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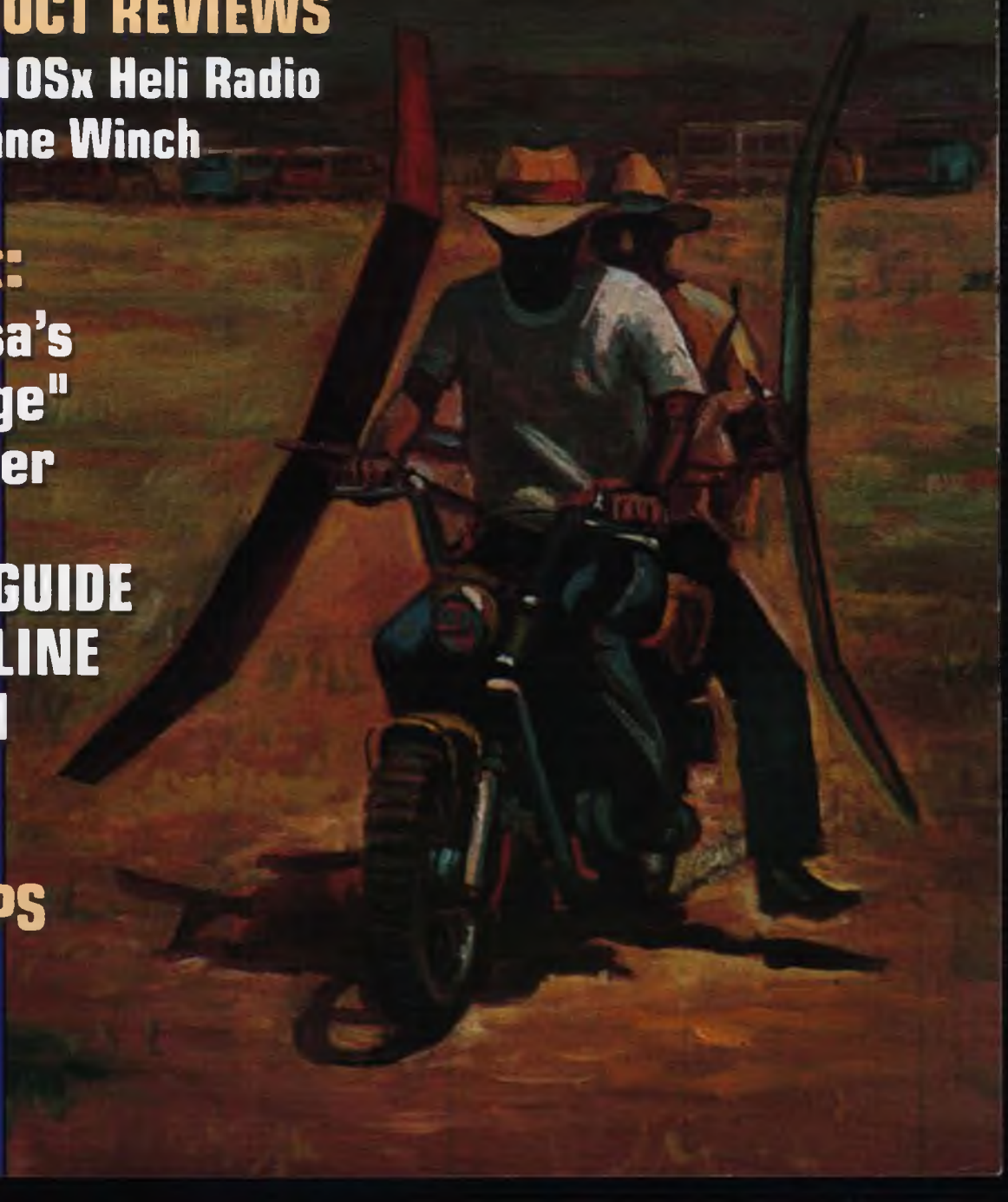

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Barnstormer 40™ Specifications

Wingspan – top 50 in, bottom 48 in
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Weight – 6.5 lb
Fuselage length – 36 in
Wing Area – 882 sq in
Wing Loading – 16.97 oz/sq ft
Engine – .40-.50 ball-bearing 2-stroke
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Radio required – 4 channel w/4 servos

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CONTENTS

MODEL BUILDER

MAY 1996
VOLUME 25
NUMBER 8

ABOVE:
Soaring columnist Bill Forrey's House of Balsa "Over The Edge" performing at the Harbor Soaring Society's field in Costa Mesa, California. Bill's review on the OTE appears on page 56.

ON THE COVER
Part of the drama of free flight is revealed in this unique oil painting by noted artist and modeler Ken Johnson, showing two competitors returning from the chase after recording a couple of maxes at Taft. Painting was photographed for *Model Builder* by PHOTOSENSITIVE (Gary Wiles and Dolores Brown).

COLUMNS

FEATURES

CONSTRUCTION

PRODUCTS IN USE

DEPARTMENTS

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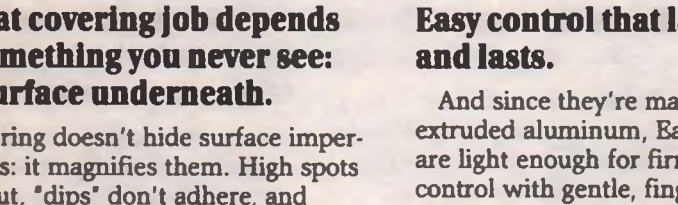

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One of master craftsman Manny Sousa's many impressive RC scale models is this Monocoupe 90A, built from an Executive Design kit and pictured here with his wife, Carin. The Monocoupe is a 1/4-scale model spanning 96 inches and is powered by an O.S. 1.60 Gemini twin four-stroke. Covering is Sig's Koverall, finished with Randolph dope. The impressive model placed 2nd in Civilian Scale at the October '94 Rally of the Eagles meet. Manny is a retired Naval aviator with over 50 years in modeling, and flies with the Northwest Florida Modelers club. *Manny Sousa, 2960 Bay St., Gulf Breeze, FL 32561.*

RC glider fliers who have been around a few years will recognize the graceful "Pantera" as originally kitted by Larry Jolly. This pretty example was built by Graham Thomson several years ago and features rudder/elevator controls as well as top-and-bottom spoilers; Graham says it's very stable and impressive in flight. The Pantera spans 100 inches and was a hot ticket in thermal duration competition in its day; our RC Soaring columnist, Bill Forrey, flew a borrowed Pantera to 9th place out of 135 entrants at the 1983 Fall Soaring Festival at Visalia. Graham owns five full-size sailplanes and says he can hardly get into his garage; he's willing to make a deal on the Pantera to someone who wants a good polyhedral floater. *Graham Thomson, 1303 Avenida De Cortez, Pacific Palisades, CA 90272.*

Here's what happens when a guy with two O.S. .32 ABCs gets his hands on a Great Planes Super Sportster 40 kit. George Lust of Columbus, Ohio did a little kit-bashing and ended up with a great looking ship he calls a "Twin Sportster." Wing was lengthened to 61 inches (area is now 635 squares), vertical fin area was increased by 20 percent, the nose gear was moved forward, and the wingtips were reshaped. A single servo operates both throttles. Radio is a Futaba, and the covering is MonoKote with trim cut from EconoKote. Flying weight is 7 pounds. Severe winter weather has kept George's as-yet-unflown twin on the ground, but he says he's looking forward to giving it a go when things warm up a bit. Good luck! *George W. Lust, 1428 Chelmsford Square N., Columbus, OH 43229.*

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This past July, the San Diego (California) Orbiteers FF club decided to commemorate the 20th anniversary of the P-30 rubber event by staging a postal P-30 contest for clubs throughout the country. Frequent *MB* contributor Dave Linstrum didn't have such a model handy but wasn't about to miss out on the fun; as a tribute to his good friend, the late Bob Peck, Dave got a Peck-Polymers "One-Night 28" kit at the last minute and after a couple of literally all-night building sessions, had a completed P-30 model, resplendent in Peck's "official" orange and blue tissue, that Orbiteers member Bob Beecroft proxy-flew in the contest. Note that Dave incorporated a number of changes along the way, such as omitting the wheel and adding a pop-off wing dethermalizer. *Dave Linstrum, 1109 36th Ave. W., Bradenton, FL 34205.*

One of *Model Builder's* all-time best-selling plans is the "Dragonfly," designed by Tex Newman and featured in the February 1976 issue. We have no idea how many have been built, but two of the most recent examples were turned out by Peter R. Moore—one for himself and one for his buddy, Bill Connery (pictured here). Both models have JR radios; one is powered by an Enya .15, the other has an older Fox .15. Peter says both fly very well and are always a hit at the field whenever they bring them out. The Dragonfly sports a two-piece, cabane-mounted 6-foot wing, a plywood box fuselage and a large lifting stab. Plans are still available for those who want to experience real fun RC flying. *Peter R. Moore, 407 S.E. Kerney Ter., Port St. Lucie, FL 34983.*

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ACE NEWS

Ace R/C's newly redesigned CVC (Constant Voltage Charger) is a 110-volt AC charger for all 6- and 12-volt

lead-acid batteries. The CVC delivers a constant 400 mA charge for 90 percent of the charge cycle, then tapers to a 15 mA trickle rate, allowing a safe full charge of any 6- or 12-volt wet cell, sealed lead-acid or gel-cell battery. Comes assembled and complete with alligator clip battery connectors, for $54.95 retail. From Ace R/C, 116 W. 19th St., Higginsville, MO 64037-0472; (800) 322-7121.

A SUPER-HOT SLOPER

If you're in the market for a really hot slope glider, take a close look at the Avocet being offered by Northeast Sailplane Products. The Avocet is a no-compromise 60-inch racer and features all-composite construction, including carbon fiber skinned foam wings, fiberglass/Kevlar fuselage and glass skinned Spyder foam V-tails. Wing area is 420 square inches, wing airfoil is the S7012 (modified at the tip), and the unballasted flying weight is listed at 25 ounces. Ailerons come pre-cut, the tail surfaces

are pre-hinged, and the two servo wells in the wing are pre-routed, keeping building time to a minimum. The Avocet is priced at $299.95 and is available exclusively from Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 05495; (802) 658-9482.

HITEC'S SPECTRA MODULE

As Eloy Marez reported in his December '95 Electronics Corner column, Hitec RCD is now producing a 50-channel synthesized frequency module for the Hitec Prism 7 radio system; the Spectra module, as it's called, is available by itself for current Prism owners, or can be purchased as part of the Prism radio package. Simply set the two rotary switches on the side for the desired channel number, plug in the module, change the receiver crystal to match and you're ready to go. No more having to share a frequency with a half-dozen others, or being unable to fly on a particular frequency because of local interference. From Hitec RCD, 10729 Wheatlands Ave., Suite C, Santee, CA 92071; (619) 258-4940.

ALTECH'S ARF TAMECAT

The most distinctive looking RC trainer on the market, the F-14 Tamecat Trainer kitted by Altech, is now also available in ARF form for those who want to get airborne as quickly as possible. The major components are pre-sheeted foam, and the model comes already covered with Super Coverite and is painted with two military colors of fuelproof paint. If you like, surface details such as panel lines can be easily drawn with a Sharpie pen and clear-coated before adding the supplied pressure-sensitive military decals. The Tamecat spans 68-1/2 inches and is designed for .40-.61 two-strokes or .53-.80

four-strokes. Suggested retail is $269.98. More info is available from Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391; (908) 248-8738.

NEW FROM BRODAK

For you control line fliers, Brodak has just released a new kit for the "Fancy Pants" CL stunter originally produced in

When contacting the manufacturers/distributors mentioned in Over the Counter, please tell them you read about their products in Model Builder magazine!

the early 1950s by Consolidated. The 41-1/4 inch span, full-fuselage design is perfect for the venerable Fox .35, features a wing-mounted landing gear, has many 1st place wins to its credit, and is well known for its excellent performance in windy conditions. The $69.99 kit is complete with all materials, die-cut parts, full hardware, instructions and full-size plans. Plans, canopy, decals, etc. are available separately for scratch builders.

All CL fliers should have a copy of Brodak's current catalog (#6). Brodak is a full-service supplier of CL-related kits and accessories, and just about everything a CL flier could possibly need or want is listed somewhere in that 60-page volume. Copies are available for $3 postpaid, from Brodak Mfg. and Dist. Co., 100 Park Ave., Carmichaels, PA 15320; (412) 966-2726.

ALL-IN-ONE HARDWARE KIT

Here's a neat idea: Du-Bro has recently come out with its E/Z Finish .40 Hardware and Accessory Kit, which contains

in one package the most needed items to complete practically any of the .40-size RC kits on the market. As seen in the photo, included are wheels, fuel tank, wheel collars, spinner, lead weights, building accessories, and more. Also supplied is a "Helpful Hints" sheet with suggestions and building tips from Du-Bro's staff of veteran modelers. The E/Z Finish .40 kit retails for $26.95 and is available in hobby shops now. From Du-Bro Products, 480 Bonner Rd., Wauconda, IL 60084; (800) 848-9411.

ATTENTION, ELECTRIC FLIERS!

Charlie Sylvia of CS Flight Systems has just come out with his new 1996 catalog—over 200 pages chock full of goodies and information of interest to electric power enthusiasts. CS is one of the largest suppliers of electric-related modeling items, carrying such lines as Astro Flight, Hobby Lobby, Pica/Robbe, Leisure Electronics, Slegers International, Lofty

Pursuits, Ace R/C and many others. Charlie himself has been flying electric for the last 15 years and is more than willing to share his knowledge with newcomers—advice is only a phone call away. The new catalog goes for $7 in the U.S., $8.50 in Canada and $10 overseas. Order from CS Flight Systems, 31 Perry St., Middleboro, MA 02346; (508) 947-2805.

MORE FF GOODIES

A growing line of No-Cal and Peanut Scale plans, documentation drawings and slides, super-light self-adhesive marking sheets and modeling accessories is being marketed by Michael A. Morrow, whose No-Cal P-63 King Cobra is pictured here. All are detailed in an illustrated eight-page catalog, available for $1 from Michael A. Morrow, 1327 44th Ave. S.W., Seattle, WA 98116.

RUBBER-POWERED CHOPPERS!

Bill Heil of Helicopter USA (see the classified ad on page 90) sent us a sample of a lightweight rubber-powered helicopter he's offering at no charge (send $4 for shipping and handling). The model is

very simple, assembles quickly without glue and flies quite well—we're consistently getting flights of up to 30 seconds and 50 feet altitude just by hand-winding. Construction consists of 1/32 balsa blades that slip into pre-slotted balsa hubs; the motor stick is a section of soda straw with special bushings at each end. Also available for $2 is an illustrated catalog of other helicopter plans and kits. Order from Helicopter USA, 555 Sloop #9, Pittsburgh, PA 15237; (412) 369-8662.

TRC'S DO-IT-ALL FIELD CHARGER

For the past couple of years we've been using a TRC Impulse II charger to fast-charge small airborne NiCd packs on the field. Now TRC Engineering has come out with the Impulse 2D, a microcomputer-controlled rapid field charger and rapid cycler that boasts state-of-the-art power conversion technology and can properly charge NiCd, NiMH and 12-volt lead-acid batteries. The unit has a large LCD readout; regulated, adjustable output current; has a four-stage charge sequence; will charge any type of cell from 50 to 1200 mAH in 15 minutes; and can perform a host of other tasks that we simply don't have the room here to tell you about. A large SASE will get you full

particulars from TRC Engineering, 10707 Whispering Valley Lane, Middleville, MI 49333.

MAKE THAT MODEL VISIBLE!

Unfortunately there's no way we can show this item's striking effect on a B&W page, so all we can do is tell you that "Sky Sheen" from Phil Pearce is a high-visibility reflective film for leading edges and such that emits a brilliant rainbow flash in sunlight. Bill Forrey used it on his "Over The Edge" slope glider (see page 56 of this issue); we flew the model and were very impressed by how well the Sky Sheen showed up in the sky—much better than the simple chrome tape commonly seen on leading edges. Phil also offers "Skyshine," a reflective fragmented holographic film that gives a quite different effect. An SASE will get you prices and samples of both from Phil Pearce, 111 E. Geneva Dr., Tempe, AZ 85282; (602) 966-6384.

MINI-TIGER III

For you lovers of small diesel engines, Dave Platt is now distributing a 6/10-scale replica of the legendary Oliver Tiger III. At .5cc (.03 cubic inch) displacement, this little jewel weighs in at just 1-1/4 ounces and even has twin ball bearings

on the crankshaft. An SASE to Dave will bring full details. Write to 1306 Havre St. N.W., Palm Bay, FL 32907, or call (407) 724-2144.*MB*

MODEL DESIGN & TECHNICAL STUFF

BY FRANCIS REYNOLDS

•Battery Tech Stuff—Lithium Pyro-technics

•Charging the Uncharge-able

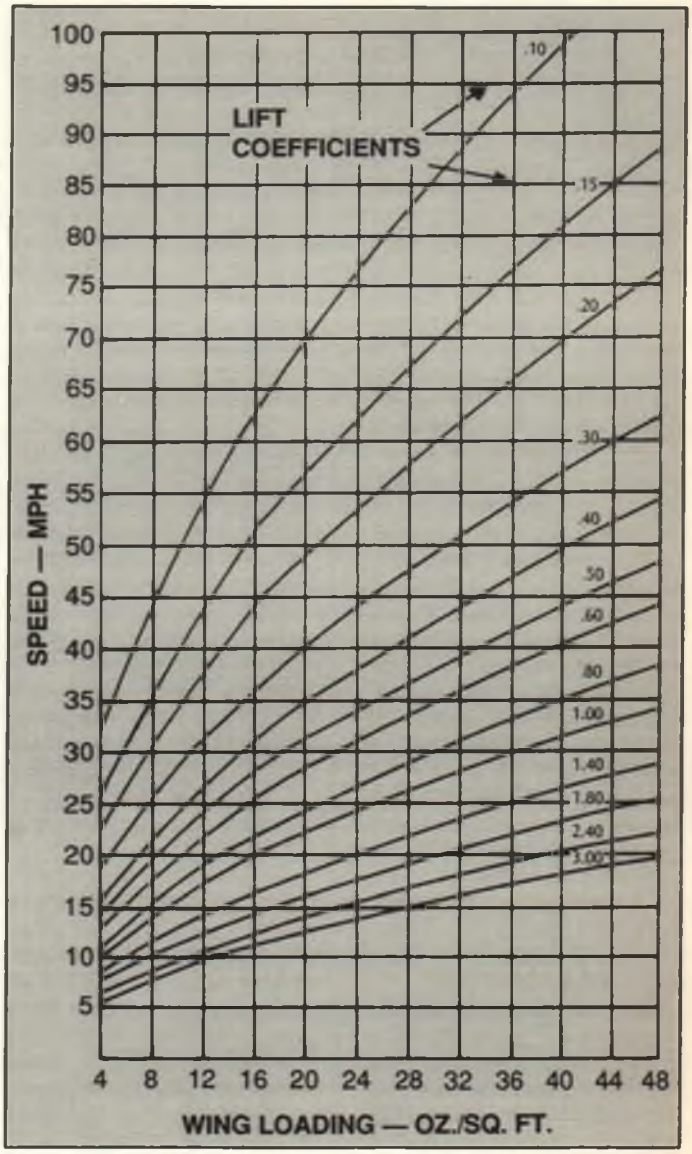
•Wing Loading, Lift Coefficient and Speed

The other day, my computer gave me a message that it wanted a new battery. (Yes, most computers have a small one which keeps the clock and calendar running when the machine is shut off.) Being a cooperative fellow I proceeded to acquiesce to its wishes. The fact that it refused to function until I did, also had a bearing on the matter.

Before I get on with this story let me say that you can, probably in most cases, replace the battery yourself and save a little money. In my PC clone it is soldered into the "mother board" (the big circuit board with a bunch of little circuit boards hanging on). I was easily able to clip off the leads at the battery, lift the battery out, bend the leads on the new battery to fit, and solder the new leads to the old leads. Some may be tempted to remove all the little boards and remove the mother board from the computer to get at the battery better, but I felt, and still feel, that installing it without disassembling things was safer. Yes, my computer works again.

But this story is about pyro-technics. Being a curious person, I like to take things apart to find how they are built and/or work. When I was a kid I could describe the internal details of the battery cells then on the market, but lithium batteries weren't around then. To bring my knowledge of voltaic-cell constructions up to date, I felt compelled to take the dead lithium computer battery apart.

The outer case on this dead lithium cell was found to be a drawn cup of thick stainless steel (to keep it from blowing up?). It didn't come apart easily like the "dry cells" when I was a kid; so I started grinding off the seam weld around the top. Eventually I got through the metal in one spot—and gas and smoke under pressure immediately jetted out of the leak! That is, it was smoke for a second or two, then it burst into a flame jet—like a dragon with a single nostril. That phase also lasted for only a second or two (this is an estimate; I was too busy to look at my watch), then the whole cap blew off, and it made like a cross between a blowtorch and a road flare. Lithium compounds (or strontium) are used to produce red colors in fireworks, but again I was too busy to notice what color the blowtorch was.



Noted aerodynamicist Andy Lennon supplied this handy nomograph for quickly determining wing loading, lift and speed.

And this was a "dead" battery. I'd hate to meet up with a "live" one!

Needless to say, I dropped the cell. My next concern was to save my nice linoleum shop floor (and also the house). There wasn't time to find a tool with which to pick up the blowtorch, so I ended up kicking it around the shop so it wouldn't burn a hole in the linoleum (being careful to kick the end without the flame jet). The blowtorch stage lasted only 10 or 15 seconds, but it seemed like 10 or 15 minutes. After scrubbing up the soot and digging clinkers of something out of the linoleum, the damage to the floor was found to be minor. Physical damage to myself was zero, but damage to my ego was moderate. I still don't know how this lithium cell was built or what chemical reactions I was observing, but my curiosity concerning the beast seems to have waned.

P.S.—*Seattle Times*, September 24, 1995: "Apple Computer has stopped shipments of

continued on page 86

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THINGS FOR TWINS!

While building his Northeast Aerodynamics Twin-Air .20 (see the review in last month's *Model Builder*), Eloy came across some electronics accessories that could be useful to others planning similar projects.

By Eloy Marez

At one time or another, most RC modelers will think "twin"! It may be that they like a particular scale subject that has two engines, or they see a twin flying and are impressed by the sound. To most RCers there are few sounds quite as pleasing as a well-adjusted model airplane engine in flight; put two such engines in an airplane, synchronize them properly, and the aural pleasure not only doubles, it goes up by at least the cube.

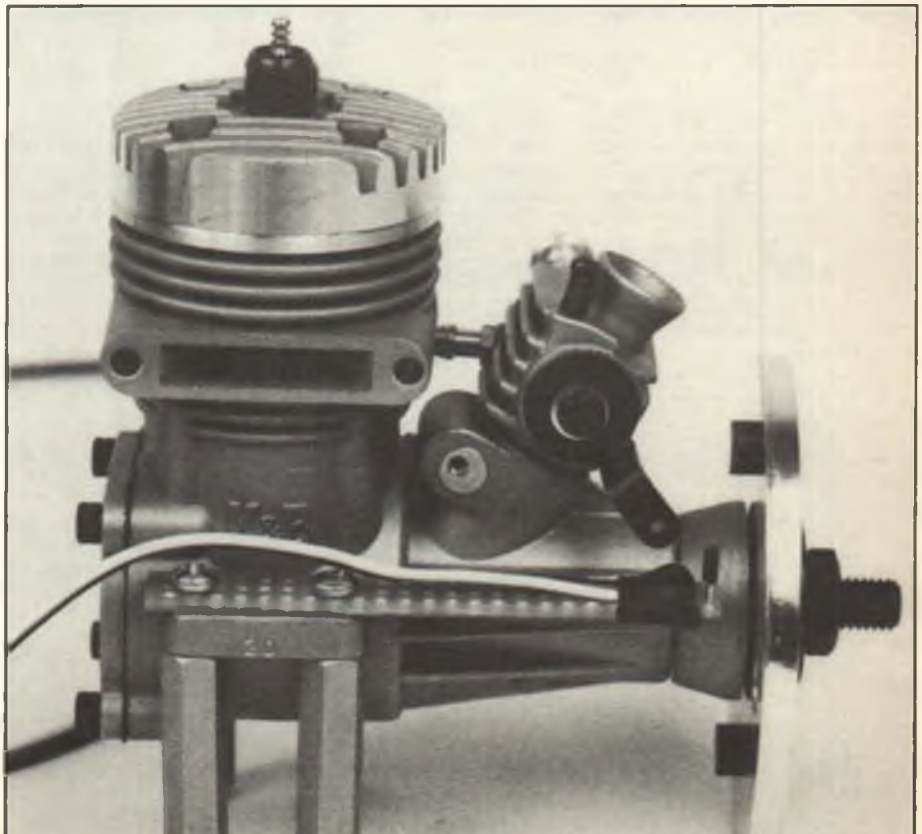
Some will also tell you that the problems associated with a twin-engine airplane go up by the cube as well. The truth is that like everything in RC, success begins in the planning stages, and in the workshop. Let's look at a few products that can make flying your twin more enjoyable and maybe add some longevity to the whole project.

JOMAR'S TWIN-ENGINE SYNC SYSTEM

This system keeps both engines running at the same speed, with precise synchronization at speeds above 2,500 rpm. In effect, the engines and their individual servos are designated as master and slave. The master combo is operated directly from the transmitter, the slave by a signal from the sync unit. Small magnets inset into the spinner backplate trigger Hall-effect sensors mounted directly behind them. These sensors pass engine rpm back to the sync unit where they are compared, the sync unit then controlling the slave servo to adjust that engine to match the rpm of the master engine. In the event you lose an engine in flight, either the master or the slave, you still have full radio command of the remaining engine.

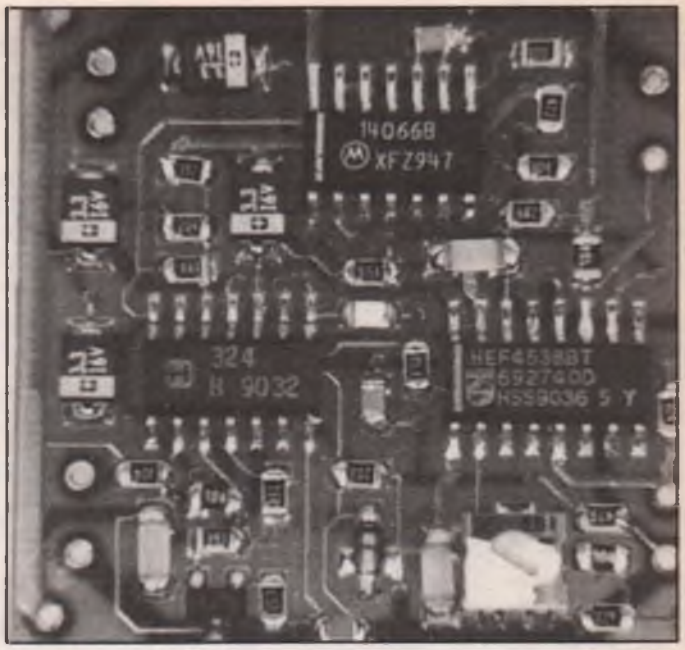
Installing the Jomar Twin Sync System is neither critical nor time-consuming, but it does require good, precise servos and a slop-free linkage—a solid wire is best, but if a cable pushrod is necessary use only the semi-flexible braided type, and keep it as short and straight as possible. No slop, no friction is the key—definitely no Z-bends anywhere!

Then there are the two round magnets to install in each spinner backplate. Be sure



The Jomar Sync System installed on a K&B 28. Note the two magnets mounted in the spinner backplate, and the Hall-effect sensor and lead on the end of a strip of plated-hole perforated electronic prototype board available from Radio Shack. Makes a neat installation, no?

The most critical part of the Jomar Sync system installation is mounting the two magnets in each of the spinner backplates; the magnets are color coded for polarity and must be installed according to the instructions. Eloy recommends this simple fixture to assure precise spacing and alignment. The board is clamped to a drill press table; the backplate is rotated into position and then clamped to prevent movement during drilling. An aluminum spinner, or at least an aluminum spinner backplate, is a must.



Though small in size, the Jomar Sync System contains some sophisticated electronic circuitry, constructed in modern surface mount component technology.

they are installed exactly 180 degrees apart, and that they are in a location to which you can align the sensors. The magnets must be press fit into a 1/4-inch hole—a drill press is a must here. I used a letter D size drill bit for this, which is .246 inch in diameter. The magnets would not quite fit into the hole. Then I put the magnets in the freezer, and by the next day the magnets had shrunk enough for an easy press fit into the backplates. A drop of Loctite or similar thread sealant around the magnet is extra insurance!

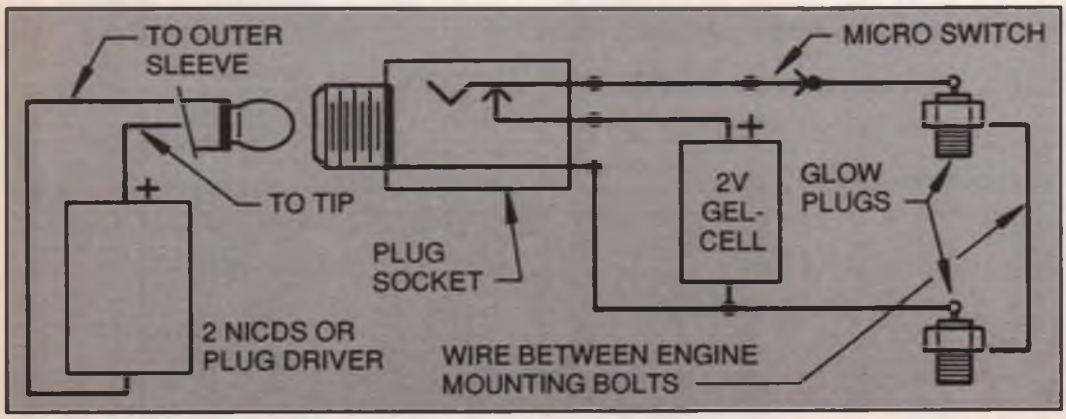
The Hall-effect sensors resemble a small three-lead transistor. They have three wire legs, to which you have to solder a wire three-wire lead that runs back to the sync unit in the fuselage. Installation of the sensors requires some thought. Quoting from the instructions: "The Hall-effect sensor should be positioned so that the back (the wider side WITHOUT lettering) faces the front of the aircraft. You can use regular CA glue to hold the PRINTED SIDE of the sensor to a small bracket mounted under one of the engine mounting lugs. The red surface of the magnets should face the sensors! Clearance of anywhere from 1/16 to 3/16 of an inch is OK."

