794

Praxis

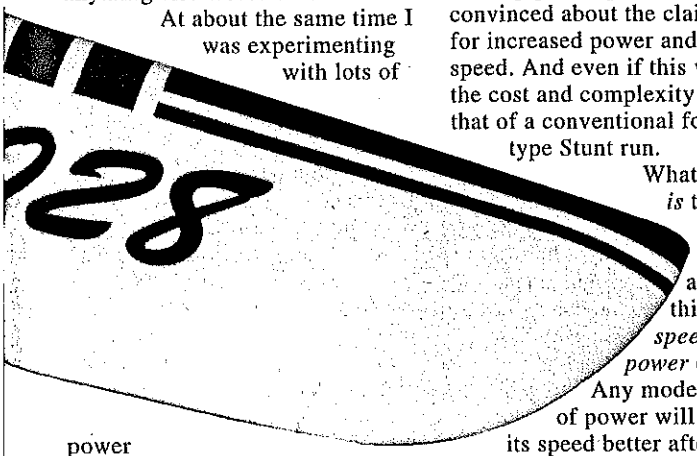
■ Tom Dixon

This design flies in the face of the prevailing wisdom in this country regarding CL Stunt models: It does not use a tuned pipe, and it has the engine mounted sidewinder-style with the cylinder mounted to the outside of the flight circle. (Texans, please do not write in!)

In 1990-91 I was an agent for importing and distribution of fully framed and finished Skywriter models by 1988-90 world champion Zhang Xiang Dong. I was impressed with Zhang's incredible workmanship and his approach to design. The Skywriters were built with two-piece wings and removable tails and fit into 40 x 20 x 12-inch boxes.

The more I looked at his side-mounted no-cowl nose treatment, the more I was impressed with its elegant simplicity. It was a natural way to mount an engine, with thrustline, wing, and stab on the same center line.

During 1993 I built a Walt Pyron-designed P-39 Airacobra for Classic Stunt. This model was designed in 1958 and uses a Fox .35 with the cylinder mounted outboard. The Fox is notoriously fickle about running properly with an outboard-mounted cylinder; however, with proper adjustment of tank height and a little experimenting with different plugs and fuels, the Fox ran perfectly. I figured that if the Fox worked this way, anything else would too.



At about the same time I was experimenting with lots of power (a Merco .61) in an airframe originally designed for a .40 or .45. My Charisma flew very well with the Merco, despite being overweight. I began to feel that there could be no such thing as overpowering a CL Stunt model, provided the wing loading was within acceptable limits and the correct propeller was used.

For convenience I ordered a foam core of Bob Baron's Avanti design from Scott Smith. The Avanti was originally flown with an O.S. .40 and .45 FSR and placed second at the 1984 World Champs. As I sheeted the Avanti wing, the thought occurred to mate this with a Skywriter-style fuselage. The no-spinner front end would allow me to try a variety of different-length engines without worrying about the spinner mating up exactly. So work proceeded to rough out a sketch to make it all come together.

The moments are an amalgam of Avanti and Skywriter. The wing is mounted 3/8 inch below the thrustline, while the stab is on the thrustline. Mounting the wing on the thrustline would require the leadouts to exit 5/16-3/8 toward the bottom of the fuselage to allow wings-level flying; the landing gear length and weight and the muffler weight on a side-exhaust engine will bias the vertical center of gravity (CG) somewhat. It was easier to move the wing than the leadouts; that's why the wing is 3/8 off center.

I have flown and observed many tuned-pipe setups, and I am not convinced about the claims made for increased power and constant speed. And even if this was true, the cost and complexity is double that of a conventional four-stroke-type Stunt run.

What certainly *is* true is that lots of power is a good thing. Not *speed*, but *power* or *torque*. Any model with lots of power will maintain its speed better after tight turns; will punch through turbulent air better; and will generally maintain line tension better under all conditions. The F2B rules limit us to 10cc (.61 cubic inches) engine size. It makes sense to use this size engine in an airframe that can be built at the correct size and weight to use the power.

