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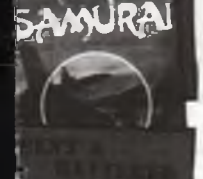



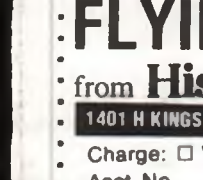

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ON THE COVER

With the historic London Bridge in the background, Bob Curtin's gigantic 1/10-scale Dornier DO-X floats placidly on the waters of Arizona's Lake Havasu. The occasion was the 1993 London Bridge Seaplane Classic, where the big ship made its one and only flight before being retired. Believe it or not, this is only the third RC aircraft that Bob has ever built! Photo was taken by Bob Martin, whose story on the model appears on page 46.

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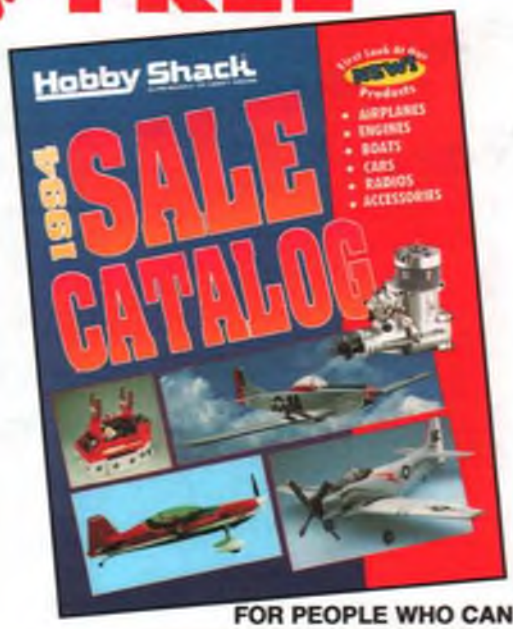

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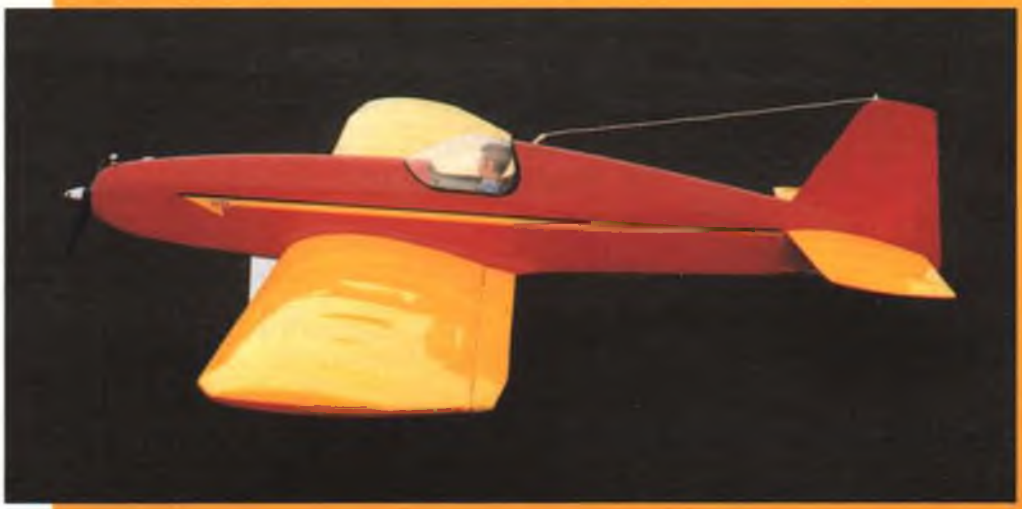
Rick Dart's Peanut model of the Gee Bee Model D Sportster was built from a Walt Mooney plan. It was great fun to build, reports the Oregon builder, but he cautions against building the nose too heavy, especially when using a plastic prop (he's using a 4-3/4 inch Peck prop). Rick says he's also built Impanema and Grahame-White Type 20 Peanut models from our plans, going back to 1983. *Rick Dart, 1709 Blankenship #8, West Linn, OR 97068.*

This lovely Peanut Scale Fokker DVII was built from A.P. Diels plans and covered with tissue decorated with art markers, a technique that adds practically no weight, according to builder Stan Fink of Pennsylvania. He writes: "The lozenges are drawn by hand using a simple template and a four-color pattern. The color is fixed with Krylon Clear 1301. To prevent the colors from running, I shrank the tissue not by spraying with water but by holding it over a steaming teakettle for about a minute. The plane weighs only 9 grams and has flown indoors for 40 seconds." *Stan Fink, 1810 Pine St., Philadelphia, PA 19103.*

George Fenstemacher, who has been flying RC for the past 20 years, says he let his Lou Andrews designed AAMCO Trainermaster languish in its box since the late '70s before getting around to building it last year. "Performance is great throughout the speed envelope," reports George. "Landing speed is slow, with no tendency to tip stall." Power is a Fox .40 Deluxe turning an 11x6 Master Airscrew prop. A real beauty! *George Fenstemacher, Rt. 3, Box 42, Raymond, WA 98577.*



Washington flier Dan Simenson says his original design "Flivver" was intended for floats, but he got so anxious to see it fly before the floats were finished that he fitted it with wheels and made the initial flights at a local paved strip. The 54-inch span, 58-ounce ship features an almost flat bottom airfoil, homemade fiberglass fuselage and a full-flying horizontal stab, and is powered by a K&B .28 Sportster. According to Dan: "It flies well—docile and stable, but it will snap, fly inverted and do vertical Cuban eights, vanilla or regular." He's planning to do a larger .91 size with a tapered wing and symmetrical airfoil. *Dan Simenson, 13174 130th N.W., Oak Harbor, WA 98277.*

Wingspan: 47 in Wing Area: 524 sq in Weight: 5.5-6 lb Wing Loading: 24-26 oz/sq ft
Fuselage Length: 56 in Requires: 2-stroke .40-.46 cu in (6.5-7.5 cc) engine & 4-5 channel radio

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Richard E. Jackson built this Plato from an old *American Modeler* plan that *MB* reissued. He writes: "A friend, Bill Johnson, had one in the '60s that flew well. Mine has a K&B .28, and the radio is a single-stick Olympic V from Ace R/C. I covered the plane with Goldberg Ultracoat." *Richard E. Jackson, 2118 Thornlee Dr., North Charleston, SC 29405.*

Don't read anything into the fact that Bruce Crosby used polypropylene signboard material from a local fertilizer manufacturer to make his Floppy Disc, as featured in the March 1993 *MB*. Or that the maiden voyage was a stinker—a crash! "I later determined that I had the elevons rigged below neutral," reports Bruce. "After I glued the firewall back on and rerigged the elevons, I had a blast. It rolls quickly and goes where you send it, but is a little hard to keep oriented, because of its shape." He built a sliding-tray mixer per the plans, and uses a Fox .19 for power. *Bruce Crosby, 133 W. 'O' St., McCook, NE 69001-2525.*

John Gray loved Stan Fink's Peanut article on the Avia BH-7b in the February 1994 *MB*. "But I'm not into small planes, so I took his plans, a set of calipers and a calculator and blew it up 700 percent," he writes. "It has an 88-inch span, 61-inch fuselage, weighs 8 pounds 6 ounces and is of built-up balsa and hardwood stick construction. It's covered with chrome and sky blue MonoKote, and has a Magnum .65 GPSE turning a 13x5 Zinger prop. It took a bit to balance it because of the short nose, but it flies great and does a beautiful flat turn. Construction time was about 132 hours." *John W. Gray, Rt. 9, Box 466Z, DeFuniak Springs, FL 32433.*

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feel the difference!

For additional information on the JR XF622, write Horizon Hobby Distributors, Inc., Dept. G, 4105 Fieldstone Road, Champaign, IL 61821

over the counter

A P-51 MUSTANG... *GLIDER?*

That's right, one of the Model Tech pre-built airframes being distributed by Global Hobby Distributors is a 50-inch span power scale slope glider version of the famous WWII fighter. We've seen one of these uncovered P-51s up close and can attest to their excellent workmanship and remarkably light weight; Global says 32 ounces ready to fly, which, at a wing area of 428 square inches, figures to a wing loading of under 11 ounces per square foot. Controls are ailerons and elevator, and there's plenty of room for standard size radio gear. There's even a built-in ballast box for when the wind gets serious. Check it out at your local hobby shop. From Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133.

A MUST-HAVE FIELD BOX TOOL

The new Mark II version of Hobbico's Digital LCD Voltmeter includes a three-position load switch which allows you to test your receiver and transmitter batteries under simulated working conditions. There's also an LED on the panel; when it glows green, you're good to go. When it's red, better recharge. With the load switch in the middle ("off") position the unit functions as a standard voltmeter and can be used to test any DC source from 0 to 19.99 volts with .01-volt resolution. The unit carries a suggested retail of $39.95, which includes a 9-volt internal battery but no hookup leads—those are available separately for Futaba, Airtronics, JR and Hitec RCD systems, as well as for all popular glow plug lighters. From Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-3630.

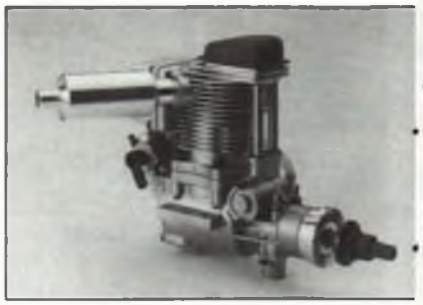
WWI SPORT FLIER

The popular, sorta-scale Taube kit produced for several years by Balsa USA is now available in a bigger version, designed for .60-.80 two-strokes or .70-.91 four-strokes. The new 1913 Etrich Taube has a 1,250 square inch wing that spans 83-1/2 inches, has a 63-1/2 inch fuselage and weighs between 8 and 8-1/2 pounds ready to fly. Wing loading comes to less than a pound per square foot—less than many RC trainers—which, combined with the thick, semi-symmetrical airfoil, should make the model live up to the manufacturer's claims of being exceptionally docile and easy to fly. The kit retails for $119.95 and contains die-cut and machine-cut

parts, hardware, plans and a photo-illustrated instruction booklet. Check it out at your local hobby dealer, or order direct from Balsa USA, P.O. Box 164, Marinette, WI 54143; (800) 225-7287. FAX: (906) 863-5878.

SUPERCHARGED FOUR-STROKE

It's been a while since we've seen anything new from YS Futaba, but now there's the just-released .91AC, which incorporates all of the sophisticated, high-performance features of the big YS Futaba 120AC into a smaller package—features like supercharging and fuel injection. Other features include a special air chamber, crankcase pressurization and a double throttle valve to increase the fuel/air charge, much like a tuned intake manifold. The engine is intended for sport and competition flying and can be used in most models designed for .60-



size two-strokes or .90-size four-strokes. From Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

BUZZ'S BIG BIRDY

At the Pasadena IMS show this past January we had the pleasure of meeting Buzz Waltz of Just Plane Fun Models, who coincidentally was debuting his re-release of the 1970s-vintage "Big Birdy" RC sailplane, which has been re-engineered to meet today's launching and flying standards. Wingspan is 100 inches, wing area 1,045 square inches. Only two channels are needed (rudder/elevator); a third channel can be used for optional spoilers if desired. The kit includes all machine cut parts, hardware, full-size plans and step-by-step instruction manual. From Just Plane Fun Models, 3390 Paseo Barbara, Palm Springs, CA 92262; (619) 327-1775.

All material published in OVER THE COUNTER is quoted or paraphrased from press releases, furnished by the manufacturers and/or their advertising agencies, unless otherwise specified. The review and/or description of any product by MODEL BUILDER does not constitute an endorsement of that product, nor any assurance as to its safety or performance.

BOB IS BACK

Got a note from Bob Dively advising that after a three-year absence due to health problems, Bob Dively Models is back on the scene and is even offering a brand-new kit, a 72-inch span Waco UPF-7. The big bipe is of all-wood construction and comes with hand-cut parts, pre-bent wire, and fiberglass cowl and wheel pants. Finished weight is about 15 pounds. Kits are currently available; contact Bob for full particulars. Bob Dively Models, 28001 Chagrin Blvd., Suite 206, Woodmere, OH 44122; (216) 292-6926.

HIGH-PERFORMANCE PROPS

Windsor Propeller Co. has introduced the first nine of what will eventually be at least 22 sizes of its new Scimitar Series propellers, made of charcoal gray glass-filled nylon. These props feature thin, undercambered blades and swept-back, narrow tips to deliver greater thrust at lower rpm and therefore lower decibels. Sizes presently available are 8x5, 8x6, 9x5, 9x6, 10x6, 10x7, 11x6, 11x7 and 12x6, with more to come later this year. A free catalog and/or more info can be had by sending an SASE to Windsor propeller Co., 3219 Monier Circle, Rancho Cordova, CA 95742; (916) 631-8385.

FLING THING TAKES WING

Rol Klingberg has added yet another to his line of Future Flight kits by introducing the new "Fling Thing" RC hand-launch glider—sort of a baby brother to the company's larger Thermal Thing sailplane. The all-wood Fling Thing spans 56-1/2 inches, wing area is 340 square inches, and the flying weight comes in around 14 ounces. It's legal for AMA Class A

(hand launch) events, but can also be high-started or even equipped with an .049 or small electric system. The kit retails for only $21.95 kit and includes a full hardware package. It's available at hobby shops or direct from Future Flight, 1256 Prescott Ave., Sunnyvale, CA 94089; (408) 735-8260.

SUPER CL STUNT ENGINE

The new Precision Aero .40 from Aero Products is a collaboration effort on the part of Randy Smith and Henry Nelson, and while it looks very much like one of those super-hot Nelson .40 pylon engines, it's actually been designed from the inside out for CL stunt competition. It features a mildly timed AAC piston and liner, high speed ball bearings, a true venturi, and a weight of just over 10 ounces. Four different versions are offered, either side or rear exhaust. For more information, contact Aero Products at 1880 Scenic Highway, Snellville, GA 30278; (404) 979-2035. FAX: (404) 985-5085.

BANDITS AT 12 O'CLOCK!

Precision Aero's new 1/12-scale Focke-Wulf FW-190D was designed with the AMA #704 RC Combat event in mind, but would of course make a fun .15-powered sport model as well. In addition to Precision Aero's usual excellent quality materials, the Focke-Wulf kit includes a factory pre-sheeted foam core wing and a vacuum-formed plastic fuselage top for exceptionally fast building time. Specs: 36-inch span, 2 pounds flying weight, ailerons/elevator/throttle controls. Going price is $59.95 plus $5 S&H per kit. See your dealer or order

direct: Precision Aero, 1561 River Highlands Dr., Oconomowoc, WI 53066; (414) 567-5341.

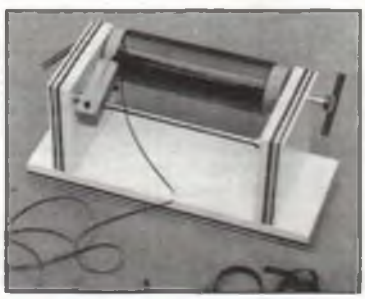
FOR SLOPE HOTSHOTS ONLY

One of the hottest RC slope gliders currently being produced is the Ultra GP from Oakland Model Academy, a sleek wingeron ship that we've heard and read is exceptionally fast and agile. It features a fiberglass fuselage, hollow molded fiberglass wings and a precision machined wing pivot mechanism that provides maximum throw for a super-fast roll rate. The wings and fuselage require no painting; getting the Ultra GP ready to fly involves only installing a radio and covering the balsa tail parts and gluing them to the fuselage. The

model spans 55-3/8 inches, wing area is 311 square inches, and the weight ranges from 24 to 27 ounces. Wing airfoil is the SD8000 at the root, transitioning to the SD7003 at the tip. Going price is $300 plus shipping. From Oakland Model Academy, 650 E. 17th St. #14, Oakland, CA 94606; (510) 839-0436.