My solution to this task was to mount the sensors to a slice of pre-drilled printed circuit board, such as Radio Shack's 276-147. In addition to properly spaced mounting holes, each hole is ringed with copper so that the components can be soldered in place. I used the end three holes for the sensor leads and the three adjacent holes for the wires, bridging one to the other. The assembly is mounted in place with the engine mounting screws. Neat, but not gaudy!

Now that you've got those engines synchronized, I have a suggestion on how to keep them running: *Light the plugs at low throttle!*

There are a couple ways of doing this. The first method I'll describe is a do-it-yourselfer, practical on larger airplanes only because it involves a somewhat large and heavy battery being carried along; but it has the advantage of being simple, cheap and generally foolproof. It involves the use of a 2-volt, 2.5-amp gelled electrolyte cell, the type commonly known as "gel cells." (New Gates gel-cells are available from Allied Electronics—800-433-5700. They are Gates No. 0810-0004, Allied No. 221-2001, and the cost is $6.51.) The system will not work the same way with a NiCd cell, which is rated at 1.25 volts.

The glow plugs are connected in series, so that each plug will receive 1 volt—not enough to start the engine, but enough to keep things going smoothly once the engine is running. For starting, provision has been made in the schematic to apply full power through a socket, preferably from a power panel capable of driving two plugs in series, or from two NiCd cells, also in series. By using the socket and plug shown, direct connections are made to the appropriate starting or on-board cells when the plug is inserted. Turning the glow plug heat system on and off at the desired point can be done with a Radio Shack



Schematic for supplying keep-alive low voltage to both engines on a larger twin (or even a twin-cylinder engine) and also for an external starting voltage. The micro-switch is operated by the throttle servo and can be adjusted to light the plugs at any point you like—usually the bottom third of the throttle servo travel. McDaniel R/C makes a lighter and much more sophisticated electronic unit that does basically the same thing—see text.

micro-switch actuated by the throttle servo, or by a pushrod-activated device called a "Switch Box" (S/N 60K31) from Ace R/C.

Another way to light the plugs at low throttle:

THE McDANIEL ON-BOARD ELECTRONIC GLOW DRIVER SYSTEM

The name is self-explanatory: this is an electronic device that lights your glow plugs while you're airborne! However, there's more to it than that; I will quote from the instructions:

"The On-Board Glow Plug Drivers will drive one to five glow plugs as efficiently as the newer power panels. It switches a higher voltage, at reduced amps, for a very short time to each plug, 'fooling' the plugs into thinking they are getting regular power. We switch the plugs on and off so fast (188 times per second), they appear to stay on continuously. This allows the use of smaller batteries to do the work of the larger, more expensive ones and reduces the overall weight and cost."

There are seven models of the McDaniel drivers; No. 472 is intended for twin-cylinder engines or twin-engine installations. This unit, recommended to be used with at least an 800-mAH four-cell battery, weighs a total of 7 ounces. The electronics package is in a small plastic box about the size of a flat four-cell 500-mAH pack. The system can be operated by the throttle channel (for which a Y-harness is required) or by any other aux channel. It can be set to go on at any point desired, at which time an LED lights to let you know that the plugs are under power.

Installation boils down to connecting a battery, connecting the plugs, connecting to the receiver, and setting the turn-on point. The plugs are effectively connected in series. In a twin-cylinder engine, the plug-to-plug connection is already there; in a twin-engine airplane, a wire has to run from engine to engine. The system comes complete with electronics, glow plug adapters, all wiring and connectors, instructions and spare parts price sheet. McDaniel R/C can also furnish batteries, chargers, Y-harnesses—everything you'll need for a custom installation. Contact them directly for delivery and price information: 1654 Crofton Blvd., Ste. 4., Crofton, MD 21114; (410) 721-6303.

There is yet one more device to tell you about:

THE EMS SERVO REVERSING Y-HARNESS

As RC aircraft became more sophisticated, the need to operate two servos from one channel became necessary. However, in some applications it's advantageous to have the two servos operate in opposite directions. Linkages are simplified and things operate exactly in step and without any undesired differential.

The Electronic Model Systems Servo Reversing Y-Harness will do just that for you—operate two servos from the same channel, each in a different direction. No adjustments, no wiring, simply plug in and go. The Reversing Y-Harness, No. SR-2Y, is priced at $19.95. A normal Y-harness without the reversing feature (No. GS-1Y) is $15. On a twin, either of these items could come in handy if you're using individual throttle servos. Both the Jomar Twin Engine Sync System and EMS Y-harnesses are available from Electronic Model Systems, 22483 Mission Hills Ln., Yorba Linda, CA 92687; (714) 692-1393.

There really is no reason to keep putting off building that twin, now is there? ***MB***

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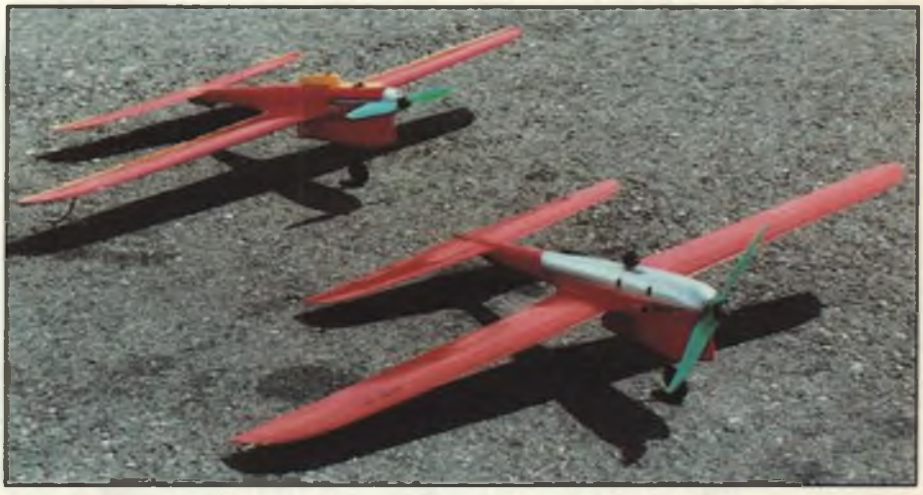
A CONTROL LINE COMPETITION PRIMER

Control line competition events are often mentioned in this column, but it's assumed that the reader is familiar with the activity. For the novice or casual flier interested in moving toward competition, however, a brief explanation of the events may be valuable.

Control line is a form of model aviation than lends itself well to competition, and for that reason a high percentage of CL fliers maximize their fun by participating in contests. Contests range from informal club fun-flies to serious national and international competition. There's a level of involvement to please almost any casual or serious CL flier.

What follows is a capsule description of most of the common CL competition events in the U.S. We'll also suggest engines and airplanes for a few of those events most attractive to novices where the choices are fairly clear-cut. In many cases, the choices are up to the individual or the constantly changing state of the art. The events are listed by category, starting with the entry-level events and move up the scale of skill requirements.

Precision aerobatics rewards the appearance of the plane as well as a well-flown aerobatic pattern. Gordon Delaney's twin-engined planes, such as this Gemini seen at the 1995 Nationals in Richland, Washington, always please spectators.



After considerable experience in introductory events such as sport race and mouse race, fliers reach the top gun level, where they may compete in rat race. These two rats are campaigned by Mike MacCarthy and Roger McIntyre of California.

COMBAT

Two airplanes are flown in the same circle at the same time. Each plane tows a paper streamer at the end of a string leader. The object is to score points by using your prop or plane to cut the streamer. Points are also scored for each second that a plane is aloft during a predetermined match period (usually 5 minutes).

•**80-mph combat:** This is not in the AMA rulebook but is one of the fastest-growing combat events because it is a true "slow" event suitable for beginning combat fliers. There are variations in how the event is run, but all use the 80-mph speed limit, which is a perfect speed for both good airplane performance and the flying skills of casual CL fliers. Basic equipment: Any common AMA fast combat flying wing design (Arrowplane, Allenplane, Gotcha, Voo Doo, etc.) and any .35 engine that can be tuned (with prop, fuel, etc.) to fly at about 78 mph (O.S. .35, Fox .35, K&B .35).

•**1/2A combat:** An AMA event for very small airplanes. The planes can be more durable than the larger planes and, if flown over soft grass, can be excellent for practice sessions. However, they are very quick and a bit more of a handful than the 80-mph planes, and the engines can be a bit more tricky to operate. The match rules are the same as for fast combat. Once you get the hang of it, 1/2A combat is fast, furious

Navy Carrier planes are rewarded for scale-like appearance. Here are two examples, an MO-1 (left) and a Hawker Sea Fury, seen at the '85 Nats.

and fun. Basic equipment: Any of numerous small flying wing designs (LiteHawk, 1/2A Arrowplane and Faisov 1/2A). Engines include the Cox Tee Dee .049, the VA .049 and the AME .049, among others, on bladder pressure.

• **Slow combat:** An AMA event for .35 powered airplanes with a fuselage, wing, tail and suction fuel system. The "slow" in the name is misleading, because the better planes fly over 100 mph. Suction fuel systems can be tricky to operate, but this makes a good steppingstone to fast combat for those who want to make the intermediate step, or just a chance to fly more matches. Basic equipment: Any profile airplane that meets minimum specifications in the AMA rulebook. A fuselage on a fast combat wing can be used; any of several common profile planes can also be used as a first effort. Engines: Fox Combat Special .36, Nelson .36.

• **FAI combat:** The international class of combat, and the rules are quite different from American combat. This is the event to fly if you want to be world champion; get a copy of the FAI Sporting Code from AMA. Airplanes are similar to U.S. fast combat designs.

• **AMA (fast) combat:** All-out combat for the kill. This is the most exciting event in CL competition, and surprisingly, can be done by fliers with only a moderate amount of practice in the above events. Speeds are in the 120-mph range. The only limitation on the equipment is the engine displacement—.36. Airplanes are flying wings of numerous designs, mostly constructed of foam.

NAVY CARRIER

This event simulates takeoffs and landings from an aircraft carrier, with a flight mission between. Airplanes use three-line control systems and feature engine throttles and deployable arresting hooks. The mission is to take off, fly at high speed for a timed period, fly at the lowest possible speed for a timed period, and make an arrested landing on the deck. The score is a combination of the three tasks.

• **.15 carrier:** A non-rulebook regional event that offers an inexpensive entry into carrier flying, and in some regions bans some of the more difficult technology from the airplanes. Any carbureted .15 and any profile-fuselage airplane with a military profile can be used (some non-scale kits can be modified to have a Navy profile).

• **Profile carrier:** An AMA event for profile airplanes; scale appearance is rewarded but is not mandatory. After a lot of practice, fliers learn to fly these very slowly, sometimes using tricky devices such as line sliders which vary the leadout position in flight. Any profile-fuselage design with a Navy profile, or which can be modified to a Navy profile, can be used. A high-performance .36 throttled engine is required.

• **Class I and Class II carrier:** These are events requiring full-fuselage scale models of carrier-based full-scale airplanes. Class I is limited to .40 engine displacement; Class II airplanes must have .40-.65 size engines.

PRECISION AEROBATICS

The most beautiful airplanes in model aviation compete in this event, as participants compete for appearance points as well as for flight scores. The task is to fly a prescribed aerobatic pattern, in order, before a panel of judges. The activity is divided into four skill classes so that any flier can compete with fliers at approximately his own ability level. The 15 maneuvers are described in detail in the AMA rulebook. There is a bonus for doing all of the events in order. It takes a lot of practice to make the maneuvers truly precise.

• **Beginner precision aerobatics:** This event features a simplified pattern as compared to the other three skill classes. Required are takeoff and level flight, wingover, inside loops, outside loops, inside square loops, horizontal eights, overhead eights, and landing. Any CL airplane that will perform simple aerobatic maneuvers can be used (Ringmaster, Prowler, Twister, etc.) Any engine appropriate to the airplane is allowed; Fox .35 and O.S. .35 are good choices.

• **Intermediate precision aerobatics:** This is the entry-level stunt event for fliers who can do the entire AMA pattern, and have not scored above 400 points. Flapped profile airplanes or full-fuselage stunters can be used (Twister, Magnum, etc.). Engines such as the Fox .35 and O.S. .35 or .40 are common.

• **Advanced precision aerobatics:** Fliers at this level have scored 400 or higher; most use full-fuselage stunt planes and usually use .40-.60 engines.

• **Expert precision aerobatics:** These are the top fliers, and their planes and patterns are works of art (these fliers have scored 500 or more points). Equipment is often high-tech. Several sophisticated kits are available, and engines such as O.S., Aero, Super Tigre and Merco are used.

• **Old-Time Stunt and Classic Stunt:** Popular variations of precision aerobatics. Old-Time Stunt requires pre-1952 designs and vintage engines. Old-Time stunt uses the pre-1952 stunt pattern. Classic Stunt uses the modern pattern but requires airplane designs to be at least 25 years old.

RACING

This is a speed and teamwork event. Two or more airplanes fly in the same circle simultaneously. They fly a prescribed number of laps in heat and feature races. Races start with the engines off and the planes on the ground. On signal, pit crews start the engines and launch the planes. One or more pit stop is required during a race; the pilot shuts off the engine, lands the plane and the pit crew refuels and restarts it. Timers at each pit station record the time it takes for each plane to make the required number of laps. Fastest times advance to the feature races.

• **Mouse race:** There are two classes for these tiny 1/2A powered racers. In Class I, the engines are restricted to reed-valve .049s (such as the Cox Black Widow). The airplane's control system must be external. Races are 50 lap heats and 100-lap features, with three up at a time. Class II allows any .049 engine—Cox Tee Dee, AME, VA and other engines can be used. Races are 75 and 200 laps. There also are variations called 1/2A Scale Race I and II in the AMA rulebook that are substantially the same except that the planes must be semi-scale models of full-scale racing planes.

• **Sport racing:** This is not in the AMA rulebook but there are popular variations in many parts of the country. These events are generally restricted in engine and airplane combinations to common, easily obtainable products. These events usually involve .35-powered planes with speeds no more than about 100 mph. They represent an excellent way for beginners to get the hang of competition in general and racing in particular.

• **Scale racing:** An AMA event that requires profile replicas of full-size racing planes. Engines are .15 size and various racing trick equipment is allowed—shutoffs, fast-fills, hot contact battery connections, etc. Engines such as Nelson and Rossi are common. Some regions have a "Sport Goodyear" class with restricted engines,

Many young fliers are attracted to combat, an athletic form of CL model aviation competition. Tim Strom used this Russian-designed plane to become the top fast combat flier at the 1995 Nats.

Speed planes are a triumph of functionality, with clean, sophisticated and sometimes exotic designs. Two examples seen at the 1995 Nats include a Formula 40 on the left (as a proto-style plane, it has a landing gear) and a conventional speed plane on the right (note takeoff dolly and tuned pipe exhaust).

and Sig Shoestring and Buster kits can be used in these. Races are 70 laps and 140 laps.

•**Slow rat racing:** This is another event in which "slow" is a relative term; good slow rats approach 130 mph. Airplanes are restricted to profiles of specified dimensions and use suction fuel systems. Nelson .36, Fox Combat Special .36, TWA .36 and other high-performance engines are used. Races are 70/140.

•**Rat racing:** This event requires true athletes as pilots. Planes are in the 150-160 mph range and pull hard. The airplane designs are unlimited except for the .40 displacement (.40 engines have a venturi-size restriction; .21 engines can run unrestricted). Races are exciting, and this event draws the top pros in CL racing. Engines include O.S., K&B, Nelson and other high-performance engines. Races are 70/140.

SPEED

There are a variety of speed classes for people with absolute velocity as their goal. The planes fly a prescribed distance all-out against a clock. Some engines are hand-built by the participants. However, even in this category, some events are designed for beginners.

•**1/2A proto speed:** Minimum dimensions are set for these airplanes, which must have wheels, a canopy and a two-line control system. Powered by .049 engines, they fly their course from a standing start. This is a good place for beginners to get the feel of speed flying. A Tee Dee, AME or VA .049 will get you started.

•**.21 sport speed:** Some airplane restrictions (such as a symmetrical design) and a two-line control system make this a place for speed novices. Engines are limited to .21 displacement. Otherwise, it's a true speed event.

•**Formula 40 speed:** This event was designed to allow a speed competition for rat racers. Planes fly proto (from a standing start) speed and must have two lines and a landing gear.

•**.21 proto speed:** Growing in popularity, this event features colorfully decorated planes with .21 engines, two-wheel landing gear, and two-line control systems.

•**1/2A speed:** This is a true high-tech event, with the national record at over 156 mph, and many homebuilt engines. Like the events below, control is via a one-line system and the planes are exotic. The only limitation is that the engine be no larger than .05 displacement. Planes have no landing gear and take off from wheeled dollies.

•**A speed:** Engines up to .15; the national record is over 179 mph.

•**B speed:** Engines up to .30; the national record is over 177 mph.

•**D speed:** Engines up to .65; the national record is over 196 mph.

•**Jet speed:** This class uses pulse jet engines; the national record is over 193 mph.

•**FAI speed:** The international speed class, using exotic airplanes, no-alcohol fuel and two-line controls. Engines up to .15; the national record is over 177 mph.

Somewhere in that array of popular CL model aviation competition categories, there's something of interest to every CL flier. All it takes is some research, some practice, and a little luck to start stocking your own personal trophy shelf!

• • •

Send contest flyers, contest results, club news, photos, questions, technical tips and other items of interest to control line fliers to the *Model Builder* Control Line column. Write John Thompson, 295 W. 38th Ave., Eugene, OR 97405. E-mail at JohnT4051@aol.com. ***MB***

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A good first competition glider, the Kestrel has all the attributes a first-timer needs: low sinkrate, hands-off launch, flat glide, and rock steady approach with no tendency to fall off at the tip.

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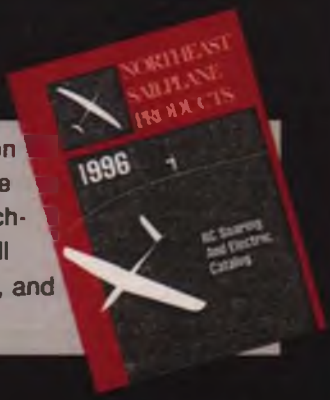


Coming Up Soon— The Postal Electric Duration Challenge!

This year's contest features three distinct categories to appeal to a wider range of fliers. Also discussed: New products of interest to electric enthusiasts.

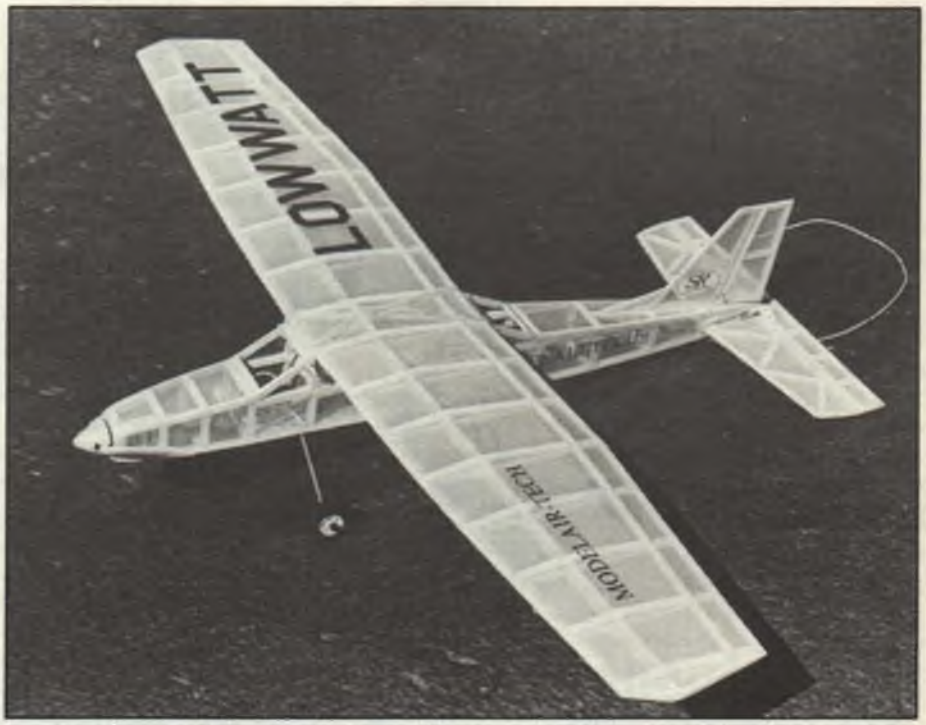
Well, here it is—time for the Third Annual Postal Electric Duration Challenge! The object of this contest, which is organized by Jerry Smartt, is to keep an electric-powered airplane in the air as long as possible. This year there will be three competition categories: 1) Continuous Motor Run, 2) NiCd Batteries Only, and 3) Anything Goes—period!

For the Continuous Motor Run class, the object is to fly as long as possible on a single non-stop motor run. The length of the motor run is what determines the winner, not the overall flight duration. As you might recall, last year's Duration Challenge winner had a flight of over 3 hours, but only an hour of that was motor run time. Electric fliers in Europe (where electric duration flying is really big) have achieved motor runs of a few times that. It's all in the proper selection of motor, batteries, gearbox and propeller.

Per suggestions from last year, there will be a NiCd Batteries Only class. In previous contests there were no limits on the type of batteries used—last year's winner used expensive, one-shot lithium cells. This new class is for those who want to see what can be done with readily available, more affordable NiCds.

The last category is "Anything Goes," and that's exactly what it means. Simply keep the plane in the air using methods limited only by your imagination and your wallet. Except, of course, an electric extension cord—that would be cheating!

The payoff for this contest, in addition to a perpetual trophy and other participant awards, is knowing you've done something that few U.S. pilots have done. Duration flying is really just in its infancy in this country, but once you try it, you may get hooked! The contest will be held between June 15 through June 23. You can fly as often as you wish during this nine-day window (including two full weekends). The entry fee is $5 per category. You must record separate flights for each category entered—i.e., one flight can't be counted for more than one category.

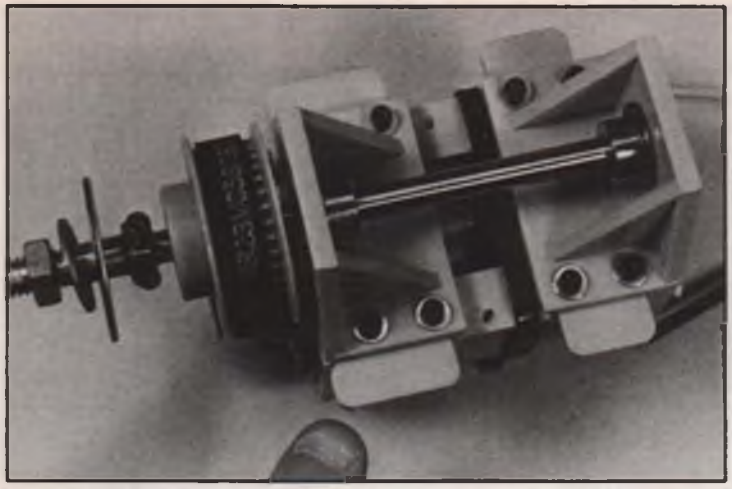


The "LowWatt" is one of several models offered in plans form from ModelAir-Tech; it's a compact 36-inch span design for Speed 400 or similar motors and is unique in that it's made almost entirely of 1/8x1/4 balsa sticks. Full kits should be available soon.

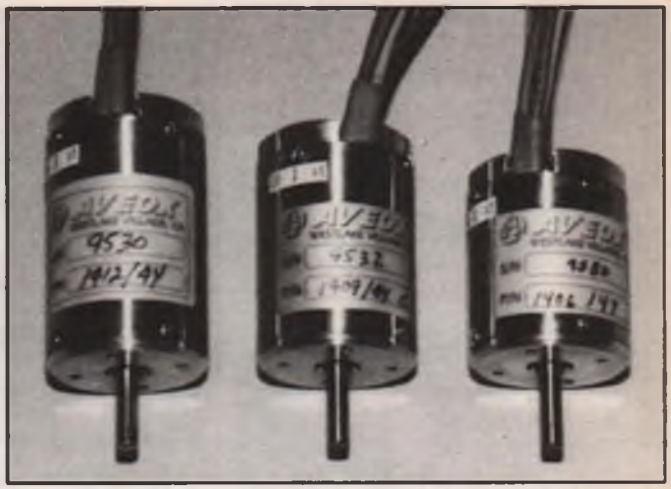
For details about the contest, contact the CD, Jerry Smartt, Rt. 3 Box 300, Warsaw, MO 65355; (816) 438-5682, Fax (816) 438-9573. I also have copies of the contest information sheet and reprints of my November 1995 column (which was devoted entirely to getting started in electric duration)—if you would like copies of these items drop me a note with an SASE and I'll send them to you.

LEHIGH VALLEY FUN-FLY

Also on the agenda for June is the Ninth Annual Lehigh Valley Radio Control



Model Air-Tech's H-1000 belt drives now feature beam mounting legs, which can be cut off if you prefer some other form of mounting. These leg-equipped molded plastic shaft supports are also available separately if you have one of the original H-1000 units and wish to upgrade.



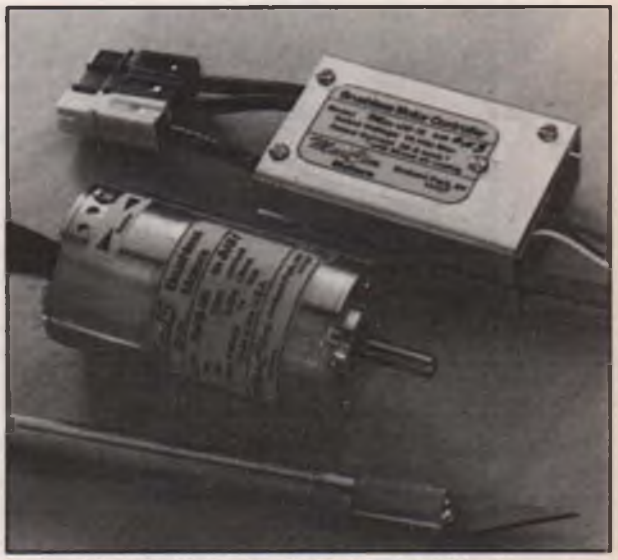
Aveox motors have become the hot ticket in electric competition, particularly the International F5B class. These motors now feature Kevlar-wrapped rotors so as to stay in one piece at revs up to 80,000.

Society Electric Fun-Fly at their club field in Easton, Pennsylvania (about an hour north of Philadelphia). This contest is open to all electric powered aircraft, and AMA membership is required to participate. There will be some open flying and some contest events—a little something for everyone. For more information contact Michael Stewart, 107 Taft Terrace, Washington, NJ 07882; (908) 689-6981. I can also supply copies of the contest announcement for an SASE.

MINI BOOK REVIEW: *CLEAN & QUIET*

Many of you know Bob Aberle as a contributing editor of *Flying Models* magazine and a prolific designer of electric models. Bob has been flying electric since 1979 and has finally put his knowledge on paper in a book called *Clean & Quiet—The Guide to Electric Powered Flight*. I've had the chance to read it cover to cover and would like to recommend it as probably the best reference for beginning electric pilots, particularly those who are already familiar with gas power. Others have written E-power books for the beginner, but this one really starts from scratch and introduces you to electric flight from the ground up.

Clean & Quiet starts off with the advantages of electric flight, and although Bob mentions the "disadvantages," he instead calls them "considerations." Bob really doesn't explore the "considerations" in depth, but I think one can assume that if you're reading a book on electric flight, your interest has been piqued to a form of flying that isn't really better or worse than gas flying—just different.



Another choice is brushless motors, the Max15 and matching microprocessor-based control unit from Tom Cimato of MaxCim Motors. With no parts to wear out, these motors have a virtually unlimited lifespan in normal use.

Bob Aberle's new book for those looking to get involved in electric power—see text for our columnist's comments.

Bob continues with a discussion of flight systems, then detailed explanations of each part of the flight system, i.e. the motors, propellers, batteries, chargers, speed controls, wire, connectors, fuses, switches, and charging techniques. Of particular importance is a table that lists typical aircraft and the flight systems recommended to fly them. As those who fly electric know, motor technology has advanced considerably, but motor designations have not, leading to mass confusion about how much power really can be expected from, say, an "05" or "15" motor. This chart goes a long way toward answering the questions of what kind of airplane to fly and how to power it.

Pictures and tables are plentiful in *Clean & Quiet*. Bob convinced fellow E-flier and cartoonist Don Bousquet to draw a series of cartoons especially for this book. Longtime modeler Frank Fanelli did the editing. If you're afraid of things getting too technical with charts and graphs and mathematical formulas, don't worry—this book has none of that. It's simply a book about how to quickly and easily get started in electric flight. If you want to get technical, there are other books out there where you can take pencil and paper in hand and exercise your calculator.

Clean & Quiet by Bob Aberle is available for $12.95 plus $3 postage, from Douglas Charles Press, 440 Mendon Rd., N. Attleborough, MA 02760. Orders may also

be called in to (508) 761-5414.