The original .60 size models were up to 900 square inches in wing area. They flew fine, but could be a real handful in high winds.

At the world level, .60-powered models are 650-680 square inches. This size model won the World F2B Championship in 1986, '88, '90, and '94. These models usually weigh about 56 ounces and use props that are 11-12 inches in diameter and 5¼-5½ inches true pitch.

Where possible, the lower diameter is used in three blade configuration. The smaller diameter one can use and still have adequate thrust and overhead line tension, the better. Diameter can cause precession problems as it increases, leading to instability or lack of "groove."

This is one of the major problems with piped models. At the high rpm they use, the prop mass becomes a significant "gyroscope." A gust of wind that yaws the model also causes a pitch up or down due to 90° effects of precession.

The lower rpm of traditional setups largely negates this problem. If you've seen pipe models "jump around" and "bounce" out of bottoms of maneuvers, this is often the cause. The "high-energy gyroscope" of the high-rpm prop is the culprit. A wiggling rudder cannot offset all the forces associated with this effect. Keeping the rpm and prop diameter as low as practical helps a lot.

"I am not convinced about the claims made for [piped models'] increased power and constant speed."

-Tom Dixon

Photos by the author Graphic Design by Heather Erdahl

Author and 10-year-old son Steven prepare for startup. Steven is a seasoned mechanic & budding flier.

Praxis was cobbled up to be a practical, easy to build and maintain model using traditional .60 power—either a Merco .61 or SuperTigre .60. Several new engines can also be used, including the ST. 60 copy Double Star from Moldova and the Discovery engines from Ukraine. If kept light, Praxis will perform well with the ST .51 or Royal/O.S. .46s. However, there ain't no substitute for cubic inches!

Praxis:

Type:
CL Stunt

Wingspan:
59 inches

Engine size/type:
Merco .61

Flying weight:
46 ounces

Construction:
Sheet & foam

Covering/finish:
Silkspan and dope on wing and stab; fiberglass, epoxy, and dope on fuselage and fin

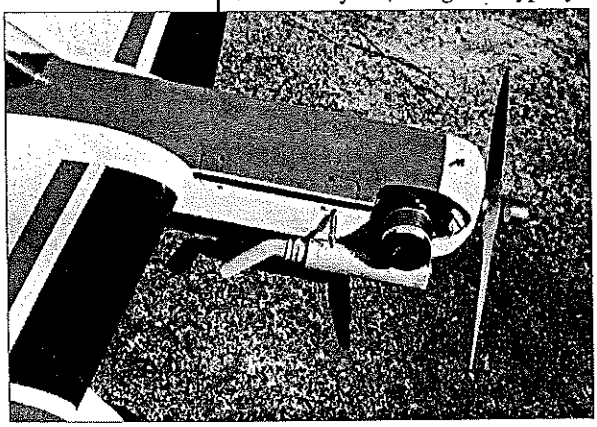
CONSTRUCTION

There is nothing especially difficult about the construction of this model if you've ever built a full-bodied competition stunter. Nonetheless, I will cover a few points for the less-experienced builders.

Wing: The wing can be built-up or foam. In most cases a built-up wing will be one or two ounces lighter.

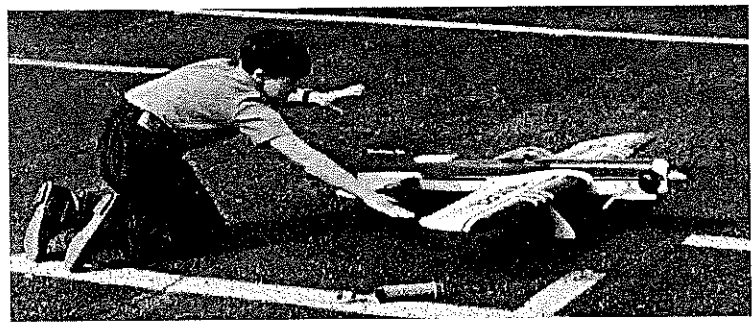
Begin wing construction by sandwiching the rib blanks between plywood templates and carving and sanding to shape. Repeat for opposite wing. Don't worry too much about the 'bevel' on the ribs, as the glue will allow adequate strength in contact with sheeting. I prefer to use an Adjusto-Jig for built-up wings, but the wing can be built on a flat surface such as a hollow door if care is taken to shim the spars to maintain true shape for the entire span.