CUSTOM CUT'S PINSTRIPING CUTTER

Rick DiBona of Custom Cut recently sent us one of his company's clever new pinstripe cutting tools to try out. Basically, it's a simple device that lets you cut constant-width stripes from plastic iron-on covering materials, in widths of from 1/32 to 4-5/8 inches. The photo shows how the tool is used. A length of covering material is taped securely to the wooden roller, a holder for a #11 X-acto blade is slid into position, and as the roller is rotated, the blade is brought to bear against the material, peeling off a width of iron-on pinstriping just as slick as you please. No longer are you limited to the widths and colors of the striping tape sold in hobby shops. The Custom Cut tool is made of wood and requires minimal assembly. Price complete is only $14.95 plus $3.50 S&H. Available direct from Custom Cut, RD 3, Box 167A, Chester, VT 05143; (800) 874-3574 or (802) 869-2508. ***MB***



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

MODEL DESIGN & TECHNICAL STUFF

BY FRANCIS REYNOLDS

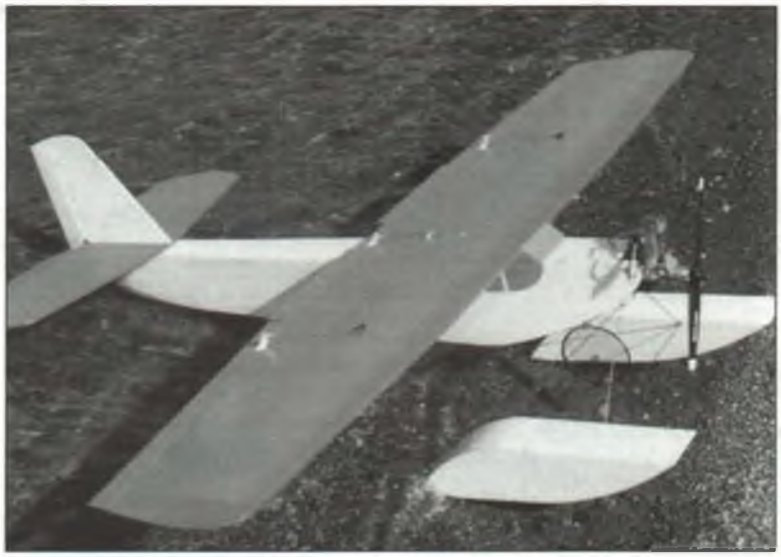
• Designing Your Own Models
• Fixed-Gear Amphibians
• Carbon Pushrods

Last September I received a letter from Ted Taylor of Columbia, Mississippi. I suspect my answer surprised him a bit, and because it struck the heart of what this column is all about, I'd like to print part of it:

"Dear Ted,

"Thank you for the letter. I am glad you like MD&TS. My models, like yours, are mostly light sport aerobatic. I am pleased that you scratch build about half of yours. Mine are 95 percent scratch-built and of my own design.

"You asked for one of my model plans. Instead of sending it, I'm going to offer a suggestion. From what you have told me of your modeling experience, and from the fact that you enjoy my column, I think you should start designing your own airplanes instead of copying what others have done. You have a lot of practical design knowledge just from observing, building, and flying; from seeing what works and what doesn't. One doesn't need to be a technical expert or an engineer to design good model airplanes; it requires mostly experience and common sense, which you already have.



Francis simplified his later fixed-gear float design by just mounting the wheel (outlined here for clarity) on the inboard side of the float.

Our columnist's "Sesquiphib" fixed-gear sesquiplane amphibian, featured several years ago in *RCM*. You can't see them in this photo, but on the bottom of the floats are slots for permanently mounted thin polycarbonate disc wheels, which permit takeoffs and landings from land or water without resorting to a complex retract gear mechanism.

"Just think about what kind of model you want and the features you like, take a large piece of paper and a yardstick, and draw a picture of a model in all three views. Any large sheet of paper will do. You may change your mind a lot when you see how it looks and will have to erase parts you have drawn and redraw them. That's normal in designing. I do a lot of erasing too.

"As you draw a part of the model, figure out what you're going to make it from, and put notes on the drawing concerning materials, dimensions, processes, and other things, the same as you see on other people's design drawings. It doesn't have to be fancy, just write so you can read it.

"If you must have assurances that what you build will fly well, then the safe way is to continue doing what you have been doing—build other people's proven designs. But I assure you that there is far more personal satisfaction and feeling of accomplishment in making your own design fly.

"You will make mistakes. All designers make mistakes. I have designed and built a number of airplanes which didn't fly the way I wanted them to. Sometimes I made changes in them to make them into good airplanes; other times I have abandoned approaches that weren't good. We learn from our mistakes.

"A designer takes chances, makes mistakes, and learns much faster than a modeler who doesn't design and take risks. The people who designed the planes you have built weren't necessarily any smarter than

continued on page 80

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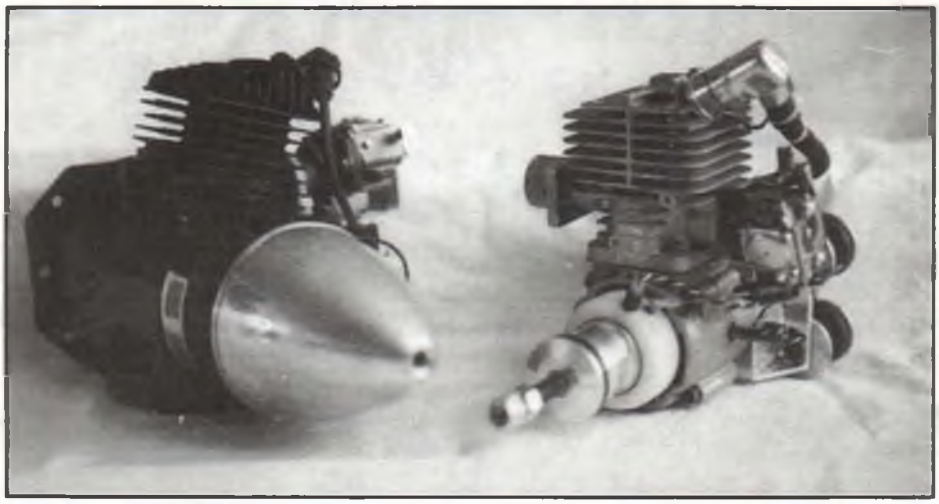

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1/4" x 1/4" x 36"	.17
3/8" x 3/8" x 48"	.40

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AT LAST, AN ORGANIZATION FOR RACERS—THE NCLRA

The National Control Line Racing Association is the newest CL special interest group and needs your support. Also discussed: Keeping in touch by means of the electronic media.

For many years, every major sector of control line model competition—except racing—has had a special interest organization to look after the common concerns of the fliers and to represent those interests to the AMA. Each of those sectors has thrived under the leadership of those interest groups, while racing activity has struggled.

Newsletters of the Precision Aerobatics Model Pilots Association *(Stunt News)*, the Miniature Aircraft Combat Association *(MACA News)*, the Navy Carrier Society *(Hi-Low Landings)* and North American Speed Society *(Speed Times)* have provided communications networks for fliers, forums for discussions of rules, safety, technology and other issues, as well as respected members of the model aviation press. Since the demise of *CL-RPM Racing News* and the disappearance of the Control Line Racing Pilots and Mechanics organization in the early 1980s, there has been no unified voice for racers.

This immaculately restored PBY Catalina is one of a number of rare airplanes in the World War II Blimp Hangar Museum at Tillamook, Oregon. A neat place to visit if you're passing through. More information in text. John Thompson photo.

Walt Legan of Orlando, Florida, and son Lance are up-and-coming fliers with a growing fleet of planes. They're proudest of their .15-powered Sopwith Camel. More information in text.

It looks like that's going to change.

As it often does, the National Model Airplane Championships provided the fertile ground for the seeds of a new organization to spring up. Racers began talking about a new organization at the 1993 Nats in July, and by autumn the organization was functioning.

The National Control Line Racing Association published issue No. 1 of its newsletter in September 1993 and was officially recognized by the AMA on October 30. A set of bylaws has been adopted. Initial officers are Larry Dziak, president; Dave McDonald, vice-president; and Jerry Meyer, secretary-treasurer.

As with all special interest groups, this one is starting small and needs the participation of every racing flier and mechanic to be successful. Annual dues of $10 can be sent to the NCLRA at 8 S. Grace St., North Aurora, IL 60542. Help with the newsletter will be especially welcomed, as such publications are the lifeblood of every special interest group.

CONTROL LINE FLIERS "ON LINE"

An activity whose participants are spread as far and wide as CL fliers are needs some form of communications network to keep enthusiasts informed of activities within their reach. That's why we frequently mention the various club, special interest and independent newsletters that help hold CL fliers together.

In this age of electronics, there's another form of network being used by CL fliers. Those who happen to also have computers and modems can plug into this network with a minimum of effort.

There are now control line oriented fo-

rums available to members of both the CompuServe and America Online services. This columnist can be contacted directly through both of those services, as well as via the Internet's electronic mail.

CompuServe is in the ModelNet forum, moderated by Doug Pratt. Though not officially affiliated with the AMA, the CompuServe forum is one mentioned in AMA publications. It contains a large library of files, such as lists of all clubs in the United States, extensive product source lists, plans and other data which can be downloaded into a member's personal computer. You can also leave messages for other fliers, or chat on-line about mutual interests.

All that's required to participate is a CompuServe membership. There is a nominal connection surcharge for use of the ModelNet forum.

As an favor for CL fliers, Doug Pratt has offered to send a free CompuServe introductory packet to anyone who asks. To receive it, call CompuServe toll-free at (800) 848-8199 and ask for Operator 169. Tell the operator you read about it in *Model Builder*. The packet should contain all the information you need to get started.

America Online is another service, similar to CompuServe, which has its own model aviation forum as part of its Aviation Club. A control line section has been started by this columnist in the model aviation/homebuilts section of the club. This is for the convenience of CL fliers who may already be AOL members.

I check in regularly on both the AOL and CompuServe networks, so text material for this column can be sent to me via either. I also can be reached directly via Internet E-mail. If you have photos to contribute, use the good old U.S. mail.

Model Builder control line column electronic addresses are:

CompuServe: 73473,1407 (If mailing from another system, the address is 73473.1407@compuserve.com).

America Online: JohnT4051 (If mailing from another system, it's JohnT4051@aol.com).

Via Internet: jmt@efn.org.

Note than when sending electronic mail, addresses must be exact, including the punctuation and capitalization.

Merle Mohring's 61-inch span Messerschmitt BF-109G-Z, powered by an O.S. .90 four-stroke, has flaps and throttle controlled electronically. Fred Cronenwett photographed it at Whittier Narrows during the recent Seebre Hayes meet.

UPCOMING CONTESTS

It was through E-mail, by the way, that I learned from Bob Furr that the Omaha Orbiting Eagles will hold their annual AA control line contest on June 12. Events will include Precision Aerobatics; Beginner Stunt; Old-Time Stunt; .15 Profile, Class I and Class II combined record ratio Carrier; Profile Scale; and Balloon Bust.

Electric Speed is a new CL event. Howard Doering displays his asymmetrical Class B ship, which established a new record of 90.42 mph at Whittier Narrows. Fred Cronenwett photo.

There are now control line oriented forums available to members of both the CompuServe and America Online services.

The Eagles are known for putting on a good contest. This one will be at Seymour Smith Park, which is easily reached from Interstate 80. For information, contact Bob Furr at 8147 Read St., Omaha, NE 68122. His phone number is (402) 571-5641, and his CompuServe address is 72500,3362 (72500.3362@aol.com).

Other noteworthy contests coming up include the Northwest Regional Championships, with a new name but the usual full range of events, on Memorial Day Weekend, May 27-28-29. The contest, which starts on Friday and runs through Sunday of the holiday weekend, is now called the Paul Agerter Northwest Control Line Regionals, in honor of the late longtime hobby shop owner in Eugene, Oregon. For information, contact contest director Mike Hazel, 1073 Windemere Dr. N.W., Salem, OR 97304.

Also on the Northwest list are the Jim Parsons Memorial Stuntathon at the Boeing Aerospace Center in Kent, Washington, on

June 11-12, and the Seattle Skyraiders' Raider Roundup September 24-25 at the same site.

Eastern Old-Time and Classic Stunt enthusiasts will be heading to Henry Tift Meyers Airport in Tifton, Georgia, on September 17-18 for the annual Eastern States Vintage Stunt Championships. For information, contact contest director Larry Draughn at 2028 McPherson St., Asheboro, NC 27203.

ODDS & ENDS

Aviation enthusiasts of all kinds, if they find themselves traveling along the Oregon coast, might enjoy making a stop at the World War II Blimp Hangar Museum just south of Tillamook, Oregon on Highway 101. Housed in the one remaining blimp hangar—of the two originally on the site—the museum's displays tell the story of the U.S. Naval Air Station Tillamook, which was the home for observation blimps. As an indication of the size of these buildings, photos show the hangars with up to nine blimps inside! These were the largest wooden buildings in the world, covering seven acres each. The doors are 120 feet high, weigh 180 tons, and are mounted on railroad tracks. A photographic postcard on sale in the gift shop shows a WWII fighter plane flying right through the building!

The one remaining hangar is still a working blimp hangar. As a bonus, it now contains a major collection of rare vintage airplanes, which can be viewed close up by the public. Some of these are the only planes of their type remaining in existence.

For information, contact the WWII Blimp Hangar Museum, 4000 Blimp Blvd., Tillamook, OR 97141; (503) 842-1130.

• • •

Here's another "must have" catalog for control line fliers. RSM Distribution has a vast range of kits, engines, parts, hardware, lines, connectors, handles, tanks, wheels, spinners, landing gear, fuel line, propellers, tools, adhesives, glow plugs, etc. Write RSM Distribution, 40 Calendula, Rancho Santa Margarita, CA 92688.

It seems that there are so many brands of cyanoacrylate adhesives on the market now that it's hard to keep them all straight. But since they're *not* all the same, each new brand is worth a try. One of the latest entries is "Kwik Bond," distributed by Global Hobby Distributors, 10725 Ellis Ave., Dept. KB, Fountain Valley, CA 92728. They offer four types—thin, thick, slow, and gel. Look for them in your hobby shop.

It's always a pleasure to receive the latest catalog from Tom Dixon, purveyor of a wide range of stunt kits, engines, plans, etc. Tom's latest care package included an example of his excellent full-size plans, this one being the Thunderbird 670, an adaptation of the classic Bob Palmer design, which Tom plans to release soon in kit form. Tom's plans and kits offer, among other things, modern versions of the great old designs that can be used in current competition. For the latest catalog, write Tom Dixon, P.O. Box 671166, Marietta, GA 30066.

• • •

The traditions of control line model aviation are passed down from the aging grownups to the young enthusiasts either in the neighborhood, the club or the family. It's always encouraging to the old-timers in the hobby to watch the torch being passed. In answer to our frequent requests for local photographs, we recently received a picture of Walt Legan and his son, Lance, of Orlando, Florida, with their 1993 fleet of airplanes. They have a Sig Skyray, Skyray .35, a Twister and others. Walt writes:

"We recently attended the Small Steps II Fly-In at Little Rock and received the most compliments for the Sopwith Camel you see in the picture. It is a 24-inch span profile of all-solid-balsa construction with a new O.S. .15 FP. It puts on a good show with schoolyard eights and inverted flying on 48-foot lines."

Photos, club news, contest information, technical tips and suggestions for items to be discussed in the column are invited. Contact John Thompson, 295 W. 38th Ave., Eugene, OR 97405, or at any of the electronic mail addresses listed above. **MB**

AIRCRAFT PERFORMANCE PARAMETERS REVISITED

Roger outlines not one but three different methods you can use to predict the performance of your electric models.

Beginning with the May 1993 issue I did a three-part column discussing my method of predicting the performance of prospective electric models. I received quite a bit of mail from readers about my theories and formulas. Just about everyone who wrote either applied my formulas to their models or shared their own flight prediction systems, and I'd like to pass some of their ideas along to you.

AIRCRAFT PERFORMANCE RATIO

Let's review my method of determining flight performance. First, figure the wing loading in ounces per square foot. Next, compute the power-to-weight ratio by dividing the input power (watts, figured by multiplying the battery voltage by the current draw) by the ready-to-fly weight (ounces). Finally, find the Aircraft Performance Ratio (APR) by dividing the power-to-weight ratio by the wing loading. The APR will indicate the model's expected flight performance according to the ranges listed below:

APR	Estimated Flight Performance
0.000—0.145	Poor
0.145—0.160	Fair
0.160 +	Excellent

WING CUBE LOADING

Using these parameters to evaluate performance has worked well for me, but fellow *Model Builder* columnist Francis Reynolds wrote with some suggestions on how to make these indicators even better. He notes that characterizing an aircraft's performance based on wing loading leads to inconsistencies among models of different sizes. As an example, the flight characteristics of an 05-size J-3 Cub with a wing loading of 25 ounces per square foot are much different than a larger 40-size Cub with the same wing loading. As another example, the large Telemaster is a nice and slow trainer aircraft even though its wing loading can be between 20 and 40 ounces per square foot. A wing loading this high on a small plane would make it impossible to use as a trainer. Clearly, there is a difference in flying characteristics between small planes and large planes with identical wing loadings; there should be a way to compensate for this disparity.

