A MODERN VERSION OF THE AIR FORCE PRIMARY TRAINER FOR FF

Designed for Rubber Scale, this model could be converted to electric-powered RC with either three- or four-channel control.

by Bob Isaacks

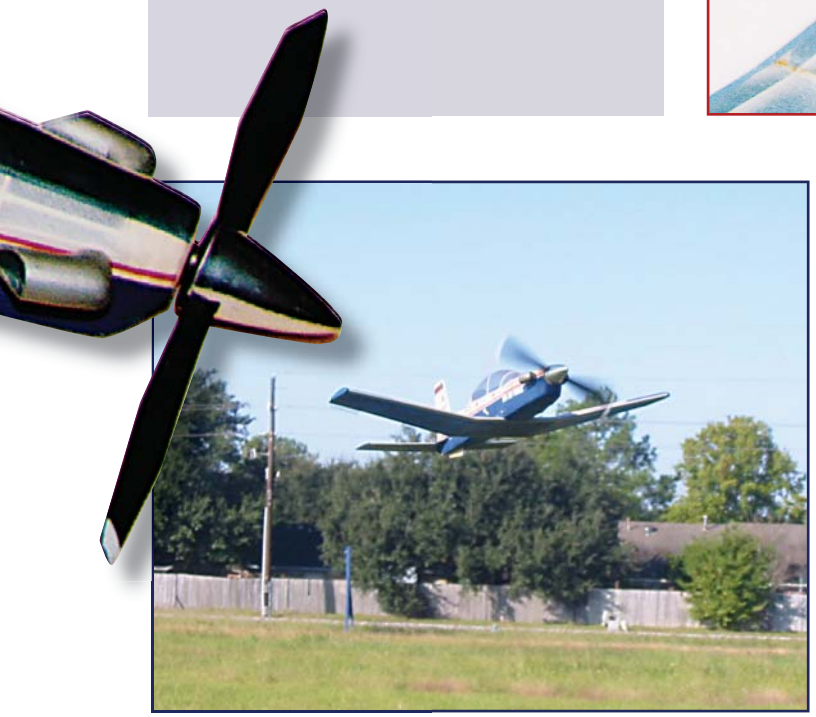
Texan II

Left: The full-scale Texan II is the primary jet trainer for the US Air Force at Laughlin AFB in Texas. The T-6 is a variant of the Pilatus PC-9.

Right: The author made the canopy from a vacuum-form mold. Thread simulates the ejection system "break" line.

Below: The Texan II uses a hand-carved propeller. The spinner is solid balsa that is finished to have a chrome appearance, as described in the text.

Below right: Vacuum-formed canopies, spinners, and water-slide decals for the Texan, as well as a tissue-covering DVD, are available from the author.



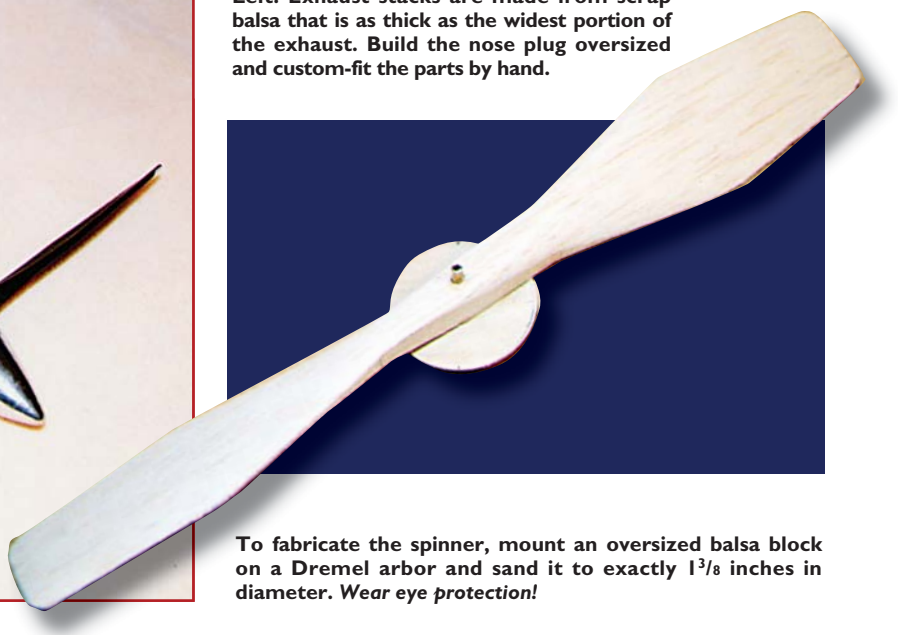
RUBBER SCALE modelers are always in search of the "perfect subject." The modeled airplane must be charismatic, well documented, and, most important, possess good areas and moments, to assure successful flight performance. Additionally, the aircraft must offer some promise of ease of construction as the plans are developed.