A foam wing can be ordered as a bare core, or completely sheeted, from Aerosmith Aviation. Contact Scott Smith for details. I sheeted the core myself, using Hobbypoxy laminating epoxy as adhesive. The sheeted panels should weigh 3½-4¼ ounces per panel for optimum performance.



Access to glow plug is simple with side-mounted engine. Almost impossible to flood, too.

The four-inch bellcrank from Dan Winship is the best I've ever seen. Control horns are ⅛ wire, manufactured by Robin Hiern of Melbourne, Australia. Bushings of 3/32 I.D. brass tubing are soldered into the horns for long wearing properties. Pushrods are Sig carbon-fiber units with 3/32 wire ends. I like to wrap the carbon tubes with some carbon-fiber cord where the stub of the wire exits the tube side, to insure it will never split and fail. The flap/elevator ratio is 1:1.



Steven Dixon executes classic Stunt launch. Praxis borrows nose construction and look of 1988-90 world champion Skywriter.

Tail Surfaces: These are pure Baron Avanti in shape and area. However, the structure is simple, solid ⅜ sheet balsa sanded to shape.

A stab assembly this size is usually sheeted foam or built-up and sheeted. But weighing test panels convinced me that solid ⅜ balsa of the proper density is as light as the more-complex structures, and is certainly a lot easier to fabricate! Two of the best-turning models I've ever built (a Mackey Lark and a Super Chief) used simple sheet tail surfaces.

Fuselage: It is somewhat unusual, as you must plan a hatch to allow the fuel tank to be installed, removed, and adjusted. (This will guarantee that you never have to do any of this, according to Murphy's Law.) The hatch is cut from the fuselage outboard side using a Dremel saw. Drill a hole to insert the blade where the overflow tube will exit. The hatch hole is lined with 1/16 plywood to receive 2-56 blind nuts for hatch retention.

The firewall is two laminations of five-ply ⅛ plywood joined with epoxy. Spruce triangular stock helps anchor the firewall to sides, and top and bottom blocks.

The engine mount is an aluminum J'Tec #53, filed as needed to accept the Merco .61 crankcase. If you wish to modify the nose for ½ square maple mounts, feel free to do so; I used the metal mount so I could try all kinds of engines.