Ted Off, in an article in *RCM* around 1987, explains what happens to an aircraft when its size is changed relative to scale speed, wing loading and engine size. Although his theoretical discussion does not go far enough, his next analytical step is that wing loading should be measured by a *cubic* term, not a squared term as in square feet of wing area. Francis took the next step in a series of columns in *Model Builder* describing the Wing Cube Loading (WCL)

continued on page 78

FIGURE 1—COMPARISON OF APR, WCL-APR, AND ROD MOORE PERFORMANCE PARAMETERS

MODEL	Porterfield	HiLiner	Lacey	Mini-Challenger	Decathlon	140% HiLiner	CadCat	Toot-E	Touche	Stik-E
TYPE OF PLANE	Scale	Sport	Scale	Glider	Scale	Sport	Racer	Trainer	Sport	Sport
WING AREA (SQ. IN.)	675	250	1005	440	810	490	179	561	615	352
MOTOR	AF 15G	IMP 30	AF 05G	AF 035	AF 40G	(2) AF 035	AF 05 FAI	AF 05	AF 25G	AVX 9/5
PROP PITCH	7	4	6	4	8	4	4	4	7	4
RPM	6200	8500	5700	9800	6600	9800	10900	9000	6900	17000
INPUT POWER (W)	230	60	151	78	540	240	200	125	400	312
WEIGHT RTF (OZ.)	73.0	28.5	55.0	32.0	95.0	63.5	30.0	43.5	97.5	56.8
WING LDG. (OZ./SQ.FT.)	15.6	16.4	7.9	10.5	16.9	18.7	24.1	11.2	22.8	23.2
WCL (OZ./CU. FT.)	7.2	12.5	3.8	6.0	7.1	10.1	21.6	5.7	11.0	14.9
POWER/WT. (W/OZ.)	3.2	2.1	2.7	2.4	5.7	3.8	6.7	2.9	4.1	5.5
APR	0.2023	0.1282	0.3484	0.2327	0.3366	0.2025	0.2762	0.2574	0.1797	0.2364
WCL-APR	0.4380	0.1690	0.9204	0.4068	0.7982	0.3736	0.3080	0.5080	0.3714	0.3696
MOORE PERF. FACTOR	150	76	145	128	316	148	256	134	179	335

APR RANGES

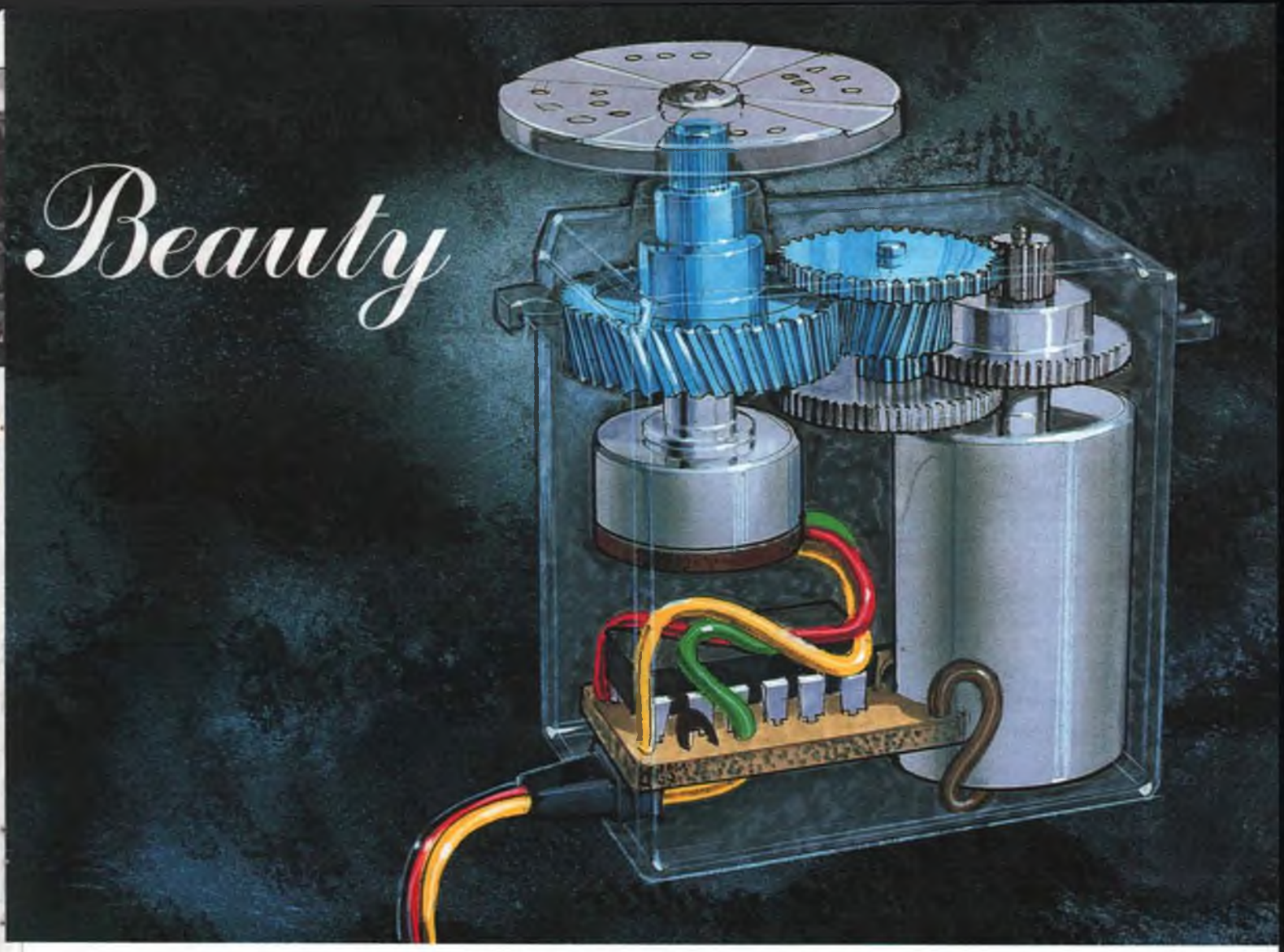
<0.145	Poor
0.145—0.160	Fair
>0.160	Good

WCL-APR RANGES

<0.15	No-Go
0.15—0.17	Marginal
0.17—0.20	Fair
0.20—0.30	Good
>0.30	Excellent

ROD MOORE PERFORMANCE FACTOR

0—79	No-Go
80—109	Modest
110—149	Good
150—189	Very Good
190—224	Excellent
225+	Superior



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Standard	HS-605BB	.13	91 oz.	Super Torque/Speed
Micro	HS-80	.12	36 oz.	Fastest Micro
Micro	HS-80MG	.12	36 oz.	Metal Gear Version

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BIG BIRDS AT THE '94 NORTHWEST MODEL EXPO

Come along as Bruce takes a look at the best of the Big Birds at the fourteenth running of the northwest's major model trade show.

The 1994 Northwest Model Exposition in Puyallup, Washington was probably the best yet as far as Big Birds are concerned. I arrived at the show at 7:30 a.m. on Saturday, February 5, a little worse for wear, having put in a 12-hour shift the day before, helping to set things up. Arriving early is essential at any of the trade shows in order to take good photos. When the halls are filled with people the background becomes very cluttered. I try to have only other planes in the background in the Expo shots but don't always succeed.

■ **RIGHT: Cliff Sand's highly modified Super Lazy Ace took 1st place in Sport Biplane. Power is an O.S. Sirius five-cylinder radial—one of a number of radial four-strokes in attendance. Cliff says his big bipe is very realistic in flight.** ■ **BELOW: Al Martens drove down from British Columbia, Canada to take overall Best of Show and 3rd place in Giant Sport Scale with his big Howard DGA-15. It's built to 1/3-scale, spans 12-1/2 feet and has a Stihl twin-cylinder engine.**

CLOCKWISE FROM TOP OF PAGE: ■ Ward Emigh received an honorable mention for his O.S. radial powered Stearman. Ward had a set of Nick Ziroli plans increased 22 percent to give a 7-foot span. ■ The Cap 108 from Yellow Aircraft is an excellent flier when properly powered, such as with a Webra Bully as used by Doug MacMillan. ■ Lloyd Marohl's "squared off" Weeks Special took 3rd place in Sport Biplane. ■ Dwayne Padgett's 1/3-scale Weeks Special is powered by a Sachs 3.2. The beautifully finished model was in a tough category and did not place. ■ The Loving Love is a very interesting design, a midget racer originally built for the 1951 Goodyear races. Harold Leininger's model spans 85 inches, weighs 21 pounds and is powered by a Zenoah 38. ■ Impressive Northrop P-61 Black Widow sprang from a set of highly modified Cleveland plans. Builder/pilot Robert Carpenter powers the plane with two O.S. BGX 3500 engines. The big 99-inch span bomber had flown twice before the '94 Northwest Model Expo.

Jerry Gray's beautiful Tiger Moth was awarded 1st place in Sport Scale and won the award for Best Aircraft of the Show.

Static judging at these big shows is always difficult because there are so many excellent models on display. Bob Benjamin has been handling this task over the past several years and does a good job of coming up with a cross-section of modelers from every part of the hobby and from as many different clubs as possible to help with the judging.

The planes that took home awards certainly deserved them and the judges did a fine job, however, I thought there should have been more honorable mention awards given because many of the planes that did not place deserved to be recognized for their workmanship, even though other models in the same categories placed ahead of them.

I feel that honorable mention ribbons encourage modelers to try again the following year. No one will ever be entirely happy with the judging because we don't all see everything the same way. The best we can hope for is that each judge will be fair and will maintain a consistent standard throughout his schedule.

The spectators voted Canadian Al Marten's Howard DGA-15 the Best of Show, while the judges gave the big plane 3rd place in Giant Sport Scale. The beautiful red-and-cream Howard has a 12-1/2 foot wingspan and a twin-cylinder Stihl engine, and would doubtless have placed higher with more cockpit detail. The exterior was very well done with such features as scale rib stitching.

This year I saw more radial engines in models than ever before. Despite the expense, modelers are spending their hard-earned money for that extra degree of realism and are even putting the engines into the air.

I don't think there's a single hangar queen in any of the pictures presented here. It's a shame to build a plane and never fly it. Museum pieces have their place, but might as well be carved out of solid wood.

Bob Carpenter's P-61 Black Widow did not place due to lack of detailing but certainly deserved honorable mention. The plane had flown twice before Expo '94 and featured operational retracts. Bob did an excellent job of modernizing Cleveland

First place in Designer Scale went to Sid Tanabe for his highly detailed 131-inch span Avid Flyer homebuilt. Like the full-size aircraft, Sid's model has folding wings, and features a welded aluminum tube structure. Power is a Zenoah G-62.

plans to bring his P-61 to life.

Dwayne Padgett's 1/3-scale Weeks Special has an outstanding finish and likewise deserved at least an honorable mention. I hope to see Dwayne on the flying circuit this year; he was flying a Waco YMF last year. I'll bet the Weeks will put a big smile on his face.

Another Weeks Special in attendance was the modified 72-inch span model by Lloyd Marohl. Lloyd simplified the structure by removing a lot of curves, however the plane retained its good looks and flying qualities. The excellent finish helped earn 3rd place in Sport Biplane. The 17-3/4 pound plane uses a Zenoah G-62 with Lloyd's own smoke system, which we featured in a previous Big Birds column.

Ken Crawford's scratch-built Extra 300S features carbon fiber spar caps, rudder post and horizontal stabilizer trailing edge. Ken also lowered the wing slightly. The landing gear plates are carbon fiber coated end grain balsa. The plane weighs approximately 25 pounds.

Next month I will report on the more noteworthy goodies that were displayed in the manufacturers' booths at Puyallup. Till then, drop me a line or club newsletter from your area. I'd love to hear from your part of the world. Bruce Edwards, 8304 53rd St. Ct. W., Tacoma, WA 98467-1816. ***MB***

HANNAN'S HANGAR

BY BILL HANNAN

'Frank Zaic is poetic on the subject of the joys of seeing it fly, but less lyrical on the preliminary hours at the workbench.'

Our lead-in quotation, by longtime model builder Herbert K. Weiss, reintroduces the issue of attracting youngsters to our hobby. Herb wondered how to get kids hooked on the experience of flying models before they are introduced to the discipline of building them, and he offered some thoughts inspired by a pastime much older than ours—model sailboating.

The Tuileries Gardens in Paris, France, has had a model yachting pond for many generations. Grandparents take grandchildren there to relive joyful experiences of their own youth. So what's so special about people sailing model boats in a public park? The boats are *rented,* complete with retrieval poles, from vendors at the pool! Herb explains: "Kids of all ages and sexes equally have the fun of sailboating with no class distinction about ability to carve hulls and hem sails. Is there an analogy for model airplanes?"

Germany's Heinz Neumann makes his magnificent models in this well-equipped work area.

Herb was thinking in terms of rentable, rugged, rubber-powered stick models or simple gliders. The question remains whether youngsters would become sufficiently gratified in operating rented models to pursue building their own. Motivations might include the chance to better express their individualities in design and size selection, decor, plus elimination of rental cost. Offsetting the perceived gains might be the initial time and money investments required. This raises the parallel question about people purchasing already-built models, as contrasted with making their own—the "sport" versus "hobby" distinction; model *operators* versus model *builders.*

Competition power model flier Mario Rocca was quoted in the French magazine *Vol Libre* (Free Flight) as saying in part: "New ways of life have developed and deeply changed our interests, creating new needs and shifting our attention from the skills we can acquire to the objects we can have." Might youngsters equate renting or buying model sailboats or airplanes with operating video games, and miss the creative potentials and satisfactions of building models completely? Food for thought.

Incidentally, the aforementioned Tuileries Gardens were the site of another historic event. During 1871, pioneer French aeromodeler Alphonse Penaud publicly demonstrated his rubber-powered flying planophores there.

Our gratitude to Herb Weiss for his ideas on a subject that seems to deserve closer examination.

OUT OF SITE FLIGHT?

Yep, we mean *site,* not sight. According to Don Campbell, reporting in the Cloudbusters newsletter, the Honolulu Hawaii Indoor Model Flyers hold their meets in the roofless Kilauea gymnasium. Wind moving across the open area can create a chimney-like draft that can really disturb models, especially very lightweight ones. Thus the modelers find themselves in a paradoxical position—building heavy indoor models on purpose! As the club newsletter editor, Ed Kuramoto, put it: "The lead sleds bore through the wind and actually fly slower in the wind. The bad news is that these heavy models tend to re-kit themselves when they hit the walls. This gym is the best place we have to fly, so we just have to take our chances with good and bad flying days." Now that's real dedication!

Jiro Sugimoto, of Japan, was in the process of building a superb Sukhoi SU-26 M-X Peanut from A.C. Anson's Aeroplans when this photo was taken in his neatly arranged workspace.

THOUGHT FOR THE DAY

Model builder Dwight Coffin, of Painsville, Ohio, says his wife has posted this definition on the refrigerator: "Retirement is twice as much husband, and half as much money." And twice as many balsa shavings on the floor?

APPRECIATE YOUR SHOP!

Most of us take our workshops or building spaces more or less for granted. Perhaps we should reflect upon how fortunate we are to have sheltered workplaces. Within recent months we've heard from readers who have suffered loss or damage of their shops to floods, fires and earthquakes. Happily, all are rebuilding and carrying on with the hobby.

Likely we all should clean out our surplus supplies, neaten our areas and spend more time actually using and enjoying our workspaces!

WHITEHEAD MUSEUM

In the February Hangar column, we discussed the Gustave Whitehead (Gustav Weisskopf) Museum in Leutershausen, Germany, and its soon-to-fly Whitehead reproduction. Joe Shultz, who supplied our information, points out that any readers who may be traveling overseas are invited to visit the museum, but cautions that there are three different towns named Leutershausen! The museum is in the one located between Rothenburg on the Tauber and Anspach. Detailed travel directions and lodging descriptions may be obtained by sending a pre-addressed return envelope and two International Reply Coupons to the museum chairman: Herman Betscher, Bahnhofstrasse 20, D-8801 Leutershausen, Germany.

COLE PALEN

Aviator/showman Cole Palen passed away of natural causes during December at age 68. Well known for his Old Rhinebeck Aerodrome and vintage aircraft airshows, Cole was also an enthusiastic supporter of model building in all its forms. Whether flying his own rubber-powered scale models or helping sponsor RC scale model contests, Cole's philosophy always placed the accent on having fun.

Fortunately, Palen had established a foundation to insure continued operation of his airfield and aircraft collection, which will serve as a living memorial to its founder. Readers who may wish to send financial donations may contact The Old Rhinebeck Aerodrome Museum Foundation, Norton Rd., Rhinebeck, NY 12572.

Our thanks to Sean Gill, Ed Whitten, the New York Wing Tips newsletter and World War One Aero for information relating to Cole Palen's passing.