The Raytheon/Beechcraft Texan II, a turbo-powered trainer, is currently in use by the US Air Force and meets all of the requirements I mentioned. I live in Katy, Texas, and own a ranch near Del Rio, Texas, which is home of the 47th Flying Training Wing at Laughlin Air Force Base. Texan IIs are constantly in the air around Del Rio, and I have spent several hours watching the sleek trainers shoot approaches and practice touch-and-gos at Laughlin.

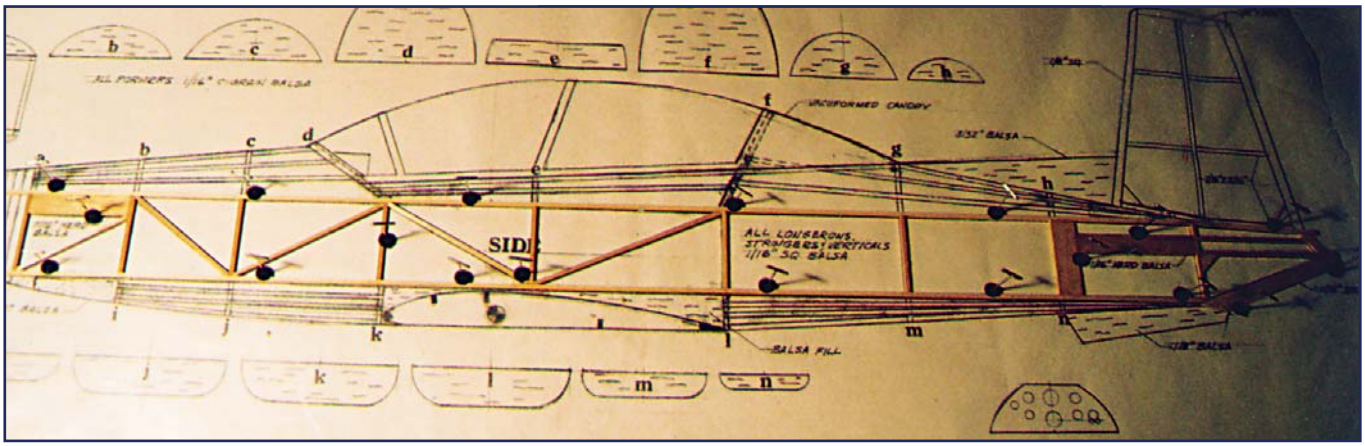
I made contact with Captain Ken Hall, chief of public affairs at Laughlin, and Kent Cummings, chief of community and media relations, who allowed me to take photos of a Texan II on the flightline for authentication of the model I'm

When satisfied with the glide, add the rubber motor (three loops of 1/8 Tan Super Sport, 40 inches long, braided), recheck the CG, and wind in 450 turns. The model should climb and turn right.

Left: Exhaust stacks are made from scrap balsa that is as thick as the widest portion of the exhaust. Build the nose plug oversized and custom-fit the parts by hand.