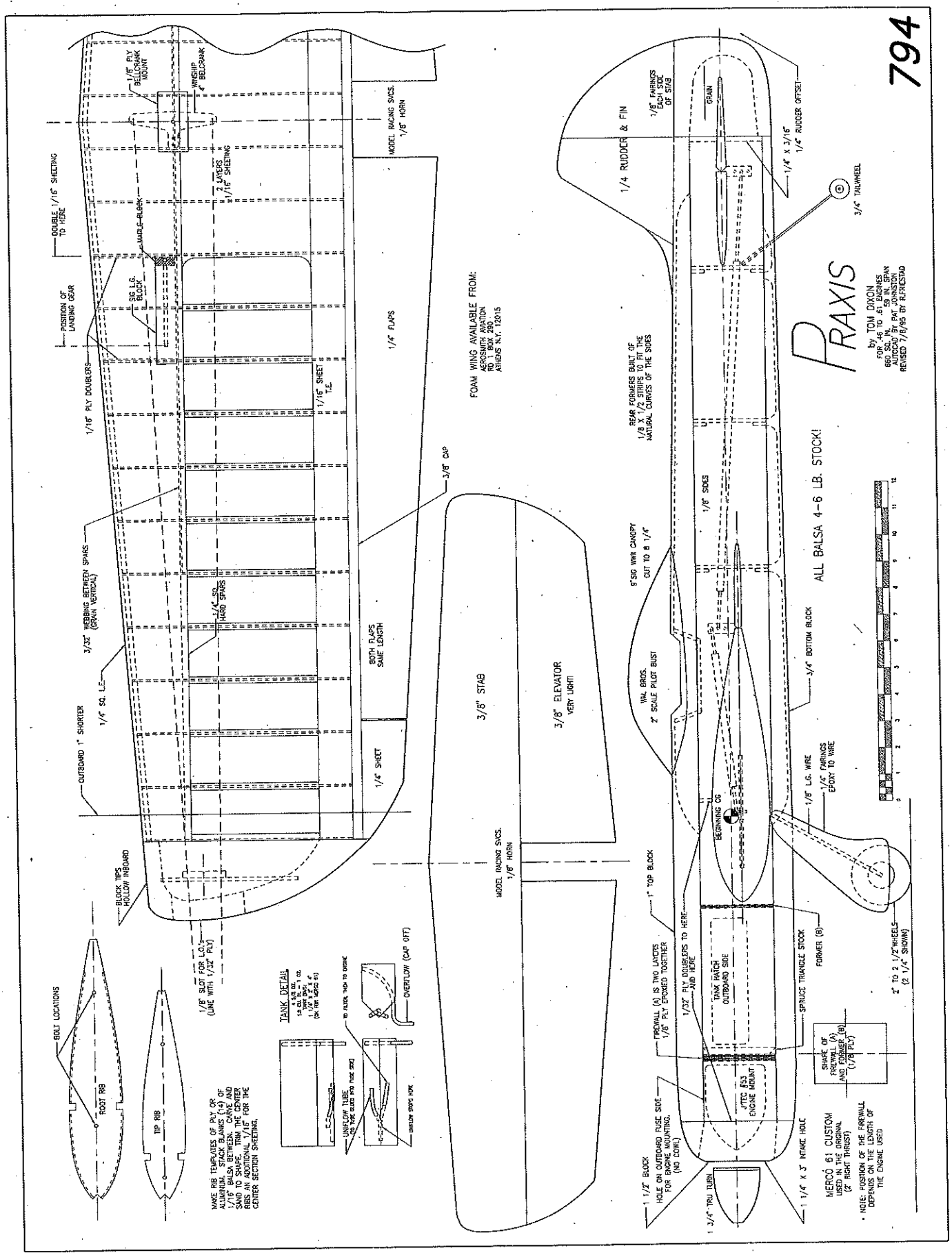
The Merco .61 needs only a four-ounce tank. For other engines, you will need to plan for both tank and hatch size. Kenn Smith can provide custom-made metal fuel tanks of larger capacity for SuperTigre and Double Star .60s. These tanks should be 1¼-1½ depth, about four inches long and two inches wide. The lower tank platform should be placed as needed to allow the tank to mount with its centerline even with that of the engine. Chances are you will need to shim the tank ¼-5/16 from there for equal-speed revs upright and inverted on most engines.

The top and bottom blocks are not hollowed from the Center of Gravity (CG) forward in order to further stiffen the nose. With the cylinder mounted sideways, the vibration forces are side-to-side, rather than up-and-down as with the usual Stunter. The solid blocks go a long way toward absorbing this vibration. The additional weight is negligible; if the blocks were hollow, you'd probably end up needing nose weight anyhow.

I prefer to frame up the fuselage with all blocks "tacked" in place with Sig-Ment. This assembly is carved and sanded to shape, then the blocks are cut free and hollowed. The engine and tank installation is fully worked out now, too. Only then are the wing and stab installed.