COMMERCIAL CORNER

New to our hangar desk this month were the following:

Larry Low, of Woodside, California, built his Walt Mooney designed Culver Dart Peanut in this workshop. Dart plans appeared in the February 1974 *Model Builder*.

A Gee Bee squadron! Six of eight Peanuts, based on Pres Brening plans, built by the Indiana Calumet Escadrille of the Flying Aces Club. Top flight duration thus far is 23 seconds. Sound easy to beat? Try one! Phil Cox photo via Paul Boyanowski.

• ***Maquettes Volantes* magazine.** Thanks to Georges Chaulet, we received issue number one of a brand new French publication devoted exclusively to flying scale models. This remarkable bimonthly magazine features unusually lavish use of color, having 48 of its 65 pages devoted to color photographs and illustrations. Featured are large-format photos of RC scale models, three-views and documentation photos of full-size aircraft, detail and cutaway illustrations, and French text. Even without a knowledge of the language, the pictures speak for themselves. For subscription data, send two International Reply Coupons to: Maquettes Volantes Magazine, E.L.T. , Rue du Chateau, Tilly, 77310 St. Fargeau, France.

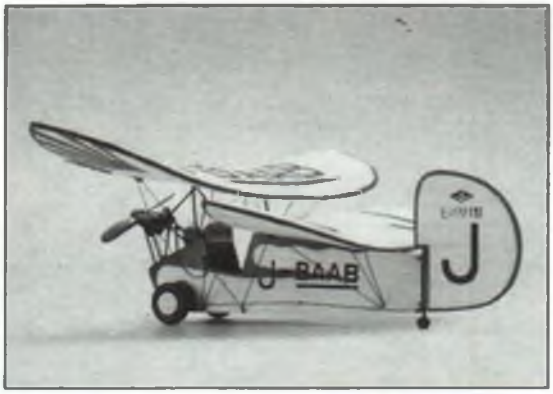
• ***Pou Review.*** This bimonthly newsletter is devoted to Pou du Ciels (Flying Fleas) and their derivatives, and features photos, drawings and news from builders of these tandem-wing aircraft, much of which might also interest modelers. Subscriptions are available for $15 (USA), $18 (Canada), or $25 (overseas), from: Raymond Buckland, P.O. Box 892, Webster, OH 44691-0892.

• **FF Scale Plans.** Chet Bukowski has established TOMACO (The Old Model Aeroplane company) to help keep traditional stick-and-tissue model building alive. He hopes to generate more interest in "the fine art of building and flying model airplanes." The first offerings are three sets of rubber-powered model plane plans, originally published by Paul K. Guillow during the pre-WWII era.

Set #1 features a Taylor Cub, Cessna, Curtiss Robin, Fleet Trainer and Arrow. Set #2 has a Fairchild 45, Swallow, Bellanca Skyrocket, Rearwin Speedster and Stinson 105. Set #3 contains plans for a Ryan SC, Mechanics Flyabout, Monocoupe 90A, Porterfield Zepher and Curtiss Hawk. Prices are $7 per set plus $1.50 postage for one set, $2.25 for two sets shipped together, or $3 for all three sets shipped together, from TOMACO, Box 116, Wilmington, MA 01887-0116.

• **More Plans.** Domeduster plans packet number 3 is now offered, featuring a dozen full-size free flight indoor model plans, the work of nine differ-

HANNAN'S HANGAR



This incredibly detailed static display model Pou du Ciel (Flying Flea) by Jiro Sugimoto of Japan spans less than 5 inches!

A cutaway example of the forthcoming GB-12, Bill Brown's current CO_2 project. The GB stands for Gasparin/Brown. More information in article. Photo by Evan Towne.

ent designers. Included are four Peanuts, one Pistachio, a profile, a Bostonian, a hand-launched glider, an EZB and two mini-sticks. The variety provides a good chance for modelers to sample a field of possible indoor types in a single packet. Price is $8 postpaid from Stan Fink, 1810 Pine St., Philadelphia, PA 19103.

•CO_2 Systems Documentation. Evan Towne is a devoted enthusiast of CO_2 power, and has compiled an extensive package of information which includes history, specifications and a selection of photographs showing his collection and many types. The accent is on the work of Bill Brown and his products, starting in 1946, and covers the OK units (which were originally designed by Brown), the Campus series, the new generation of powerplants, the Micro-Jet as well as the current productions, with data about each, three comparison charts, plus 30 3x5 color prints and a sheet identifying every engine. One of our photos is from the series, and graphically demonstrates the sub-miniaturization taking place in these systems. The entire documentation package may be obtained for $8, from Evan T. Towne, 591 Buchanan St., Huntington, IN 46750.

SIGN-OFF

From the *New York Indoor Times* newsletter, edited by Ed Whitten, this parting inspiration: "Time passes, circumstances change, but aeromodeling and friendships last forever." ***MB***

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FREE FLIGHT

BY BOB STALICK

The Next-Generation Free Flighters—Where Are They?

A recent article in *Scatter* asked the question, "Are we the last?" The premise was that those of us who are getting long in the tooth represent the dying skills of a past generation. Our generation remembers using balsa and tissue instead of carbon fiber and epoxy to build our models. We used nitrate dope and fuel proofer instead of plastic iron-on materials. When we flew, we sensed thermals instead of using sensitive electronics to detect them.

The article created a sense of longing and loss for me. I have often wondered whether the skills of past free flighters are still around today. Is the art of free flight dying out as we age? Have we passed on the enjoyment of our youth to an upcoming generation, or are we content to carry our knowledge, skills and joy to our retirement and ultimately to our graves?

Recently, I attended the Northwest Model Exposition in Puyallup, Washington, and saw literally hundreds of models on display. Many were exquisite and artistic works of craftsmanship, and some had been crafted by a younger generation of less-experienced modelers. Those models that demonstrated excellence in tissue and silk covering were few and far between and were far overshadowed by the behemoths in fiberglass and plastic film. It was an eye-opener for me. I recall a conversation I had with an ex-free flighter who has since moved to RC Old Timers because he can no longer chase; he said he loved to see free flighters enter these display events because it was with us that true excellence in silk and tissue covering was demonstrated.

Steve Welch with his 150 percent T-Bird (a Campbell kit). Model was being test flown at Harts Lake Prairie in preparation for an upcoming Nostalgia competition. Model flies as well as its smaller counterpart and is easier to see.

As I ponder our future, it may be time to take a youngster under our collective wings so that the joys and skills of our youth may be perpetuated and shared with the future. The time will come when there may not be enough of us to make a difference.

JUNE MYSTERY MODEL

Harry Murphy brought this one to my attention. He claimed it would be a sleeper in the Early Nostalgia class we've been promoting of late. The ship has a diamond-shaped built-up fuselage, rectangular wing and stab, and the entire model has that lightweight characteristic necessary for those wimpy little .049 engines approved for use in the event. It appeared in the early '50s in one of the major U.S. model mags.

Think you know what it is? Write it down and send it in to *Model Builder*. The one whose name is drawn at random from among the correct entries wins a free one-year *MB* subscription. Simple as that!

MARCH MYSTERY MODEL WINNER

No one was stumped by this one—all ten of those who wrote knew it was the Sizzler 40 by Bob Buragas, published in the July 1951 Model Airplane News. *Although it was presented as a 40-inch span ship for .049-.074 engines (the plans showed an OK Cub), the article included a small three-view drawing with some suggested spans and chords to make 540 square inch Class B and 700 square inch Class C versions. Whether Mr. Buragas or his buddies ever built Sizzlers in those sizes, we don't know. What we do know is that it was Nat Antonioli of Poway, California who scored himself a complimentary one-year* MB *subscription.*

JUNE THREE-VIEW: EASY RISER P-30

The popularity of current free flight events is easy to gauge by reading the club newsletters.

It's seldom that a drawing of a Class C or D gas model appears; more often, the gas models that are being designed today are 1/2A or F1J ships. For rubber power, new P-30 designs seem to pop up every couple of months. P-30 has become the most flown outdoor rubber event at most free flight contests.

The Easy Riser P-30 appeared in the pages of *El Torbellino*, the journal of the San Diego Orbiteers. The article accompanying the drawing had this to say about the model:

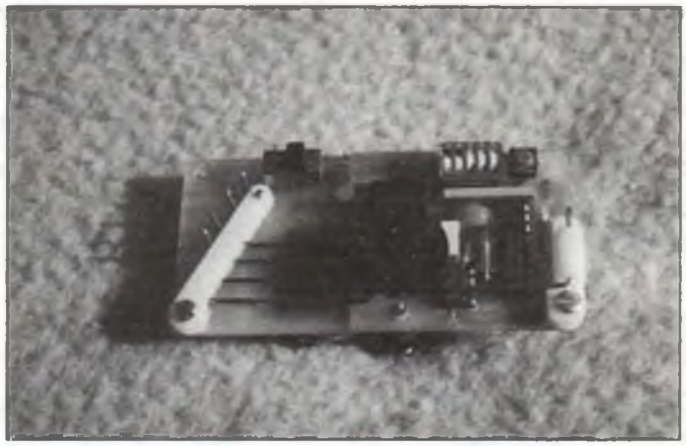
"Architect Bob Thompson's sortie into the long motor run strategies (of P-30) are coming along quite nicely, despite some early teething problems. This ship has shown well of late both at Otay and Taft. New 10-gram motors have given it a zippier style.

"A lighter version may be in the works, but outlines and parts will be the same. Bob has several sets of full-sized prints to share with interested parties whose hangars need another P-30."

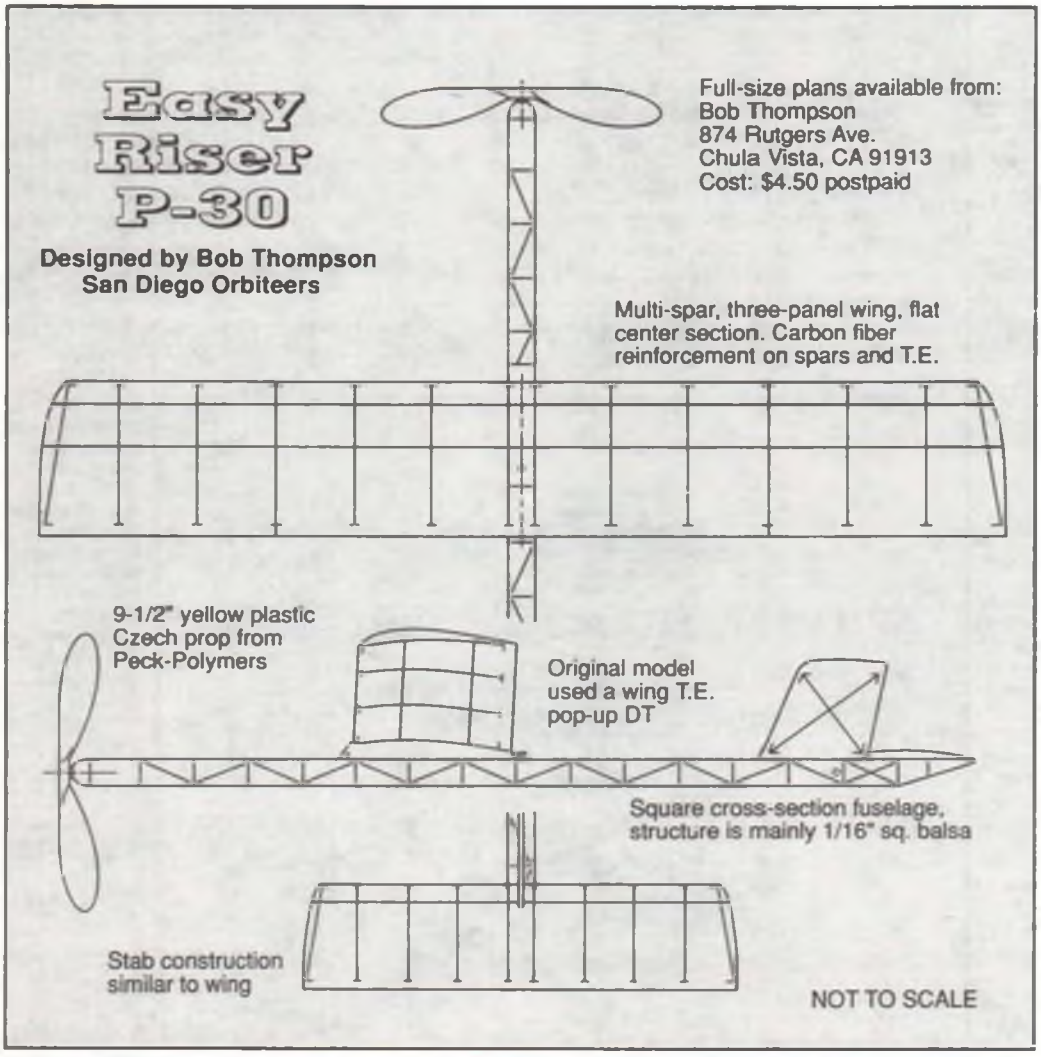
To get a set of those full-size plans, send $4.50 to Bob Thompson, 874 Rutgers Ave., Chula Vista, CA 91913. Plans are sent folded, and the price includes postage.

RJL HORNET EMERGES

At the N.W. Model Expo I had a chance to visit the RJL Industries booth. My interest was in the recently advertised upcoming release of RJL's replica Holland Hornet. I learned that the Hornet is intended for release in June, and that the cost will be in the $85 range. Also available will be some of the previously difficult-to-obtain spare parts. So, if you are interested, I suggest you call or write to RJL directly. Address: P.O. Box 5, Sierra Madre, CA 91025; (818) 359-0016.



Bill Young's electronic five-function timer for FAI Power. See column for details.



SUPPORT THE INDOOR PROGRAM

One of the more innovative ways to fund AMA programs was started a couple of years ago by Ray Harlan and Dr. Vern Hacker. This was the sale of surgical instruments proven useful in modeling. Two years ago, sales brought in over $3,000 for the AMA's indoor program fund. The amount generated in 1993 was also sizable ($2600+) and will be used to support the junior free flight fund and the museum at Muncie.

Vern intends to continue offering these instruments to modelers; the entire purchase price is donated to the indoor and other funds. Available are the following: A grasper and pair of scissors ($10 each, tiny instruments at the end of a 12-inch long handle, handy for getting broken rubber motors out of fuselages); eye scalpels (three for $5; according to Vern's son, Dale, they are the best he's found for cutting the heavier films such as MonoKote); and a variable temperature cautery ($12), the best indoor film cutter available anywhere today.

FREE FLIGHT

These prices are better than any you will get anywhere else, and where else can you get good tools for a fair price and have all of the proceeds go to a good cause?

For more information or to place an order, contact Dr. Vern Hacker, 25599 Breckenridge Dr., Euclid, OH 44117; (216) 486-4990.

1993 AMERICA'S CUP WINNERS

After 21 contests and over 2,000 flights, we now have the three winners of the 1993 America's Cup. They are: Pierre Brun in F1A Glider; Jerry McGlashan in F1B Wakefield; and Ralph Cooney in F1C Power. Brun won out over 42 others in the glider event, McGlashan bested 48 others in rubber and Cooney beat 33 competitors for his award.

The finish of the Glider class was high drama indeed! After a year of intense competition, F1A was settled in the last flight of the last contest. Pierre Brun pursued the cup for several years and with a fierce effort, he finally nailed it New Year's weekend in Florida.

Jerry McGlashan scored points in nine contests, which meant he traveled back and forth in both the U.S. and Canada. He became the second Canadian in a row to win Wakefield in the America's Cup.

Ralph Cooney has been near the top in F1C Power for several years, and in October got top scores in two very large California contests against world class competition to win over World Champion Randy Archer. He did it the hard way!

A big round of applause should be given to the person who has directed the effort for the past four years—Al Hotard of the Southern California Aero Team. Thanks, Al. It wouldn't have happened without you.