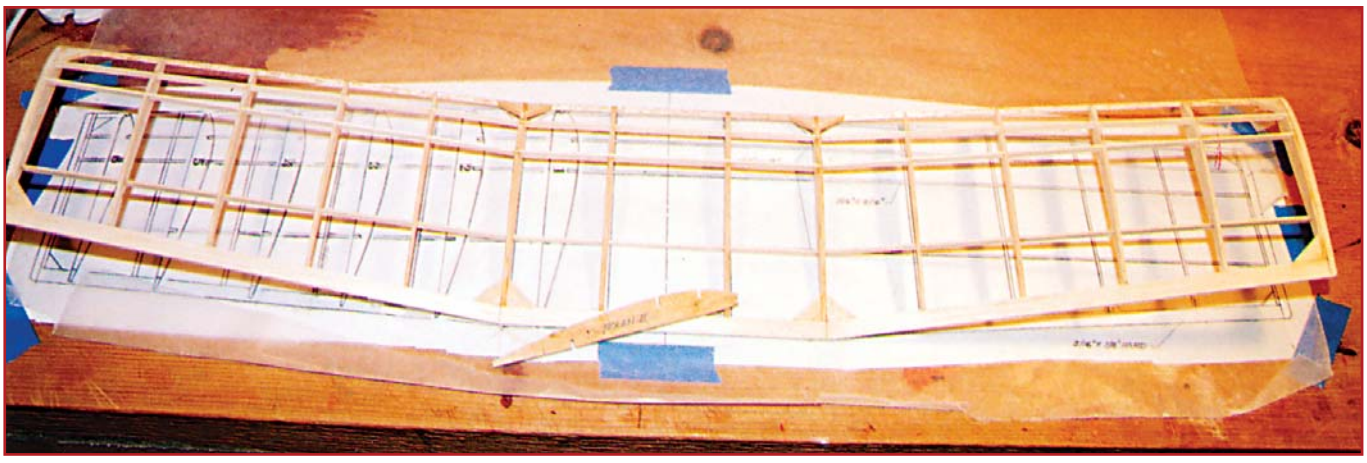


To fabricate the spinner, mount an oversized balsa block on a Dremel arbor and sand it to exactly 1 3/8 inches in diameter. *Wear eye protection!*



The fuselage is constructed from 1/16 balsa. Use square sticks to frame the sides. Build the right and left sides on top of each other, to assure symmetry.

Photos by the author



Every rib is cut using the same template. Smaller/shorter ribs are made by rotating the template TE down to achieve the length measured from the plans.

presenting in this article.

My thanks to the personnel at Laughlin—especially Carl Riordan, T-6 maintenance work leader, and Mark Escobar, aircraft sign painter—who were very cooperative in helping me obtain some details that are not currently available on the Internet.

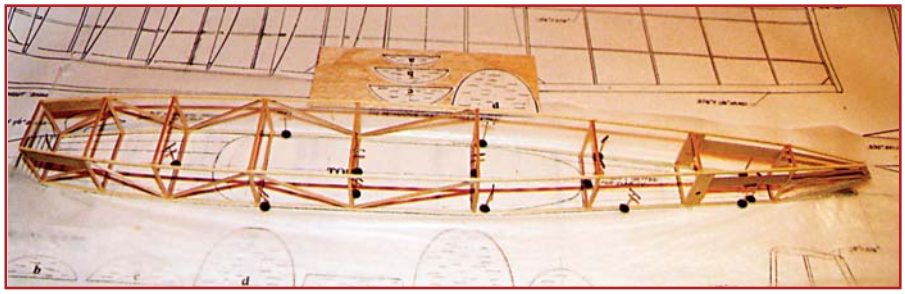
The Texan II is a development/redesign of the Pilatus PC-9: a trainer that several countries currently use. With slight modifications to the fins and canopy framing, the model in this feature can be built as a PC-9. A Google search will yield a myriad of mouthwatering PC-9 color schemes that beg to be replicated on a model.

While researching the Texan II, I found references indicating that the Pilatus is a direct descendant of the Arado Ar.96 German World War II trainer. My last article published in *MA*, in the December 2005 issue, was about an Ar.96. The design similarities are astonishing, and the Arado was conceived in 1938.

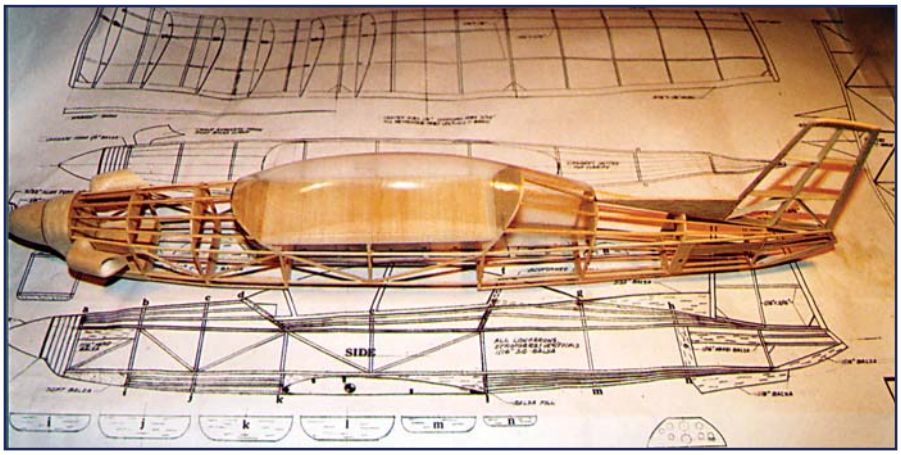
CONSTRUCTION

A quick glance at the Texan II's plans reveal its low wing placement, which is ideal for conversion to an RC electric-powered park flyer. There is plenty of room for miniature servos, and the rudder and elevator surfaces can be hinged by simply doubling their respective spars.

