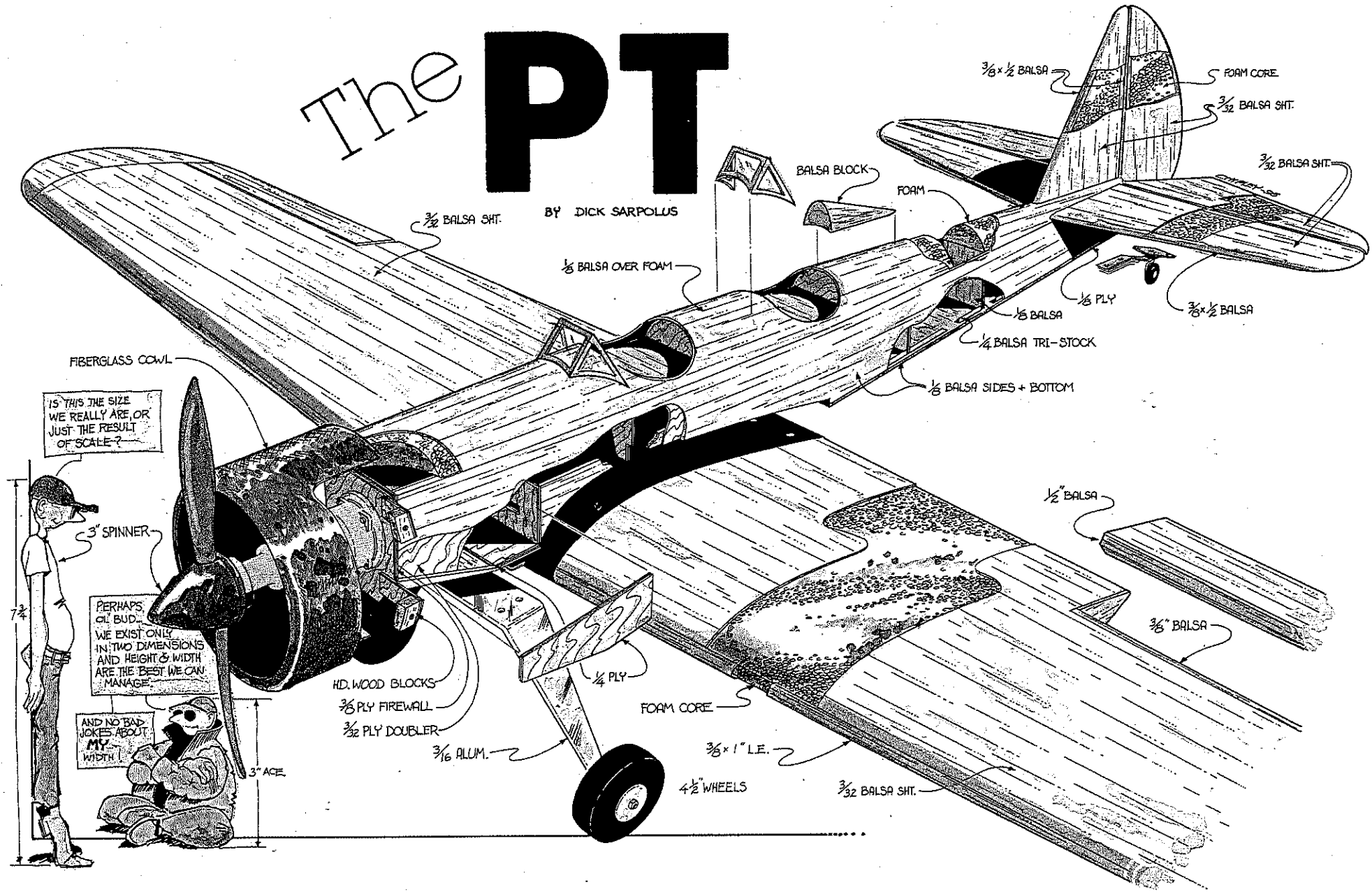
With the joint laid flat on the workbench, scrape the excess glue off with a putty knife, continue the same process with the balance of the joints, and weight the wood down until the glue dries. Peel off the masking tape and use the taped side as the outer surface of the sheeting.

I sand the inside surface of the sheeting with rougher sandpaper to speed up the work, and use finer sandpaper to finish off the outer surface.

For years, I've used Dave Brown's Southern Sorghum contact cement for sheeting cores. Alternatives are thinly spread

The PT

BY DICK SARPOLUS



epoxy glue or other suitable contact cements. Just be sure the type you select is made for this hobby use, or test it thoroughly yourself. Some contact cements can dissolve foam, after you think your completed wing is safely done.