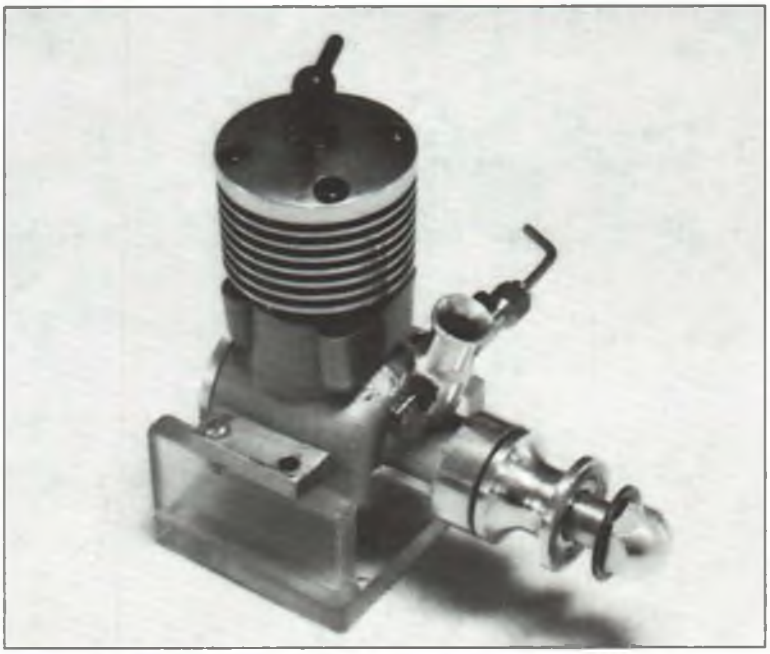
SOME ODDS AND ENDS—BITS AND PIECES

I receive a number of announcements and useful bits of information during the year, and here's a brief look at the most interesting of the recent bunch:

•**Old Model Plans.** Chet Bukowski is reproducing some of the neat old scale model plans for either indoor ten cent or indoor O.T. scale events. Chet has three plans sets ready to go now and more are on the way. Included in set #2, for example, are a Swallow, Fairchild 45, Bellanca Skyrocket, Rearwin Speedster and Stinson 105. More info can be obtained by sending an SASE to Old Model Aeroplane Co., Box 116, Wilmington, MA 01887. The sets are priced at $7 plus $1.50 postage.

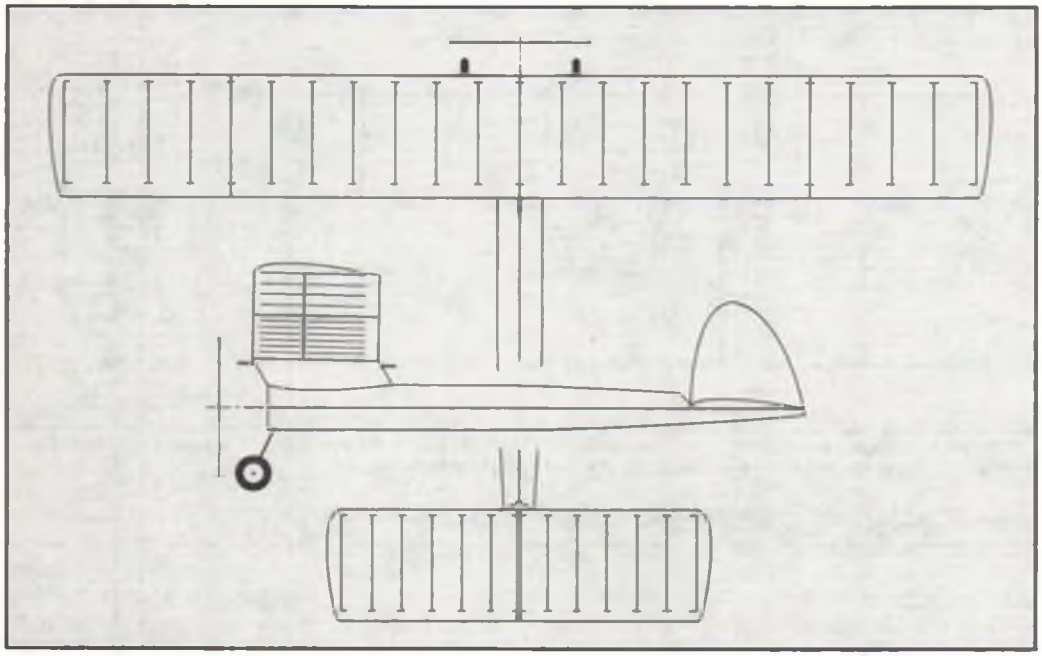
•**Uber Skiver Blades.** I picked up a container of 20 blades at the N.W. Expo for $10 from Edjer Co. Their address is P.O. Box 1775, Hemet, CA 92546, or call (909) 925-2344. These are excellent products and superb for use on thin, lightweight balsa.

•**1/2A Engine Starter.** For awhile, these starters were available, then they weren't, then they were again. Now, Miller R/C Products has an improved version that has a better rubber starter cone and a smaller diameter motor. Contact Miller R/C at P.O. Box 425, Kenwood, CA 95452; (707) 833-5905.



One of the CS-built replica diesel engines being distributed in the U.S. by Dave Platt is this Oliver Tiger III; also available is an Elfin diesel (a favorite in O.T. Class A competition). Both are .15s. Details in text.

JUNE MYSTERY MODEL



•**Replica Diesels.** Elsewhere in this column you will see a photo of a shiny Oliver III replica diesel engine, currently being produced by the CS company in China. Dave Platt is importing this as well as a replica Elfin diesel into the U.S. Both engines are 2.5cc (.15 cu. in.) displacement. Further information about these engines can be obtained by contacting Dave at 1306 Havre N.W., Palm Bay, FL 32907; (407) 724-2144.

•**Electronic Five-Function Timer.** Bill Young is offering a limited run of electronic timers directed at F1C Power fliers. These units are programmable in .5 second increments for the first four functions and in .5 minute increments for the DT function. Rechargeable batteries are used to power the unit, which is 1.4 inches deep, 1.7 inches wide and 3.5 inches long. Weight of the complete unit is 2.5 ounces including batteries. Cost is $150 each plus $5 postage. Further information can be obtained from Bill Young, 8106 Teesdale Ave., North Hollywood, CA 91605. ***MB***

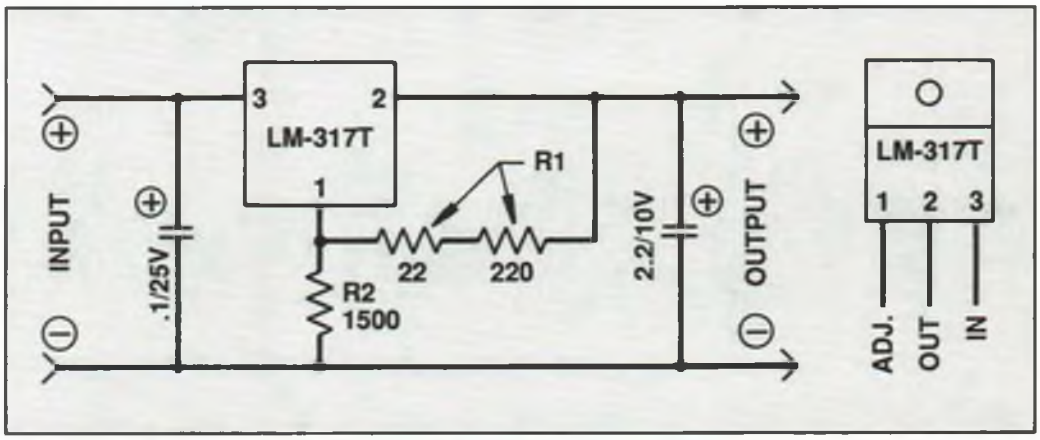
ELECTRONICS CORNER

BY ELOY MAREZ

• Modifying the Cox Failsafe Charger

• Removing Components from PC Boards

• The Royal ProTach Revisited



Circuit used to provide the 9 volts DC required by the Cox Failsafe and Flight Command system chargers, to replace the original six D-cells used. Can be powered from a wall transformer or any auto or similar battery.

The Cox Failsafe and its newer sibling, the two-channel Flight Command RC system, continue to be consistent subjects in my mail. One recent letter had to do with the companion charger, and just when I was doing some tests, the six D-cells that power it chose that time to roll over and expire. And of course, it was late at night and I didn't have any replacements!

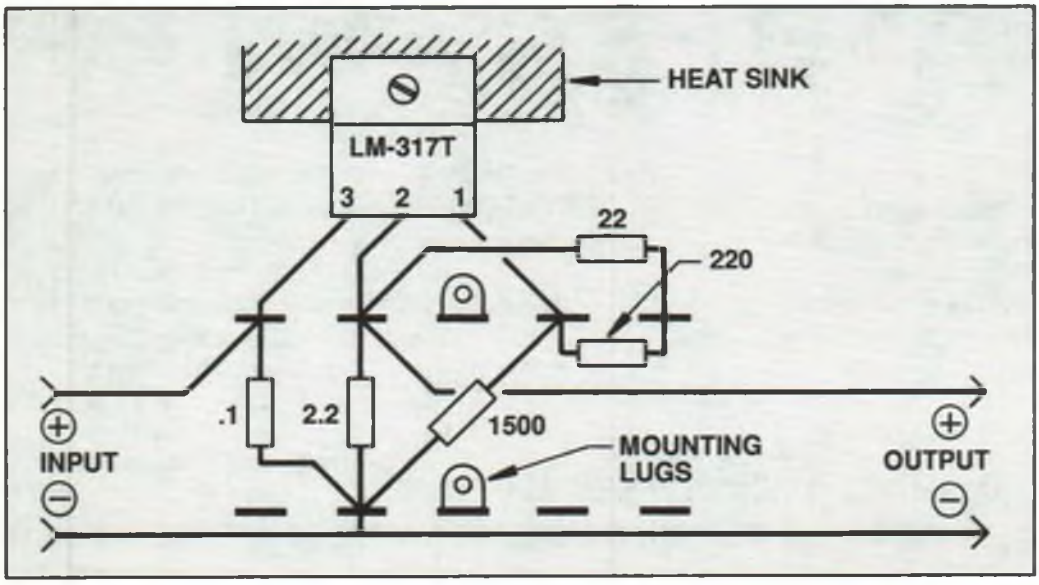
It was then that I had the thought I should have had long ago: this charger, originally requiring 9 volts, needs to be modified for 12-volt DC operation. This would allow it to be powered from the always-handy car battery via the cigarette lighter receptacle, or from a common 12-volt battery used to power glow engine starters.

The whole thing is simple, and can be done in a number of ways. The first one that comes to mind is to use a dropping resistor. This will work, but the output voltage regulation will be very poor, the charging current varying with any variations in the 12-volt supply voltage. Such variations would occur when using a starter battery which is itself low in charge, and would increase, possibly unacceptably high, if the charger were to be used in an automobile with the engine running. As such times, with the alternator charging system operating, the voltage is somewhere over 13 volts.

Another way to adjust voltages, which sometimes works well if the arithmetic cooperates, is to use a series diode, or diodes. A common silicon diode causes a voltage drop of .7 volt in any circuit it is installed in. It actually works better than a resistor because the voltage drop across it is constant, while the voltage drop across a resistor varies with the current flowing through it. Again, however, the output voltage regulation is poor. A true voltage regulated circuit is neither complicated nor expensive, and that is the way we're going to go.

There are many ways to skin this particular electronic cat, the easiest being to use one of the Linear Integrated Circuit family of voltage regulators. These are three-pin devices, in various common packages, differing only physically and in their current handling capabilities. As a general rule, the larger the device is, the more current it will handle. Though they look just like a transistor, they are actually rather complex ICs, but are super simple to use, requiring only input, output and ground connections. As with any voltage regulating circuit, the input voltage has to be higher than its output.

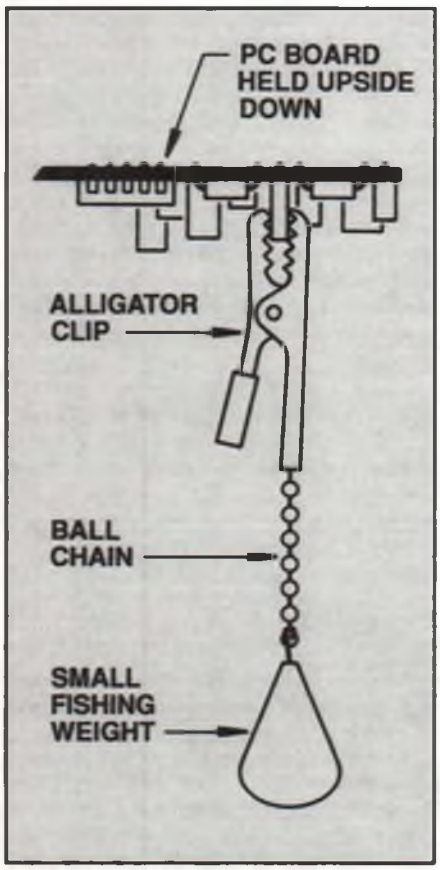
These voltage regulators are available for a variety of the voltages most commonly called for by solid-state circuits, both positive and negative. However, the only one available for the 9 volts we need in this case



Pictorial of the voltage regulator circuit for the Cox charger, assembled on two five-terminal strips available from Radio Shack. Nothing critical about this one—no adjustments or tuning required—simply wire it and go!

is a small one rated at 100 mA—not enough! Fortunately, there are also a couple of such ICs intended for non-standard applications like ours, which can be tailored to provide regulated voltages anywhere from 1.2 to 27 volts. Using one of these—an LM-317T to be exact—we can come up with the exact 9 volts obtained from six alkalines.

Refer to the schematic. Other than connecting to the proper pins on the voltage regulator, and observing the polarity signs on the capacitors, there is nothing critical about the circuit.



Removing components from double-sided, plated-through hole printed circuit boards is difficult and often results in damage to the leads. The use of Eloy's handy-dandy component puller-offer makes the chore a lot easier and safer. Eloy actually has two different types: one as shown and another with a hook in place of the alligator clip—handy for removing items with holes, such as TO-220 transistors, etc.

Nothing to adjust or tune! Though there is no need to duplicate my unit, I've included a sketch of how I mounted the various components on a couple of Radio Shack terminal strips (274-688), which are then mounted to the inside of the charger battery compartment with a couple of screws.

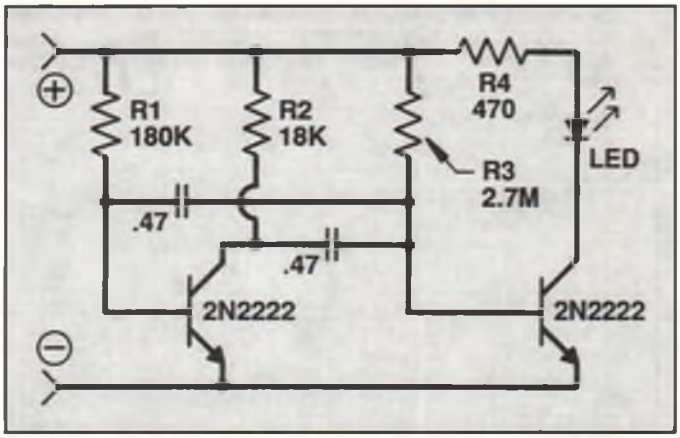
Input connections to the voltage regulator can be through a cigarette lighter cord (RS 274-331) or simply a couple of wires with appropriately colored clips on the end, depending on how the charger is to be powered. At the output end, you can remove the top section of the charger and connect the regulator output at the same places the wires from the original battery contacts are installed, or simply solder to the battery contacts themselves. Again, watch that polarity.

If for any reason, you would want to power your Cox charger from a nearby 110VAC wall socket, you can do so by connecting the output of any wall plug-in charger or DC adapter capable of producing at least 12 volts at .5 amp. One such possibility is Radio Shack's No. 273-1652, though it is kind of pricey at $10.99. There are many similar units to be had for less than half that amount. If you live in a large city, check your electronic stores; if not, try the ads in one of the electronic magazines.

Other parts required, with Radio Shack numbers, are:

- Voltage Regulator LM-317T 276-1778.
- Heat Sink for above 276-1363.
- 15K 1/2W Resistor 271-025.
- 220 Ohm 1/2W Resistor 271-015.
- 22 Ohm 1/2W Resistor 271-005.
- .1 uF Capacitor 271-1432.
- 2.2 uF Capacitor 271-1435.

The 22 and 220 ohm resistors are connected in series to come close to a less common 240 ohms unit required, labeled together as R1.



Battery-saving blinking LED circuit that Eloy suggests could be used in the Royal ProTach as an "on" indicator to serve as a reminder to turn the unit off before putting it away. The circuit will work with from 4 to 24 volts; on to off time depends on the exact value of the components used.

The LM-317 variable voltage regulator is a good thing to know how to use, as it can come in extremely handy for producing non-standard voltages such as the above. It's good for a maximum of 1.5 amps; should you need more than that, substitute a LM350T, which is good for up to 3 amps. Like all IC voltage regulators, they are easy to understand and use. The basic circuit is as shown, the actual output voltage being determined by the value of R2. A variable rate charger could be made by simply substituting a 5K pot for that resistor. The same circuit will also work as a variable supply for your experimentation, though some input filtering may be required if it is not already included in the basic source.