For rubber-power enthusiasts, the CG



At this point, spray the completed structure with a mist of water while it is still pinned down, to relieve any built-in stresses in the balsa construction. This results in a true fuselage.



The oversize formers are centered on each station and, when dry, are sanded to blend perfectly with the fuselage sides and each other.

Type: Scale rubber-powered FF

Skill level: Intermediate

Wingspan: 25.25 inches

Wing area: 120 square inches

Airfoil: Wing, modified Neelmeyer; stabilizer, 5% cambered

Length: 25 inches

Weight without rubber: 50 grams

Motor: Three loops of 1/8-inch Tan Super Sport, 40 inches long, braided

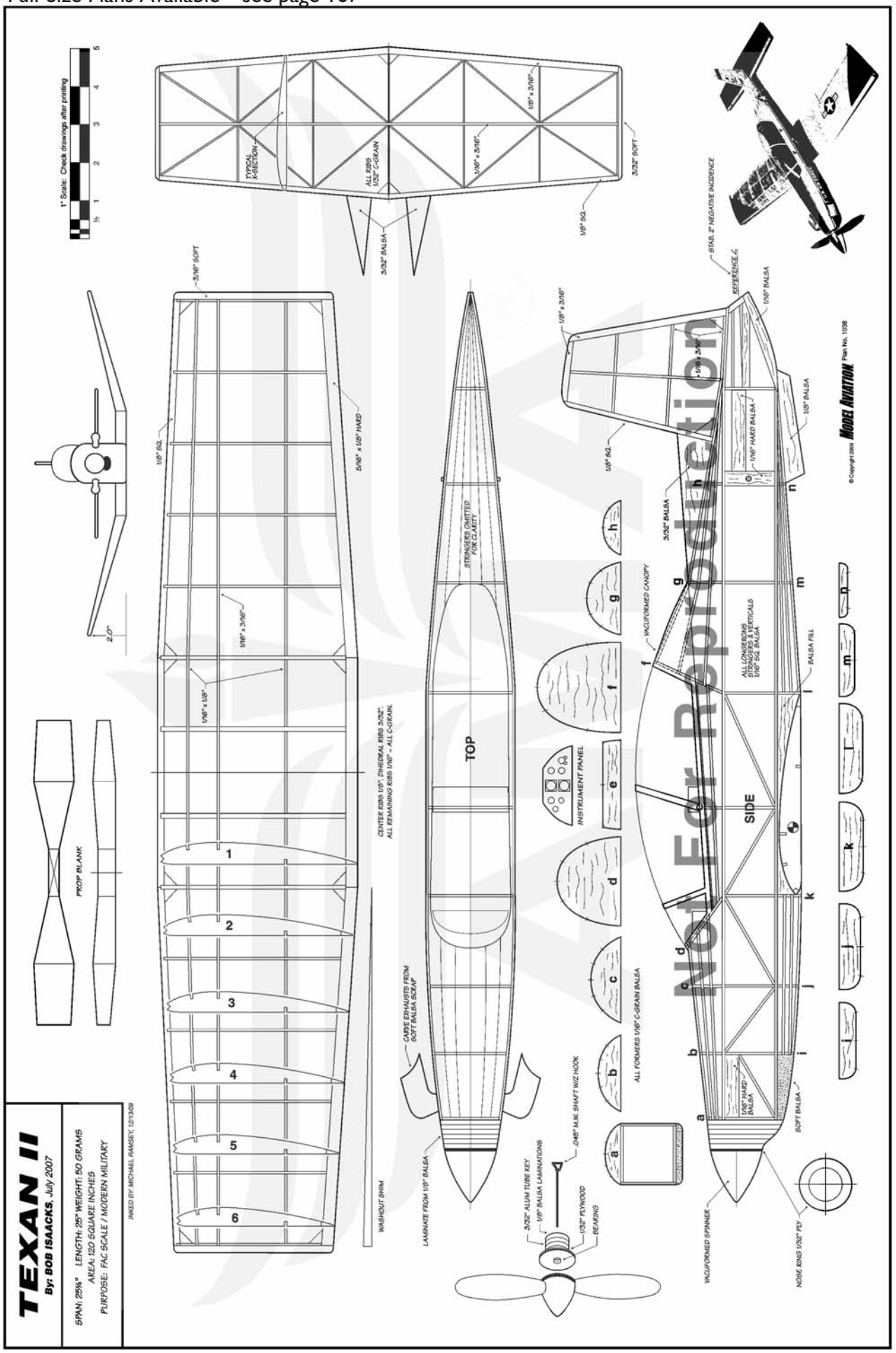
Construction: Primarily balsa with 1/32 plywood reinforcement