(In fact, I prefer to pre-finish the wing and stab to a point ready for the silver base coat before

Continued on page 63


794
PRAXIS
by TOM DIXON
50" SPAN
660 SQ. IN.
59 IN. SPAN
AUTOCAD BY PAT JOHNSTON
REVISED 7/8/95 BY R.FORESTAD
ALL BALSA 4-6 LB. STOCK!
FOAM WING AVAILABLE FROM:
AEROSMITH AVIATION
RD 1 BOX 290
ATHENS N.Y. 12015
MERCO 61 CUSTOM
USED IN THE ORIGINAL
(2" RIGHT THRUST)
• NOTE: POSITION OF THE FIREWALL
DEPENDS ON THE LENGTH OF
THE ENGINE USED
3/8" STAB
3/8" ELEVATOR
VERY LIGHT!
1/4 RUDDER & FIN
1/4 FLAPS
BOTH FLAPS
SAME LENGTH
1/4" SHEET
1/16" SHEET T.E.
1/16" PLY DOUBLERS
OUTBOARD 1" SHORTER
1/4" SQ. L.E.
3/32" WEBBING BETWEEN SPARS
(GRAIN VERTICAL)
1/4" SQ. HARD SPARS
2 LAYERS 1/16" SHEETING
DOUBLE 1/16" SHEETING TO HERE
POSITION OF LANDING GEAR
SIG LG. BLOCK
MARQUE-BLOCK
1/16" PLY BELCRANK MOUNT
WINSHIP 4" BELCRANK
MODEL RACING SVCS. 1/8" HORN
3/8" CAP
BLOCK TIPS HOLLOW INBOARD
1/8" SLOT FOR L.G.'s (LINE WITH 1/32" PLY)
BOLT LOCATIONS
ROOT RIB
TIP RIB
MAKE RIB TEMPLATES OF PLY OR ALUMINUM. STACK BLANKS (14) OF 1/16" BALSA BETWEEN. CARVE AND SAND TO SHAPE. TRIM THE CENTER RIBS AN ADDITIONAL 1/16" FOR THE CENTER SECTION SHEETING.
TANK DETAIL
UNFLOW TUBE
OVERFLOW (CAP OFF)
1 1/2" BLOCK
HOLE ON OUTBOARD FUSE SIDE FOR ENGINE MOUNTING. (NO COWL)
FIREWALL (A) IS TWO LAYERS 1/8" PLY EPOXIED TOGETHER
1/32" PLY DOUBLERS TO HERE AND HERE
1" TOP BLOCK
TANK PATCH OUTBOARD SIDE
SPRUCE TRIANGLE STOCK
FORMER (B)
SHAPE OF FIREWALL (A) AND FORMER (B) (1/8 PLY)
UTEC #53 ENGINE MOUNT
1 1/4" X 3" INTAKE HOLE
1 3/4" TRU TURN
2" TO 2 1/2" WHEELS (2 1/4" SHOWN)
BEGINNING CG
1/8" L.G. WIRE
1/4" FAIRINGS EPOXY TO WIRE
3/4" BOTTOM BLOCK
9" SIG WWII CANOPY CUT TO 8 1/4"
WWII BROS. 2" SCALE PILOT BUST
REAR FORMERS BUILT OF 1/8 X 1/2 STRIPS TO FIT THE NATURAL CURVES OF THE SIDES
1/8" SIDES
GRAIN
1/8" FAIRINGS EACH SIDE OF STAB
1/4" X 3/16" 1/4" RUDDER OFFSET
3/4" TAILWHEEL

Praxis/Dixon

Continued from page 58

installation in the fuselage. Working on all the components separately lets the work go faster and cuts down on dings and hangar rash from handling the complete model.)

Finish: I am not one of the country's best! I prefer *light and good enough* to *flawless, but too heavy.*

Paint a coat of Hobbypoxy clear paint on the wing and tail. When this has cured, it is sanded and a couple of coats of Sig clear nitrate dope are brushed on. Medium silkspan is then applied, using nitrate as adhesive. The silkspan is given a thorough sanding with 180- and 240-grit sandpaper after one or two coats of nitrate, then another two or three coats are sprayed on. This is sanded with 320 and 400 as needed.

Next comes a filler coat of nitrate and talc. (I use a pharmaceutical talc which has no scent or oils—check with your druggist.) The filler is sanded with 240, then 320, and finally 400. This is a tedious process!