Like many things electronic, there is a formula! Or formulas actually, though the only one that appears in the maker's literature is for calculating the output voltage with a given R2 value. It is:

Vout=1.25(1+R2/R1)

I've never quite figured this out; maybe you are supposed to try random values of R2 until you come up with one that gives you the voltage you're after. Anyway, I have transposed it to:

R2=Vout/1.25-1xR1

Let's prove it out with the values as shown. We require 9 volts, which divided by 1.25 yields 7.20. Less 1, we get 6.20, which is then multiplied by 242 (R1), for a product of 1500.4. Close enough for all purposes, though the 5 percent resistors used in this case can cause a slight change one way or the other. No matter—real precision is not required in this case!

A lot of effort has been made by IC producers to optimize the voltages required to a few standard values, but some circuits sill require non-standard values. It sure is nice to have adjustable voltage regulators like the LM-317 around!

TAKE 'EM OFF

Removing electronic components from the double-sided, plated-through hole printed circuit boards used in today's small RC equipment, without causing damage to the board, requires more than a little care. For those not familiar with PC board construction, we are talking about those that have conducting "lands" (traces of metal) on both sides, interconnections being made by holes through the board which have been plated to form a solid connection between the two. These same holes are also used to mount leads in, and that's where we sometimes run into trouble when we have to remove a part. It's virtually impossible to remove all the solder from the lead and that little hole so that the component will fall out, especially with multi-lead devices such as coils and transistors.

However, using one of Eloy's tricks, most all such devices can be removed rapidly, and most importantly, without damage to the board. As shown in the sketch, the idea is to hang a small fishing weight onto the part to be removed, and then apply heat simultaneously to

all of its leads. The procedure often works best by applying additional solder to the leads and then using a piece of solder wick between them and the soldering iron to distribute heat to all of the leads evenly. The weight will pull the part off slick as a whistle, after which the holes can be cleaned of solder with your solder wick.

I use two types of "pullers." One has an alligator clip, which works best with coils and other items; the other has a hook, which is handy for "holed" components such as TO-220 transistors, voltage regulators, etc. The ball chain allows you to swing or bounce the weight for an extra bit of help with stubborn parts. Try one or both—they really work!

MORE ON THE PROTACH

The Royal ProTach mentioned in the February issue has brought a lot of mail; there are a lot of them still in use and those who have them care for them faithfully. The oldest one reported is owned by Andy Sulkowski of Oakville, Ontario, Canada, who says his is "18 or 19 years old, and still works like a charm." Andy also reminded me that the instrument first appeared as an *RCM* construction article back in July 1975!

I was also reminded of the only negative feature of this great instrument; the locking on-off switch makes it easy to leave the tach turned on, with disastrous results to the two expensive 9-volt batteries inside. I solved that on mine a long time ago by replacing the switch with a simple push button. I did have to sacrifice the battery test function, but since I can't inadvertently run them down, I find that I don't have to test them as often.

Those not wanting to replace the switch might consider the addition of an LED as an "on" indicator. However, as normally connected, especially for maximum daylight visibility, they too can consume a fair amount of current—as much as 25 mils. Enter the low current LED indicator.

(Actually, you *could* do the job with an LM-3909, an IC specifically designed to flash an LED with extremely low current consumption. However, the circuit shown, also an LED blinker, has the added advantage of using all readily available, inexpensive parts.)

Basically, it is what is called a multivibrator, with the LED in series with one of the transistors. It is timed for a longer off than on time, the actual blinking frequency and current consumption being determined by the input voltage, which can be as high as the 18 volts used in the ProTach.

The resistors used are all 1/4 watt; capacitors are ceramics at a voltage equal to or higher than the supply voltage. For resistors, most any NPN silicon such as 2N2222 or 2N3904 will do. There is an NTE replacement for both of those, but that's the expensive way to go—try whatever you have or can locate inexpensively.

Eloy Marez, 2626 W. Northwood, Santa Ana, CA 92704. **MB**

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THE ISS 'DASH FOR CASH' RC HAND LAUNCH CONTEST

One of the most interesting and certainly most challenging soaring events, RC hand-launch is rapidly growing in popularity. This newest annual meet features a separate event with cash prizes.

RC SOARING BY BILL FORREY

■ SPREAD: All of the original design models, all original kit prototypes, and all highly modified kit sailplanes were asked to group for this photo. In the past, this has actually been the largest group, but as more and better kits come onto the market, fewer people are experimenting. Too bad.■ BELOW: The Inland Soaring Society has a reputation for hosting one of the finest hand-launch glider meets in the country every June, and now there's the Dash for Cash. Thirty-eight fliers is not a bad turnout for a mid-winter sailplane contest, especially the first annual!

■ TOP LEFT: Winner Joe Wurts' original design Aftershock passes overhead. Model weighs just 11.8 ounces in spite of having four servos. It features an NSP Sparrow fuselage, flaperon-spoileron mixing, RG-15 airfoil, and a 1/4-inch flaperon-to-wing gap which is hinged and sealed by Airtronics hinge tape to allow for a soft radius hinge line to minimize boundary layer separation at the trailing edge. Wing is 1/32 balsa over white foam with tapered (triangular) C/F tow spars, and 3/4-ounce glass cloth at 45-degree bias under the skins. Balsa skins have one "swipe" of cillica-thickened epoxy for finish. TOP. ■ Gordon Jennings (2nd in Cash and 2nd in Trophy), consulted with Joe Wurts before designing and building this original HLG. Joe's comments that DJ Aerotech's Monarch was the "best HLG kit on the market" made Gordon want to know why. The 7 percent thick SD7037 is one reason, so Gordon used it in this design too. Model features fiberglass fuselage, balsa-over-foam structure, 460 square inches wing area, and weighs 12.5 ounces. ■ ABOVE: Merrill Farmer is one of the Ms in MM Glider Tech. New this spring is his Commoner HLG, with which he placed 7th out of 38. The Commoner handles extremely well and is very forgiving . . . so much so that it more than makes up for any aesthetic or aerodynamic shortcomings of its constant chord wing. Airfoil is unusual too, the SD7084. ■ LEFT: Top money winners in the Dash for Cash were (from left): Joe Wurts (1st, and overall high point winner with his original design Aftershock); Gordon Jennings (2nd, original design); Steve Condon (3rd, Climmax); Arthur Markiewicz (4th, original design—also placed 3rd in the trophy class with the same model); and Mike Reagan (5th, own "Lil' Devil" kit).

Famous since the early '80s for its annual RCHLG contest held every first weekend in June, the ISS club of Riverside, California has this year also added the first of what will be an annual mid-winter HLG event. They named it the "Dash for Cash" and promoted it with two separate winner categories: one for those who would rather fly for cash prizes, and one for those who prefer trophies. Held late in January on Super Bowl Sunday, the event drew a very respectable 38 fliers.

Weather for the event could not have been better—temperature in the high 60s to low 70s. Skies were blue with plenty of thermal-generating mid-winter sun.

The ISS club has always been a leader in RCHLG contest formats. Their events are always fun and challenging. For the First Annual Dash for Cash, they came up with new tasks that proved popular with the fliers.

Round 1 was unlimited throws for your best single flight time within a 5-minute time slot. Flight groups consisted of eight to ten fliers per heat. Scoring was man-on-man to minimize weather luck during the round. The best time of the flight group was given 1,000 points and the rest were normalized to the winner's time. This was the scoring method used throughout the meet.

Round 2 was equally challenging. Here you were given a 7-minute time slot and limited to only four throws to achieve three 2-minute maxes. Strategy was paramount to winning this task. Using your timer and thrower's eyes and ears to find lift on the field were crucial to winning. Constant updates on other fliers in your group were needed to conserve precious throws. If you weren't sure where to throw to get in lift, it was better not to throw at all, but to look for a sign of lift. Piggybacking off the more experienced and talented pilots was the rule!

The Climmax from C.R. Aircraft Models has become quite popular in a short time; 11 showed up at Riverside. Ron Schark flew one and had the distinction of beating the ultimate Dash for Cash winner, Joe Wurts, in Round 1 with a flight time of 4:51 from a single throw, versus Joe's 4:48.

Round 3 was a big 10-minute slot with unlimited throws. The task was to achieve a 2-minute max, a 3-minute max, and a 5-minute max. Deciding at 1:45 whether your thermal was good enough to go for the 3- or 5-minute max was the recurring question. This was a tough round!

Round 4 was another 10-minute slot. This time a six-throw limit was imposed on the fliers. The task was to achieve as many 2-minute maxes as possible (officially five, but obviously a time warp would be needed for more than this).

Round 4 finished up in time for most fliers to travel home and see the last half of the Super Bowl. Next year, this event will likely be held on a different January day to attract more fliers.

MODELS FLOWN AT THE DASH FOR CASH

By far, the most numerous kit model flown was the C.R. Aircraft Models Climmax. At least 11 were entered. The Climmax is unique in that it has a very thin, all-flying (all-moving) vertical stabilizer of fairly high aspect ratio. One would think it would be marginally effective and prone to stalling at high attack angles, but apparently this isn't the case.

The Climmax features a 400 square inch, fully sheeted foam wing with a "transition modified" SD7037 airfoil, the purpose of which is to prevent tip stalling and enhance upwind penetration in breezy conditions. The model launches high, slows to a crawl, and can penetrate without ballast when needed. The ship typically comes in at 14 to 16 ounces, ready to fly, with the lower figure probably more common if it's built carefully.

The next most numerous kit designs flown were the four new Vagabonds from Larry Jolly Model Products (LJMP) and the three

Larry Jolly is returning his focus to his kit line and has just introduced the new Vagabond HLG. Conventional balsa D-tube structure with conventional balsa fuselage and V-tail stabs make it attractive to the foamophobic masses. The performance, handling and stability of the design are truly first rate. Larry's son Emmett has become quite the competitor in RCHLG with his Vagabond.

Ian Douglas and his trusty old Paraphrase by Scot Whitney. Kit is long out of production, resembles a miniature Mirage. Paraphrase flew well enough to be competitive a few years back.

new Commoners from MM Glider Tech.

The Vagabond is a beautiful V-tail, polyhedral, rudder/elevator, conventionally built sailplane that grew out of the LJMP Request prototypes of a few years back. Two of the shortcomings of the Request design were the Go-795 airfoil combined with the narrow wing chord, which tended to lose performance when slowed down; and inadequate dihedral, which slowed roll response. Both have been corrected in the Vagabond with dramatic results.

The Vagabond has a wing area of 430 square inches and the S3021 airfoil. It also has greater dihedral for quicker roll response. The whole model, ready to fly, weighs only 12.5 ounces, for a wing loading of just over 4 ounces per square foot.

The Vagabond kit will come with a balsa fuselage, but if you like, a fiberglass fuselage that weighs only 60 grams will be available as an option. Larry's son Emmett flew a production run fuselage in the contest. If the Vagabond is of interest to you, contact LJMP at (714) 826-6861.

A testament to Larry's flying and designing abilities is his performance in Round 3, where he made his 5-minute max, made his 3-minute max, and simply ran out of time to finish his 2-minute max but still managed over 1 minute.

MM Glider Tech's new Commoner made its contest debut at Riverside and performed quite well. It has a 59.5 inch span, 480 square inches of wing area, and weighs around 13.5 ounces ready to fly. It features the SD7084 airfoil, which Selig's Princeton wind tunnel data graphs say should have a lift range close to the S3021 but with better penetration in wind at lower angles of attack. Combine this with the Commoner's wide, constant chord wing and its 4-ounce wing loading, and you are looking at a ship that can help earn you RCHLG trophy hardware.

I was offered the chance to fly Merrill's personal Commoner at the end of the meet. I flew it for perhaps a dozen throws, some by my arm, some by Merrill's. I have to tell you, this plane is the easiest handling RCHLG I've ever flown. I absolutely could not find fault with its manners at all.

There's a bit of washout in each tip to help reduce some of the extra induced drag that constant chord wings tend to have by nature. The result is a ship that you just can't tip stall (well, almost!). The dihedral angles and vertical stab balance each other perfectly, with just the right amount of spiral stability and roll response. The long tail moment and big horizontal stab allow you to pull really hard in turns, stretch out those last few seconds from a landing, or pull

K&A Models produces a kit for the "Thermal Buster" HLG, displayed here by K&A's Ken Williams. Model features an Eppler 205 airfoil with conventional balsa D-tube wing structure. It has a wing area of 354 inches over a full 59 inch wingspan with a flying weight of 12 to 14 ounces. For info, call K&A at (310) 804-0006.

Mark McReynolds is mainly a model rocketry buff, but couldn't resist bringing his RC boost glider to the Dash for Cash. Model uses a C engine tube and nose cone for a fuselage, has a 215 square inch hollow balsa wing, weighs only 6.5 ounces with two Kyosho KS10 servos and a 27 MHz band Hitec two-channel receiver. Model was prone to tip stalling if slowed too much and wasn't as maneuverable as most, but was interesting nevertheless.

right up to a stall in your hands. I'm serious. It may not be the prettiest RCHLG you've ever seen, but it really works well.

If you'd like more information about the Commoner or where it can be purchased, contact MM Glider Tech at (310) 923-2414.

One of the group photos shows the experimenters who either designed their own gliders or took a kit and made modifications to it. To me this photo is most revealing, as it shows what kind and what quantity of original thinking is still going on out there. I was a little disappointed that the photo contained only nine planes, or a little over 23 percent of the total. Hand-launch is the easiest of all sailplane categories that one can experiment in, and in the past this has been reflected in the highest percentage of original designs.

One of the most important aspects of multiple max rounds is time management. You can't waste time if there's lift around! Here Dennis Brandt catches his LJMP Vagabond at the end of one 2-minute max so that he can immediately throw into the thermal he found on his flight back to himself.

Perhaps we'll see more originals at the June ISS RCHLG contest. I certainly hope so! If you want to attend that event, it will be held on the first Saturday of June (that's the 4th). Write or call if you need directions. Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330; (909) 245-1702 after 7 p.m. weekdays, pot luck on weekends. ***MB***

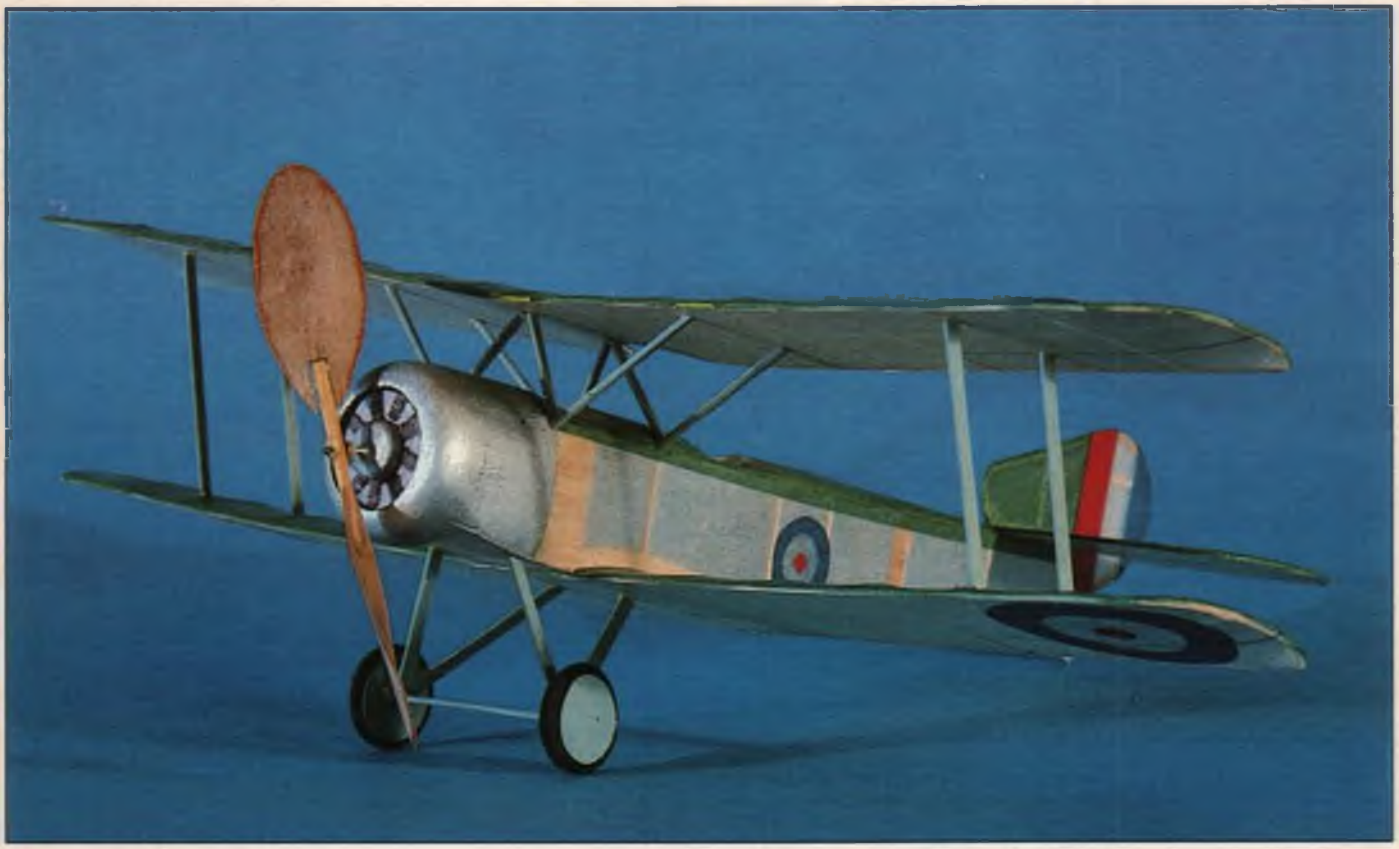
SOPWITH 1-1/2 STRUTTER

Everyone likes biplanes—here's a Peanut version of a WWI favorite.