Propeller: Hand-carved balsa with 1:1 1/4 pitch-to-diameter ratio

Finish: Esaki tissue, dope for color

Trim: Right/right

Full-Size Plans Available—see page 167



sits almost exactly halfway between the model's rear peg and nose—perfect for a *long* motor. Let's begin.

Fuselage: The fuselage build is based on the conventional box/former method. All of the components are constructed from 1/16 balsa except for the nose blocks, so it will be unnecessary to raid the piggy bank to purchase several thicknesses of balsa.

Pin down and build one fuselage side on top of the other, noting that all verticals on the box are the same length. I made a stop on a miter box and cut all the verticals at one time.

Also notice that the rear peg support can be cut at the same time as the 1/16 uprights. The fuselage longerons are straight, except for the rear of the top longeron. It can be notched and "cracked" to match the fuselage/rudder rear line.

After the sides are completed/separated, pin them to the top view on the plans and add the crosspieces in the cabin area. Use a square to keep the sides square and vertical.

When the cement is dry on the crosspieces, glue the tail and front crosspieces in place, making sure that the nose and tail are square and centered on the plans. Add the remaining crosspieces, front and rear, checking for squareness at each station.

At this point, I spray the completed structure with a mist of water while it is still pinned. This relieves any built-in stresses in the balsa construction and results in a true fuselage. *No bananas wanted here.*

I should mention that the plans are covered with waxed paper before any construction commences.

When the stress-relieved structure is dry, add the bottom formers, front to rear. As shown on the plans, the formers are purposely slightly oversize. I typically make a copy of the formers on bond paper and use rubber cement to attach the copies to the appropriate thickness of balsa sheet.

After cutting the formers from the sheet, I can easily peel off the paper copies. Slight rubbing removes the rubber cement residue from the balsa.

The oversize formers are centered on each station. When dry, they are sanded to blend perfectly with the fuselage sides and each other.

I add the center stringer, making sure that it is straight front to rear, and then I add the remaining stringers, alternating from side to side, measuring to assure symmetry. I use a small Swiss File to notch the formers and get a perfect fit for each stringer.

After the bottom stringers are in place and dry, remove/unpin the fuselage from the plans. Add the top formers in the same manner as the bottom.

The cockpit flooring is made from extremely light 1/32 balsa, applied cross-grained to the box. Laminate the 1/8 balsa for the nose block, and add it and the bottom chin block to the fuselage.

Leave these components slightly oversize, add the 1/32 plywood nose ring to the front of the assembly, and carefully sand/blend them to the fuselage. Use the plans and photos to obtain the correct side and top profile.

I drilled the initial undersized hole for the nose plug using a router bit with a Dremel tool. Then I finished/sized the hole using a sandpaper-wrapped dowel.

The exhaust stacks are made from scrap balsa that is as thick as the widest portion of the exhaust. I made copies of the top view of the exhausts on bond paper, rubber-cemented them to the scrap balsa, and jigsawed them to shape.