MODELAIR-TECH NEWS

Bob Aberle and Tom Hunt continue to design, develop and market products for their company, Modelair-Tech. I received copies of two of their recent model plans, the LowWatt and the DimWatt. These planes are tailor-made for the Graupner Speed 400 class motors, and there is a twin Speed 400 version of the DimWatt in the works. What's so nice about these two designs is that you can build the models primarily with 1/8 x 1/4 balsa sticks. There are no formers and no ribs to cut — just sticks! The only parts that aren't balsa sticks are the 1/16 plywood motor mount and the 1/8 plywood landing gear mount. The plans look great. I'm partial to the LowWatt and am really anxious to start building. As luck would have it, I have a couple of Speed 400s with nothing to do at the moment. At the moment only the plans are available for these planes, but some kits should be in stock by the time you read this.

Modelair-Tech's H-1000 belt drive unit has been improved with the addition of molded mounting ears for easier beam mounting. Plans for some classic Old Timer aircraft are also available, including the Playboy Senior and Don Foote's Westerner, both scaled to 630 square inches for seven-cell systems. Other plan sets and semi-kits are available, as is their new 1996 catalog. To get a copy, send a self-addressed business-size envelope with two 32¢ stamps to Modelair-Tech, P.O. Box 12033, Hauppauge, NY 11788-0818; (516) 979-1475. For two stamps you can't go wrong!

"NO NOISE" T-SHIRT

While scouring through the many electric club newsletters I get each month I found an ad for Tim McDonough's "No Noise" T-shirts, and had to get one for myself. I've had a lot of compliments from my fellow electric fliers, and it causes quite a stir at the gas field where I fly periodically. It's an attention-getter off the flying field too! If you'd like to buy one, contact Kirk Massey for details and pricing at New Creations R/C, P.O. Box 496, Willis, TX 77378; (409) 856-4630. Club discounts are offered for eight or more shirts shipped to the same address. Clubs should contact Tim directly at 127 S. Oaklane Rd., Springfield, IL 62707; (217) 523-8625.

BRUSHLESS MOTOR UPDATES

Also in the mailbox recently was information from two brushless motor manufacturers. First up is Tom Cimato and his line of MaxCim motors. Tom is promoting his new Max15 series of high-performance motors. Features include an aluminum housing around the coil windings to provide a direct heat dissipation path to outside air, the best temperature-stable samarium cobalt magnets available, an advertised motor life approaching 50,000 hours, fixed optimum timing positions for each motor direction, and a no-maintenance design. The microprocessor-based motor controller has a feature list a mile long and is equally impressive. MaxCim Motors can be contacted at 57 Hawthorne Dr., Orchard Park, NY 14127-1958; (716) 662-5651.

Cathy Jaffe models the new "No Noise" T-shirt being marketed by Tim McDonough—sure to guarantee you a warm welcome at the local gas flying field. Text tells where to get one for yourself (the shirt, not Cathy!).

Aveox has also made some improvements to their line of brushless motors, including a new Kevlar-wrapped rotor assembly that can operate at speeds in excess of 80,000 rpm without disintegrating. This high-strength material was used in the 10-cell 1412/2Y Y-wind motors (running 27 cells, a 3.8:1 gearbox and 15x12 prop) that have made the Aveox motors virtually unbeatable in European F5B contests. If you'd like to learn more about the Aveox line of motors and speed controls, you can contact them at 31324 Via Colinas #104, Westlake Village, CA 91362; (818) 597-8915.

THE WRAP-UP

So now the mish-mash file is empty; next month I should have some great information and super pictures on the First Annual Electric Fall Fest Fun-Fly in San Diego. Until then, please send your comments and pictures to me at 6462 Sunny Brae Dr., San Diego, CA 92119; (619) 463-4453 (between 8 and 5 Pacific time, Monday through Friday) or via e-mail at 74164.3237@compuserve.com. ***MB***

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ELECTRONICS CORNER

BY ELOY MAREZ

RC Electronics Lingo—Let's Get It Right!

The "ModelCalc" from Calculated Industries

Lithium Batteries

I forget who, but someone is claimed to have stated that "There is nothing new under the sun." Obviously that person was not involved in RC; I see new items and ideas with every month's crop of magazines. However, as someone else claimed, "What goes around comes around"—and I recently noted something in that respect as it applies to us RCers.

Way back in the pioneer days, to be an RC modeler, you had to be a "ham," a radio amateur, which also meant that you had to be on speaking terms with electrons. Even in the early days of non-ham RC, the days of 27 MHz, when almost all flying was done with home-brewed equipment, knowing your way around electronic circuits was still a necessity. In the early '60s, we began to see commercially produced equipment, though it still helped if you knew about such things as polarity and knew how to solder.

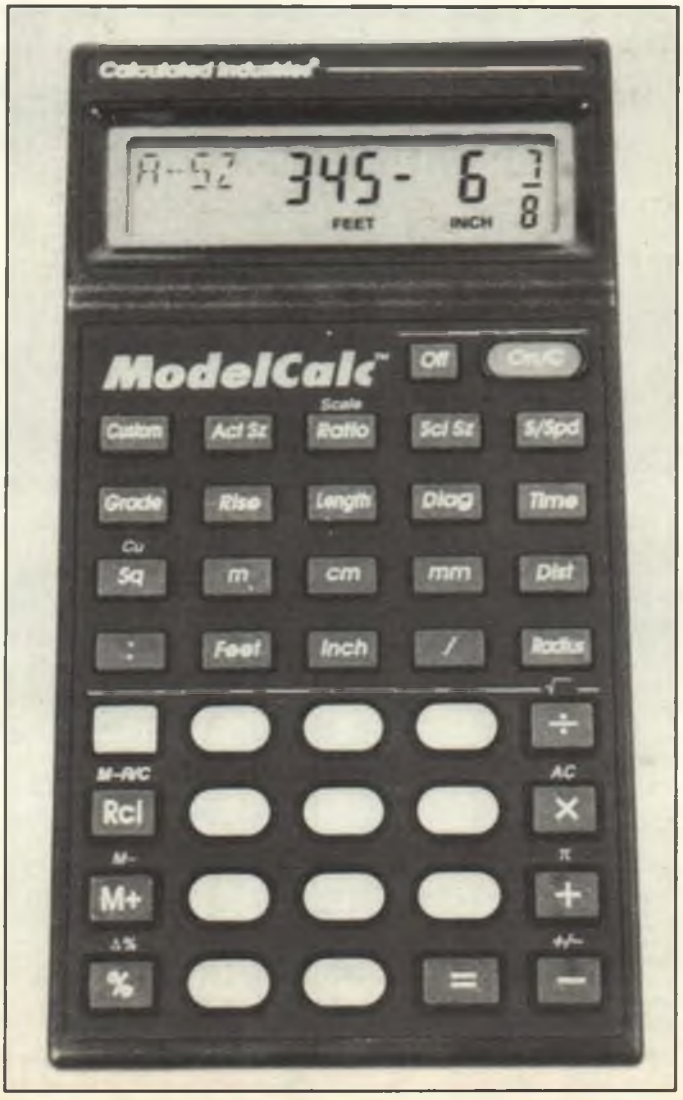
Toward the end of that decade, though, things changed, and the first "install and fly" radios appeared, and a whole new world opened up for the model builder and flier. One could be successful in the hobby with little knowledge, or interest, in what was inside that black or gold or red box! Which is the way it should be, because even with my personal interest in what goes on inside those now almost all chrome and black boxes, I never forget that this is basically a flying and not an electronic hobby.

However, things have now indeed come around. With the advent of electric power and computer-based radios and a lot of useful add-on accessories, to be successful one has to learn at least the rudiments of things electric and electronic. Look through any magazine; you'll find articles and advertisements dealing with all kinds of sophisticated accessories, which require that at least the difference between a lot of terminology not directly connected to flight be known. Think about it—AM, FM, PCM (generally referred to incorrectly), volts, amps, MOSFETs, amplifiers, coreless motors, narrow band, etc., etc., etc.!

Unfortunately, a lot of what we read in that respect is not always 100 percent correct. It often seems that something just has to *sound* impressive to be taken for gospel, and printed. As I prepared to do this month's column, I ran across both an article in which mA (milliamperes) and mAH (milliampere hours) are used in reverse; and an ad for a new autopilot device in which mAH is used when clearly mA is meant. There's nothing we can do about the wholesale mistakes by the RC world, but so that EC readers can understand the two, I would like to discuss them.

First of all, we're talking about electrical current, the unit of measure of which is called an "ampere." Comparatively speaking, an ampere is a pretty healthy amount of current, especially in modern solid-state circuitry, so we often measure current in submultiples, the most common being the milliampere (mA), which is 1/1000 of an ampere. If even smaller amounts of current need to be measured, it is done in millionths of an ampere, called microamperes (uA).

The correct way to express these abbreviations in written form is to use capitals for all basic complete units, such as A for amperes and H in the example to follow for hours, and



The "ModelCalc," intended primarily for scale model building calculations. It accepts and scales and/or converts all linear, square or cubic units, both inch and metric. This is a must-have tool for all who design and build their model airplanes from scratch.

to use small letters for all multiples or sub-multiples, such as m for milli and u for micro. (Actually, the u is incorrect, standing for the Greek "Mu," which is correctly written with a long lower leg on the leading edge. However, most typewriters not having this symbol, the common u is accepted.)

Anyway, the whole thing is simple, which makes incorrect usage an even greater sin. Milliamperes, or mA, is the measure of the current flowing in a circuit. Milliampere-hours, or mAH, is the capacity of a battery, stated as a value—600 mAH, for example—being the amount of current said battery is capable of furnishing under parameters specified by its maker. For example, Sanyo rates its cells at a 5 hour rate at 0.2C. That is, the 600 mAH Sanyo cell will produce 120 mA (600x0.2) for 5 hours. Obviously, a deviation in the current drain will effect the available time, higher drains resulting in lower operating times and vice versa.

A rough analogy can be made to the fuel tank in your airplane. The tank has a capacity, as does a battery, which we measure in ounces—a 10 ounce tank, for example. If we use the fuel at the rate of 1 ounce a minute, we can then refer to it as a 10 ounce-minute tank, right? As in the case of a battery, if the rate of fuel consumption decreases, the running time will increase, and vice versa. In a battery, then, this is milliampere-hours (mAH)—the *amount of milliamps* that the battery can furnish over a given number of hours. The *rate of usage* is stated as milliamperes (mA). They are different animals.

Incidentally, since you asked, an ampere is the number of electrons passing a given point in a circuit in a second, that number being 6,250,000,000,000,000,000. Now aren't you glad you read the column this month?

THE "MODELCALC"

To someone like me, who at one time made calculations with a slide rule—which I now look at as only slightly better than an abacus—the modern electronic calculator is a wonderful device indeed. I recently became acquainted (actually I should say I am still getting acquainted) with a most interesting and useful calculator called the "ModelCalc," from Calculated Industries.

It's described as a "Scale Modeler's Dimensional Calculator," and includes every possible function you can think of to scale dimensions up or down, as well as right angles, circular and speed/time/distance features. It includes 22 common scale ratios which can be used to find the scaled size of any project with the press of a key. If your project has to be some non-standard scale to accommodate, say, a certain size set of wheels, you need enter that information only once, after which all other dimensions entered will be calculated rapidly and correctly. You can permanently store up to four such custom scales, any of which you can then use as desired for accurately scaling your drawings or photos.

Converting common fractions to decimals (always a necessary step) could not be any simpler, as the ModelCalc accepts common fractions as written, i.e., 7/8, and does the necessary conversion with the next calculation. You can even mix denominators, such a 1/2, 5/8, and 7/32, and have your answer after pressing one button. Not only that, it will work similarly in converting all common units to whatever one you most like to work in. It will do that for feet-inches, decimal feet, decimal inches, inches-fractions, meters, centimeters, and millimeters—any of which can be mixed in the same entry with your answer in the unit you prefer. If that isn't enough, it'll work in square and cubic formats of all of those units. Speed calculations are made by entering the distance traveled and time; both scale and actual speed calculations can then be obtained.

ModelCalc includes what is referred to as a "paperless" function that allows one to review the last 20 calculations. This feature saves having to remake calculations, sometimes needed for verification. As a more common math calculator, the ModelCalc includes +/-, square root, Pi, delta % functions, as well as incorporating memory and auto-off functions.

Even with all that capability built in, the ModelCalc is only 2.875x5.5x.5 inches in size; the digits being 5/16 inch high. It is priced at $59.95 plus $5.95 S&H, which includes a case and 47-page User's Guide. It is available directly from Calculated Industries, Inc., 4840 Hytech Dr., Carson City, NV 89706. It is also available from some dealers; call (800) 854-8075 for the one nearest you. Canadians call (800) 667-1476 for that and any other information.

LITHIUM BATTERIES

David Lewis, of Cleveland, Ohio, wrote to ask how to determine the remaining

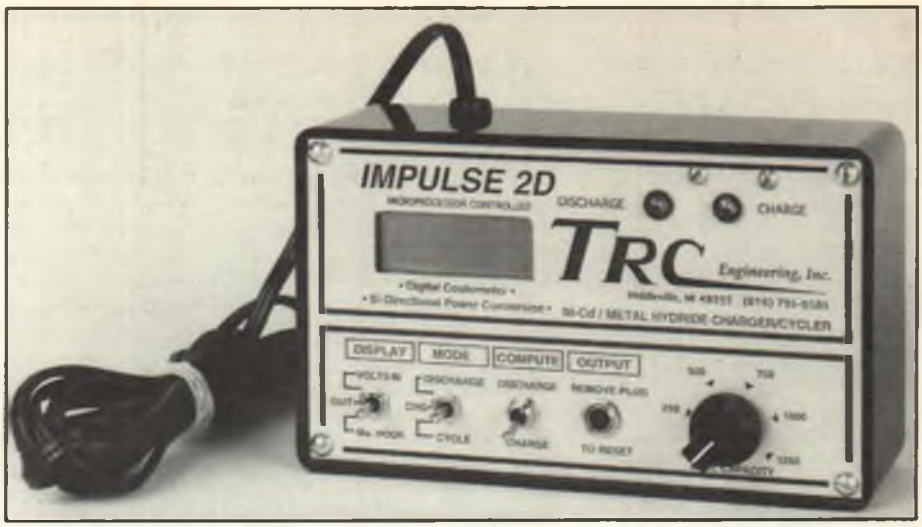
An example of ModelCalc operation: 2000 millimeters (top), instantly converted to feet, and then to inches, all at the touch of a button.

capacity of lithium batteries when used in flight packs.

Well, David, there is no easy way. Actually, with the exception of instruments such as the AeroGauge and AeroGauge LCD, previously described in this column, there is no accurate way to tell the remaining capacity of *any* flight batteries, despite what the makers of Expanded Scale Voltmeters might tell you. With NiCds, our main power source, the voltage curve can't be called a curve at all, being much too flat. To compound the problem, both the discharge curve and the capacity are affected by such things as temperature and battery history. Lithium cells are better as far as providing a steady output, but it's impossible to estimate their remaining capacity by measuring voltage.

However, all is not lost—there *is* a way! First, however, you'll have to fly with NiCds, using a battery for which you have first measured the capacity with an instrument such as the Ace R/C Abacus or Digipace or Great Planes Accu-Cycle. On the second flight, fly for a carefully timed period, then, without recharging, measure the remaining capacity. The amount you have left, subtracted from the original amount, tells you how much capacity (in mAH) you used. Dividing that by the flight time in minutes gives you the mAH used per minute. Then, dividing that into the rated mAH capacity of your lithium battery will give you the approximate flying time. For safety purposes I would de-rate that to some 90 percent. Note again that the discharge curve is perfectly flat; you are not going to get much of a warning of a low battery. The rated capacity of lithium cells is imprinted on some of them and will have to come from the maker in others.

Why lithium in the first place? Because they have a better energy-to-weight ratio, by far, than NiCds. For example, a set of Saft LSH series lithium cells weigh only 3.88 ounces, yet have a rated capacity of 5200 mAH. That's over 5 amps!



TRC Engineering's new Impulse 2D microprocessor-controlled field charger/cycler works on NiCd, NiMH and lead-acid batteries. Eloy has one and will be doing a Products In Use review for us soon. See also the write-up in this month's Over The Counter column.

Lithiums come with some cautions. They are rated for maximum recommended current as well as capacity, such information being available from the manufacturer. Also, they are rated at 3.6 volts per cell, no-load, dropping to as little as 3.0 under significant drain. This extra voltage might create some problems for our equipment, which is designed for 4.8 or at most 6.0 volts. However, when lowest possible weight is a factor, many airborne systems will operate well with only 3.6 volts, with reductions in servo speed and power but none in range. Some careful antenna-down tests are recommended.

If full voltage is required, two cells can be used, for a total of 7.2 volts, but with the voltage reduced with a 7805 voltage regulator or simply by inserting three 1N4001 diodes in series with the positive lead, which will effectively drop the voltage to 4.95 without any changes being effected by the surges normally caused by servo loads. Again, thorough pre-flight tests are highly recommended. Incidentally, lithium cells are considered discharged at 2.0 volts. A comprehensive brochure about lithium cells can be obtained from Saft America, Inc., 711 Valdosta, GA 31601; (912) 247-2331.

As an alternate, David, you might consider nickel-metal-hydride (NiMH) cells, which provide around twice the capacity in the same size and weight package as do NiCds—and they are rechargeable. Great Planes markets its line of "HydriMax" NiMH AA cells and also sells a special companion wall charger. Be aware, though, that all makers of these batteries recommend different charging parameters than are used for NiCds. The only charger I know of that includes a different charging program for NiMH cells (besides the Great Planes unit) is the Impulse 2D from TRC Engineering, soon to be the subject of a complete review here in *MB*. Stay tuned!

Eloy Marez, 2626 W. Northwood, Santa Ana, CA 90274. ***MB***

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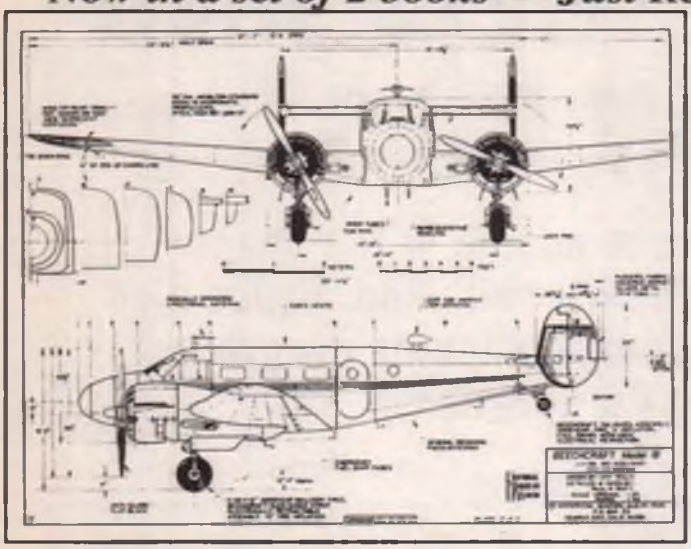

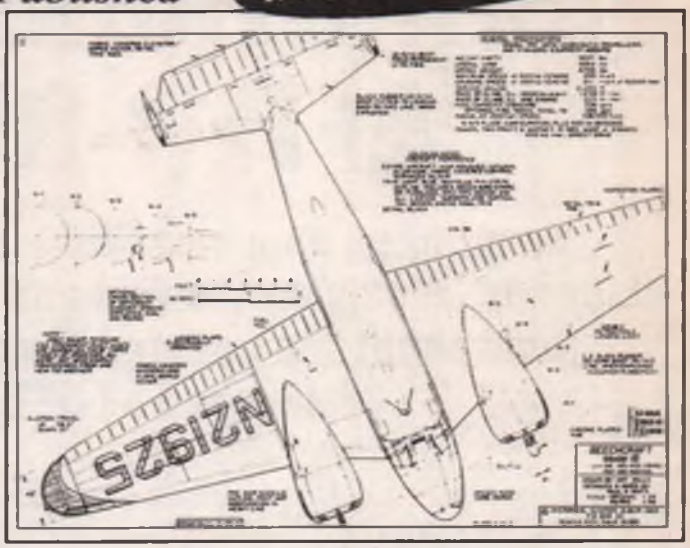

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FOUR-STROKE FUELS AND AFTER-RUN OILS

Keeping an expensive four-stroke engine in top shape depends largely on the fuel and after-run oil used. Bruce also talks about the updated Aero-Comp computer program developed by USR&D Corporation.

I really like the large four-stroke engines we have available for use in our Big Birds, especially the twins, and I naturally want to use the best fuels and after-run oils on the market.

A lot has been written about what percentage of lubricant to use in various four-stroke engine fuels. The latest word out is that regular two-stroke fuel with 20 percent lubricant works best.

When I did the review of the Reid "8-Ball Special" (November '95 *Model Builder*), I used my Saito 300 four-stroke twin and burned regular two-stroke model fuel that contained 20 percent lubrication and 10 percent nitro. This combination worked extremely well. I experienced no flame-outs at idle, and full throttle performance was all I could ask for. Apparently the 20 percent lube was an acceptable mixture for the Saito engine.

Have any of you four-stroke enthusiasts had a similar experience? I would really appreciate any comments you might have.

If the correct four-stroke fuel issue was not confusing enough, we have this after-run oil controversy. "Experts" have encouraged us to use everything from no after-run oil to transmission fluid and air tool oil.

We know that nitromethane, alcohol and high humidity cause rust and corrosion, most commonly in the engine bearings. Our big four-stroke twins are expensive, so it's natural that we should want to give them the best possible care. I had been using several recommended after-run oils, in copious quantities, in my Saito 270 and found that the bearings were still going bad. I had the main bearings in my Saito 270 replaced and asked to have the old bearings returned along with the repaired engine. The old bearings were dry and coated with brown residue.

How could this be, and what corrective action could I take? I had used recommended after-run oils, yet still lost the bearings. Is it possible that the corrosion occurs as the engine is running?

According to Bill Pottage, his Ikon N'west Travelaire 2000 biplane has been a real joy to fly. Wingspan is just over 5 feet, and Bill is using an O.S. .90 four-stroke for power.

After some careful thought, my conclusion is that automotive transmission fluid and air tool oil are not made for the high temperatures encountered in an internal combustion engines. Transmissions are water cooled, and although transmission fluid has anti-corrosive ingredients, those ingredients turn ugly when subjected to the heat encountered in an internal combustion air-cooled engine.

The same is true of air tool oils. Air tools seldom encounter anything like the temperatures inside a two-stroke or four-stroke model engine, and while the anti-corrosive qualities of air tool oil are very good, air tool oil also turns ugly when subjected to the temperatures encountered in our model four-stroke engines.

Perhaps the answer is to somehow expel these low-temperature, anti-corrosive oils before the engine is run again, but it seems to me that you would still have enough residual oil in the crankcase to cause a sludgy buildup. At some point you have to ponder where this all ends.

Several local four-stroke engine users I've talked with are not using any after-run oil and are not experiencing any difficulties. I tend to think they have simply been fortunate, because the atmospheric conditions in my area tend to aggravate the tendency of metals to corrode.

I tried Robart's Snake Oil and it seems to have far better qualities for four-stroke engine protection than the other types of after-run oils I've tried. Unfortunately it is not always readily available in hobby shops.

I decided to mix my own formula of after-run oil using lubricants I felt would

Columnist Bruce says the article on his electric-powered 1/4-scale J-3 Cub (February '96 MB) has been quite well received. For Big Bird fliers who would like to get in on the electric bandwagon, Modelair-Tech currently offers plans (and full kits in the near future) for the "MegaWatt," pictured here with designer Tom Hunt. The model spans 80 inches and is built around M-T's H-1000 belt drive unit with either a Graupner Speed 700 or Dewalt tool motor, running on 16-21 cells. To get an illustrated catalog, send a business-size SASE with two 32¢ stamps to Modelair-Tech, P.O. Box 12033, Hauppauge, NY 11788-0818.

Scale builders will love this: Jerry Nelson is now offering these beautifully machined scale-type clevis ends, perfect for flying wires and pull-pull cable control systems. The clevis ends are made of steel, are nickel plated, and come in a package of two, complete with .079-inch diameter steel clevis pins and two 1/32-inch cotter pins. The clevis ends are available either with a 1/32-inch full-length hole (which can be drilled out to 1/16-inch if you have access to a lathe) at $5.50 per pair, or with a 2-56 tapped hole for an adjustable setup, at $5.95 per pair. S&H runs $3. Order direct from Nelson Aircraft Co., 21550 N.W. Nicholas Ct., Unit D, Hillsboro, OR 97124; (503) 629-5277.

not break down into sludge when the engine was run. I mixed 66 percent Klotz model engine lube with 34 percent T-Plus, an engine conditioner that contains liquid teflon. The flying season is near so I will be giving my home-brewed after-run oil the ultimate test and let you know if it works.

GETTING THE YOUNG FOLKS INVOLVED

Last year was the first time in a number of years that some of our national model associations experienced no growth; some even lost membership. Fewer participants in our hobby also equates to fewer readers of our hobby magazines.

I think the loss of interest can probably be attributed to the growing use of PCs, or personal computers. They are clean to use and offer many exciting games, even simulated RC flight. Knowledge of their use is practically mandatory for any type of school or business these days.

Children seem to take to PCs like ducks to water and find them less threatening than our model planes. Getting blown away in a computer game is far less painful than having a propeller cracking across the fingers!

Computers help us draw plans and plot airfoils more quickly and accurately, and as you will see later in the column, even help find the most efficient propeller for your latest plane.

The traditional skills and craftsmanship associated with model plane building take quite a bit of work and time to develop. It's far easier to load a game into a personal computer than it is to learn to sand a fuselage to a smooth finish or build a straight wing.

Today's youth tend to want instant gratification, which is easily achieved with a personal computer game. The older we get, the more we seem to appreciate the older traditional skills found in the model building hobby, which might explain why model builders tend to be older. Young people can be shown the excitement and joy of model building and flying, but it's going to take more than lip service on the part of us older modelers to do so.

It's heartening to see that many model plane clubs throughout the United States are becoming more involved with schools. I belong to the Mount Rainier RC Society, the RC club that hosts the Northwest Model Exposition in Puyallup, Washington each year, and I'm happy to say that we have a student program underway that should prove very helpful to youngsters in our area over the years. I believe there are several other clubs in the area doing the same good work. I'll keep you posted on our progress in upcoming columns.

Ready to get involved with REALLY Big Birds? TEAM Aircraft, producer of the MiniMax ultralight that's been advertised in Model Builder for some time now, also produces this nifty "Airbike" which can be built either as an FAA-legal ultralight (no pilot's license required) or as an Experimental class homebuilt. Kit is virtually complete except for paint and instrumentation, comes with a pre-welded steel tube fuselage and tail surfaces; wings are wood. Complete kit price ranges from $6,000-$7,500 depending on the engine chosen. For more information, contact TEAM Aircraft, 10700 Ivy Bluff Rd., Bradyville, TN 37026; (615) 765-5397.

USR&D'S AERO-COMP PROGRAM

I have received several letters from readers who found my column on electric Big Birds (February '96 *Model Builder*) interesting and encouraging. There are many areas where electric power would work well on Giant Scale aircraft. Bob Benjamin's 81-inch span, Astro 60 powered Dynaflite Spitfire, the subject of an electric conversion article in the February '95 *Model Builder*, is a fine flying Big Bird. Bob has another big scale plane ready to fly and I will try to get some good photos of his latest endeavour for an upcoming column.

On the day I first flew my Astro 60 powered 1/4-scale electric Cub, Randy Smitheiser was present with his electric Cub, also 1/4-scale. Randy was using an Astro 90 on 32 1500-mAH cells with a 16x8 prop on direct drive. He and I were both amazed that my Cub was performing

continued on page 82

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ULTIMATE
Fun Fly

SIG

KIT # RC-71

Designed By: Mike Pratt

The Sig Ultimate fun fly was modeled after one of the most recognized biplanes on the air show circuit today, the Ultimate 10-300. This biplane has captured the imagination of many modelers with its distinctive looks and outstanding flight performance. Following in the footsteps of the popular Sig Fazer, the Ultimate fun fly is an easy to build all wood design with a profile fuselage and traditional built-up balsa wings. The flight performance of the Ultimate is AWESOME! Super tight loops, lightning fast rolls, flat spins, knife edge flight and hovering are just a few of the maneuvers that this model can perform.

The CAD (computer aided drafting) drawn plans, computer generated tooling and laser cut parts ensures the modeler that all the parts will fit precisely the way they were intended. The laser cutter has allowed us to design the parts in this model to greatly simplify its construction. One other benefit of the laser cutter is that all the critical alignment holes in the cabane and interplane struts are pre-cut allowing the wings to be set at there proper incidences during construction.

SPECIFICATIONS:

Engines:
.32 to .46 cu. in. 2-stroke
.40 to .50 cu. in. 4-stroke
Wing Span: 42 in.
Wing Area: 798 sq. in.
Wing Loading: 13 oz./sq. ft.
Length: 43.5 in.
Weight: 4.5 lbs.
Radio: Minimum 4-channel w/5 servos

KIT FEATURES:

- **Laser cut balsa and plywood**
- **Top quality Sig Balsa and plywood**
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- **Router-cut balsa profile fuselage**
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HANNAN'S HANGAR

BY BILL HANNAN

"Helicopters don't really fly; they merely beat the air into submission."

This month's quotation, origin unknown, is almost a cliché among helicopter enthusiasts, but serves to introduce our first topic.

IN SEARCH OF SIMPLICITY

Considering the complexity of modern helicopters (model and full-size), it is intriguing to examine their simple beginnings. Historically, model helicopters are thought to have predated fixed-wing fliers, with the possible exception of kites. A *spiralifere,* one of those little pull-string activated helicopters, was shown in a religious painting dating back to about 1460. And, Leonardo da Vinci's more complex spring-powered "aerial screw" was designed only 20 or so years later.