With the core sheeted top and bottom, trim off the leading edge and block-sand it square. Add an oversized leading edge strip; plane and sand it to shape.

The one thing that had held me back from building an aircraft like this was deciding what to do for the wingtip structure. I finally hit upon cutting the tip section in an upper and lower part, and joining them to get the tapered foam core tip section.

Two plywood templates are needed: one for the planform layout of the wingtip from the end of the main wing panel to the tip; at the root of that template, I added another, of the upper half of the airfoil. A mirror-image template setup is needed for the other half of the wingtip.

Cutting the cores wasn't bad, once I reduced the wire temperature somewhat to avoid melting too much of the foam away. A balsa stiffener between the upper and lower foam cores helps keep things aligned until the core is sheeted. With the tip section sheeted and sanded, it is simply epoxied to the main wing panel.

Before you sheet the tip core, trial-fit it to the main wing panel and sand the foam if necessary for a good fit after it is sheeted. Epoxy the sheeted tip to the main wing panel and sand to round off the outer edge of the tip section.

The ailerons are cut from the sheeted wing and trimmed to allow for the balsa edging. Glue the edging to the wing panels and to the ailerons, plane and sand them to shape, and hinge the ailerons along the centerline using large, sturdy, freely moving hinges. Cut recesses into the lower wing surfaces for the aileron servo mounting.

Before you join the two wing halves, be sure to make the holes through the foam cores for the aileron-servo extension cables. I heat the end of a piece of heavy steel rod, then push it through the foam core from the root to the aileron-servo mounting location.

I used to install the servos within the wing section and use removable hatches above them, but the current trend is to simply install the servos into the wing surface and leave them visible. It doesn't look as neat, but the servos and linkages are certainly accessible.

A plywood wing-mounting key is used at the leading edge to position and retain the wing in the fuselage. It is reinforced by a plywood rib installed at the root of the wing cores. The contact area of the fuselage bulkhead that retains the wing mount can be trimmed or shimmed as necessary to get the correct wing-to-fuselage fit. I prefer this method, and find it easier than using one or two heavy dowels for wing retention.

After the wing halves are butt-glued with epoxy, the center joint is wrapped with heavy (six-ounce) fiberglass cloth and epoxy glue. Use a double layer in the center. I've been using nine-inch-wide strips of cloth,

overlapped in the center to give a five-inch-wide double layer. I brush on a coat of epoxy, position the fiberglass cloth, and brush on additional epoxy to be sure the cloth is saturated.

For a reasonably smooth appearance without too much sanding, I squeegee off the excess epoxy, leaving enough so the cloth is saturated for strength, but is smooth and level. Hobbypoxy's Smooth 'n' Easy epoxy is ideal for this.

Tail surfaces: These are flat-plate section, and use hot-wire-cut ⅜ foam panels as cores inside the balsa framed and sheeted assemblies. A built-up internal construction could be used, but the foam makes it easier and quicker for me.

The tail surfaces are built flat on a workbench surface. The foam cores are cut to shape, with the ⅜ x ½ balsa framing and reinforcements added, then sheeted with 3/32 balsa as was done with the wing cores. The edges are shaped; the trailing edges of the stabilizer and vertical fin are left square, and the leading edges of the elevators and rudder are beveled, for centerline hinging.

Fuselage: Select firm-to-hard balsa for the two sides, edge-gluing and splicing as necessary to get the size required. Glue the 3/32 plywood doublers, ¼ plywood landing gear block doublers, balsa wing-saddle pieces, stab saddle doublers, and balsa lower edge strips to the two fuselage sides before adding the bulkheads. I laminate pieces of ¼ and ⅛ plywood to make the ⅜ firewall.

With one fuselage side flat on the workbench, add the firewall and the next three bulkheads to the side, installing them perpendicular to the side. Glue the second side to those bulkheads; the sides are parallel from the firewall to the wing trailing edge position.. Add triangle stock and heavy fiberglass cloth behind the firewall to reinforce its junction with the sides. Add the ¼ plywood wing-bolt plate and the balsa cockpit floor.

Pull the tail end together, installing the rear bulkheads. As this is done, you can position the assembly over a centerline to be sure the fuselage is straight, and the fuselage sides taper in a straight line to the rear so the straight-cut foam top block will fit correctly.