Carve/sand away anything that does not look like an exhaust stack. I employed a

Model Aviation's Frequently Used Abbreviations/Acronyms

AMA	Academy of Model Aeronautics	**EPP**	(foam) expanded polypropylene	**Li-Poly**	Lithium Polymer
ARF	Almost Ready to Fly	**ESC**	Electronic Speed Control	**mA**	milliamperes
BEC	Battery Eliminator Circuit	**EPS**	expanded polystyrene foam	***MA***	*Model Aviation*
CA	cyanoacrylate glue	**FAI**	Fédération Aéronautique Internationale	**mAh**	milliampere-hours
CAD	computer-aided design	**FCC**	Federal Communications Commission	**MHz**	megahertz
cc	cubic centimeter	**FF**	Free Flight	**mm**	millimeter
CD	contest director or compact disc	**GHz**	gigahertz	**Nats**	AMA Nationals
CG	center of gravity	**ID**	inside diameter	**nitro**	nitromethane
CL	Control Line	**Kv**	rpm/volt	**Ni-Cd**	Nickel Cadmium
cm	centimeter	**kV**	kilovolt (1,000 volts)	**NiMH**	Nickel Metal Hydride
cu. in.	cubic inch	**LCD**	Liquid Crystal Display	**OD**	outside diameter
dBA	DeciBels Adjusted (noise power calculated in dB [decibel])	**LE**	leading edge	**RC**	Radio Control
DT	dethermalizer	**LED**	light-emitting diode	**rpm**	revolutions per minute
				RTF	Ready to Fly
				SASE	self-addressed, stamped envelope
				SIG	Special Interest Group
				TE	trailing edge

Dremel cutter to hollow out the stacks' interior.

The stacks are one of the features that gives the Texan its look, so take time to shape them correctly. I used a circle template to inscribe a ring on the inner portion of the exhaust, where it is attached to the fuselage. By carving and sanding the balsa to that circle, the exhaust stacks will quickly take on the desired profile.

The spinner is made utilizing a Dremel tool. Use scissors to cut a piece of 1/32 plywood slightly larger than 1 3/8 inches in diameter. Mount this on a Dremel arbor (the one used for holding abrasive discs) and sand it to exactly 1 3/8 inches.

Add an oversized balsa block to the plywood disc using Ambroid or Duco cement. (You will have to rout out a small recess in the center of the block, to clear the arbor screw.) Give the glue plenty of time to dry completely.

Rough-shape the spinner block with an X-Acto knife before beginning to spin it up. Use a sanding block and light pressure to shape the spinner, comparing its profile to the plans. *You must wear eye protection for the preceding operation!*

The nose plug is made from laminated 1/8 sheet. I made an oversize lamination and used it for both the nose block and the nose plug.

The nose plug is made in the same manner as the spinner. A plywood disk is spun/sanded to size (3/4 inch). Glue the oversized, laminated balsa plug to the disk and spin it to size, while checking to ensure that it is a good fit to the nose block. Fit a 1 3/8-inch-diameter 1/32 plywood disk to the front of the plug and glue it.

Drill the nose plug on center at the front with the other end of the plug resting on a 4 1/4° wedge. When rotated correctly, the plug will yield the desired 3° of downthrust and right thrust. Install a brass tubing bushing with an ID to match the propeller-shaft OD in the drilled hole, and the nose plug is complete.

Wing: Make a rib template. I fabricated mine from 1/16 plywood, by copying the root rib on bond paper and rubber-cementing the reproduction to the plywood. I jigsawed the template and carefully sanded it to the exact profile.

Drive two straight pins through the template, letting them project 1/16 inch below the bottom surface. Use CA to adhere the pins in place and cut them off above the top surface. These pins are used to hold the template to the appropriate balsa thicknesses, so you can carefully cut around the template with an X-Acto knife.

I cut every rib using the same template. I made smaller/shorter ribs by rotating it TE-down, to achieve the length measured from the plans. The point of rotation is the center of the LE notch.

Pin down the TE along its entire length and add the ribs, making sure that they are square to the building board. Add the LE in the fish-mouth front of the ribs and the wingtips. When that assembly is dry, remove it from the building board and sight over the top of the ribs, to make sure that there is a uniform taper from root to wingtip.

Use a long sanding block to remove high spots in the upper camber of the wing. At this point, I use a steel straightedge to mark the spar locations, and I notch the ribs for the spars with a small Swiss File.

Glue the spars in place *except* for the bottom spar on the outer wing sections. To ensure that washout (TE high at the wingtips) is permanently built into the structure, pin the LE down and raise the TE using the wedge shown on the plans. Glue the bottom spar in place and you are there.

Sand a bevel on the outer wing-panel LE, TE, and spars, to allow for the 2-inch dihedral on each panel. Glue the outer wing panels in place, measuring to assure that an equal amount of dihedral is in place. Add the dihedral braces and gussets, give the wing a final touch-up sanding, and you are finished.