After the wing and tail are installed, the fuselage and fin are covered with Sig glass cloth. This is applied using Hobbypoxy finishing epoxy thinned with acetone or dope thinner; lay the cloth on the model and brush the epoxy mixture through the cloth. Do not use any more epoxy than necessary to tack the cloth down; the wood will absorb the thinned glue, adding weight.

After the first epoxy coat, the cloth is sanded lightly with 240 paper, and a second thinned coat of epoxy is applied. It will look like it is not filling the cloth, but it is—don't worry.After curing at least 24 hours, this second coat is sanded with 80-grit paper to break the hard surface shell, then wet-sanded with 320 and 400. Low spots will show up "shiny" when light is bounced off the surface; keep sanding until they are gone.

If you sand through the cloth in a spot or two, these can be touched up with cyanoacrylate (CyA) glue and kicker, then sanded to match the surrounding areas.

After glassing, the Epoxolite fillets are added, then the fuselage and fin got a couple of coats of nitrate and then filler coat. I always sand out the fillets wet, using 240 paper, then clean thoroughly with alcohol. Two coats of unthinned nitrate are then brushed onto the fillets. I've never had a fillet "bubble" using nitrate-based filler.

The colors are Sig dope. The white has extra pigment added (from Windy Urtnowski). The red and blue are from Sig spray cans. I hate cleaning the gun and changing trim colors! As long as you're satisfied with basic colors, the cans are so much easier. The clear top coat is automotive acrylic lacquer (DuPont 3608s or equivalent). Be sure to use only the recommended thinner if you use acrylic.

The clear is allowed to dry four or five days (a month for dope!) then wet-sanded with 1000-grit and 1500-grit paper. I use auto windshield washer fluid as a medium for wet-sanding, as the fine-grit paper wants to "grab" when using water. After sanding, the clear is polished with DuPont #7 white compound, then Brasso. Finally, apply a coat of wax.

Flying: The Praxis is flown on .018 cable, 69 feet in length (from the centerline of the airplane to the centerline of the handle). If a .51 or .46 is used, the lines should be about 65 feet in length.

I use a .285 venturi in the Merco .61, along with a Kustom Kraftsmanship needle assembly, with a brass tubing extension soldered to the needle to clear the fuselage. The muffler is a custom tube type (manufactured for me by Art Adamisin), shortened on the intake stack to pull it up close to the fuselage. I use Taffinder PA blend fuel, 10% nitro.

The prop is usually a three-bladed Bolly 11 ¼ x 6½ that I have depitched to

5¼ or 5½ depending on conditions. More pitch is used in dead air, and less in high wind.

If you have props of the same make and diameter, reworked in ¼-inch pitch increments from 5 to 6.25, you will be ready for any conditions. A 12 x 6 two-blade reworked in various pitches is also good. Master Airscrew wood props, the old Top Flite "paddle blades," and the B-Y&O props from Clarence Bull are excellent. I prefer a wide 12 x 6 to a narrow 13 x 5 due to precession effects mentioned earlier.

And just what *does* Praxis mean, anyhow? It's used in various psychological and theological texts to refer to the integration of thought and behavior; a fitting name for a model that integrates a number of different beliefs.

Enjoy your Praxis and fly safely!

Sources:

Merco .61 custom engines, Double Star Engines, control horns:
Controline Sales
Box 67166
Marietta GA 30066

Bellcrank:
Dan Winship
5971 Oak Hill East Dr.
Plainfield IN 46168

Foam wings and cores:
Aerosmith
RD1 Box 290
Athens NY 12015

Fuel tanks:
Kenn Smith
521 Jansen Ave.
San Dimas CA 91773

Three-bladed props:
Brian Eather
9 Medley Ave.
Liverpool NSW 2170
Australia

Bolly Props
Unit 8-9
100 Hewittson Rd.
Elizabeth West, SA 5113
Australia

Wooden Props:
B-Y&O Props/Clarence Bull
Box 492
Harrisburg OR 97448

Paint Pigment:
Windy Urtnowski
93 Elliott Pl.
Rutherford NJ 07070 ✈