Next in recorded helicopter history was a series of simple models featuring two rotors turning in opposite directions, such as those of Bienvenu and Launoy, Sir George Cayley and Alphonse Penaud, all of which were well documented during the 1784-1870 era.

Another *really* basic helicopter, since it has only one moving part, consists of a propeller mounted on a dowel which is spun between outstretched hands. Instructions for building them were published at least as early as the 1920s. The one shown in our photo took only a few minutes to assemble from a lightweight gas-model propeller and a hardwood dowel.

How helicopters began. At top left is a simple prop-on-a-stick, to the right is a 1940s Giro-Prop, then a 1982 AIRFOX; at bottom left is an 1870 Penaud, and finally an 1879 Dandrieux Butterfly. More in text.

By contrast, the 1870 Penaud twin-rotor helicopter was surprisingly work-intensive, requiring about a half-day to construct. The performance, however, was reward enough for the extra effort expended. The little butterfly is of a type marketed on Paris streetcorners at the turn of the century. A similar toy given to Wilbur and Orville Wright is credited with helping to inspire their interest in flying machines.

The GIRO-PROP is a 1940s adaptation of the ancient spiralifere, manufactured by Allied Industries of Wichita, Kansas. The stamped aluminum two-blade rotor was lofted by a wound-string launching handle. The hype on the box offers the following incentives to buy the toy: *"A New Thrill—Shoots Higher Than Most Birds Fly!"* And: *"Soars Straight Up 200 to 300 Feet in the Air—Returns Like a Boomerang."* Next, that old-fashioned admonishment: *"Be the First to Own One of these Wonderful Flyers!"* How could one resist?

A much more sophisticated toy is the 1982 Lanard Corporation AIRFOX, featuring a realistic injection-molded semi-scale helicopter, with a safety ring around its three-blade rotor, and an automatic string-rewind mechanism in its clever launching handle.

From these pioneering examples to current high-tech RC helicopters seems an incredible leap in progress, and yet even the most basic of the

A small sampling of the holiday cards and mementos sent to the Hangar by readers. Grateful thanks to everyone!

Merle Olmsted, of Paradise, California, crafted this carefully detailed Loening S-1, primarily from basswood. Traditional wooden solid models remain popular among builders of display models.

vertical fliers were quite remarkable for their times.

WE GET LETTERS

And that's not all. We're grateful to all of our loyal readers, and offer special thanks to those of you who sent holiday cards, encouraging words and mementos to the Hangar. Some were so special that they deserve sharing. Pictured in one of our photos are hand-made cards from England, France and Germany; a charming Pistachio Druine Turbulent model from Japan, a Santa-in-a-plane Christmas tree ornament, a scale model contest emblem from Poland, and a "Bah! Humbug!" card from full-size racing plane builder Bill Turner, who always seems to be surrounded by beauteous "aviation enthusiasts." Although difficult to see clearly in our photo, the card in the lower right-hand corner, by M. Fillon of France, features a model sailplane illustration painstakingly composed of actual thin balsawood strips glued to the card. What a thoughtful, generous and creative audience we have!

WE SHALL REMEMBER

Sadly, the 3-D "pop-up" Zeppelin in our photo was sent by the late Ken Sykora, arriving shortly after he passed away at age 67. Ken may be best known as the proprietor of Oldtimer Model Supply, who contributed a great deal to keeping vintage model plans and materials available to a worldwide network of model builders. It was my privilege to have known Ken for more than 30 years, sharing our common interest in modeling and writing about it. He was an outstanding researcher who maintained a large personal library of aviation books and magazines, as well as an expert on building and trimming techniques.

It was always a pleasure to fly models with him, because he maintained a positive outlook even when conditions were discouraging. I particularly recall a time during the 1968 Kansas Nationals, when our free flight scale entries were defeated by the strong wind. Ken merely shrugged it off and volunteered our services, along with Jed Kusic, to serve as ground-crew for Doctor Linton Keith's magnificent control line Avro Lancaster. Never mind that we had no experience, or that we had to perform under difficult contest conditions. Imagine finding yourself confronted with starting four Super Tigre engines, synchronizing them, and topping off the fuel tanks within the short allotted time! In spite of our ineptness and lack of practice, we somehow managed, and as the beautiful bird became airborne, Sykora remarked: "I feel like a father!" Fittingly, Ken's photo appears on the back cover of the new *Flying Aces*, Volume 2, and it's expected that his business will be continued. Our heartfelt condolences to his wife Ginny and family.

Another chapter in modeling's golden age closed with the passing of Bob Copland, in England. Aged 78, Bob was a lifelong modeler and a highly respected competitor. His contest successes began during 1936, and he won numerous prestigious awards in England and other countries over the years, including high placings in various Wakefield events, and an outright Wakefield win in 1951. He represented England in five different countries, and served as a proxy flier of models from two others.

Copland later took up gliding, first in RC and then full-size form, eventually becoming an instructor. In his professional career, Bob was associated with Hawker Aircraft and British Aerospace for 45 years, during which time he advanced through the ranks from apprentice to Head of Design, managing a staff of 300 people. He had contributed directly to the development of such aircraft as the Hurricane, Hunter and Harrier. Truly, aviation was his life. Our thanks to Ron Moulton for providing this information.

Legendary Douglas "Wrong Way" Corrigan died at age 88, during December of 1995. He became famous for his "faulty-compass navigational error" in flying from New York to Ireland, instead of returning to California as officials had decreed. They had denied permission for an ocean flight, considering his Curtiss Robin incapable of such a mission. Upon his return home (by boat), he had become a folk hero, and was given a more rousing reception than was accorded to Charles Lindbergh! Doug later served as a WWII test pilot, and ran an air-freight service before retiring. His Curtiss Robin was displayed as recently as 1988 and deserves placement in a museum, to serve as a memorial. Our thanks to Mark Fineman for providing us with these facts.

FLY BY MOUSE?

New "flight simulator" computer games usually tout the opportunity to "pilot" current high-performance fighter aircraft. Herb Weiss feels the game designers are overlooking a fertile field by ignoring pioneer aeroplanes, and says: "It seems to me that it would be a lot more fun to fly the original Wright biplane at a simulated Kitty Hawk. Or to emulate Glenn Curtiss, by flying his pusher down the Hudson River to try for the Scientific American prize. Or to get the original Langley off the top of the houseboat. Options might include changing the designs a bit, such as adding more power for the Wright, or

HANNAN'S HANGAR

Mrs. and Mr. Ed Stoll prepare their Corben Super Ace for flight during the Interscale '95 indoor contest conducted in Holland. This model placed 1st in the rubber power event. Photograph by Tonda Alfery, of the Czech Republic.

a proper wing truss for the Langley aerodrome. Herb recalls seeing movies of early Wright aircraft clearly showing their dips and swoops caused by instability and/or marginal controllability, and thinks it would be fascinating to explore the same control problems. What a great way to learn aviation history!

FORTHCOMING CONTESTS

This year promises to be another banner year on the international flying model scene, which is scheduled to include the following:

• Openscale '96 will be conducted May 25-26 at the Medlanky Airfield near Brno, in the Czech Republic. Events will include FF Rubber Scale and CO2/Electric Scale. Sponsors are the Hotel Santon, model suppliers Gasparin CO2 motors, GMOT, Svet Kridel Flying Styro Kits, and Modela. Complete rules and lodgings information is available from Ing. Lubomir Koutny, Zahrebska 33, 616 00 Brno, Czech Republic.

• In Belgium, the 19th International Contest for Indoor Flying Models is scheduled for August 22-25 at Liege. FAI events will include Microfilm, Micro 35, Saint Formula, Peanut Scale, Rubber Scale, CO2/Electric Scale, and Pistachio. Proxy entries are invited for the Pistachio class. Whether you may consider attending in person or sending a Pistachio, complete details may be obtained by sending three International Reply Coupons to Bernard Delhalle, Rue de Souret, 62, B4200 Sclessin, Belgium.

NEW PRODUCT PLUGS

Bob Banka's 1996 188-page Scale Model Research Documentation and Resource Guide lists more than 5,000 Foto-Paaks and 33,000 three-view drawings depicting an incredible variety of aircraft. Punctuating this almost overwhelming amount of data are philosophical sayings such as these: "Change is inevitable . . . growth is optional." "Almost everything in life is easier to get into than out of." How true! Additionally, it features 13 informative articles by leading RC scale model competitors. Order from Bob Banka, 3114 Yukon Ave., Costa Mesa, CA 92626. Postpaid prices are $8 (U.S.), $10 (Canada), and $15 (overseas).

Stan Fink's latest release is Domeduster Plans Packet Number 6, containing 13 full-size model construction drawings, including eight flying scale models (five Peanuts, a Walnut and two Pistachios), a No-Cal profile, catapult glider, Pennyplane, Ministick and an Old Time R.O.G. Contributing designers are Jake Larson, Jerry Wagaman, LeRoy Satterlee, Rob Hudson, John Koptonak, John O'Donnell, Ed Berray and Stan Fink himself.

Certainly there is exceptional variety here! Scale subjects are primarily vintage types and include monoplanes, biplanes and a sesquiplane. Most of the plans specify vital color data, and we were especially impressed by the highly detailed 1927 Elias Aircoupe Peanut. The plan packet sells for $12, postpaid, from Stan Fink, 1810 Pine St., Philadelphia, PA 19103.

SIGN-OFF

Don Typond reminds us that even if our packaging may be a bit tattered, we're all still young inside, and offers this wonderful quotation: "If you haven't grown up by age 35, you don't have to!"

Bill Hannan, Box 210, Magalia, CA 95954. ***MB***

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PRODUCTS IN USE

■ By George Voss

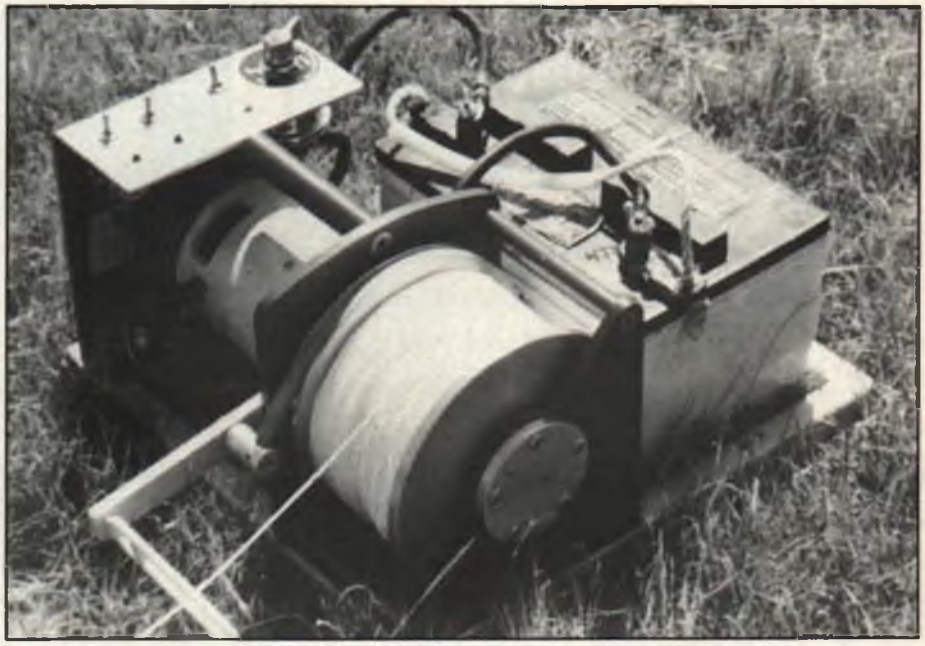
THE BAT WINCH FROM BASIC AIRCRAFT TECHNOLOGY

If you're in the market for an RC sailplane winch, you've come to the right place! This heavy-duty competition winch can handle everything from the lightest floaters to the biggest cross-country ships.

Cottage industries—the world of RC Soaring thrives on them. From special control horns to completely test flown and trimmed high-performance aircraft, cottage industries provide the many special items required to keep sailplane fliers happy. And due to the relatively small demand, winches have typically been manufactured by cottage industries.

Basic Aircraft Technology (BAT) is a partnership between Bob Harman and Dennis Williams. The goal of BAT is to provide top-of-the-line components to the sailplane community, including the subject of this review, the BAT winch unit. BAT will provide winch components to meet each modeler's needs, from a spool to a completely painted, anodized and ready-to-run winch.

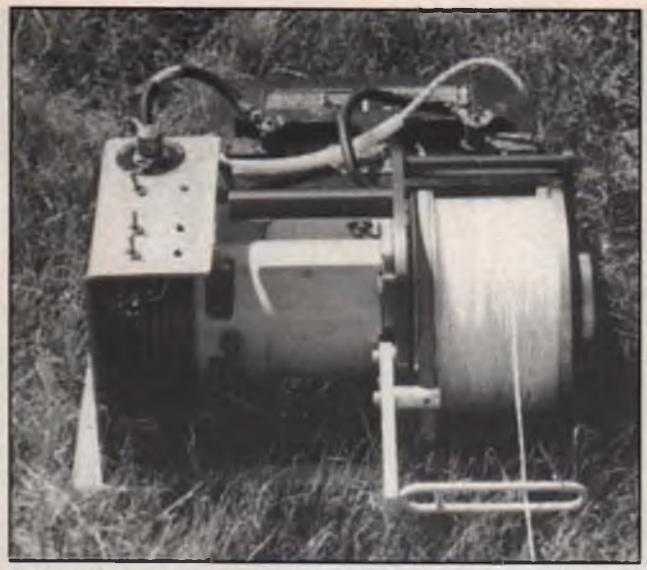
The BAT catalog contains a complete section on selecting the best controls and indicators. Bob has strong feelings about this subject and his comments and concerns are voiced in this section. He recommends you select the degree of protection you feel comfortable with and briefly describes a runaway winch! Since you choose the type of equipment you want, a simple panel could consist of an on-off toggle switch, a solenoid and a foot switch plug. I purchased their "best" finished panel, which consists of two solenoids, two arc suppression circuits, a master switch in the positive side of the battery circuit, two solenoid on-off toggle switches, a standby/off indicator light, two solenoid test switches with test lights to determine if the solenoid has internally welded itself closed, four high-current cables (they look like welding cable!), a foot switch connector and all the necessary mounting hardware. Whew!

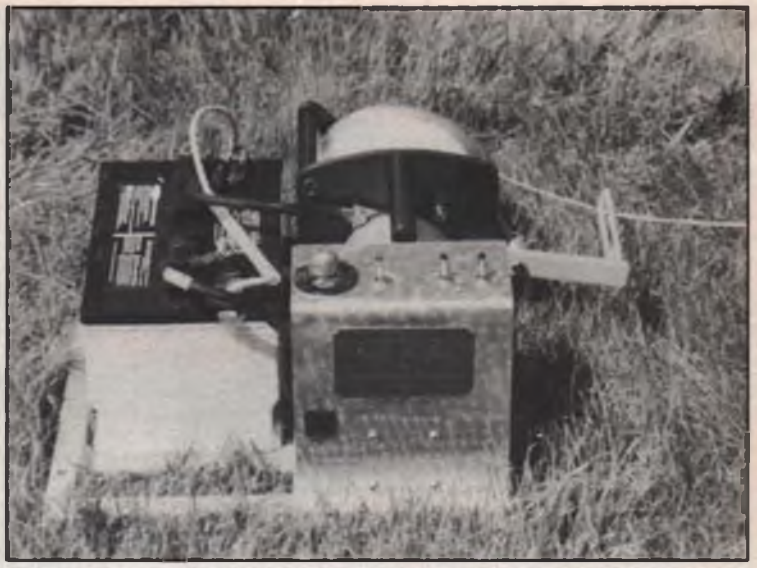


This review covers the winch unit, turnaround with stake, the frame and the deluxe power panel.

The winch unit consists of a drum with integrated anti-backlash brake, an inner and outer frame and an outer ball bearing housing. The machining work is excellent, and stainless steel fasteners are used throughout. The turnaround is a dual ball bearing unit that can be mounted on a standoff to keep the line off the ground. The spool of the turnaround is hard anodized. This is the best turnaround on the market, in my opinion.

Each BAT winch is built by hand by Dennis Williams. All winch and turnaround components are machined and have a brushed aluminum finish. The frame and turnaround stake are jig welded and painted, unless ordered otherwise. My frame was ordered unpainted so I could match the paint on the frame with the paint on the motor housing. Bob recommends a model #3136 Ford long shaft starter motor for the winch. This is a four-winding motor and is considerably more powerful than the two-winding version. He also recommends that the user purchase a motor locally to avoid the additional shipping charges required—those things are heavy! Bob kept me abreast of shipping dates as my winch was being assembled. He was very professional, helpful and knew his business quite well.





Front and side views of the author's BAT winch. These units are custom built to order and so can range from the most basic setups to this one, which has all the bells and whistles a competition sailplane flier could possibly want. The addition of Doug Boyd's "Real Balls" ball bearing starter motor endplates is a great improvement over Mr. Ford's oilite bronze bushings.

The control panel of the BAT winch is simple and effective. From left are the master on/off switch (mounted in the positive side of the battery cable, the standby switch, and the test lights for the two solenoids. Pressing the switch toward the winch tests the light itself; moving it toward the operator checks the solenoid. Each solenoid is tested individually. The switches should be in the middle position during launch.

The turnaround and stake. These are high-quality units that are a far cry from lesser bicycle hub turnarounds.

When the friendly man in the brown truck delivered the two boxes, I was just like a kid at Christmas. I couldn't wait to open them! Everything arrived in excellent shape.

My first task was to disassemble the winch unit for anodizing (this is not required, but I like my equipment to look nice) and grind the welds on the frame in preparation for painting. To show the type of quality BAT delivers, the inside corners of the frame were brazed to allow a nice fillet to be installed before painting. I had the anodizing done locally and all parts were covered under their $20 minimum fee.

Since this was meant to be my last winch ever, I also installed "Real Balls," the replacement front and rear aluminum motor endplates manufactured by Doug Boyd. They are CNC machined and as their name suggests, have ball bearings for the motor shaft instead of the standard oilite bushings. I had these endplates anodized also. There was a noticeable increase in rotational freedom after the Real Balls were installed. If nothing else, this is a glorious looking piece of machinery. The photography doesn't do this winch justice. Add to this its ability to launch an airplane harder than any other winch I've seen, and you have one potent package!

After the cosmetics were complete, I applied a coat of clear K&B Super Poxy to keep the frame looking nice and protect it against corrosion. Three spools of 230-pound test braided line were installed and I was ready for launch testing.

There is only one adjustment that can be made on the BAT winch, that being the anti-backlash brake. It comes adjusted from the factory and mine needed no further adjustment. The Real Balls also have one adjustment, that being the ability to advance or retard the timing. On the BAT winch, either the winch unit or the power panel must be removed to gain access to the bolts holding the endplates on. Both Bob and Doug worked together with me on my winch to assure compatibility between the two products. It's great to see manufacturers work together to provide us with high-quality products.

We used several different ships as test beds for the BAT winch. First was the Dodgson Designs V-gilante. At a mere 45 ounces, the "V" went up like a rocket with no signs of slowing the winch down. We also launched several unlimited size ships weighing up to the 90-ounces range. The BAT winch did an excellent job of launching these heavier ships. ZOooOM launches are outstanding! If you launch a lightly built ship on this winch, care must be taken as to the amount of "down time" the pedal maintains.

In closing, this is a very high quality winch unit that I can highly recommend. The ability to pick and choose the type of electronics, frames, etc. allows the user to adapt the winch to his own type of flying/use. Give Bob Harman a call or write to Basic Aircraft Technology, 10424 Golden Willow Dr., Sandy, UT 84070; (801) 571-6406. Dennis Williams can be reached at 2269 W. 10755 S., South Jordan, UT 84095; (801) 254-7788. For information on Real Balls, contact Doug Boyd, 29918 S.E. Davis Rd., Estacada, OR 97023; (503) 3515. Tell these two manufacturers you saw their products in *Model Builder!* ***MB***

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BY JOHN WALKER

A WWI Favorite: THE SPAD XIII

A particular airplane can be so well known and popular that it gets completely overlooked! Reprinted from the March 1976 *Model Builder*.

The Spad XIII was preferred by such famous Allied aces as George Guynemer, Rene Fonck, Eddie Rickenbacker, Frank Luke, Phineas Pinkham and G-8, because it was a solidly built fighter that did not shed wing fabric in a long dive, as did the more lightly built Nieuports. Sixteen pursuit squadrons of the AEF were equipped with Spad 13s.

Designed in France by the Societe pour Aviation et set Derives (headed by Louis Bleriot), the fighter was developed from the earlier Spad A.2 and Spad 7.

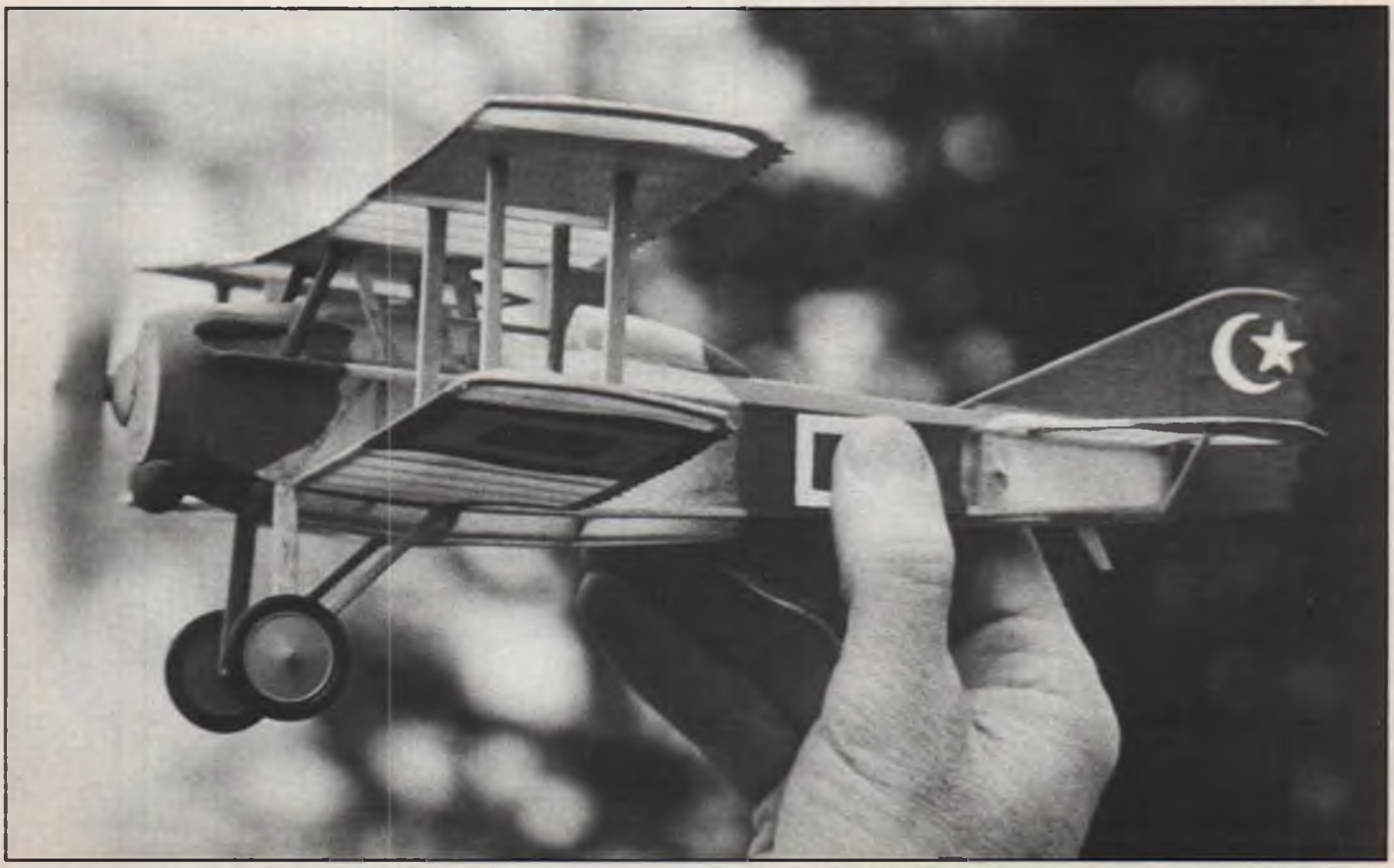
The craft had a span of 26 feet 11 inches, a length of 20 feet 8 inches, and was powered by a 200-horsepower Hispano-Suiza engine. It is thought to have been the first French plane fitted with twin synchronized machine guns.

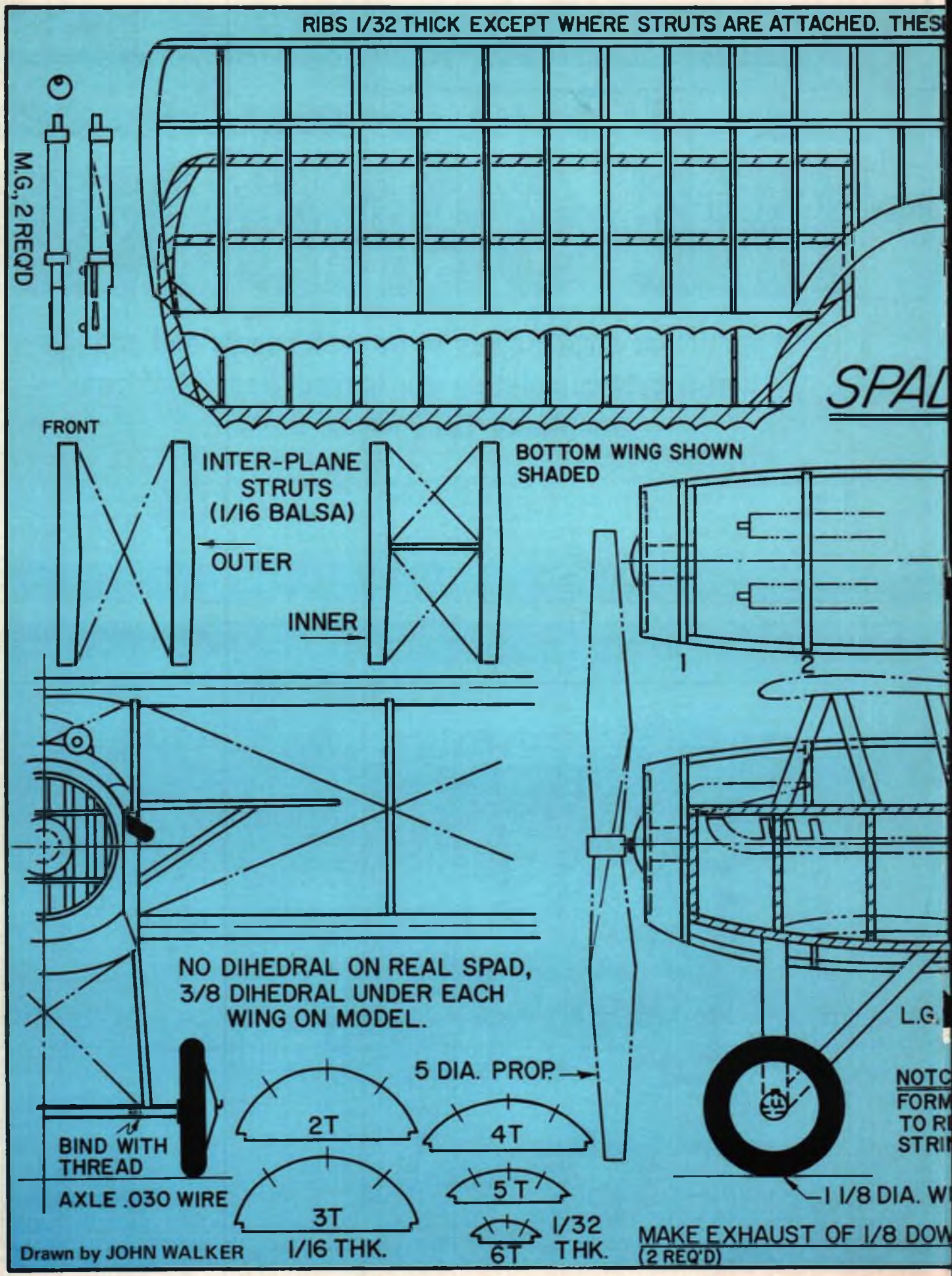
Spad 13s flown by Guynemer and Fonck were fitted with a single-shot 37mm cannon that fired through the hollow propeller shaft. Top speed was 130 mph at 6,500 feet, with a maximum service ceiling of 22,300 feet.

After the war, many of the 8,500 Spad 13s that were produced could be found in flying services around the world (including the U.S.) as first line fighters, well into the 1920s.

BUILDING THE MODEL

Mount the plan on a flat building board.