BY JOHN BERRYMAN

The prototype 1-1/2 Strutter flew in December 1915, and the first production versions entered service in early 1916. Well liked by their crews and reliable by the standards of the day, the Sopwith soldiered on in various capacities (two-seat fighter, observation aircraft, light bomber, etc.) until the end of the war. It was probably one of the first aircraft to feature "dive brakes," indicated by the dashed square panels at the roots of the lower wing. Later versions of the fighter were powered by a 130-hp Clerget rotary engine, and the ship could top 100 mph—fairly sprightly performance for a two-seater.

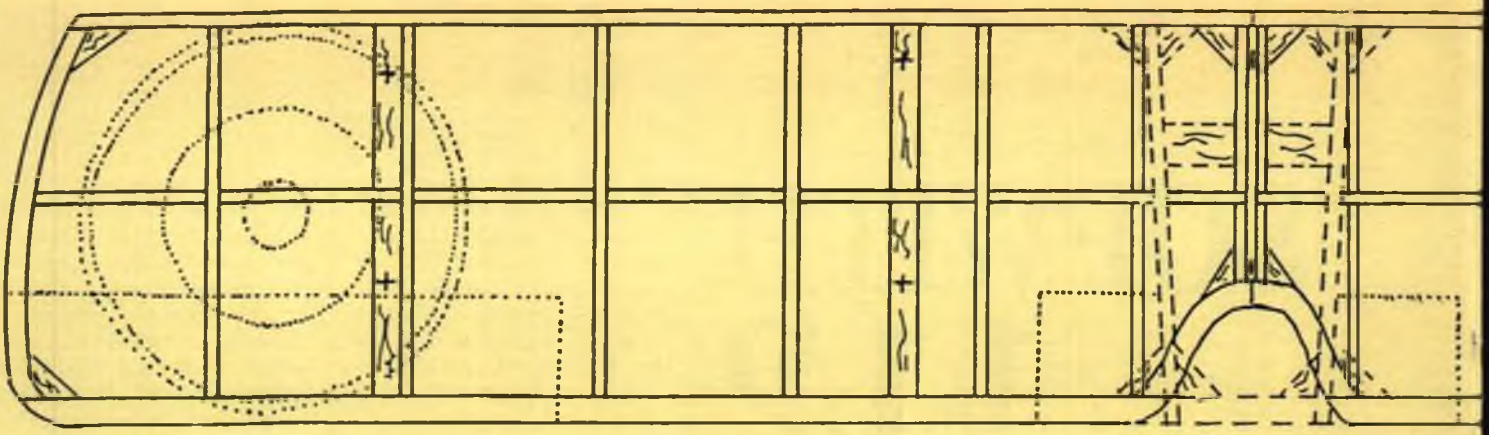
Sopwith's 1-1/2 Strutter (so boxy enough to withstand some judicious enlarging via the office copier without appearing to be excessively non-scale (the surfaces shown on the plans are about 120 percent of scale). Better still, the fuselage is also boxy enough to permit fairly light building techniques to be used—always a consideration when inherently clunky biplane subjects are considered. And finally, a substantial number of 1-1/2 Strutters (including my version) seem to have been built as unarmed aircraft. Avoiding the necessity of building itsy-bitsy Vickers and Lewis guns and associated Scarff rings and the like, reduces complexity and saves weight.

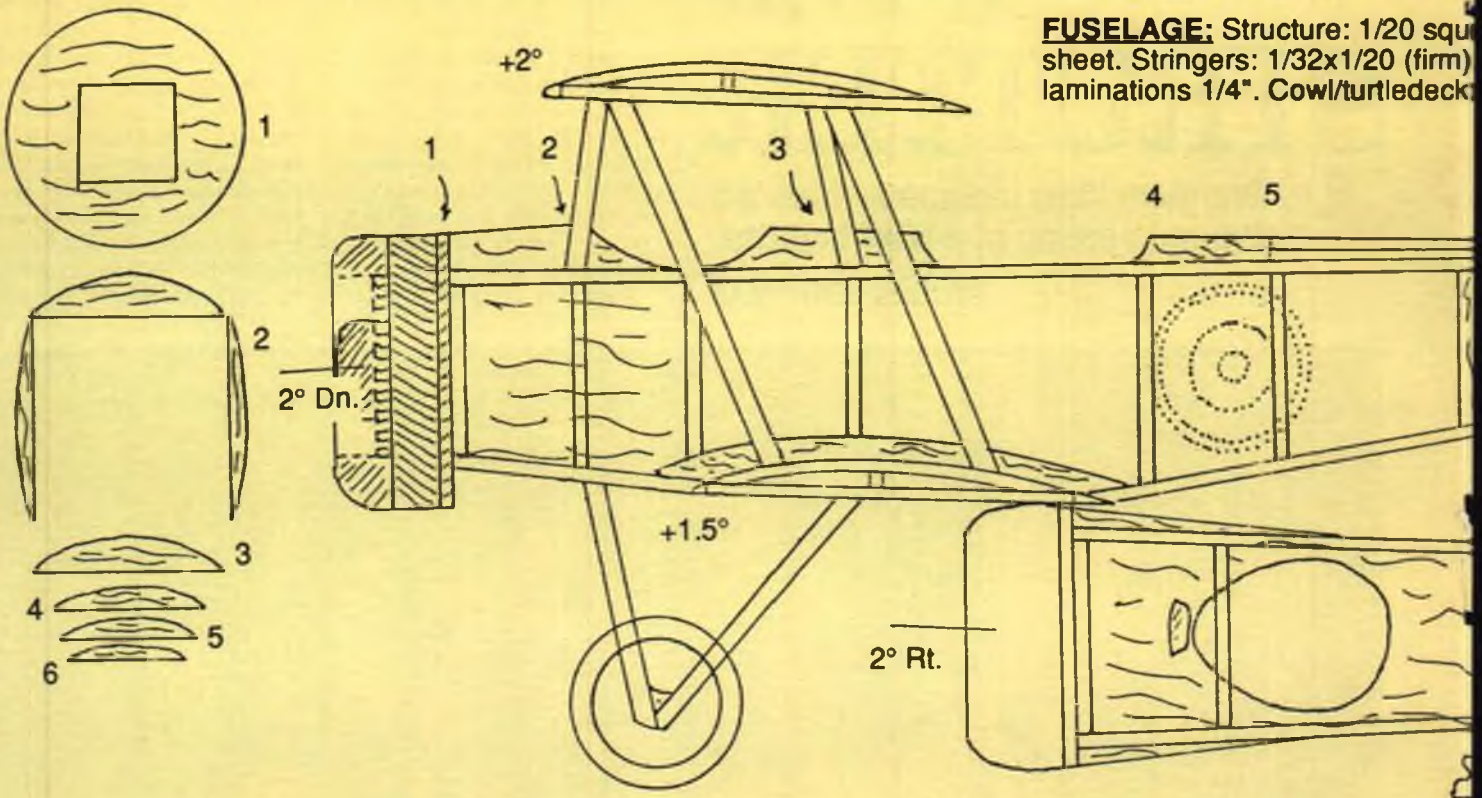


called because of the cabane struts that reach out to midspan on the upper wing) presents several features of interest to the Peanuteer. Unlike most WWI rotary-engined ships, the Sopwith actually has a bit of a nose moment. In addition, the tail surfaces are

CONSTRUCTION

Wing: Not much really new here. Note that the dashed structural lines refer to differences between the upper and lower wing, and that the mounts for the jury struts are required only on the upper wing. Otherwise, the wings are identical. If you





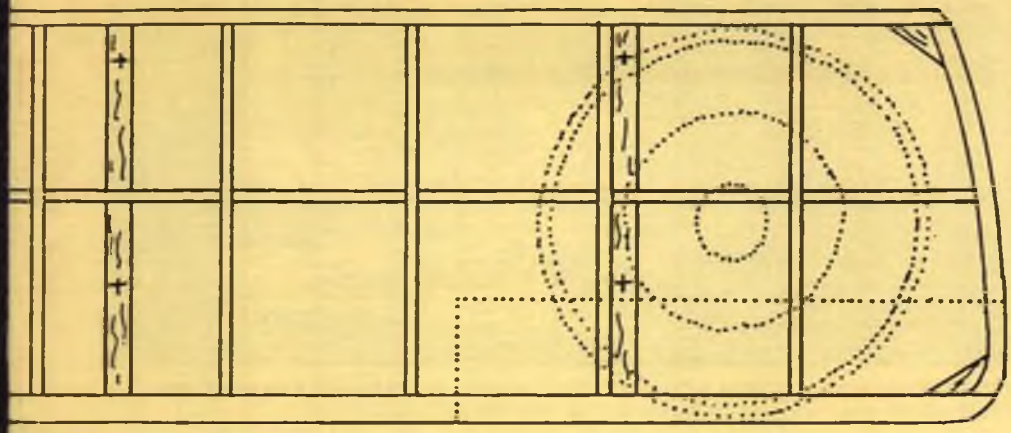
FUSELAGE: Structure: 1/20 squ
sheet. Stringers: 1/32x1/20 (firm)
laminations 1/4". Cowl/turtledeck

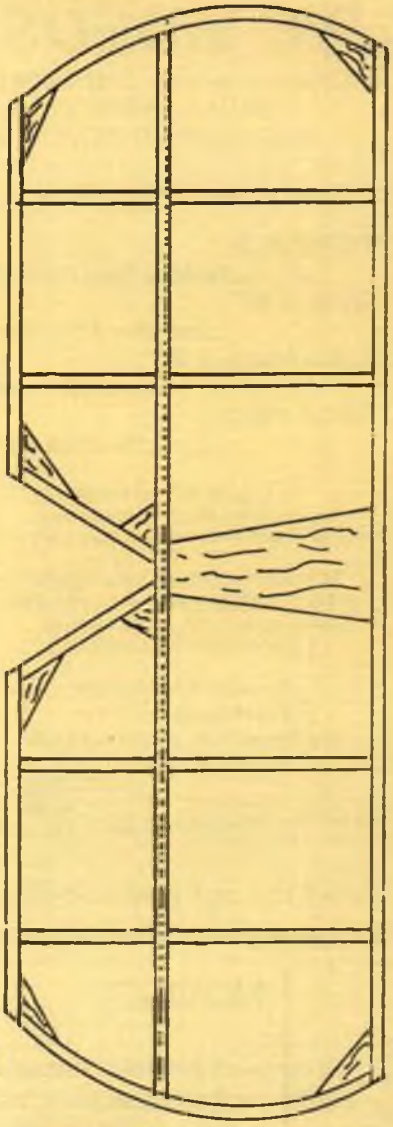
MISCELLANEOUS: Gear legs, 1/16x1/8 firm balsa or light spruce. Wheels: 2 laminations 1/16 (bush with 1/16 dowel). Hubs: Stiff paper cones. Cabane struts: .015 music wire covered with 1/20x1/8 light. Interplane/jury struts: 1/20x1/8.

COLOR SCHEME: Tops of flight surfaces: Olive green ("Khaki"); bottoms white. Fin: White. Rudder: Red, white, blue stripes. Top of fuselage down to upper longeron: Olive green, balance white. Cowl aft to first cabane strut: Silver. Struts/gear legs: Gray. Number (9378): Black.

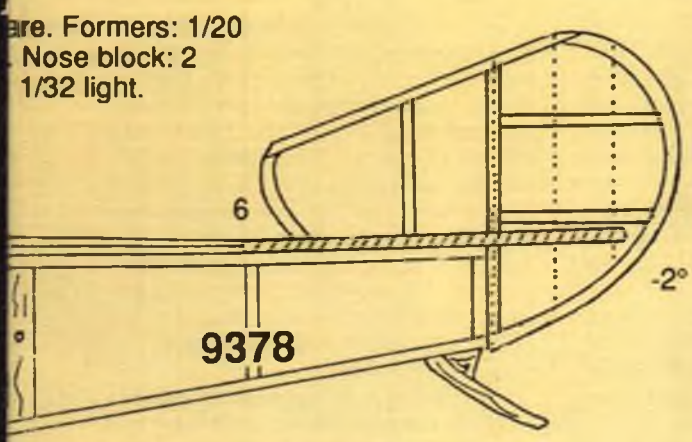
NOTES: Ailerons present on both wings, dive brakes on lower wing roots only. This aircraft was apparently unarmed. Reference: *Aircraft Archive of World War One* (Argus Books/ Motorbooks International), Volume 1, pp. 39-41.

PROP: Spar: 1-1/2" long 1/8" dowel. Blades: 1/64 ply., soaked, taped to a 12-ounce beverage can at 20 degrees from vertical (L.E. of blade to left, hub end down. Glue to spar at 30 degrees pitch angle.

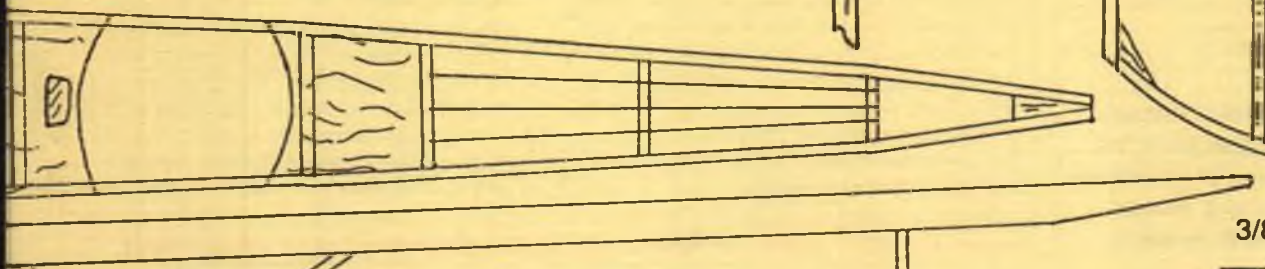




ire. Formers: 1/20
Nose block: 2
1/32 light.

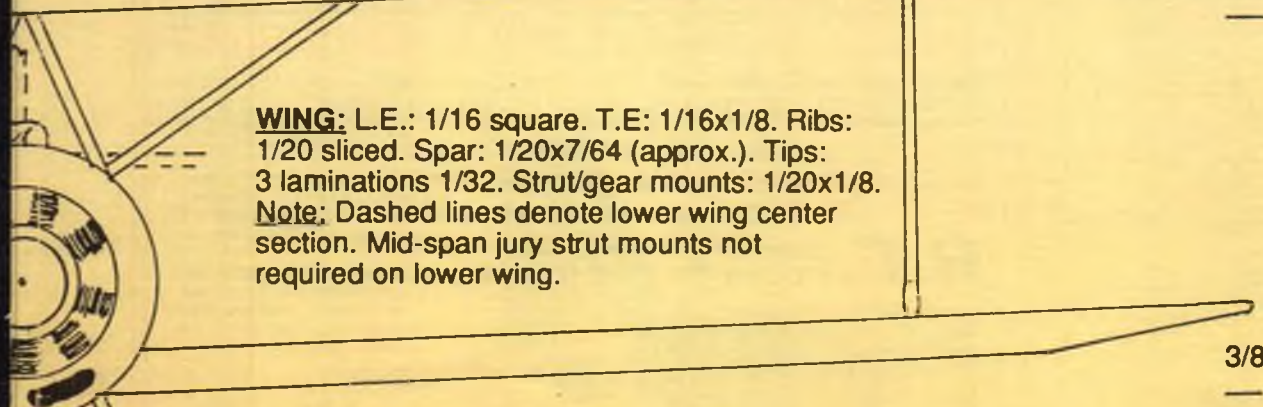


STAB/RUDDER: 1/20 square (light). Curved surfaces, 3 laminations 1/32 light.