Tail Feathers: The tail surfaces are built in a similar manner, with one exception. The rudder is built with a symmetrical airfoil, so it is necessary to shim the LE and TE off of the building board before adding the ribs. The stabilizer is flat-bottomed, so you can pin all components directly to the board.

After gluing in the ribs, the stabilizer is airfoiled (the top surface only is cambered) while the rudder is airfoiled (cambered) on both sides. Cut the stabilizer strakes and rudder forward fin, sand the appropriate edges, and the tail surfaces are ready to cover.

Propeller: Carve the propeller by hand, using the profile shown on the plans. Jigsaw the top "bowtie" profile and drill a 3/32-inch-diameter hole in the center. Jigsaw the side profile.

Begin carving with the back of the propeller, carefully moving across corners. Go slowly and make sure that both of the propeller's undersides are carved to match. I use a small balsa sanding block with a 5% arc on its upper surface to sand in a slight undercamber on the blades.

Carve a camber on the top surface, using your fingers and *feel* to attain the same thickness on both blades. Spin/sand a 1 3/8-inch-diameter 1/32 plywood backplate, and enlarge the center hole to 3/32 inch.

Install the propeller on the backplate, using 3/32-inch-OD brass tubing to bush both the backplate and the propeller. Install a larger brass-tube "clutch" over the bushing, and the propeller is ready for finishing.

Add the hollowed-out balsa spinner or a vacuum-formed version after you finish the propeller, backplate, nose plug, shaft, and bearing assembly. See the sketch of these components for reference purposes.

Finishing: The traditional nitrate dope-and-Esaki tissue method was used to finish the Texan. I prepared all surfaces by coating every one that would contact the tissue with several coats of nitrate dope, sanding after the first coat. I applied enough dope so that the surfaces would appear glossy.

I applied the white Esaki tissue wet, using 70% alcohol as the wetting agent. I used thinner, brushed through the tissue, to apply it to the airframe.

It is important to apply the thinner only to the periphery of the surface that is being covered. This allows the wet tissue to shrink evenly and will result in a superior, wrinkle-free covering job. Tissue overlaps require a

second coat of dope on the overlapped surface, to get the added tissue piece to adhere properly.

After the tissue is stretched and dry, brush it with a coat of nitrate that has been thinned 50%. The red stripe on the fuselage is a piece of red Esaki that is applied with thinner and given a coat of the 50/50 nitrate.

The blue fuselage bottom, wing underside, top chevrons, and stabilizer were airbrushed using the pigment from Dark Blue Floquil model-train paint, mixed into nitrate thinner and added to clear nitrate dope. In the same manner, the wing, stabilizer, and rudder LEs were airbrushed with Old Silver Floquil. Frisket paper was used to mask the surfaces for all airbrushing.

I trimmed the canopy and attached it to the finished model with Pacer Formula 560 Canopy Glue. The spinner, which I vacuum-formed from .030-inch Vivak, was airbrushed on the inside with chrome enamel, which is designed for use on model-car bodies. I coated the spinner with flat-black enamel, to give a deep, polished look. I glued the spinner to the propeller backplate with Formula 560.

I gave the propeller several coats of clear nitrate mixed with talc to fill the balsa grain. I airbrushed it with flat-black enamel and then painted the tips flat white.

I have vacuum-formed canopies, spinners, and water-slide decals for the Texan, as well as a tissue-covering DVD for aeromodelers. I will also provide assistance with questions concerning construction details via e-mail. Please preface all such correspondence with "Texan II" in the subject line.

Flying: My Texan flew "off the board" with little adjustment required. Remove the propeller and add clay to the nose, to get the CG correct. Test-glide the Texan over high grass, by pointing it at a spot close to 50 feet ahead and giving it a firm toss toward that spot.

Cure diving or stalling with small adjustments to the stabilizer decalage. Cure unwanted turning/spiraling by adding small bits of clay to the wingtip opposite the turn.

When you are satisfied with the glide, add the rubber motor (three loops of 1/8-inch Tan Super Sport, 40 inches long, braided). Recheck the CG and wind in 450 turns. When released, the model should climb and turn right; make all adjustments by shimming the thrustline.

As the airplane begins to behave, add turns until you get to approximately 1,750. At this point, make sure that you have binoculars available and a reliable way to retrieve your model.

Good luck with your Texan II. MA

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