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OUTER
INNER
BOTTOM WING SHOWN SHADED
1
2
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5 DIA. PROP.
L.G.
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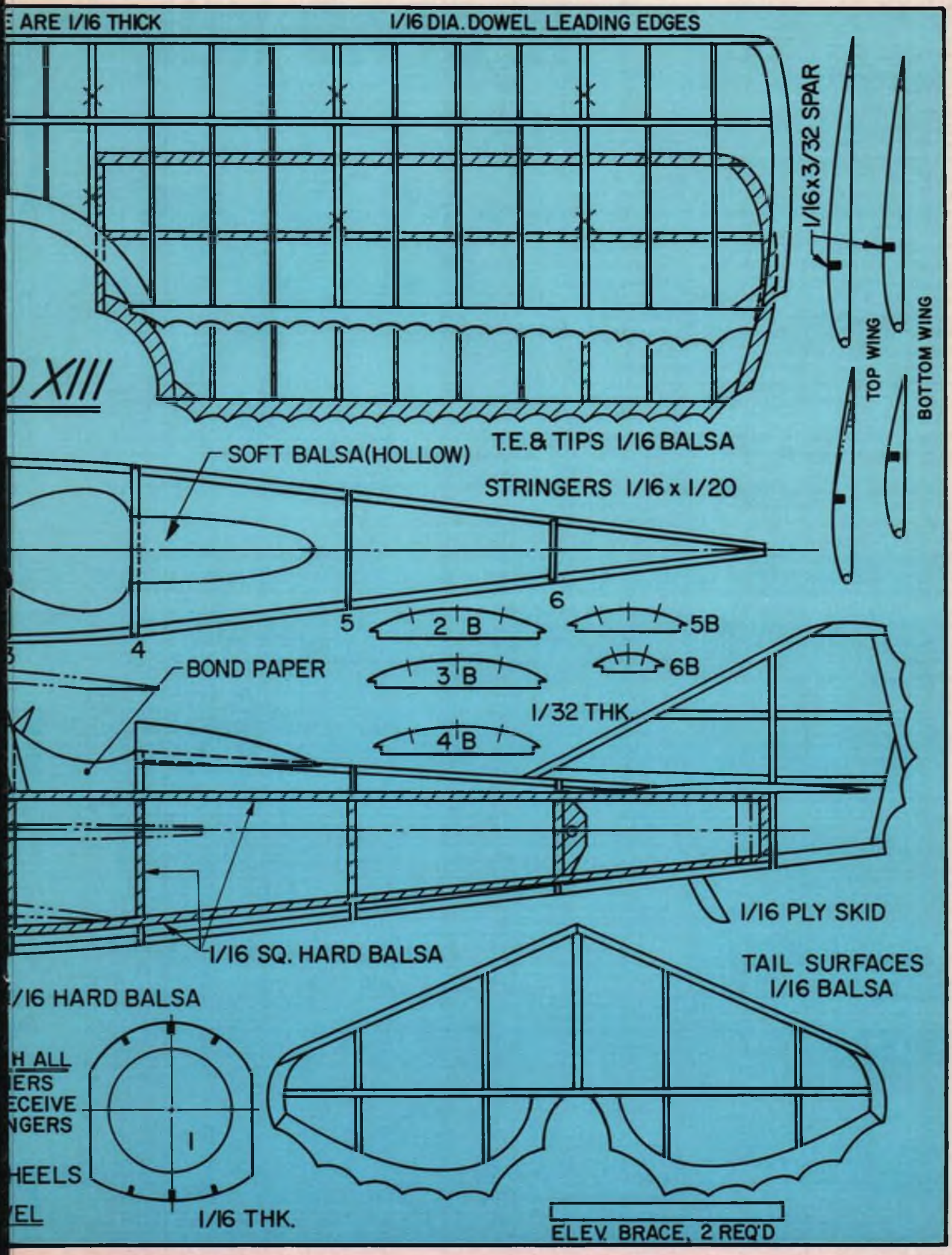
(2 REQ'D)
Drawn by JOHN WALKER


E ARE 1/16 THICK
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TOP WING
BOTTOM WING
D XIII
T.E.& TIPS 1/16 BALSA
SOFT BALSA(HOLLOW)
STRINGERS 1/16 x 1/20
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4
2 B
5B
3 B
6B
4 B
BOND PAPER
1/32 THK.
1/16 PLY SKID
1/16 SQ. HARD BALSA
TAIL SURFACES
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1
1/16 THK.
ELEV. BRACE, 2 REQ'D

THE SPAD XIII

Protect it with clear plastic sheet. We save the leftover backing from MonoKote for this purpose.

Start by constructing identical fuselage sides from firm 1/16 square balsa. Hot Stuff or Zap CA adhesives greatly speed up construction. Assemble the finished sides starting at the nose. Make sure your work is square. We use aluminum blocks to keep the sides square during assembly.

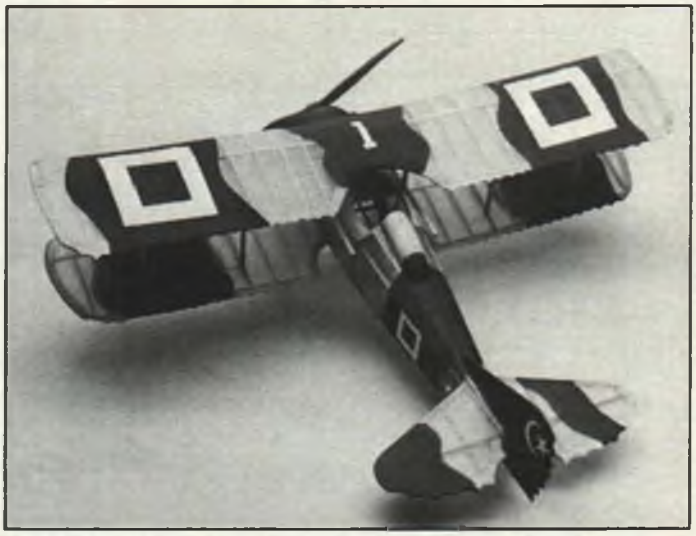
Add the formers and stringers. Strengthen the area in the tail where the dowel holding the rubber will be mounted. One advantage of using Hot Stuff or Zap is that excess adhesive adds little extra weight, and is absorbed into the wood to make it stronger. Lightly sand the fuselage structure before covering. Bond paper or 1/64 balsa may be used around the cockpit area.

Construct the landing gear legs and cement them in place. Hard balsa or basswood should be used. Don't forget to round the edges of the landing gear struts before assembly. Williams Bros. vintage wheels were used.

Assemble the tail surfaces—*keep them light.* Remove sharp edges by careful sanding.

Last, but not least, we come to the wings. Use care so that they will be warp-free. Curved sections are shown on the plans cut from solid sheet wood, but weight can be saved by fabricating them from thin strips of balsa formed over cardboard patterns. They may even be formed from bamboo, if you want to track down the wood. We found that some shoe stores use a good grade of bamboo strip to hold display shoes in shape.

Cover the model, using your favorite technique to attach the tissue. Shrink the tissue with water or rubbing alcohol. When thoroughly dry, apply two coats of thinned, plasticized nitrate dope. The camouflage on our model was added using colored dope.



Since Spads were used as first-line fighters by many countries after WWI, the author did up his model in Turkish Air Force markings. Camouflage was done with colored dope. Those scalloped trailing edges require some extra effort, but really look great on the finished model.

Since Spads were used by many flying services after the Great War, we selected and added Turkish insignia to our model. The center square is red and is outlined in white. The center was painted using dope. The outline was made from white trim MonoKote. The moon and star on the rudder were also cut from trim MonoKote.

Assemble the wings and tail surfaces to the fuselage. When we built our first biplane waaaay-back when, the local club expert told us to build in a bit more incidence into the lower wing than in the top wing. Apparently this causes the lower wing to stall first—the plane remains a relatively stable high-winger. Keep in mind that a carefully aligned and rigged airframe is one secret of successful flight.

Two wings produce a considerable amount of lift, so more weight than usual is required in the nose of a biplane. A propeller carved from basswood is the easiest way to get this weight.

Where can you get basswood and have it cut to outline shape? Visit the Industrial Arts department of the local junior high school. They usually have basswood, and the instructor will cut you enough prop blanks for 10 years of model building by just coming in with a few of your models and talking to his classes.

Use the "old tall grass" bit for test-gliding your model until it is trimmed out. We used one loop of 3/16-inch rubber for power, which provided enough oomph to permit the model to R.O.G. (rise off ground). You might have to use more or less power depending upon the weight of your model. Have fun with your Spad XIII! ***MB***

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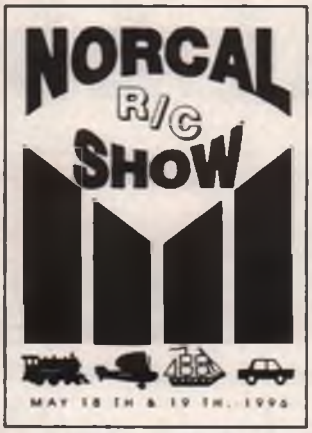
Presents:



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Static Judging And Trophies
Registration: 9:00 AM to 8:00 PM Friday May 17th
8:00AM to Noon Saturday 18th

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6. Sport Scale W.W. II (1937-1946)
7. Golden Age (between W.W.I & W.W.II)
8. Post War (Any Airplane Built after W.W.II)
9. Sport Homebuilt (Homebuilt type)
10. Pylon (Race planes of full size and same paint)
11. Jet (Includes Ducted Fan)
12. Giant Scale (1/3, 1/4, 1/5 Scale)
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2. "O" Scale
3. "S" Scale
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5. "Hon3" Scale
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THE UNLIMITED RC AIR RACES— MADERA 1995

Giant scale racing is growing by leaps and bounds. Similar events are held in other parts of the country, but Madera is still the Big One!

By Eloy Marez

■ ABOVE: The 1995 Top Dawg! Don Albright, of the Braun Racing Team, Winamac, Indiana, with his Unlimited 1st Place Gold winning Lancair; A3 8.8 engine and Airtronics RC system. ■ RIGHT: 1st Place in T-6 Silver went to Jim Maroney (right), of Hanford, California; his entry was built from the popular Byron kit. Like all T-6s, it has a Zenoah G-62 up front.

It's the end of September, and all roads seem to lead to Madera, California. It's funny, but only five years ago, outside of Californians (and not all of them at that), few had ever heard of the place, and would not have been able to find it on a map. That has changed—Madera is definitely on the RCers map now. It's the home of the Unlimited RC Air Races.

Initially it was felt by many that the event would not survive. It was too

MADERA '95 WINNERS

UNLIMITED

Gold:
1) Don Albright, Lancair, A3 8.8.
2) David Von Linsowe, Lancair, A3.
3) Rob Pastor, P-51, Aerrow 200.
4) Rusty Van Baren, Vendetta, Herbrandson.
5) Dave Smith, Stilletto, Aerrow 200.

Silver:
1) Bill Hempel Jr., Vendetta, Aerrow 200.
2) Frank Noll, Lancair, A3 8.8.
3) Jay Replogle, Lancair, Unknown.
4) Chuck Brown, Lancair, 3W 120.
5) Ron Goodrich, Pond Racer, A3 8.8.

Bronze:
1) Wayne Voyles, Roto Finish, Aerrow 200.
2) John Krohn, Sea Fury, Aerrow 200.
3) Ken Trainor, P-39, Sachs 5.8.

FORMULA ONE

Gold:
1) John Krohn, GR-7, Aerrow Q75.
2) Ken McBride, Nemesis, J. George 4.2.
3) Fred Weaver, Li'l Toni, Husky 4.4.
4) Bill Knudsen, GR-7, 3W.
5) Rick Maida, Cosmic Wind, J. George 4.4.

Silver:
1) Tom Easterday, Nemesis, Laski/3W.
2) Ken Thornton, Ole Tiger, Aerrow.
3) Jerry Arsenault, Li'l Toni, 3W.
4) Diego Lopez, Nemesis, Bully.

AT-6 (All T-6/G-62)

Gold:
1) Bubba Spivey.
2) Arcie Snider.
3) David Von Linsowe.
4) Shawn Everson.
5) Takashi Komura.

Silver:
1) Jim Maroney.
2) Karl Almendinger.
3) K. McSpadden.
4) Leonard Wyatt.
5) Diego Lopez.

Bronze:
1) Ken Knowles.
2) Gary Korpi.
3) Larry Sutherland.
4) Walter McKee.
5) Mac Douglass.

BIPLANE

Gold:
1) Cliff Sands, Knight Twister, J&K 4.4.
2) Jim Goad, Pitts, Zenoah 4.45 Twin.
3) Wayne Voyles, Weeks Special, Unknown.

BEST OF SHOW

Biplane: Ron Eisner, Solution RS, Quadra 75RSS.
AT-6: Takashi Komura, T-6, G-62.
Formula One: Bill Hempel Jr., GR-7, A3 4.4.
Unlimited: Dennis Crooks, P-38, Husky 6.6 (2).

TOP QUALIFIERS

Biplane: Kent McKenna, Boogie, Aerrow 75.
AT-6: Gary Hover, T-6, G-62.
Formula One: Ken McBride, Nemesis, J. George 4.2.
Unlimited: Don Albright, Lancair, A3 8.8.

GSARA GRAND NATIONAL CHAMPIONS

T-6: Bubba Spivey.
Formula One: John Krohn.
Unlimited: Wayne Voyles.

Just about to touch down is the GR-7 flown by Leonard Norred. A popular subject, other GR-7s entered at Madera took 1st and 4th in the Formula One Gold races. Photo by Eugene Anastasi.

much work, too expensive, too fast, too dangerous, etc. What was forgotten is that, fortunately, there are still those real builders and fliers out there who don't see too much work, etc.—they see instead the challenge, and the satisfaction that comes from meeting a difficult and demanding task head-on, and giving it their all! The Unlimited has grown to unexpected proportions, credit for which must go to Endless Horizons, Inc., the organizers, and to these racers whom we recognize as definitely having "The Right Stuff"!

This year, a new event for bipes was added, bringing to four the number of classes flown. All rules and technical requirements are coordinated with the Giant Scale Air Racing Association, with the blessing of a board of technical advisors composed of many well-known members of the model and full-scale aircraft world. In short, these classes are:

•**Unlimited:** Must be a scale Reno racer; 100-inch minimum wingspan for single engine, 122 inches for twins. Single-engine aircraft are limited to a 14 pound maximum engine weight, twins to 8 pounds per engine. Maximum ready-to-fly weight (wet) is 55 pounds. Top speeds of 200 mph are not uncommon. Based on their qualifying speeds, Unlimiteds are raced in three categories: Gold, Silver and Bronze.

•**Formula One:** Must be a 42 percent replica of an airplane that flew at the Cleveland or Reno races. Wing thickness must be at least 13 percent, root and tip; engine size is 4.6 cubic inches maximum. Engine mods are allowed, but not tuned pipes. Two categories, Gold and Silver, are established.

•**AT-6/SNJ:** The "Terrible Six," as they were known during the Korean conflict, draws the greatest number of entries, and is considered something of an entry-level class. They must span 101 inches, with proportionate dimensions throughout, and are

You won't get this one mixed up in the gaggle; John Krohn's (Whittier, California) distinctively colored, Aerrow Q75 powered GR-7 earned him a 1st Place Gold in the Formula One category.

Lanier R/C's Bubba Spivey flew formation exhibition flights with his Lanier Stinger and also competed in the Unlimited class with this colorful Sea Fury.

Ron Goodrich (left) and Ralph Braun, of the Braun Racing Team, with a most impressive scratch-built Pond Racer; placed 5th in the Unlimited Silver class, uses A3 8.8 engines, Airtronics radio.

powered by Zenoah G-62 engines for which fuel and a prop are furnished. T-6s race in Gold, Silver and Bronze categories.

•**Biplane:** A number of well-known bipes are eligible. They must have a minimum wing area of 1460 square inches for both wings combined, with no less than 30 percent being contained in the smaller wing. Root and tip thickness must be at least 12 percent, and engines are limited to 4.6 cubic inches; no mods, no pipes. This is a single category event—all bipes are Gold!

After registration, tough technical inspections and qualifying flights, four- or five-airplane heats are flown. After the heat races, the top five aircraft in each class go on to the trophy races, with two runners-up in case one of the top five has a no-start.

The Unlimited '95 purse was a total of $15,500. It's always nice to take home some money, or at least something of value. However, I firmly believe that few, if any, racers come here for that reason; they come here for the sheer excitement

The Braun Racing Team's biplane entry was this "Full Tilt Boogie" as flown by Frank Noll Jr. Photo by Eugene Anastasi.

MADERA 1995

Even the brass comes to play at Madera! Well-known pattern and TOC flier David Von Linsowe, of Sutter Creek, California, is seen here with his T-6 Gold 3rd place winner.

The Stiletto, a highly modified P-51, is a popular Unlimited entry. Here we see Race No. 2 settling in for a successful landing.

I firmly believe that few, if any racers come to Madera for the money; they come here for the sheer excitement of competition, and yes, the risk, because the biggest rewards in life also involve some risk.

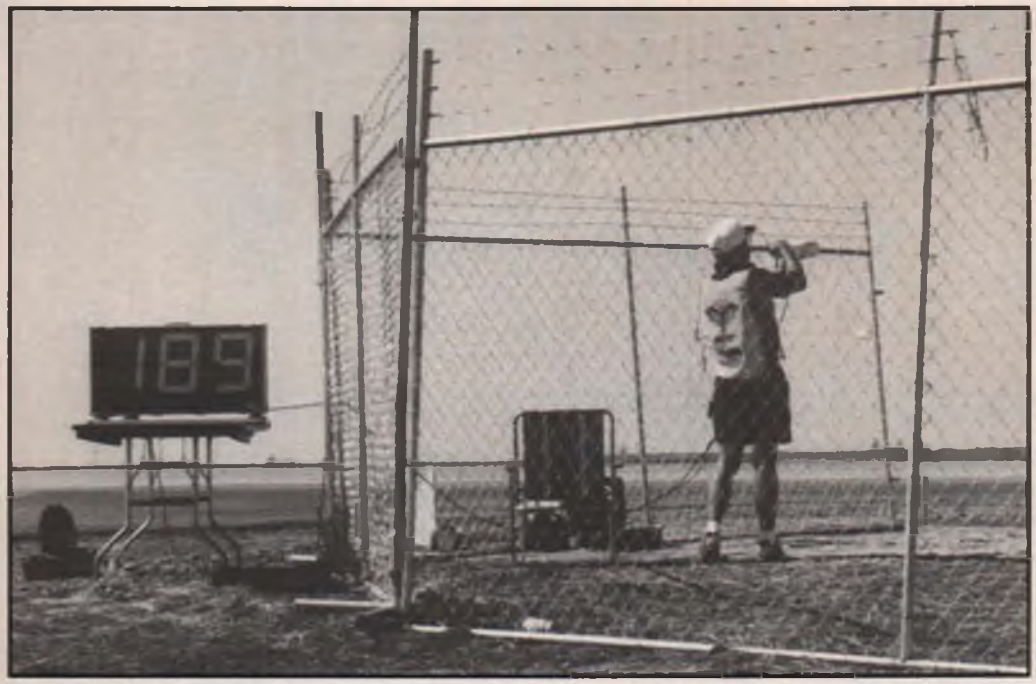
Billy Hempel Jr. (left), of Tucson, Arizona, flew off with 1st Place Silver in the Unlimited class with his Aerrow 200 powered Vendetta. Billy also took Best of Show in Formula One with his GR-7.

of competition, and yes, the risk, because the biggest rewards in life also involve some risk. Were we to wire up racers as they do astronauts, I'm sure we would see a major jump in all vital signs at the call of "Gentlemen, you've got a race!"

In addition to the excitement that racing brings, one also gets to share in the camaraderie that exists amongst those with similar interests; they came from as far as Japan this year. We can't debate the fact that without the fliers themselves, events such as the Unlimited could not exist, but neither can we ignore the invaluable contributions of the many workers, both from Endless Horizons and the many volunteers.

Contributors too numerous to mention are involved, including some rarely seen non-industry sponsors: Budweiser, Chevron, Pennzoil, and Tecate (Mexican beer). The Discovery (TV) Channel, producer of the renowned "WINGS" series, was on hand and

MADERA 1995



There's no question about the speeds involved at Madera; this highly sophisticated radar system measures and displays the individual racers' speeds as they fly the course.

presented special CD-ROM "Best of Show" awards to each category winner. We all benefited and enjoyed the lap-by-lap race commentary over the PA system by the Rush Limbaugh of aviation announcers, Mr. Sam Wright, whose company, Acro-Star Productions, also produces the Unlimited Race video.

There will definitely be a Sixth Unlimited Air Race. Information for potential racers and/or visitors can be obtained from Endless Horizons, P.O. Box X, Torrance, CA 90507; (310) 320-8369, Fax (310) 320-8354. GSARA rules and kit and equipment information can be obtained from them at 1744 Greenwood Ave., Torrance, CA 90503; (310) 212-3257, Fax (310) 320-8354. See YOU at Madera in 1996! *MB*

House of Balsa's "Over The Edge" Slope Glider, Part 2

In the March issue Bill began this informal product review of House of Balsa's aileron slope sport/trainer with the basic construction; this month he concludes with the finishing and flying.

After completing the framing and shaping of the wings, stabs and fuselage, we tackled the radio installation. All of the necessary pushrod, clevis and horn hardware is supplied in the kit. Because the Over The Edge (OTE) has such a roomy fuselage, radio installation is easier than in most sailplanes.

Following the instructions, we mounted the aileron servo to the bottom center of the wing. One very important consideration here which is only briefly covered in the instructions (Step 73, top of page 20) must not be overlooked: *differential aileron throw.* More up than down is needed to counteract adverse yaw, a condition caused by the unequal aerodynamic drag created by equal aileron throws. A plane with adverse yaw will bank one way but yaw the opposite way in an inefficient, crabbing sideslip.

If you look closely at the manual's two not-too-clear photos at the bottom of page 19, you can just barely see that the aileron pushrods are attached via Z-bend *ahead* of the pivot point of the output wheel by 45 degrees on each side. This gives about a 2:1 differential, which is ample in preventing adverse yaw at all but the slowest speeds. We talked about this very subject in detail in the December '95 column.

The elevator servo is even easier to install than the aileron servo. The plywood servo rails are glued atop a pair of rail supports on the fuselage sides for a very strong and tight-fitting joint. Drill four holes and use the servo's mounting grommets and screws for a neat installation. The elevator pushrod has a straight-shot run back to the tail where it curves outside through a molded plastic exit guide to meet the elevator horn.

The OTE lacks any kind of wing saddle doublers. We recommend adding scrap balsa sticks along the inside edge of the wing saddle to spread out the load created by the wing hold-down rubber bands. We also put a bead of silicone rubber along the top of the saddle, protected the wing with wax paper, then rubber banded the wing in place until the silicone cured. This gives a soft,

Bill looks pretty pleased with the way his Over The Edge came out. Model is covered entirely with black Solarkote, trimmed with Solartrim. Vinylwrite lettering and PEP's "Sky Sheen" reflective leading edge tape are nice, practical additions.

First test-glides should be performed over soft grass to prevent possible landing damage from being out of trim.

The OTE performing in light slope lift at the Harbor Soaring Society's club field in Costa Mesa, California. MB's editor was flying the model for photos and agrees with Bill that the OTE is as docile and stable an aileron sloper as one could possibly ask.

anti-slip saddle that won't gouge or mar the wing sheeting.

In our test plane, we found that with a 500-mAH square battery pack in the forward radio compartment, there's just enough room behind the pack for a small receiver (in our case a Cox 8219 two-channel mini AM unit) and an on/off switch. Larger receivers may have to go back under the wing as shown in the manual.

FINISHING

Covering a model is a lot of work. Fortunately, the OTE is a small sailplane that covers fairly rapidly.

The open-structure wingtips have a strange compound curve that makes it tough to get a wrinkle-free finish. Relief cuts help some, as does hot-stretching the covering material; but some small wrinkles here are almost unavoidable. However, no one will see them as the model flies by on the slope, so this may not be such a big deal.

Trim colors are a must for a model like this. Although we covered the entire model in black Solarkote, we added contrasting, bright Solartrim trim colors on the top, and a totally different trim scheme on the bottom.

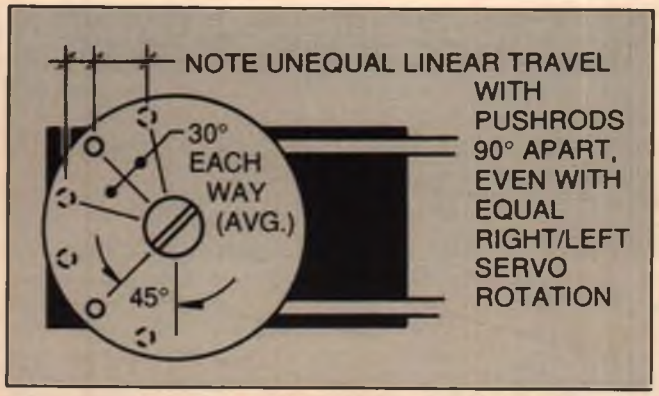
The "Over The Edge" and "OTE" lettering we used was provided by Art and Cynthia Morgenstern at Vinylwrite. They were extremely helpful in creating these graphics, which if done by hand would have taken several hours and not looked nearly as clean and professional. Vinylwrite is back in business again after a total shutdown caused by the infamous Northridge earthquake of early 1994. The Morgensterns can be reached at 16043 Tulsa St., Granada Hills, CA 91344; (818) 363-7131 (10-4, Monday-Thursday).

To further enhance the visibility of our OTE, we split a single, 1-inch wide strip of PEP's "Sky Sheen" leading edge tape and applied it to each wing. The flashes of rainbow-colored light that this "holographic-prism-inside-the-chrome" adhesive tape product produces are beautiful as well as practical. It's great insurance against flyaways as the flashes can be seen at great distances, much like a strobe light. These leading edge tapes are available in four sizes and two types. The second type looks like holographic-chrome glitter and is called "Skyshine." Contact Phil Pearce, the PEP guy, at 111 E. Geneva, Tempe, AZ 85282-3638; (602) 966-6384. An SASE will get you a free sample.

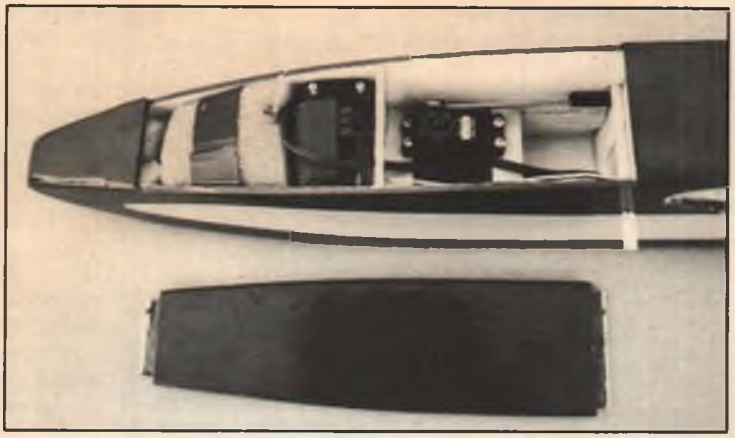
FLYING

Once covered, hinged, set up and balanced where shown on the plans, it was time for the OTE's test flights. Our review plane needed just 1-1/2 ounces of nose weight (yes, there was room!) to achieve the recommended balance point. Later in the flight testing, this small bag of #9 lead shot was removed and the OTE flew just fine with a little less up trim.

Test-glides were performed on the grassy, flat landing area well behind the slope where we planned to fly. We recommend that all initial test-glides be performed over thick, soft grass, as it is great crash insurance in case your model turns out to be incorrectly balanced or way out of trim. Our model was a little out of trim on the first toss. Dead-neutral at the elevator combined with the recommended slightly forward CG produced a little dive. Subsequent near-full-up trim on the transmitter's trim lever produced a nice flat glide. The aileron trims also needed a bump to the right to counter a left rolling tendency. Once straightened out, we headed for the slope for the real acid-test flights.



Sketch illustrating how to get the all-important aileron differential with a single servo, something Bill feels isn't too clearly shown in the OTE instruction manual. Connecting the aileron pushrods to the servo wheel at 45 degrees forward of center gives about twice as much up aileron as down to counteract adverse yaw. It's important to realize that the pushrods are connected forward of the servo axis only if the servo and horns are mounted to the bottom of the wing, as in the OTE; if they're on top, as in the case of a low-wing model, the pushrods would be connected AFT of center. Bill talked about this in more detail in his December '95 column.



The elevator servo, battery pack, on/off switch and receiver all fit nicely in the roomy nose of the OTE. There's even room for foam rubber and a little nose weight if needed. Radio is a simple two-channel Cox Cobra.

There is always something very final and nerve racking about that first throw off of a cliff. If something goes wrong, bad things can happen fast. But if everything goes right—and it should if you're careful—then fear turns to euphoria and all you have to worry about is other air traffic and always turning *away* from the cliff.

Our Over The Edge went . . . over the edge . . . and flew like a champ! From the start it was very easy to control and exceptionally stable. This is *truly* an aileron trainer! With minimal control throws the OTE performs very much like a rudder/elevator sailplane. We could see where an experienced rudder/elevator flier would have no trouble transitioning to ailerons with an OTE.

In fact, on our first day out we met a fellow named Karl who had never before flown ailerons and was in fact in the midst of building his own OTE. He had an Easy Answer polyhedral ship with him. After a brief cliffside chat, we offered to let him fly our OTE; Karl accepted and quickly became right at home with it, making turns and staying high with no help from us. Before long Karl was smiling broadly and expressing his need to go home and finish his own OTE right away!

If you're a rudder/elevator flier and are still a bit ham-handed on the controls, set up your OTE with the indicated CG location. It's a little on the forward side, which will serve to soften the already gentle stall. After removing our 1-1/2 ounces of nose weight, which moved the CG back 1/2 inch, the stalls were a bit more pronounced but still very gentle.

In Part 1 of this report we wondered about the strength of the wings due to the lack of a joiner blade; would the 3/4-inch fiberglass joiner tape be enough to hold the wings together? Well, so far, with just the normal flight loads (including loops and rolls) in relatively light lift, no added ballast and no crash landings or ground loops, the answer appears to be yes. However, for that wonderful peace of mind that comes from knowing your plane is as strong as the next guy's—build a 1/8 plywood joiner blade and install it between the top and bottom spruce spars. Make it long enough to span between the first ribs outboard of the center. If nothing else, at least double up and widen the fiberglass joiner tape. That's our recommendation.