Before sheeting the foam fuselage top blocks, check to see that they will line up flush with the bottom fuselage assembly when sheeted, or close enough to be sanded to match. The foam cores can be sanded to some extent for proper alignment.

Sheet the foam blocks in the same manner as the wing cores. Trim the sheeting, check the fit, and cut the two cockpit openings before gluing the top block in place.

Depending on the fuel tank configuration you use, and whether or not you'll be using a smoke tank, you might want to carve a recess in the foam top block behind the firewall for added internal room. I lined the cockpit openings with thin plywood, epoxied in place. Cut a slot in the rear fuselage top block for the vertical fin, and glue the top block in place.

Add the plywood landing gear mount and forward bottom section to the fuselage. Before

adding the rear fuselage bottom section, cut holes in the rear bulkheads for the elevator and rudder pushrods. I wait until the tail surfaces are installed on the fuselage, the pushrods are installed, and the wing is fitted before adding the bottom planking.

Fit the wing to the fuselage next, adjusting the fit of the wing mounting key as necessary through the fuselage bulkhead, and drilling and tapping the wing mount plate for the two ¼-20 nylon bolts.

With the wing mounted, add the horizontal stab, aligning it with the wing. The vertical fin is added, perpendicular to the stabilizer. A ⅛ plywood section on the bottom rear of the fuselage is used to mount the leaf-spring tail wheel assembly.

Whatever type of hinges you use, cut the notches or drill the holes along the centerlines of the surfaces and notch the control surfaces as appropriate to permit a close fit of the surfaces to the main structure, still allowing proper movement.

I recess the control surfaces to accept ¼ plywood mounting pads for the nylon horns, which go on the ailerons, elevators, and rudder. Epoxy the plywood mounts into the surfaces; the horns are mounted with self-tapping screws.

I use ¼ plywood for the servo mounts in the fuselage, and 4-40 threaded rods and clevises for all linkages. Fiberglass-tube pushrods are used for the elevator linkages.

Using separate servos for the elevators, each with its own pushrod, allows the pushrods to be perfectly straight. Since the pushrods cross over within the fuselage, one of the elevator servos is mounted higher than the other to keep the two pushrods from rubbing together.

The tail wheel steering is tied to the rudder with small springs; the actual rudder linkage can be done with a pushrod or a twin-cable pull-pull setup. I make up aileron extension cables into a Y harness for the two aileron servos mounted in the wing.A 1200 mAh battery pack is used, wrapped in foam rubber and positioned behind the fuel tank, above the wing. The fuel tank can be positioned with foam-rubber blocks, or held in place with rubber bands and screw eyes.

Engine mount: For the Quadra Q-42, we like the quiet stock muffler that come with the engine. To permit its use, a ¾-inch-thick spacer (three layers of ¼ plywood) behind the engine mount provides clearance for the muffler ahead of the firewall.

To position and retain the round fiberglass cowl, four plywood pieces and hardwood blocks added to the firewall will locate the cowl. The cowl is trimmed as needed and held in place with four nylon bolts; drill and tap the hardwood blocks to accept the bolts.

The plywood landing gear mount is also drilled and tapped for the bolts that hold the gear in place.

I mount the ignition switch on a bracket off the side of the firewall, where it is accessible from behind the rear edge of the cowl. Use a spinner or aluminum hub nut for appearance.

The cockpit windshields are cut from ⅛ plywood, fitted in place, and epoxied together. I cut into the top sheeting a little (after the airplane has been covered) to ensure a good bond when gluing the windshields in place. Clear plastic is glued inside the windshield pieces. I used Williams Bros. pilots, spacing them up a bit from the cockpit floor with balsa blocks for the proper appearance.

Covering/trim: Use one of the iron-on plastic films for the quickest and lightest covering. I covered the fuselage with chrome MonoKote and rubbed it with fine steel wool to kill the shine and better resemble an aluminum covering.

Any sort of insignia is available from Major Decals/Northeast Screen Graphics; their selection is great. For more Scale effect, rigging wires and struts could be added between the fuselage and wings, and wire bracing on the tail surfaces. This is a sport aircraft, but some scale detailing is always nice.

Flying: I wasn't worried about test flying the PT, and was immediately comfortable with its flying characteristics. It's aerobatically capable, and still very easy and comfortable to fly. It slows up nicely for landings, and I wish I had installed landing flaps; it doesn't need them, but they would add some fun and would look good.

The PT requires the same caution and attention due any large aircraft, but this thing is pure fun to fly. Fly safely!

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