In summary, if you want to graduate from rudder/elevator to ailerons, House of Balsa's Over The Edge is your plane. It builds quickly and easily, it's lightweight and capable of flying in light winds, and is stable and has a very gentle stall. The OTE meets its design goals in spite of some unorthodox construction. We witnessed one successful OTE aileron graduation in front of our very eyes. We believe you can do it too!

Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330; (909) 245-1702 (evenings). ***MB***

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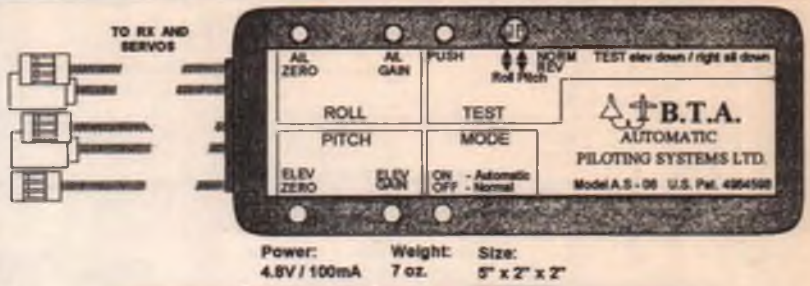

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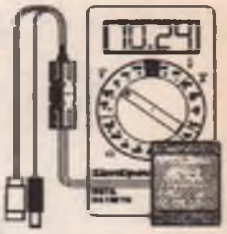

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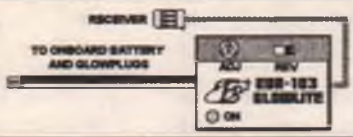

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FREE FLIGHT

BY BOB STALICK

•The "Wee Willy II" for Pee Wee 30

•Tissue Covering with Glue Stick

I have always marveled at the inventiveness of our species. The species *Model Airplanus Free Flightus.* Who else can take little sticks of wood and make a contraption that will fly for 40 minutes inside a large gym?

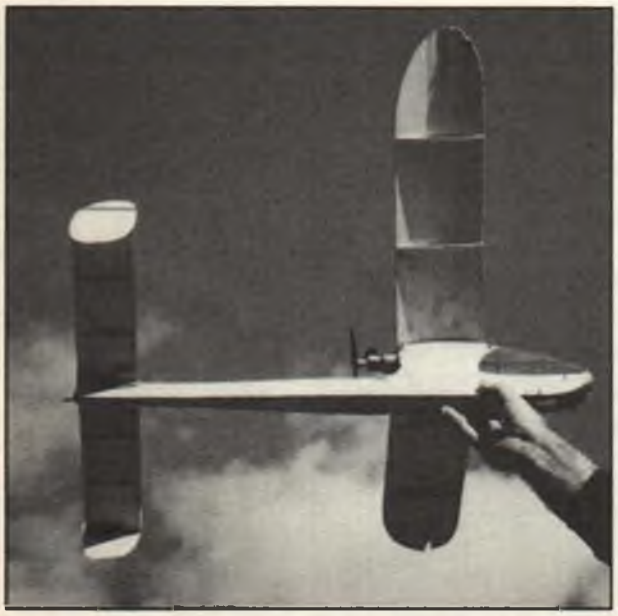
Who else can fashion objects that are made of paper and cellulose that will glide out of sight, and with the demise of a small rubber band, bring the whole works back to earth in a matter of minutes?

Who else can make wonderful devices in their home that develop into a whole cottage industry that spans the globe?

The brotherhood of free flighters is universal. No matter which country or which language, it's one and the same, friendship and sharing.

We pass on our secrets as though they were universal truths. I read once that creativity exists when something that was developed for one use is successfully adapted to another, unrelated use. Free flighters do that all the time. One example: I had read several times about the virtues of using a glue stick to adhere covering materials to a model framework, but like an old dog, I wasn't interested in learning a new trick. Then, in a moment of weakness, I did it. Now I wonder why I didn't try it earlier. It was a discovery that others had made, but until I discovered it myself, I was unmoved. Farther along in this month's column we'll talk about this technique in detail.

Excellent action shot of our columnist launching his Upstart Class C Nostalgia model at a recent Harts Lake Prairie contest. The 758 square inch model is powered by a K&B .32. Photo by Bob Hatch.



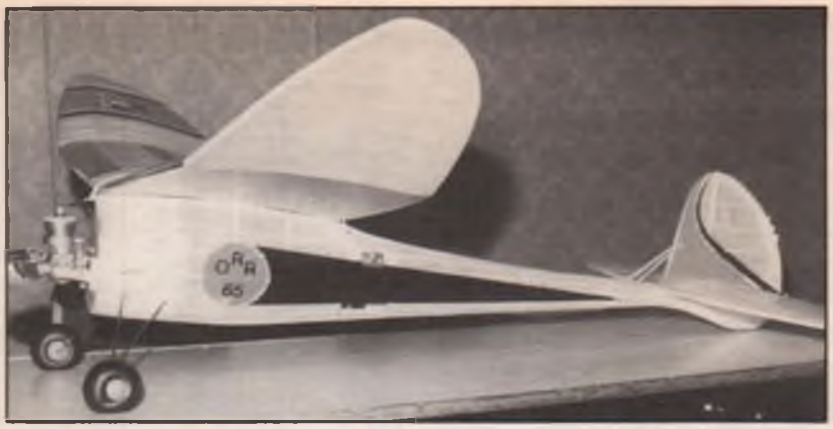
The January Mystery Model (see text for write-up) was the Pushover, designed by Bill Baker. This photo, supplied by Bill Jenkins of Memphis, Tennessee, shows his version, which he claims has thermalled several times but never glided well enough to get lost.

PLAN OF THE MONTH

John Houtenbrink's "Wee Willy II" Pee Wee 30 model recently appeared in the Florida Modelers Association newsletter, and represents a simplified approach to the event. This model has had its share of competition successes in the Florida area and can be built quickly. No full-size plans are available, nor are they needed; the model is so simple that even a beginner should have no problems building one from the detailed drawing presented here.

The fuselage is a simple square cross-section box made of 1/8 square longerons and uprights. After it's built, the fuselage is rotated 45 degrees up on edge to give it a "diamond" cross-section. The wing and stab ribs are made of sticks, the height of the spar determining the maximum height of the airfoil. The front turbulator spar provides curvature to the front of the airfoil, improving the glide. When the structure is finished, the whole model is covered in Japanese tissue and given three or four coats of nitrate dope with a coat of fuelproofer over everything.

The Pee Wee 30 rules specify that no mechanical timer be used. The eyedropper tank shown provides an approximate visual determination for the length of the engine run. The technique is to fill the tank, start the engine, tune for peak rpm and wait until the fuel level reaches a predetermined point near the end of the eyedropper before launching. Mark the spot on the fuselage next to the eyedropper where the engine run is consistently 13-14 seconds. *Don't* set the engine run mark at exactly 15 seconds; you don't want an



One of the nice features of the SAM Champs is the awarding of the Concours d'Elegance trophy for the model voted the most attractive. This white Hayseed C model designed by Carl Hermes was entered by an unidentified builder; power is by an original spark ignition ORR .65. Photo by Charlie Reich.

overrun, as it counts against your score. Better to be safe than sorry.

MORE ABOUT PEE WEE 30

Pee Wee 30 was developed about 10 years ago by the San Diego Orbiteers as an engine-powered derivative of their very successful P-30 rubber power event. It was intended as an inexpensive entry point to gas engine competition for beginners. The Pee Wee 30 rules, in brief, are:

1. Wingspan and fuselage length must not exceed 30 inches.

2. Weight of complete model ready to fly must be at least 100 grams.

3. Model must use a Cox Pee Wee .020 engine.

4. No mechanical device may be used to limit engine run.

5. Model must be equipped with two-wheel landing gear.

6. Three official flights are required, one of which must rise off ground.

7. Two minutes constitutes a maximum flight.

8. Engine runs are timed and any engine run that exceeds 15 seconds will be deducted from the score by means of a formula.

9. Scoring is by a formula which divides the flight time (up to 120 seconds) by the engine run time multiplied by 100 to achieve the score. Any engine run up to 15 seconds is counted as 15 seconds. A perfect flight is 800 (120/15=8x100=800).

You can see that every effort has been made to equalize the competition and make it possible for newcomers to compete. Cox Pee Wee .020 engines can be picked up at most swap meets for $5 or so. The ability to enter this event with practically no cost makes it particularly appealing for younger fliers or those on a limited budget. I personally like the event and have flown it since its inception. I still have one of my original Spacer Pee Wee 30 models left—it's been lost and retrieved more than once. I think anyone interested in flying an engine powered model would do well to try Pee Wee 30. It's inexpensive and the models are easy and fun to build and fly.

MYSTERY MODEL WINNERS

We plum forgot to pick a Mystery Model winner last month, so we'll do two right now. All six who responded to the December '95 MM were correct in identifying Ray Booth's "Pendy-Wing," a pendulum-controlled 1/2A tailless sport job which appeared in the December 1952 issue of Flying Models. *Jerry Knoblauch of Simsbury, Connecticut won the free* MB *sub.*

The January model brought in ten replies, only one of which was incorrect. The model was the "Pushover" as designed by Bill Baker, who currently writes the Free Flight Old Timers column for Model Aviation. *The Pushover was a 33-inch span, twin-fin, all-balsa 1/2A pusher, published in the December 1963* M.A.N. *Winner of the one-year* MB *sub is Herman Fessler of Coon Rapids, Minnesota.*

COVERING WITH GLUE STICK

As noted in the introduction to this column, it takes me a while to change old habits. I've been tissue-covering models using nitrate dope and thinner for years, with mixed results. I would pre-dope the structure with as many as five coats of dope and sometimes still had trouble getting the tissue to stick down by brushing thinner through it.

Then I read somewhere about a modeler who had used a glue stick to adhere tissue to a framework, so I decided to try it on my latest F1J model wing and stabilizer. What I found was a system so superior to the old way that I cannot see myself ever using dope and thinner again.

Here's how it works. Prepare the surface by applying one coat of nitrate dope on all surfaces where the covering material will be attached—leading and trailing edges, the rib undercamber if it is not a flat-bottom wing, and at the dihedral joints. A light sanding after the dope dries will remove the fuzzies.

Starting at the bottom wing center section as usual, rub glue stick onto the leading edge. Make sure the entire panel bottom leading edge is covered. Be careful not to put it on too thick, or it will take forever to dry. Apply the tissue, straightening it as you put it in place. When it is adhered, apply glue stick to the trailing edge and the dihedral and polyhedral ribs (also to the bottom of the ribs if they are undercambered). Fold the paper into place and, using your fingers, rub the paper so that the glue stick grabs it. Gradually work the paper until it's smooth and wrinkle-free. If you get a fold in it, lift the paper off and do it again.

Glue stick dries slowly, so you'll have at least 15 minutes of working time to get the paper on correctly. Be careful not to pull it too tight. Finish covering the rest of the wing bottom. When dry, trim the excess tissue away and glue stick any ends in place. Cover the top of the wing in the same fashion.

After the glue stick is completely dry—I suggest letting it set for several hours—you can water-shrink the paper. I was initially concerned that the glue stick might not hold, but this concern turned out to be groundless. I initially shrank the paper on the wing using alcohol applied with a piece of cotton; I later used water on the stabilizer and the glue stick held just fine. Don't drench the covering in water, a fine mist will do perfectly. After the tissue dries, dope the surfaces as usual.

A couple of tips:

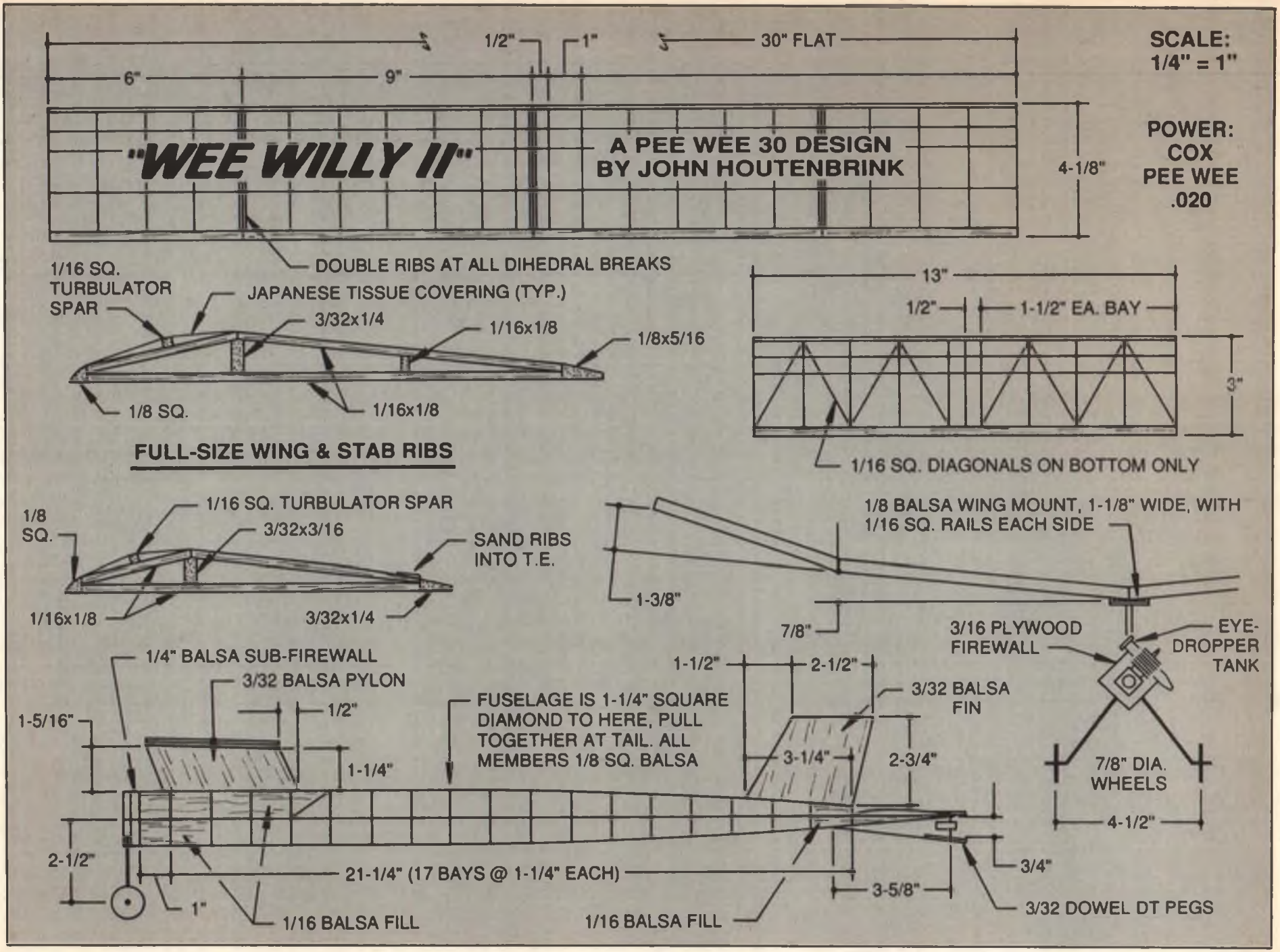
1. I found that the glue stick called "UHU Stick" works very well. It has a purple color before it dries but turns clear when cured. It also comes in two sizes. The smaller of the two is more convenient to use and gets into the corners better.

2. If you wish, you can use a wet brush to apply the glue stick. This will allow the adhesive to be thinned out somewhat and give you more control over application. In this case, the larger tube of glue stick will be more convenient to use.

3. Be careful not to stretch the tissue too tightly when gluing in place. When it is water-shrunk and doped, it can crush small cross-section ribs. This happened on my stabilizer. One suggestion would be to use non-tautening dope to minimize such damage. A couple of other benefits to using glue stick: It has no odor, and can be cleaned up with soap and water.

DOPE "BRUSHES"

While on the subject of covering models, I hope none of you are still using bristle-type brushes to apply dope to large surfaces. If so, go to your local paint or hardware store and pick up some inexpensive foam brushes. These come in different types and sizes; the best ones have a wooden handle attached to a beveled black


"WEE WILLY II"
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13"
1/2"
1-1/2" EA. BAY
3"
1/16 SQ. DIAGONALS ON BOTTOM ONLY
FULL-SIZE WING & STAB RIBS
1/8
SQ.
1/16 SQ. TURBULATOR SPAR
3/32x3/16
SAND RIBS
INTO T.E.
1/16x1/8
3/32x1/4
1/8 BALSA WING MOUNT, 1-1/8" WIDE, WITH
1/16 SQ. RAILS EACH SIDE
1-3/8"
7/8"
3/16 PLYWOOD
FIREWALL
EYE-
DROPPER
TANK
1/4" BALSA SUB-FIREWALL
3/32 BALSA PYLON
1/2"
1-5/16"
1-1/4"
FUSELAGE IS 1-1/4" SQUARE
DIAMOND TO HERE, PULL
TOGETHER AT TAIL. ALL
MEMBERS 1/8 SQ. BALSA
1-1/2"
2-1/2"
3/32 BALSA
FIN
3-1/4"
2-3/4"
7/8" DIA.
WHEELS
4-1/2"
2-1/2"
21-1/4" (17 BAYS @ 1-1/4" EACH)
1"
1/16 BALSA FILL
1/16 BALSA FILL
3-5/8"
3/4"
3/32 DOWEL DT PEGS

foam "brush." These are the perfect applicator system for large surfaces or any silk or silkspan covered surface. I usually buy the 2-inch size and use each brush twice before tossing. They can be washed out with thinner, but eventually they begin to break down and will leave little black spots on the surface.

One nice thing about using foam brushes on silk is that they can be held at an angle and therefore won't squeeze a bunch of dope through the covering. The finish looks much better without all those translucent puddles showing through.

HEDGEHOPPERS NEVER DIE!

Contrary to what Mark Sexton thinks ("I hate Hedgehoppers," he proclaims), someone besides me really does like them. Recently I received a letter from Jerry Heinsen of Berkeley, California, who writes: "Thanks so much for publishing the plans for the Hedgehopper II [September '95 *Model Builder*]. I have been reduced to RC HLG due to lack of real estate. I multiplied the plans by two for a two-channel RC model. It weighs 5.2 ounces and is almost exact scale (had to get the radio inside). It flies just great with that tail-down glide that free flighters love and RCers never see. Over 100 flights and still going strong. Of course, it has a few patches here and there."

Thanks, Jerry. Sounds like a potential article in the wind with this one. Hedgehoppers forever!

TWO MORE PASS OUR WAY

It's getting depressing to note the passing of our friends. Since the last column, Jimmy Dean and Ken Sykora have passed away. Jimmy was one of the stalwarts of the Old Timer FF movement until he retired and moved to Oregon about 10 years ago. We used to see him at the free flight contests. He hadn't flown much for awhile, but he would always bring some gadget or model to show off to us. He still had that inventive mind that could be put into something concrete.

Ken Sykora, who ran Oldtimer Model Supply, passed away in his workshop in December. Ken's shop was a complete source for hard-to-find items such as bamboo, hardwood wheels and the like. His catalog was one of the most interesting to read of any I received.

The Bellanca C-27A as built from a ScienText kit. The model spans 36 inches and is one of 10 excellent designs available from this growing cottage industry. Photo by Peter Wank of ScienText.

THE END

As you read this column, flying fields throughout the country are beckoning. Do me and our many readers a favor and take a few good photos of the activity for this column. Be sure to send along all pertinent information. We will publish the good ones. No payment—but plenty of fame.

Bob Stalick, 5066 N.W. Picadilly Circle, Albany, OR 97321. ***MB***

PLUG SPARKS

BY JOHN POND

◦Jet Powered Old Timers?

◦The E.D. Mk. IV Hunter

◦The Bay Ridge "Ike"

It's been a long time since this writer ran into the idea of using jet propulsion engines to power a free flight model, let alone an RC model. When this columnist attended the SAM 26/30 meet at Loren Schmidt's Ranch, Elk Grove, he ran into a jet model on the flight line in the SAM 30 club group.

Upon inquiring of the Jim Kyncy and Stan Lane team about whether or not the Anderson Pylon model had ever been tried, a negative answer was received. The writer recalled about 20-25 years ago, a free flight Comet Sailplane made its appearance at a Fresno GMA meet. Reports at that time were a little scary as they were flying the model in dry grass—a cinch way to start a bad fire! At least one flight was taken with rather unsatisfactory results. Since then, nothing more has evolved in the O.T. flying events.

Upon request, Jim Kyncy sent a letter and photos describing the jet powered model. Jim's description of the flight was rather disappointing as the flying speed was less than 10 mph (Kyncy's estimate). Instead of a hot, thundering, uncontrollable climb, the model turned out to be a pussycat (easy to fly). The writer would remind the reader that this was 1200 square inches of wing area which gave a lot of drag.

Photo No. 1. What the heck will these guys think of next? Stan Lane (pictured) and Jim Kyncy, both of SAM 30, teamed up to refit their RC Anderson Pylon with a Dyna-Jet, mounted above the wing. A new SAM event?

Photo No. 1 shows Jim Kyncy's buddy Stan Lane with the completed model, ready to fly. Note the amount of downthrust needed to clear the tail feathers from the fiery exhaust. Note the accessories needed to make the model airborne: a gallon of unleaded gas, a Model T Ford spark coil, a tractor battery, plus safety equipment of fire extinguisher, spray bottle of water, and clear area of gravel and dirt.

Does the model fly? Take a look at Photo No. 2 with the Anderson making a fly-by. Model demonstrates very smooth takeoff as there is no upsetting torque as encountered in a normal reciprocating engine.

In launching, the model must be held by a wingtip (very similar to control line flying) to assure clearance from that fiery blast coming out of the tube.

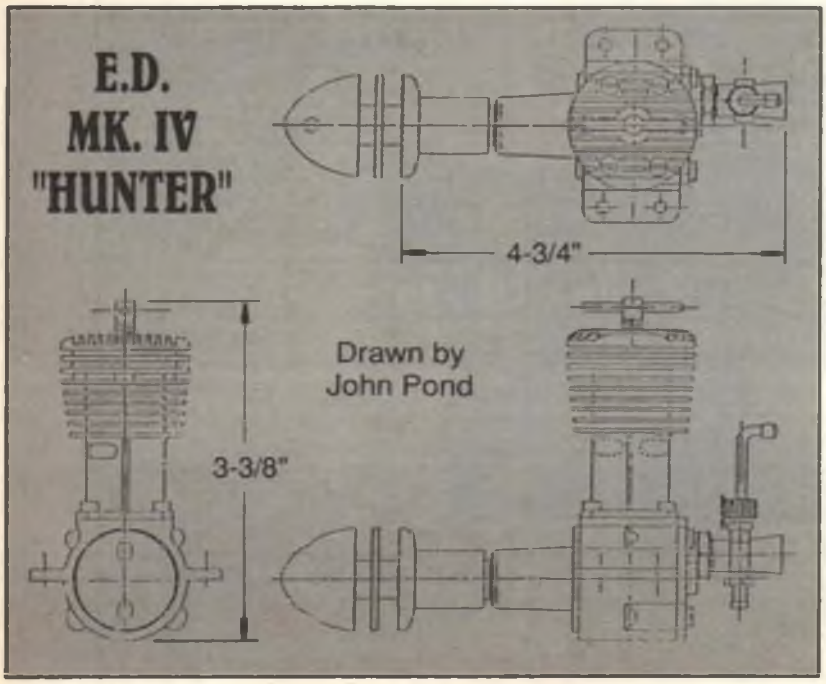
Jim is enthusiastic about jet flying and he envisions a competition event for jet engines. The best part of all, the Dyna-Jet engine is still available from America's Hobby Center at 146 West 22nd St., New York, NY 10011-2466. The latest ads appearing in the model magazines give the price at $249.99 plus shipping.

O.T. RC GLIDER

This event, conceived by Hardy Robinson and Ron Doig of SAM 26, is an interesting event that has not fully caught on. To the best of this writer's recollection, the event has yet to draw 10 entries. This is not to say the event is not competitive as this writer found out with his scaled-up Jasco Floater, but generally speaking, this special event must be flown off to one side to prevent towlines tangling with the hot gas jobs.

In a recent issue of the Swedish newsletter *Old Timer* there appeared a picture (Photo No. 3) of a canard glider. This writer has always had a soft spot for canards or pushers. There was nothing to do but to write a letter of inquiry to *Old Timer* editor Sven-Olov Linden at Hovastavagen 15, 703-63 Orebro, Sweden.

Most surprisingly, this writer received a prompt answer to all my questions. The model does qualify under the 1950 dead-



ENGINE OF THE MONTH

line, and the designer, Oscar Lauridsen Vang of Denmark, had the plans available at a nominal price. Yang was kind enough to send newspaper clippings from the late '40s showing the model in full flight. According to the write-ups received, the model did fly well.

Plans for the 60-inch model are available from John Pond O.T. Plans, but after looking at the current drawings, plans have been made to enlarge the model to 84-inch wingspan to carry the load of RC gear. Might mention that great minds run in the same channel as Yang has indicated he is going to come up with a larger version for free flight. Incidentally, the model is known as DUCK-2, short for Donald Duck. This looks like a fun model. Will be interesting to see how it handles on a bungee cord launch.

JUNIOR BIRDMEN DAZE

Not too much praise can be written for the William Randolph Hearst chain of newspapers, which picked up the challenge left by the AMLA association as organized by the *American Boy* magazine.

Just when model aviation (all over the USA) needed a real shot in the arm (after AMLA), 16 Hearst papers in all the major cities started running articles of model airplane construction, competition and general information as disseminated by Lawrence Shaw, the Director of the Junior Birdmen movement. He was assisted by various regional directors (also doubling as columnists) who wrote daily articles in their particular local newspaper. Major Burdette A. Palmer was our boy in the San Francisco Wing, *S. F. Examiner.*

All this was brought about by a photo from Ernie Wrisley of San Diego, who sent in Photo No. 4 showing an Outdoor Cabin as designed by Virgilio Sturiale of *Model Aircraft Engineer.* This model appeared in the May 1934 issue, which had full-size plans as an insert. This was great! If you liked the model, you could build it immediately.

Wrisley reports that Bob Aberle saw mention of his model in the SAM 41 (San Diego) newsletter. Bob put Ernie in touch with "Jiggs" (as he was called rather than Virgilio), who had just retired from Grumman Aircraft Co. Ernie says this was quite a shock to him as he visualized Sturiale as much older! Jiggs plans to do some electric glider flying.

As a sidenote, this columnist built most all the Sturiale designs and this cabin model was no exception. In competition he found the propeller block of 1x2x16 inches was too low of a pitch, cutting the motor run between 35-40 seconds at best. Later on the standard 1-1/2x2x16 prop was used quite successfully and promptly lost!

Photo No. 2. Yes, it do fly! Surprisingly, the model flies slower with the jet than with its normal glow engine.

ENGINE OF THE MONTH

As first reviewed by *Aeromodeller* and *Model Aircraft* (British magazines), the E.D. Mk IV "Hunter" was one of the first post-war British engines to incorporate some of the ideas from American engines that had (to the Brits) fantastic performance claims. Although our English cousins doubted the figures presented, they finally came to the conclusion that they, too, could produce hot running engines.

This small Class B engine of 3.46cc (.21 cubic inch) displacement first attracted this writer's attention at the 1994 SAM 101 Annual at Camarillo, California. Al Heinrich of Aerodyne Products was demonstrating a new import being manufactured by CS, the Chinese company that has been flooding the market with a series of diesel engines.

Starting the engine seemed easy enough with the engine running quite well. Then Heinrich fine-tuned the needle valve and proceeded to screw down the contrapiston. There was no question about power as the noise output (for a diesel) included revolution ratings well over 10,000 rpm.

Inspection of the engine showed nothing revolutionary, but the engine follows the practice of American high-speed spark ignition engines by using a ball bearing to support the inner end of the crankshaft while being supplemented by an front plain bearing. A rotary disc valve is employed for fuel induction.

After noting the power of the E.D. Hunter, the writer was surprised not to see an annular port layout, but the engine does feature transfer grooves in place of separate passages. The two exhaust ports are located on the right-hand side of the cylinder (opposite of the transfer), while the piston is flat on top—no baffle. This arrangement provides an output of more than 1/4 horsepower.

The E.D. Mk IV Hunter replica is manufactured by CS out of Shanghai, China and is being represented in the U.S. by Aerodyne. Rather than get into a laborious write-up on the idiosyncrasies of diesel engine operation, the best idea is to purchase one of these replica engines as they come with two pages of introduction and instructions. Aerodyne is located at 603-B San Michel N., Costa Mesa, CA 92627; (714) 646-8864.

ROBERT COPLAND

Received some rather sad

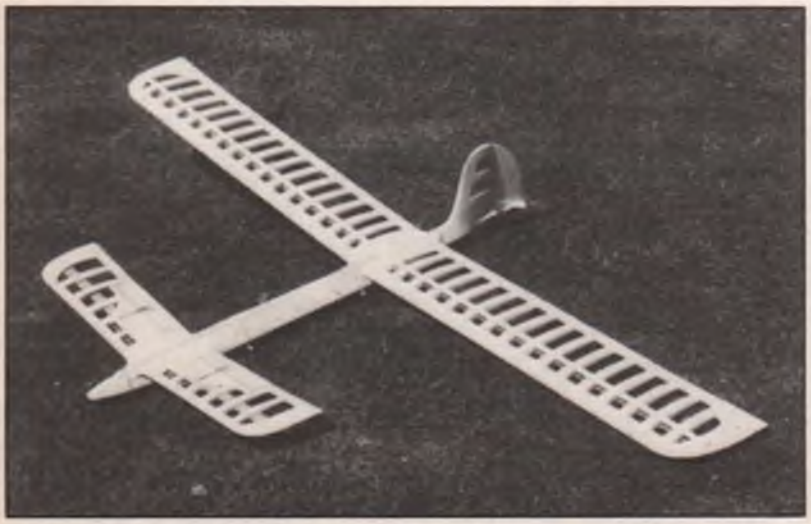
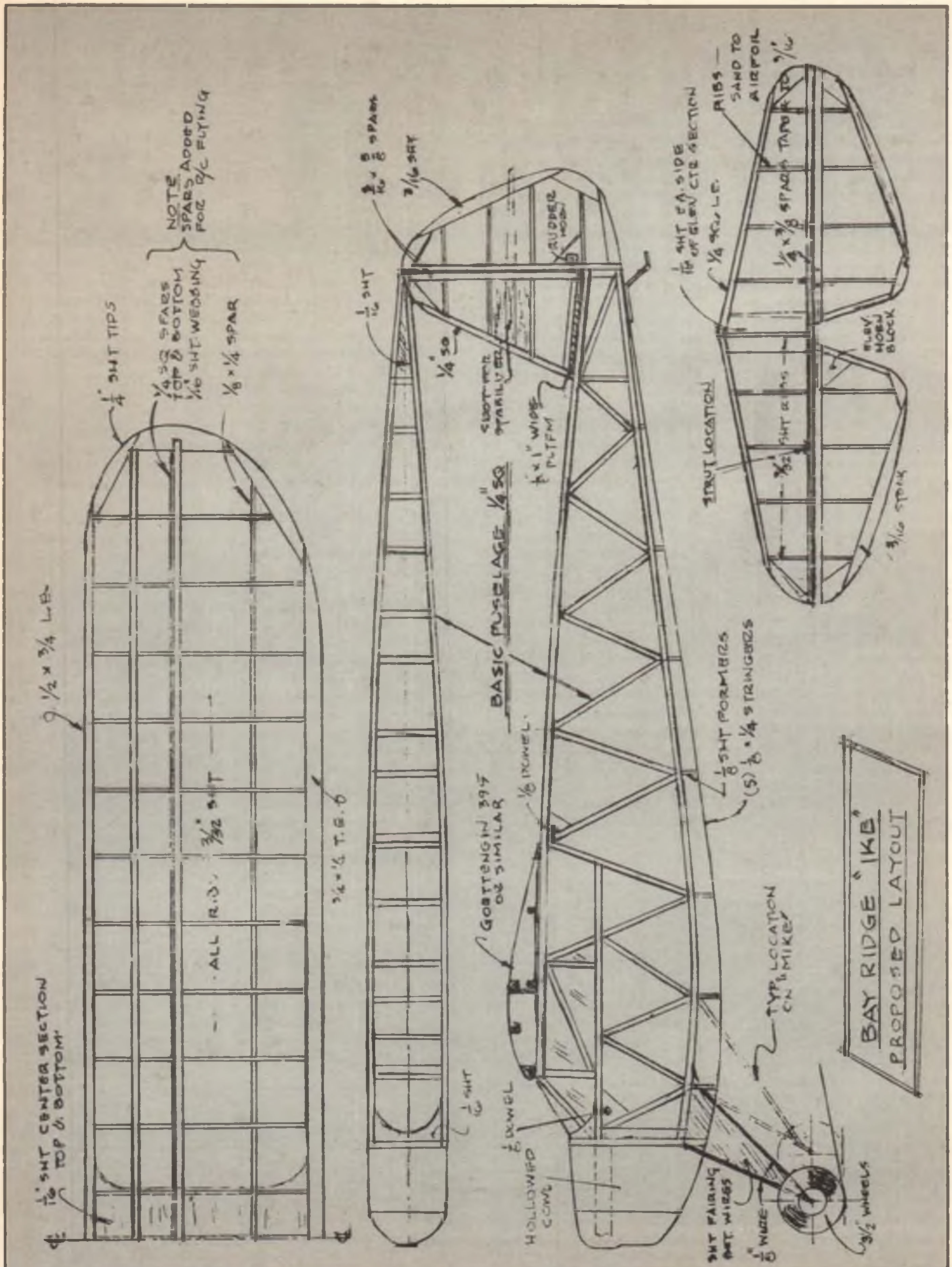


Photo No. 3. The "DUCK 2," a 60-inch span, pre-1950 canard towline sailplane as designed by Danish modeler Oscar Vang. Pond plans to scale up the drawings for the O.T. RC Glider event. Who will be the first to build one?



PLAN OF THE MONTH

Photo No. 4. Ernie Wrisley turned out this good-flying example of the 32-inch Outdoor Cabin as originally designed by Virgilio Sturiale and presented as full-size plans in Model Aircraft Engineer, May 1934. Model flies on 10 strands of 1/8-inch FAI tan rubber, and Ernie says the DT is absolutely necessary. Pond has plans.

news from Ron Moulton, former editor of the British magazine *Aeromodeller*, wherein he announced the passing of the famous British modeler Robert Copland, or Bob as he was called by all his associates.

As a Senior Fellow of the SMAE, he commanded the highest respect in the sport of model aviation and later on with his association with Hawker Aircraft. He was the leading member among the great names of the Northern Heights Model Flying Club.

In 1936, Bob placed 2nd in the Gamage Trophy, following this up with a 6th place among 123 entrants for the Wakefield event. Copland won 3rd place in Wakefield and 2nd in the Stout Trophy. Sailing both ways (Aquitania and returning on the Europa) was a tremendous experience for Copland.

Dropping the box fuselage lightweight design, Copland adopted the streamlined shape he was so famous for competitions. In 1937, he won the Pilcher Cup, missed the A place on the national team that year.

The year 1938 saw Copland winning the Weston Cup again, but just missed placing on the Wakefield team. However, he did fly Jim Fullarton's model representing Australia in France.

A new international event for the King Peter of Yugoslavia Cup was established and Bob not only qualified, he won the cup, establishing records of 33:09 for duration and 6,800 feet altitude. Having set records in indoor flying, Dr. A.P. Thurston, SMAE President, was impressed to the point where he recommended Copland to Sydney Camm, Chief Designer at Hawker Aircraft.

A new event for the Queens Trophy, which was for a larger model than Wakefield, attracted Copland's attention with a scaled-up version of his streamliner. Placing 2nd in 1949 and 1950, he finally won in 1951.

Placings and wins are far too numerous to note as Copland was the true competitor devoted to model flying. Bob never married, so deep was his devotion to model design. This attention to detail followed him to Hawker where he was in the original design of the Kestrel prototype. On the day of his funeral, November 16, his credits of the Hurricane, Hunter, and Harrier brought out a tremendous crowd to pay tribute. There will be only one Copland.

MODEL OF THE MONTH

This month we are going to try something different; i.e, present a plan that this writer has been unable to run. We are referring to the Bay Ridge "Ike," one of the combinations that Bay Ridge Co. put out in the late '30s. In viewing photos and specifications of these two similar models, it occurred to this writer to use some excellent advertising material on hand to create a reasonable set of reliable plans that would withstand criticism.

To that end, this columnist has contacted numerous people associated with Bay Ridge in an effort to find the original plan. Even Art Hassolback, the driving force of Consolidated Models (so-called from the consolidation at the beginning of WWII of Bay Ridge, Jerry's Hobby Shop, and Burkhard). No luck here!

Other old timers in Brooklyn such as Bill Seidler, the manufacturer of Pacemaker engines, drew a blank in his searches. Even old timer admirer of the Ike, Don Broggini, was enlisted to try and find the designer.

Finally, with no other avenue open, this columnist drew up a set of Ike plans based on all available literature, information and photos. These drawings have been sent to various well-known pre-WWII designers, notably Ray Heit. Heit designed for just about every modeling firm and magazine. Running down his whereabouts was no easy task. When Ray viewed the Ike drawings, his immediate reaction was, "Nice model, but I didn't design it."

For this reason, the plans are being submitted for any modeler's critique, ideas and suggestions. If nothing more is forthcoming, this columnist will issue the Ike plan on the basis that it's the only one available; therefore, any modelers building this model start from square one (namely the same plan). Comments and suggestions are solicited from *MB* readers and others connected with that era.

John Pond, P.O. Box 90310, San Jose, CA 95109-3310. *MB*

LEFT: A rough sketch drawn by John Pond for the Bay Ridge Ike, authentic plans for which apparently don't exist. John based his drawing on all available photos and literature, and plans to submit it to SAM for approval if no other information about the model is forthcoming.

BY LARRY KRUSE

Orr's "Pacemaker"

For Old Time Rubber Competition

Classic O.T. rubber at its finest! Properly built, this 1940 twin-fin cabin job can be very competitive in SAM Commercial Rubber and Small Rubber Fuselage events.

In the late 1930s Wichita, Kansas was a hotbed of modeling activity, spurred on by the full-scale aircraft industry which was just recovering from the throes of the Great Depression. During that time, R.J. (Bob) Youngman, a talented model designer in his own right, was a modeler's best friend. Bob ran the model supply shop for one of two Orr's Department Stores, which were located strategically within the city. Both of Orr's stores stocked modeling supplies because full-scale and modeling activities were growing at an accelerated pace. However, the location of the College Hill store, just across from East High School, guaranteed a steady supply of modeling customers during noon hours and after school.

Bob designed his first kit model, the J-Hawk, in 1938. Subsequently, Orr's sponsored a one-design contest for models built from the kit. In 1939 Bob produced his second kit model, the Chieftain, and again, no strangers to promotion, Orr's featured it in another one-design contest. By all standards, the Chieftain was an improvement over the J-Hawk. It was larger, flew better and as a consequence, the annual contest grew—both in entrants and in prizes.

In 1940 Bob produced his third and best rubber model kit, the Pacemaker. Much cleaner and more visually attractive than either the J-Hawk or the Chieftain, the Pacemaker featured elliptical flying surfaces with a V-dihedral wing and stabilizer. Although it was much more complex than either of the first two designs, the modeling youth of Wichita by now looked forward to the annual one-design contest and snapped up the kits as fast as they were produced.

Jim Katkuhn shows us his version of the Pacemaker decked out in yellow and black trim. The unusual lines of the model make it an attractive as well as an efficient planform. The huge 14-inch propeller is a decided advantage in SAM Commercial Rubber events. A dethermalizer system is an absolute necessity; Jim opted for a pop-up stabilizer. The Pacemaker might also be a good candidate for a pop-off wing DT.

Dean Zongker, a local modeler, had been chosen to build all of the test models for the series. As a friend of Dean's, and a participant in the first two contests, Ernie Linn was involved in the flight testing of the Pacemaker. Unlike the first two designs, which were literally off-the-board fliers, this newest effort from Youngman seemed to be prone to a tail-heavy condition which showed up as a stalling tendency in the glide. To correct that condition, Dean and Ernie decided to move the cabin structure aft 3/8 of an inch, rake the windshield back more sharply to match the new angle created, and increase the lifting horizontal stabilizer area from about 30 percent to 39

percent of the wing area. These corrections fixed the problem and the model performed flawlessly after that.

The Pacemaker's classic lines make it a very attractive ship to build. At the same time, because of its numerous compound curves and relatively complex structure, it is not a good ship for the beginning builder to tackle. However, for the more experienced builder and serious competitor, it has a great deal to recommend it. First, it satisfies the SAM "Commercial Rubber" event. It is within the maximum wingspan specified and has a large 14-inch freewheeling prop. Most Commercial models have a prop diameter no larger than 1/3 of the model's wingspan, or more in the neighborhood of 11-12 inches. Likewise, it satisfies the FAC "Old Time Rubber" event because it meets the maximum 36-inch allowable wingspan rule. And again, that big freewheeling prop offers the same distinct advantages in FAC flying as it does in the SAM event. As a bonus feature, the performance of the Pacemaker is good enough to fly it in SAM "Small Rubber Fuselage" events against larger designs.

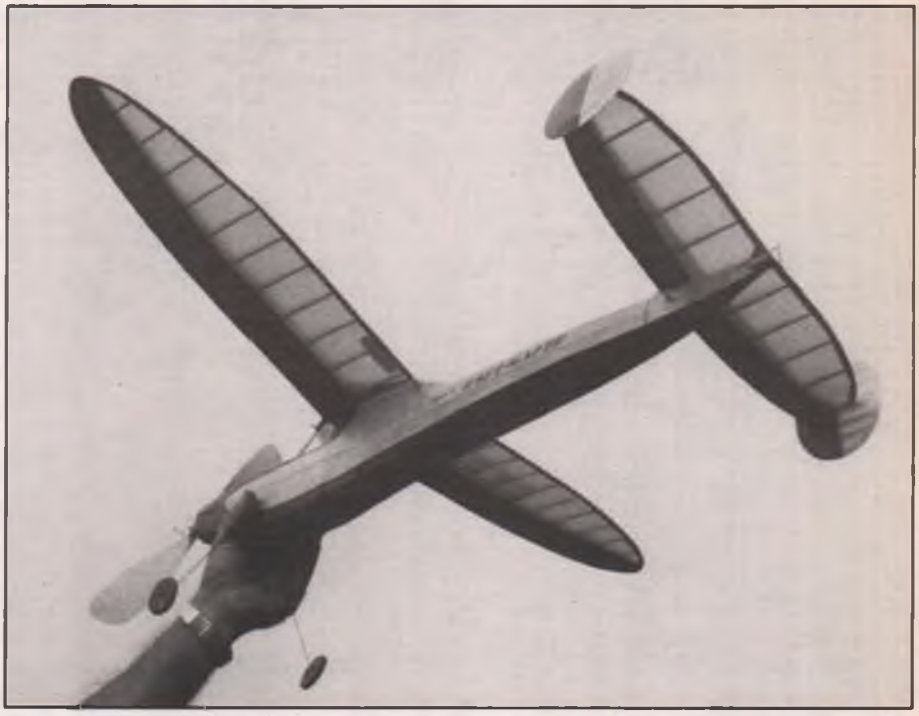
BUILDING NOTES

The fuselage presents the most challenging aspect of the model. The longerons must be matched for equal flexibility to keep the sides from warping disproportionately. After the basic box structure is put together squarely, as noted in the perspective drawing shown on the plan, the nose and underbelly formers can be added. When laying in the 1/16 square stringers, take care not to pull the fuselage box off to one side. The same holds true for the formers on the rear deck, although by the time the underbelly structure is in place the fuselage should be fairly rigid. Some different accommodation for mounting the wings might be considered also. The photos show a dowel arrangement, which is much preferable to the "rubber band around the fuselage" instructions given on the plan. Likewise, modifications for a pop-up-stab dethermalizer should be made if you want to keep your Pacemaker around for more than one flight. (More about that later!)

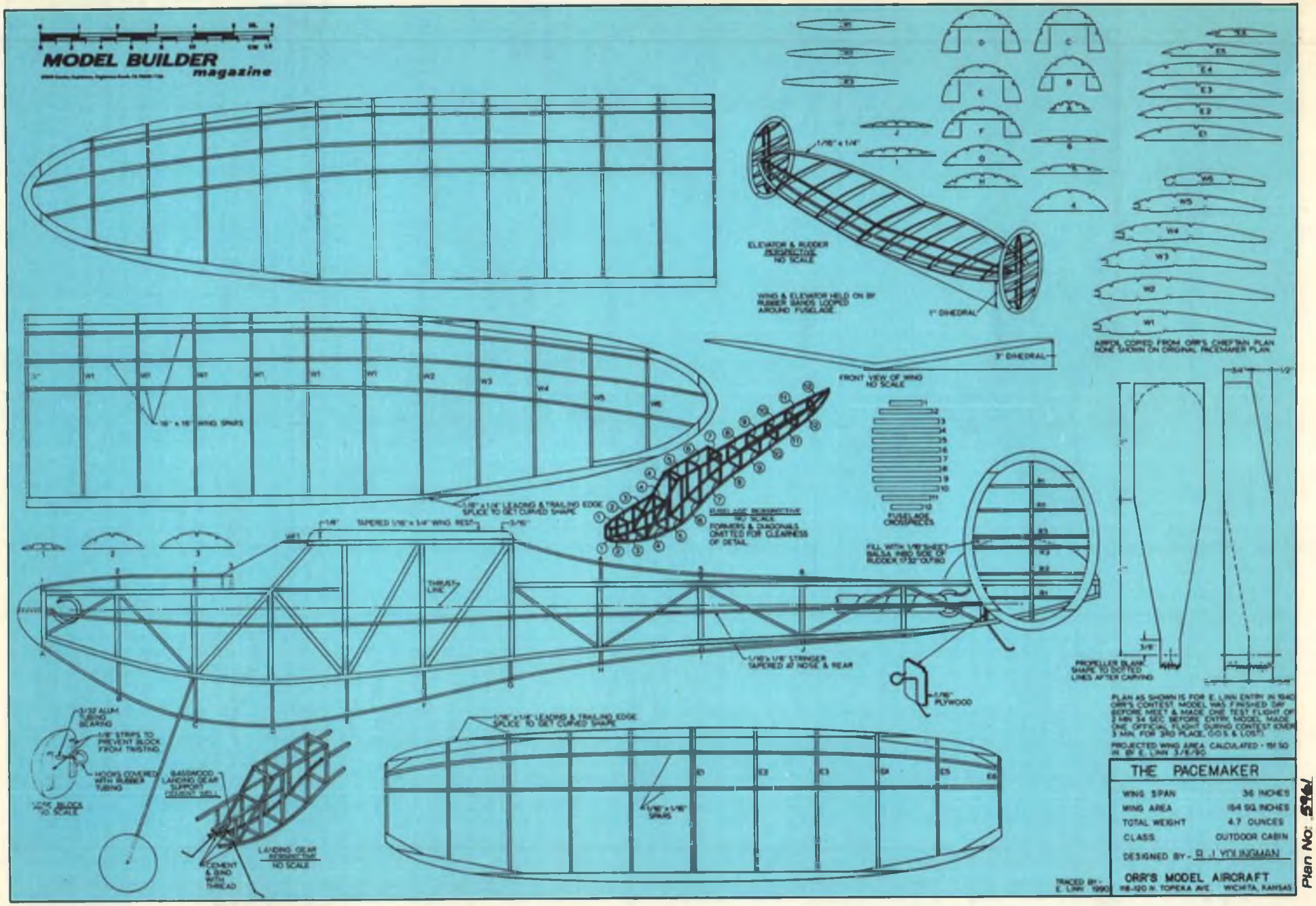
The most painful part of completing the fuselage is covering it with multiple pieces of tissue, due to the numerous compound curves. Using thinned white glue as the adhesive and applying it with a small, pointed brush makes the job a bit easier. The photos also show a very attractive yellow and black decorating scheme that Jim Kutkuhn used on his model, but again, there is a certain amount of painful *deja vu* associated with covering compound curves, particularly in two colors.

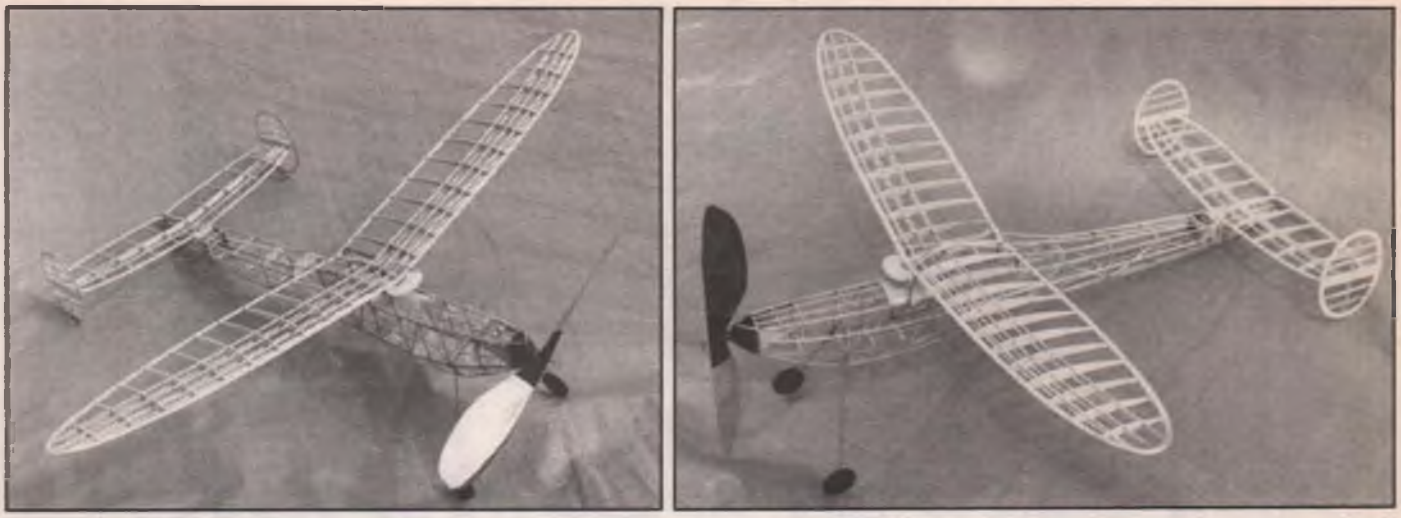
The wing and stabilizer construction are very much alike. The process can be sped along by first making up the spliced leading and trailing edges, and, while they are drying, cutting out the ribs for both surfaces. Construction is pretty straightforward, beginning with pinning down the trailing edge of the wing, gluing the ribs in place and then slipping the leading edge into the rib slots. All spars can be added after the dihedral is installed. Both the leading and trailing edges of the stab can be pinned down and the ribs slipped in place. Stab spars work the same way as they do in the wing. Install them after the dihedral angle is glued in. Be sure the spar material for the stab is light and flexible. We don't need to induce warps as the spars are bent to fit the compound curvature of the leading edge.

The twin fins are probably unnecessarily complex. Each consists of eleven separate pieces—six ribs of three sizes, four formers of two sizes and a center spar. Whew! They are, however, light and warp-free, so there is some compensation. Besides, classic twin-finned designs not only are unique-looking and draw more than their share of admirers on the ground, they're often easier to trim, as the rudders are out of the propwash. Once again, you'll



These views show off the elliptical wingtips and the small amount of dihedral incorporated into the stabilizer. While construction is a little more complex than the typical "box" fuselage and squared-off wings, it is not overly difficult for experienced builders. All of the elliptical surfaces are constructed by joining smaller pieces of straight sheet balsa to make the curved outlines. Could also be laminated from balsa strips.


MODEL BUILDER
magazine
ELEVATOR & RUDDER
PERSPECTIVE
NO SCALE
1/16" x 1/4"
WING & ELEVATOR HELD ON BY RUBBER BANDS LOOPED AROUND FUSELAGE
1° DIHEDRAL
AIRFOIL COPIED FROM ORR'S CHIEFTAIN PLAN
NONE SHOWN ON ORIGINAL PACEMAKER PLAN
3° DIHEDRAL
FRONT VIEW OF WING
NO SCALE
1/8" x 1/8" WING SPARS
1/16" x 1/16" LEADING & TRAILING EDGE
SPLICE TO GET CURVED SHAPE
FUSELAGE PERSPECTIVE
NO SCALE
FORMERS & DIAGONALS
OMITTED FOR CLEARNESS
OF DETAIL
FUSELAGE
CROSSSECTIONS
FILL WITH 1/16" SHEET
BALSA INSIDE SIDE OF
RUDDER (7.32" OUTSIDE
TAPERED 1/16" x 3/4" WING REST
THRUST
LINE
1/16" x 1/8" STRINGER
TAPERED AT NOSE & REAR
1/16"
PLYWOOD
PROPELLER BLADE
SHAPE TO DOTTED
LINES AFTER CARVING
3/32 ALUM
LANDING
BEARING
1/8" STRIPS TO
PREVENT BLOCK
FROM TWISTING
HOOKS COVERED
WITH RUBBER
TUBING
1/2" BLOCK
NO SCALE
BASSWOOD
LANDING GEAR
SUPPORT
(DOUBLE 3/8")
CEMENT
& BIND
WITH
THREAD
LANDING GEAR
NO SCALE
1/16" x 1/16" LEADING & TRAILING EDGE
SPLICE TO GET CURVED SHAPE
1/16" x 1/16"
SPARS
PLAN AS SHOWN IS FOR E. LINN ENTRY IN 1940
ORR'S CONTEST MODEL WAS FINISHED DAY
BEFORE MEET & MADE ONE TEST FLIGHT OF
3 MIN 34 SEC BEFORE ENTRY. MODEL MADE
ONE OFFICIAL FLIGHT DURING CONTEST (OVER
3 MIN. FOR 3RD PLACE. O.O.S. & LOST)
PROJECTED WING AREA CALCULATED - 151 SQ
IN BY E. LINN 3/6/90
THE PACEMAKER
WING SPAN 36 INCHES
WING AREA 154 SQ. INCHES
TOTAL WEIGHT 4.7 OUNCES
CLASS OUTDOOR CABIN
DESIGNED BY - R. J. VEJNOSKA
ORR'S MODEL AIRCRAFT
118-120 N. TOPEKA AVE. WICHITA, KANSAS
TRACED BY -
E. LINN 1990
Plan No. 516



Les DeWitt's Pacemaker in its bare-bones state. Les elected to cover his prop with silver Mylar for added visibility and ding-proofing. These photos give a good sense of perspective to the craftsmanship required to build this airplane.

need to get out the thinned white glue and small pieces of tissue to cover the airfoiled, elliptical shapes of the fins.

FLIGHT TRIMMING

While the plans don't show it, as is often the case with designs of this vintage, the model does require about 5 degrees of downthrust and 3 degrees of right thrust. The noseblock can be drilled out to accommodate those thrust requirements, or you can shim them in later. It's a much neater assembly, though, if the thrust settings are incorporated initially. The plane also requires about 3 degrees of negative incidence in the stabilizer, which can be shimmed in during the initial hand glides.

The Pacemaker should balance at 50 percent of the wing chord without the rubber motor in place. All-up flying weight with a 24-inch, 16-strand braided motor of 1/8-inch FAI Tan installed is 4.2 ounces. Expect the motor to weigh about 1-1/3 ounces (33 grams), which leaves an acceptable airframe weight of just under 3 ounces for the plane itself. If you're someplace in that ballpark, you have a real competitor on your hands.

The model should be trimmed to climb steeply to the right on the initial power burst, then level out and open up as

continued on page 84

Helicopter World

■ BY JAMES WANG

JR'S PCM-10Sx HELICOPTER RADIO

JR produces some of the best radio control equipment in the world. This month James examines their new top-of-the-line 10-channel heli radio, and also takes a look at JR's revolutionary "Super Servos."

I've used my JR PCM-10 and 10S for many years. I feel they are the most user-friendly radios among the high-end types. Now JR has introduced an even more sophisticated system, the PCM-10Sx, in both airplane and helicopter versions. What's more, if you already own a 10S, you can send it off to JR Service Center of America and have it upgraded to a 10Sx for about $200. That's what I did, and I'm very happy with my new third generation JR PCM-10Sx.

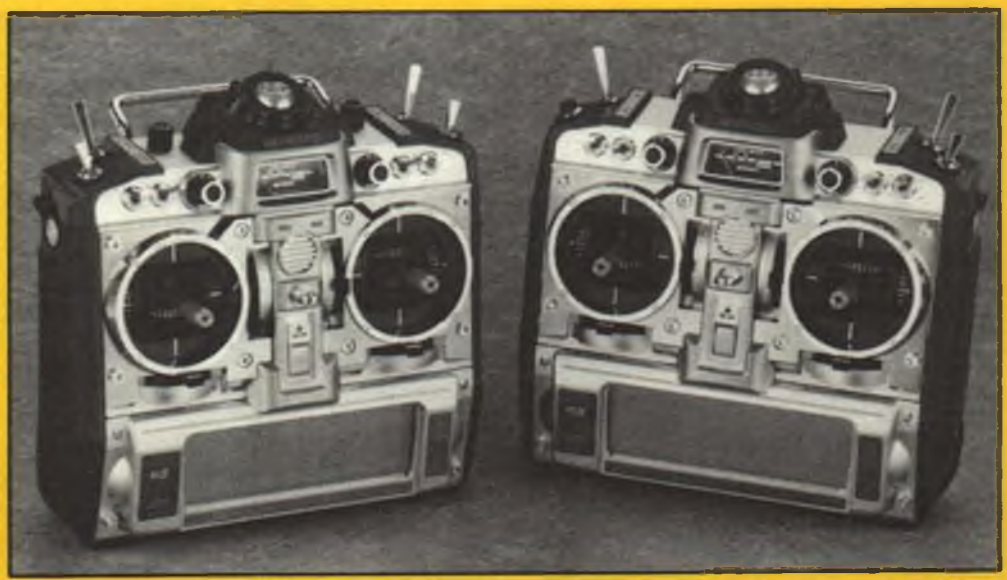
The most important new features of the 10Sx are full page display of program features, idle-up 3 and 4, multi-point programmable mix, and adjustable swashplate timing. These features make the 10Sx very versatile, powerful and simple to use!

The new adjustable-contrast LCD screen lists all of the features simultaneously on the screen. (The older models listed one feature at a time and required you to scroll up or down to find the program feature you wanted to change.) You just look at the screen, type in the feature number and you're ready to make changes. The LCD screen also clearly illustrates all the throttle and pitch curves, programmable mix curves, and exponential control curves, which makes programming fun and easy.

The original PCM-10 and 10S have five throttle and pitch curves; the 10Sx adds two more idle-ups. Normal mode, idle-up 1 and 2 are still controlled by a three-position toggle switch. New idle-up 3 and 4 are activated by flipping the gear switch or the aileron dual rate switch (you decides which switch you want to use). When you're in idle-up 1, flipping the switch will kick you into idle-up 3; in idle-up 2, flipping the switch will move you into idle-up 4. It took me some time to get used to this concept.

Do we really need four idle-ups? I think so. The added flexibility allows you to tailor the performance of the helicopter during flight. For instance, normal throttle and pitch curves are set up for standard hovering. Idle-up 1 can be used for precision hovering, idle-up 2 for doing forward flight aerobatics, idle-up 3 for high-speed flight, and idle-up 4 for switchless inverted flight and 3-D hotdogging.

Let's see how we can accomplish these goals using the throttle and pitch curves and the auto dual rate function. In the normal mode we would set the carburetor to have an almost linear



The versatile and user-friendly JR PCM-10Sx systems pictured here are the helicopter (left) and airplane transmitters. JR systems and accessories are distributed in the U.S. by Horizon Hobby Distributors.

Helicopter World

James is very impressed with the new JR "Super Servos," the low-profile NES-7000 (left) and standard size NES-4000; see text for comments.

JR's new NES-531 could be considered a "high-performance sport servo," features a five-pole ferrite motor, ball bearing supported output shaft, and 51 inch-ounces of torque.

response. And we can use the JR auto dual rate feature to make the aileron, elevator and rudder move at about 90 percent of max throw. (The JR menu says aileron, elevator and rudder, but in helicopter jargon they really should be called roll cyclic, fore/aft cyclic and yaw control.)

If we want to use idle-up 1 to make the model even less touchy in the vertical direction in hover, we can flatten the throttle and pitch curves near center stick. At the same time we can reduce the aileron, elevator and rudder throw to 60 percent in auto dual rate. We can also add in about 30 percent exponential for aileron, elevator, and rudder to achieve a really tame hovering helicopter.

Let's use idle-up 2 for forward flight aerobatics. Here we want a high rotor speed (1700-1800 rpm). We also need to bump up the throttle opening at the low end and mid-stick positions, and reduce the collective pitch by about 1 degree at mid-stick.

To set up idle-up 3 for high-speed level flight, we want an even higher rotor speed—1800-1900 rpm. Now we want the throttle full open starting at half stick, and should reduce the top end pitch by about 1 degree so the engine is not overloaded. Since you're flying fast, the aileron, elevator and rudder auto dual rate should be kept at around 60 percent to avoid overcontrolling the model.

JR's new "Extra" series of reliable and long-lasting airborne NiCd battery packs. Available in four- or five-cell packs, from 600 to 2000 mAH.

Finally, idle-up 4 is set up to have a U-shaped throttle curve and 100 percent aileron, elevator and rudder throw for all-out 3-D hotdogging.

Another new feature that I'm very impressed with is the 8-point programmable mix. The PCM-10 and 10S had five simple programmable mixes; the 10Sx has four simple mixes and four multi-point mixes. Programmable mix lets one channel dictate how another channel will move. For example, if the model rolls to the left slightly every time you pull up elevator to do a loop, then the programmable mix can be used to automatically feed in some right aileron when up elevator is input.

In this example, the old mixing method only lets you define how much the aileron will move when full elevator is given. The amount of mixing is strictly linear, so you have zero mixing at center stick and maximum mixing at full cyclic stick. The new multi-point mix allows for up to eight points to be programmed and manipulated from 0 to 100 percent.

With multi-point mix you can even program in your own tail rotor/collective pitch mixing schedule. Better still, you can select when the mixes come on. For instance, we can program the U-shaped tail rotor mix to come on only in idle-up 2 and 4, and off at all other times. Use a different mix in idle-up 1 and 3. With the 10Sx I don't use the revolution mix anymore; instead I program my own tail rotor mixes. The power of this radio is endless!

When using a gyro with gain adjustable from the transmitter, like the JR piezoelectric gyro, up to three gain rates can be selected. Any one of the three gain settings can be programmed to automatically activate in any of the seven flight modes (normal, idle-up 1, 2, 3, 4, hold, and invert).

Another useful feature is called swashplate timing; a value of -30/+30 degrees can be input to correct any elevator/aileron or aileron/elevator control coupling. You can see this phenomenon when the model is sitting on the ground with the main rotor spinning at regular speed; feed in a pure fore/aft cyclic and you will see the main rotor disk does not tilt exactly forward and back, it also tilts slightly to one side. Same thing when a pure roll cyclic is put in; the main rotor tilts fore and aft slightly. This is due purely to the dynamics of a helicopter rotor system. For most full-size and model helicopters, the phasing can be as much as 10 to 20 degrees off.

The PCM-10Sx heli system comes with five servos and a 1000-mAH receiver battery. You have a choice of JR's standard NES-517 servos, the NES-4131 or 4721 high-performance

Helicopter World

coreless motor servos, or the NES-4000 Super Servos. My personal choice would be the inexpensive 517 or 531 for throttle, the 4131 or 4721 for roll and fore/aft cyclic, and the 4000 for collective and tail rotor.

The new 10-channel D940S receiver uses JR's 1024-bit SPCM coding system. The older PCM-10 uses 512-bit ZPCM coding. The PCM-10 transmitter won't work with the new receiver, but the PCM-10Sx can transmit in FM, ZPCM and SPCM, hence it is compatible with all JR receivers (except the PCM 9 and Century 7 PCM).

The PCM-10Sx has memory for 10 different models; you can program in a 16-letter name for each one. They are clearly displayed on the LCD screen. Most of the other features are the same as the proven PCM-10S, which we reviewed in detail in the June, July and August 1993 *Model Builder*.

You will love this system. You can't beat it for its reliability, user-friendliness and excellent instruction manual. It is sophisticated, but not complicated.

THE SERVOS

JR's Super Servos represent the quintessence in servo technology. At the 1993 RC World Championship in Austria, the 1st and 2nd place winners of both F3A pattern (Hanno Prettner and Chip Hyde) and F3C helicopter (Curtis Youngblood and Kazuyuki Sensui) all flew with JR Super Servos. At close to $130 apiece, they aren't cheap, but they are the best that money can buy.

What makes the Super Servos special is their precision and holding power. When you put in a command, these servos respond *immediately*. With conventional coreless motor servos, when a command is given, it takes a fraction of a second for the servo to get up to a steady rate of movement. Super Servos also use coreless motors, but their special amplifier circuitry pulses 40 times faster than conventional servos. The servos produce much more power immediately off neutral and have significantly reduced deadband.

Super Servos also have very high resistance against external forces at neutral or at any specific commanded position. Horizon tested them and found that with 30 inch-ounces of push, the arm on a conventional servo of similar torque would be displaced over 4 degrees from the desired position, while the Super Servos were displaced only 1 degree!

These characteristics make Super Servos excellent for precision hovering, where the controls are moved a very small amount; we also want our servos to have a high start-up torque to overcome the friction in the controls but not overshoot. And the close-to-zero deadband reduces slop in the blade and paddle controls, also improving precision hovering.

To reduce expense, I use Super Servos just on the collective and tail rotor control. The tail rotor servo is constantly moving due to the rate gyro, so I want the servo to be able to precisely follow every feedback command from the gyro. Collective control really benefits from the holding power; when I move the stick, the collective response is positive and instantaneous.

For servos, coreless motors are generally better than ferrite motors because coreless motors can accelerate and stop faster. Coreless motors also cost significantly more than ferrite motors, hence JR has introduced its new NES-531 servo. The 531 incorporates a five-pole ferrite motor, which is much superior to the traditional three-pole motors used in inexpensive sport servos. The 531 costs less than $50 and fills the gap between JR's contest level 4131/4271 and standard 507/517 servos. The 531 offers 51 inch-ounces of torque and the output shaft is supported by a single ball bearing. This new servo is perfect for all .30-.60 size helicopters.

THE BATTERIES

Whether you're using the higher current drain Super Servos or not, you may want to consider upgrading your receiver and transmitter NiCd pack to the JR "Extra" series of NiCd batteries. These are made with Sanyo's top-of-the-line E type NiCd cells. The E cells give a longer flat discharge curve which provides 5-10 percent longer flight time for the same mAH capacity.

Horizon carries over 20 different sizes of receiver and transmitter packs. Flight packs are available with four or five cells and range from 600 to 2800 mAH. Each pack is quadruple welded to ensure the highest level of reliability. Heavy gauge wire is used to reduce resistance, and each pack is equipped with a JR connector. Many people prefer a five-cell pack (6 volts) because it speeds up the servo by another 20 percent. A five-cell pack also speeds up the gyro motor to make the gyro more sensitive.

The PCM-10Sx transmitter comes with a 700-mAH pack, which gives 2 hours and 40 minutes of flying on a full charge. The transmitter beeps when the voltage reaches a dangerous level. An optional 800-mAH Extra series battery pack is available for the 10Sx transmitter.

James Wang, 7365 Main St., Suite 106, Stratford, CT 06497. ***MB***

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MODEL BUILDING 101

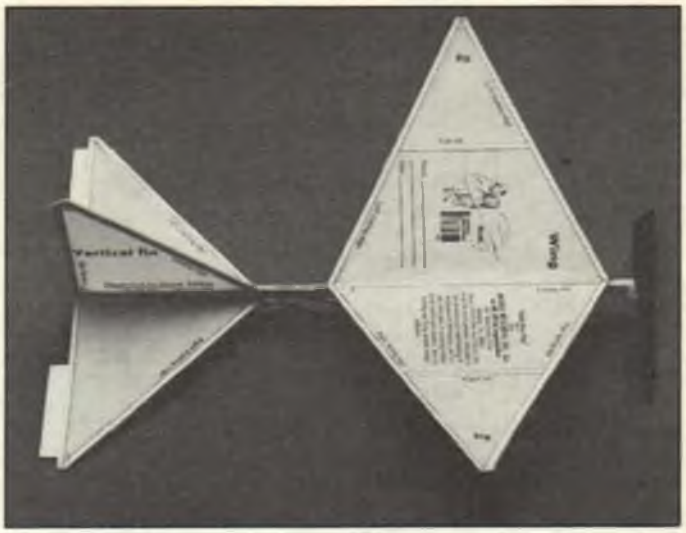
BY J.J. LEVINE

MB101 Academy Now In Operation!

Those who have followed these reports are well aware of the Chattahoochee Riverside Flyers club in Cumming, Georgia. Formulated by Don Erch and manned 24 hours a day by the very dedicated Hiram "Hy" Haggett (who lives on site), we are now operating an academy for teachers or group leaders. MB101's goal is to explain the skills and methods we've acquired for teaching aerodynamics, via the use of our three custom-designed model aircraft, to students of all ages. For details about curriculum and classes, please send an SASE to MB101 and we will be happy to furnish the information.

• • •

I am constantly amazed at the formidable personnel this industry attracts. Time after time I'm reminded that there is a small but solid core of caring, dedicated, benevolent members of the "gray brigade" that want to, and do, help. Such was the letter we received in December from Charles Ziehl. Charlie also sent a donation to MB101, which we greatly



The Delta Step-1 as produced for the MB101 program by Sig Mfg. Co. Note that the plan/covering incorporates the MB101 logo, a place for the builder's name and the date, and the names of the individual basic components. These kits are available; send an SASE to the address given in the text for information.

appreciate. (This might be a good time to mention that every dollar received from donations or through sale of our products goes directly into school programs. There are no salaries paid to any of our directors, advisors or volunteers.) However, it was the accompanying letter which meant a great deal to me:

"I have just read your MB101 in the January '96 *Model Builder* and find the whole idea is right on.

"I went to high school too many years ago. The school was Brooklyn Technical in the place where trees grow. I also hold a degree in Aero Engineering from, where else, but Brooklyn Poly (now New York Polytechnic).

"How can I help in your (our) effort to share the best thing that happened to me in my lifetime, other than my wife and five children?

"What else can I do?"

We wondered, as we read this, how many of the our over 1,000 middle school children we have been instructing to date will, in the future, will be able to write similar letters in remembrance of our efforts.

MB101 BUILD-AND-FLY CONTEST

Dennison Love is a dedicated proponent of rocketry. We have known each other, as not-for-profit organizations, for some time, and meet each October at the National Radio Control Model and Hobby Show in Chicago.

During the '95 show, we were across the isle from each other. As Dennison extolled the well-deserved virtues of his rocketry program, he kept getting exposed to our instructional videotapes and "pitch" for MB101's Middle School program.

We are now happy to report that he has organized a Build, Fly and Exhibit Competition, to be held at the Harlem-Irving Shopping Mall in the Chicago area, 8:30 a.m. to 9:30 p.m., June 22-23, 1996.

Basing the contest on our sixth grade Delta Step-1, seventh grade Tennyson Step-2 and newly developed Tennyson Electra Step-3 for the eighth grade, the contest has the makings of an annual event. As I mentioned, Love is dedicated, capable and very deeply involved in the development of aeronautics among the emerging young generation.

For any additional information contact Dennison Love at (708) 699-0889, or contact MB101 with an SASE.

An MB101 purchase plan for schools and groups has now been formulated. Detailed information can be obtained from J. J. Levine, Model Building 101, Inc., 1891 Branchview Dr., Marietta, GA 30062; (770) 973-3598, Fax (770) 422-2765. Our organization must depend on outside funds to continue supplying the necessary basic materials for our classes. Your donations, made out to Model Building 101, are most welcome. ***MB***

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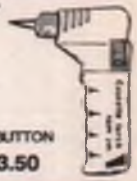

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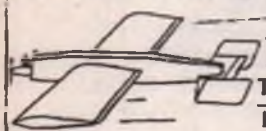

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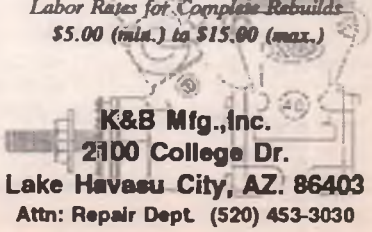

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Sunday, July 7th: a full day of Vintage Control Line, Vintage Free Flight and Vintage RC, followed by a "Gathering of the Clan" banquet. Nats '96 registration begins.

Area hotels offer special AMA rates. Or, if you act fast, you can stay in the new dorm at Ball State University. Each room sleeps two and shares a bath with the adjoining room. Take your choice of single or double occupancy... both well under $30 per person. If you decide to stay more than four nights, the rest of the seven-day week is free!

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BIG BIRDS *cont. from page 33*

just about the same as his. At 16 pounds, my Cub was a full pound lighter. I was using an Astro 60 with a Modelair-Tech H-1000 belt drive unit, swinging a 22x12 propeller and drawing 23 amps of current at 3,300 rpm. The static thrust was just over 7-1/2 pounds.

Since that time I've changed the reduction ratio from 2.15:1 to 1.76:1 and have tried an 18x16 prop that turned 3,700 rpm at 30 amps and delivered 6 pounds 10 ounces of thrust. An 18x14 prop turned 4,000 rpm and drew 25 amps; the thrust was 6-1/4 pounds. I have a few other ratios to try as soon as I can out to the field again.

After I had struggled out in the cold January weather to obtain the above data, I received a brochure from Paul Ogushwitz of USR&D Corporation regarding their Aero-Comp computer program, version 3.1-E. I find I could have determined all of the above information using the Aero-Comp program without ever leaving the computer! Aero-Comp's program is endorsed by noted electric power enthusiasts such as *Model Builder's* Roger Jaffe and Bob Boucher of Astro Flight.

Aero-Comp's program can help you select the proper motor for your plane, can assist in finding the best propeller for the gear ratio on your belt or gear drive, and can help select the correct battery packs. You can also determine the optimum weight, airfoil, wing design, fuselage design, rate of climb, and flight duration.

If you enter the correct data in Aero-Comp's program, the output data will be 95 percent accurate. If the Aero-Comp program says your plane will fly, you can be reasonably sure that it will. An Aero-Comp program is now available for engine-powered planes too.

Aero-Comp's program is for use with IBM-compatible PCs that have at least a 2.0 DOS capability, or Windows 3.0. For more information contact USR&D Corp., P.O. Box 753, Hackettstown, NJ 07845-0753; (908) 850-4131.

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"PACEMAKER" *cont. from page 71*

torque diminishes. The prototype was trimmed to transition into a left glide turn with no stall using stabilizer tilt to adjust the turn. In all probability, the model could be set up to fly right-right as well, simply by washing in the right wing panel about 1/8-inch. The big freewheeling prop will keep it turning to the right in the glide.

Kansas modeler Ernie Linn was involved in testing the prototype Pacemaker back in 1940. Ernie has been a moving force in SAM (the Society of Antique Modelers) for many years now. During this time he has resurrected several designs, including his own Kansas Watchbird that would have been lost to time had it not been for his efforts. The Pacemaker is one of these. Ernie may be pressed shortly to help resurrect Orr's other two designs, the J-Hawk and the Chieftain, both mentioned in this article.

Probably the most entertaining and compelling description of the Pacemaker's performance ability comes from Ernie Linn's first experience with the design, 56 years ago at Orr's 1940 annual contest. Dean Zongker was his helper.

"We finished our model," Linn says, "late Saturday night. Sunday morning, we were at the contest site early, ready to make our first test flight. It was a good day for flying—pleasant temperatures and wind about 5 to 10 mph. This was not the kind of day where the winning flight would be over 10 minutes duration, like the first J-Hawk contest, but it was better than average for Kansas.

"We put about 200 turns in the motor for our only test flight. The model performed perfectly and was up for 2 minutes 34 seconds. The climb and glide circles were acceptable, and there was no tendency to stall. We entered and had our Pacemaker processed (brief inspection and 4.5-ounce minimum weight).

"When it came our turn to fly, we wound over 400 turns into the rubber and launched. The model performed like it had made up its mind to clear up any doubts we might have had about its ability to do the job right. We did have doubts, and it was a finger-crossing type of situation, but in the next few minutes these tensions disappeared. The air was good and we logged a flight of just over 3 minutes in sight

of the timer—good enough, as it turned out, to claim 3rd place and a Herkimer OK .49 engine for the performance. Unfortunately, the model continued out of sight and was lost.

"Two other models also thermalled over 3 minutes, but were stalling in the glide and stalled out of their thermals. Ours was the only model lost that day. Sure wish we had known about dethermalizers! I never could get that OK .49 to run. I wish my Pacemaker had stayed in sight a little longer. I could have used the Brown Junior they were giving for 1st place."

As a postscript, Linn offers, "The body and wing of the Pacemaker are more difficult to cover than the other Orr's models, due to the excess of compound contours. The fuselage takes more time to construct, but this is a clean, simple, pretty model that gives one a lot of satisfaction. Hope you experience the Pacemaker syndrome."

Because of its numerous compound curves and relatively complex structure, [the Pacemaker] is not a good ship for the beginning builder to tackle. However, for the more experienced builder and serious competitor, it has a great deal to recommend it.

In a more modern context, the Pacemaker has performed very well. It has won numerous local and regional contests since its 1991 debut at Lawrenceville, Illinois, where it placed 2nd in Old-Time Rubber. In March of 1993, the Pacemaker, in the able hands of Les DeWitt, placed 1st in Class C Small Cabin at the prestigious SCIF meet in Taft, California. Well-known SAM competitor Jim Kutkuhn also has had great success with the design, placing high in several SAM Champs since its reintroduction.

Questions or comments about the Pacemaker are invited and may be directed to Ernie Linn, 3505 Mt. Vernon, Wichita, KS 67218-3959. Please include a self-addressed, stamped envelope if you need a reply. ***MB***

TECH STUFF *cont. from page 14*

its new PowerBook 5300 line due to a safety problem with the model's lithium-ion battery pack, which caused two computers being used within the company to catch fire. In a press release, Apple said it will substitute a nickel-hydride battery pack—the type used in other PowerBook models."

P.S.S.—*Seattle Times*, November 19, 1995: "A fire two weeks ago in a Sony Corp. lithium-ion computer battery plant in Koriyama, Japan, has idled all production." Happy net surfing.

SPEAKING OF BATTERIES . . .

I don't use five-cell receiver packs; I only would if I really needed more speed or torque on my servos. I think some guys are going to five cells, not because they need them but because of the "If some is good, more is better" philosophy. Or, "More power." I was once standing on a streetcorner when a big motorcycle pulled up beside me to wait for the light. I noticed the handlebars were way up in the air, at what looked like a most uncomfortable position, and I asked the rider why. He said, "Power, man, POWER!" and roared off.

The negatives of five-cell receiver batteries are: more cost, more weight, more chance of battery failure, and possibly shorter radio and servo life. Another consideration is discharge time. Comparing permissible flying times for four- and five-cell packs is difficult. Because the higher voltage will force greater current through the circuits, a five-cell pack will discharge faster than a four; but there's more to think about. Radio control is lost when the voltage gets too low; but with five cells the extra cell is adding its bit to the voltage of a nearly discharged battery. The slope of a NiCd battery discharge curve is very steep near the end, however, and I wouldn't want to push my luck out there. I will vote for greater *dependable* flight time from a four-cell flight battery than from a five-cell.

If a pilot is really so good that he can honestly tell that he flies better if the servos are a little faster, then maybe he needs five cells. Four cells are enough for me. If the radio manufacturers thought five cells were needed they would have provided five-cell batteries. Five-cell packs are being promoted by the battery companies.

CHARGING THE UNCHARGEABLE

The secondary or rechargeable battery systems we use the most are of course the lead-acid wet cell (and the later and much less troublesome "gel-cell" sealed lead-acid battery), the nickel-cadmium (NiCd) batteries, and the more recent nickel-metal-hydride (NiMH) batteries. Most of the other

types of batteries we use these days consist of primary cells and are considered nonrechargeable. To name some of them: the old original dry cell, the higher-energy alkaline cells, mercury cells (now largely phased out because of environmental concerns), silver-oxide cells, and several versions of lithium cells (watch out—these can bite!).

None of the primary cells listed above recharge to any major degree, but most of them have some minor recharging or pseudo-recharging effects which can be useful in an emergency.

This morning I needed to take photographs of a subject which was only going to be available for a few minutes. I set up the first shot, pushed the shutter button, and nothing happened. A voltmeter indicated the camera battery was dead. I had no spare, and all the stores where I could buy a new battery were too far away.

The meter indicated that the open circuit (no load) voltage of this particular 6-volt silver-oxide battery was down to 4 volts. Rather than give up on the photos I stuck the sick old 6-volt battery directly across my 12-volt RC engine starter battery. There were no violent sparks, so I left it charging for about 20 seconds (a wild guess at what I could easily get away with at an unknown charging rate). Then I put the voltmeter back across the camera battery. Aha—6.1 volts! With the battery back in the camera I took the four photographs I wanted.

Later, out of curiosity I took the old camera battery out and tested it again. Reading: 5.2 volts. It is now some hours later and it still tests 5.2 volts. More surprising, I also got a reading of 250 milliamps in a momentary short-circuit-current test. A final voltage check: 5.0 volts. Good! Lastly I checked to see what charging current I had given it: about 400 milliamperes—very reasonable for such a short time. This nominally "nonrechargeable" battery would have been good for still more use on this and future charges; but I didn't baby it along any further. My object was to get some otherwise impossible photographs, not to try to save money on camera batteries.

I wasn't surprised that this silver-oxide primary battery took a little charge; but I was pleased with how well it did after this very short, high-rate, unmeasured and uncalculated charge. With other types of primary batteries the results may not be this good, but there will always be a positive effect. With some batteries there will be little or no recharging in the true sense, that is, no actual reversal of the primary chemical reactions which are producing electricity during a discharge; but there will be some depolarizing action, which will also permit the battery to do a bit of useful work again.

A battery user need never know whether an effort to recharge and temporarily revive a primary battery really recharged it, or depolarized it, or a combination of

both; but from the standpoint of the battery itself, the actions are distinctly different. With true recharging, external energy from the charger is being converted into potential chemical energy in the battery, which can later be converted back into electrical energy upon discharge. In depolarizing, the energy from the charger is not being stored in the battery for later use. All of the energy taken out in discharges after depolarizing alone is part of the energy which remained in the battery. Depolarizing merely increased its accessibility.

So what is this mysterious depolarization? Not to put too fine a point on it, polarization is the masking of the cathode with microscopic hydrogen bubbles as a result of the discharge reactions, such that the effective resistance of the cell is seriously increased and the performance of the cell is greatly reduced. Most types of batteries have depolarizing chemicals around the cathode to dissipate the hydrogen, but at high discharge rates these are not completely effective, especially in cells which are nearly worn out. Since a charging current reverses this generation of hydrogen at the cathode, it will depolarize a battery when the chemical depolarizing system has ceased doing an adequate job.

There is one more effect of "charging" primary and secondary batteries which may be useful in very cold weather. The chemical reactions of batteries, like most chemical reactions, proceed faster at higher temperatures. Battery cells have a somewhat higher voltage and lower internal resistance when warm than when cold. The simplest way to warm a battery which is too cold to perform satisfactorily is to charge or overcharge it briefly at a very high rate. What you can get away with without damaging the battery depends upon the type, charging rate, etc.

SUPERSONIC SURFING

Surfers ride on the front face of a wave so they are always "coasting down hill," but they don't *go* down, because the wave is advancing and effectively rising at the same rate as the surfboard and its passenger are descending. In my younger days I did something different: "wake surfing" behind a boat on a lake. This was similar to ocean surfing, except that the wave was the stern wave of a water-ski boat. To get going, one has to hang onto a water-ski rope and maneuver the surfboard onto the front face of the wave, then let go of the rope. If the boat is heavy enough to make an adequate wake and is going the right speed, the surfer can surf behind the boat indefinitely. There have been news reports of surfers riding the wakes behind ferries.

Slope-soaring sailplanes do somewhat the same thing on ridge lift as a surfer does on the ocean.

We've mentioned portable-slope soaring in MD&TS several times over the years, but to repeat: A small, very light indoor glider can be kept in the air indefinitely by

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walking behind it with a sheet of cardboard, held so that it causes a current of air to rise up over it as it progresses. The glider is steered by shifting the cardboard and walking in a turn. The portable-slope glider rides the *moving* ridge lift much as a wake surfer rides the moving wake behind a boat.

Migrating geese and other V-formation fliers do something similar. Each bird or plane (except the leader) decreases its drag by riding the wave from the one ahead.

Could we ride a wave at Mach 5? Yep, NASA Langley at Hampton, Virginia has already done it—with an 8-foot model in a windtunnel! We are many years away from full-scale manned vehicles of this type, however. Also, we should state up front that we aren't talking about "free" travel in the sense of slope soaring or surfing. We will have to pay for this speed by burning fuel; but it has been demonstrated that the drag of a vehicle riding its own shock wave is greatly reduced, and therefore so is the fuel consumption.

It still sounded phoney to me when I first heard of it—how could a vehicle possibly ride its *own* shock wave? Actually the trick will only work at hypersonic speeds. It has to do with the angle at which the shock wave leaves the nose of the vehicle.

At around Mach 1, a shock wave forms at the nose. The faster the vehicle goes after that, the more the shock wave angles back from the forwardmost point of impact with the atmosphere. At hypersonic speeds the shock wave, if we could see it, would look like a sharp arrowhead. According to the *Newport News Daily Press:* "In the waverider design, the leading edges of the [delta] wings, which run all the way forward to the tip of the aircraft's nose, would touch the edge of the shock wave. At this point, the shock on the upper surface disappears and the plane 'rides' the wave on its lower surface."

Let's hear from Larry Hunt, aerospace engineering manager, systems analysis, Hypersonic Vehicles Office, Langley Research Center, NASA: "When the waveriding effect is achieved, the high pressure on the bottom can't spill up around the leading edges to the top. It confines the pressure to the lower surface of the vehicle." Since none of my models are ever going to fly at Mach 5, "waveriding" airplanes are not going to affect my life; but some of our younger readers may take a high-altitude hypersonic waverider across an ocean someday.

WING LOADING, LIFT COEFFICIENT, AND SPEED

The wing loading of an airplane and the lift coefficient at which it is flying are synthetic factors which are useful to us, but speed is a natural physical parameter. These three factors bear an interesting and simple relationship to each other; from any two of them we can calculate the third.

In the case of airplanes, the power, the airfoil used, the aspect ratio, the weight, and the size of the airplane don't have to be known for certain calculations; wing loading, lift coefficient and speed are a self-sufficient trio. This fact is easy to see when we look at the lift formula. Lift equals the coefficient of lift (CL), times the density of the air divided by 2, times the wing area (S), times the square of the velocity (V). At sea-level density, with area in square feet and velocity in miles per hour, the Lift (in pounds) = $(CL)(S)(V^2)/391$.

We are speaking here of straight and level flight, so lift equals weight. Therefore wing loading also equals lift/area. Substituting WL for lift and area in the lift formula, we can get the relationship: $391\ WL = (CL)\ (V^2)$.

The curves show this relationship in handy nomograph form. I am borrowing these curves from page 25 of Canadian modeler A.G. Lennon's fine book, *R/C Model Airplane Design,* with his permission. I checked a few points on the curves for accuracy, and they came out right on the money. (If you're flying above a thousand feet or so, some correction to the curves is needed.) Not only are the curves useful in studying the performance of our existing and proposed models, but thinking about these relationships helps our understanding of the whole lift picture.

Francis Reynolds, 3802 127th Ave. N.E., Bellevue, WA 98005-1346. *MB*

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A classic Old Timer cabin rubber model, vintage 1940, originally designed by Robert Youngman and produced by the model division of Orr's Department Store in Kansas. Model spans 36 inches, features twin fins, elliptical flying surfaces and a V-dihedral wing and stab. The Pacemaker is a SAM-approved design and is legal for O.T. FF rubber competition. Our plan was drawn by Ernie Linn (who helped with the flight testing of the original model), the text was written by Larry Kruse.

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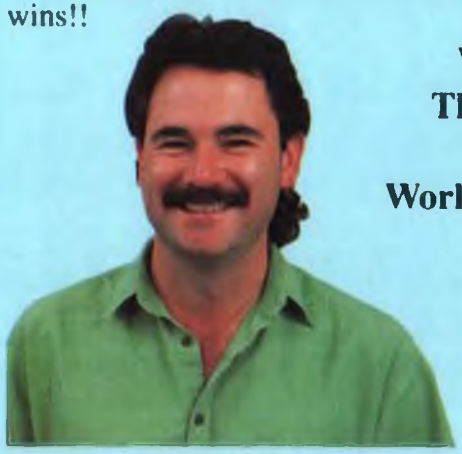

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