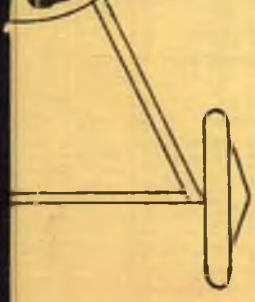


3/8"

WING: L.E.: 1/16 square. T.E: 1/16x1/8. Ribs: 1/20 sliced. Spar: 1/20x7/64 (approx.). Tips: 3 laminations 1/32. Strut/gear mounts: 1/20x1/8. Note: Dashed lines denote lower wing center section. Mid-span jury strut mounts not required on lower wing.

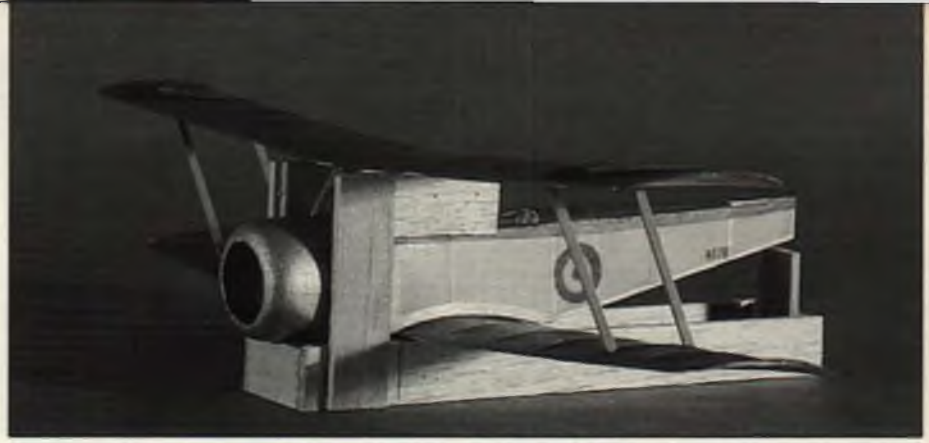


3/8"



The Sopwith 1-1/2 Strutter

Designed and Drawn by John Berryman



Getting everything in proper alignment is one of the toughest things about building biplanes. A few minutes spent making a simple scrap balsa jig like this one can save you a lot of time and frustration.

like an additional bit of insurance, you can certainly increase the dihedral from 3/8 to 1/2 inch per panel. Also, when you begin detailing your Sopwith, bear in mind that ailerons were present on both the upper and lower wings, while the "dive brakes" were present only on the lower wing. As is the case with most of my Peanuts, the curved surfaces (wingtips and upper wing center section cutout) were built from laminated 1/32 sheet balsa.

Tail: Another straightforward cut-and-pin-and-glue job. As always, this is a nice place to use that 5-pound stock you've been saving for a rainy day—weight saved here is a blessing.

Fuselage: Start by building two fuselage sides, one on top of the other, to assure that they are identical. Of course, separating the two sides with a piece of waxed paper makes things much easier. As always, I used my "temporary bulkhead and build in the air" method of construction to assemble the sides into a three-dimensional structure. You may choose to be a bit more conventional and jig the completed fuselage sides in place before you insert the cross-pieces.

The cabane struts may be a bit difficult or at least novel for some builders, and you may wish to refer to the photos to see them au natural. I bent mine to shape from .015 music wire and glued them in place with CA at formers #2 and #3. The turtledeck is then installed around the wire cabane struts. It takes a bit of fiddling, and perhaps some strong language, but it can be done.

I used 1/32 sheet on the top and sides of the cowl. I typically sand the sheet a few times before I cut out the pieces, and tell myself confidently that it is thereby reduced to 1/64 sheet.

The cowling itself was laminated from a couple of pieces of 1/4-inch light stock, and a "firewall" (former #1) is installed at the rear of the cowling to form the supporting structure for the noseblock.

Miscellaneous: The "V" legs of the gear on the prototype model were made from 1/32 spruce; the gear takes a beating, and I like some strength here. The cross-piece is made from two pieces of 1/32 balsa with the .015 music wire axle sandwiched in between. When the glue has dried, a couple of passes with some sandpaper will reduce

Underside view with the wheels removed reveals the spring coils bent into the axle wire to provide shock absorption on landing. Prop blades are 1/64 ply, formed around a 12-ounce beverage can. The ink outlines on the bottom wing next to the fuselage represent air brakes; the 1-1/2 Strutter was one of the first aircraft to use them.

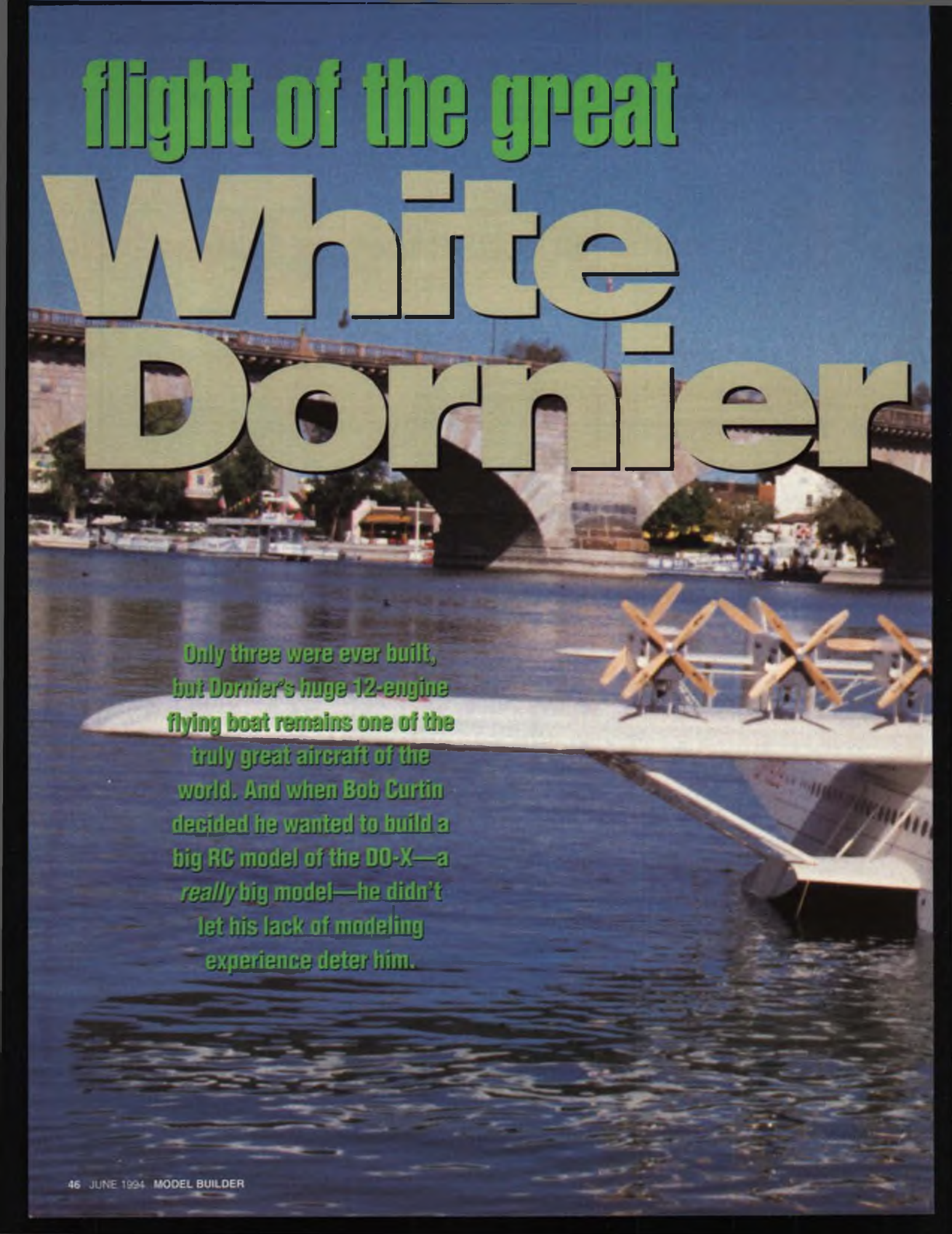
the thickness to match the "V" legs. I take a moment to build in some shock absorption capability in the form of "springs" in the ends of the wire.

The wheels are made from two cross-grain laminations of light 1/16 stock and bushed with 1/16 birch dowels. The inner side of the wheel is flat, and the wheel cover can be represented by a painted paper disc. The outer wheel cover is conical and is represented by a cone formed from stiff paper. Sadly, this is strictly a "cut-and-try" proposition for me, and I'm afraid you may have to make a few attempts before you get the size right. On the plus side, the cone allows you to hide the "keeper" that holds the wheel in place. I use a small square of .010 styrene CA'd in place.

I hope that the instructions called out on the plan for the prop are reasonably self-explanatory. If you're not a prop builder and you're considering using a plastic one, bear in mind that with the wood prop, the Sopwith and a 10-inch loop of .100 FAI tan came *very* close to balancing without weight. If you go with a plastic prop, you may want to move the rear peg location back one bay, but bear in mind that this and the associated plastic prop together will add significant weight to the ship (mine weighed 11 grams, sans rubber).

Final Assembly: Of course, the trick part of building bipes is putting the whole spidery affair together in a fashion that will actually permit it to fly. After years of trying various methods (because I *hate* to build stuff that isn't actually part of the airplane), I have finally accepted the fact that, when it comes to bipe assembly, a jig is the only way to go. The photo shows the sort of jig I build. It's certainly not fancy, but it does do the following very important things: preserve appropriate stagger and incidence angles between the wings, and preserve appropriate decalage between the wing assembly and the horizontal stabilizer. And, after years of making due with stop-gap stuff, I am embarrassed to admit that the time it takes to construct the jig is significantly less than the time it usually takes to attempt to do the job improperly. My advice: build a jig. ***MB***

flight of the great White Dornier



Only three were ever built, but Dornier's huge 12-engine flying boat remains one of the truly great aircraft of the world. And when Bob Curtin decided he wanted to build a big RC model of the DO-X—a *really* big model—he didn't let his lack of modeling experience deter him.

■ ABOVE: Pretty shot of the majestic DO-X on a fly-by with the setting sun reflecting off the starboard side. ■ RIGHT: "Mr. Engine Man," Ralph Cunningham, caught in the process of cranking up the six Zenoah G-23 engines. Ralph operates a business called RC Ignition in Phoenix: he replaced the G-23s' magnetos with electronic ignition systems, which make for easier starting and increased reliability—important on a model like this.

BY BOB MARTIN

The scene was last November's London Bridge Seaplane Classic, where Bob Curtin's huge DO-X made its public debut and maiden flight. General specs on the model are as follows: wingspan, 15-feet 3 inches; wing area, just over 44 square feet; flying weight, 97 pounds; and overall length, 10-feet 1 inch. The model is presently on display in Frank's Hobby Shop in Phoenix, Arizona, and will ultimately find a home in a museum—most likely either the AMA Museum or the Glenn Curtiss Museum in Hammondsport, New York.

As could be expected, getting the DO-X ready to fly is a real team effort. That's Bob Curtin second from left.

Before I tell you about this incredible model aircraft, let me introduce the man behind it—Bob Curtin. Bob was a developer in the construction business in the Chicago area who retired in the warmer Scottsdale, Arizona area. Forty years ago he built rubber-powered models but only recently returned to the hobby and got involved in RC.

I first met Bob and his lovely wife, Carol, during a Schneider Cup event in Lake Havasu. Bob had called me a few months before the event and asked if he could fly his full-size Tiger Moth up to Havasu. I thought it would be a great idea. His arrival was one that later I came to accept as his style, a class act.

Bob arrived and made several slow flybys that thrilled all of us. After he landed, he came over to the event and offered to allow us to raffle off a ride. (I was very disappointed that I didn't win!) The following year he returned and repeated his kind offer. A fellow by the name of Ken Lagge won that flight and proclaimed it the highlight of his life. The point here is that Bob has shared his wonderful aircraft with many, including terminally ill children. He is a gentle, kind and caring man, but he does enjoy challenges of an unusual nature—hence this story.

In November 1991, Bob told me of a project he wanted to tackle: a huge 1/10-scale model of the German Dornier DO-X, the largest flying boat to ever go into passenger service, carrying over 150 passengers and a crew of 10 in luxurious comfort.

Professor Claude Dornier began his design studies in 1916 and by 1922 had formed his own aircraft company. Because of the ban by the Allies after WWI, Dornier built most of his flying boats in Italy, beginning with the Delphin, an eight-passenger seaplane. Next was the DO-J Wal, which had two engines in tandem and sported thick, stubby, wing-like sponsons that replaced the need for tip floats. There were many versions produced, each larger that the previous ones, and as they needed more power, Dornier simply added more engines, culminating in the four-engine DO-R Super Wal.

With the desire to produce an aircraft that could span the oceans and carry a substantial load, Dornier doubled the size of his DO-R. The result was the DO-X, which at the time was by far the largest aircraft in the world, powered by a dozen 500-horsepower Siemens Jupiter engines. Later these were replaced by 650-horsepower Curtiss Conquerors.

Three of these giants were built. Two were sold to Italy, but never achieved much success. The third carried passengers around the Atlantic rim, from Europe to South America, to North America and back to Europe. However, the tour was plagued with problems, and the aircraft was later sold to Deutsche Lufthansa. It ended up in the Berlin Museum where it was destroyed in the bombing of Berlin in WWII.

Building a model of this giant is no small

A clever design feature of the model Dornier is the engine module—a strong, removable section of the wing that supports all six engines along with their fuel systems, mufflers, servos and throttle radio. It's a completely self-contained unit that simply bolts to the wing, no other hookups required.

The Dornier uses a separate radio system to control the six engines; each engine can be controlled independently by the flight engineer by means of this special transmitter devised by John Wisniewski. John was the pilot for the flight, Bill Reed was the flight engineer.

project for a longtime modeler, let alone a person with little model building experience. The Dornier is only Bob's third RC aircraft, but he didn't let that discourage him, and set out to gather every possible bit of documentation available. Mike Kelley, Bob's neighbor, has offices in Germany, and assisted in locating some of the information.

The drawings he received needed to be enlarged. Not just blown up with wide lines, but done properly, so he enlisted the

The Dornier is only Bob's third RC aircraft, but he didn't let that discourage him, and set out to gather every possible bit of documentation available.

services of Dave Bueschl of Concept Technology of Poway, California, to enlarge the three-views. Bob also enlisted the services of Professor Bill Reed at the University of Arizona to help engineer the huge wing spar and perform computer simulations to determine power, drag and lift coefficients, propeller selection and efficiency, etc. Professor Reed is an RC modeler and later served as flight engineer.

Gary Thompson of Gary's Hobby Center in Racine, Wisconsin generously supplied six G-23 Zenoah engines and props. Bob then contacted Ralph Cunningham of RC Ignition in Phoenix to assist with converting the engines from magneto to electronic ignition—a vast improvement in performance. Ralph also built the special exhaust systems.

One question that came up had to do with controlling the six engines. With no water rudder, if one or two engines on one side were to quit while on the water, the aircraft would taxi in circles. In the air, it could be disastrous.

John Wisniewski, an electrical engineer and pilot for the project, solved the problem. He designed and built a special transmitter with six individual throttles, so that each engine could be controlled independently, making for extremely precise maneuvering on the water. On-board telemetry was used to alert the flight engineer in the event an engine quit in flight, allowing him to back off the matching engine on the other side. As it turned out, the engines all ran perfectly and this built-in safety feature never came into play.

Redundant receivers were used for both the flying as well as the throttle systems. The flight system was a JR PCM-10S; the receivers for the throttles were also JR.

A project of the size requires a great deal of glue and wood. Tom Walker of Robart donated tons of ZAP CAs and epoxies, and Frank Garcher of Midwest Products supplied a tree or two worth of balsa. Matt Parsons of Bob's Woodworking in Phoenix supplied a huge piece of spruce for the spar.

George Zien of Custom Screen Print in Phoenix did all of the markings and windows, as well as the team T-shirts. Aerospace Composite Products made the material for the firewalls (carbon fiber/balsa laminate) and engine boxes (fiberglass/balsa laminate). Most of the other products needed were purchased from Bernie Frank of Frank's

Close-up of the wing cavity where the engine module fits. Note the simulated sheet metal corrugations along the leading edge.

Hobby in Phoenix. Bob's longtime friend Walt Kessler, in Marengo, Illinois, made the team hats.

The model was built in components—fuselage, wing, engine module, and tail assembly. Although Bob Curtin built most of the aircraft, he's quick to point out that without the many hours of hands-on assistance of friends, the project would have never been completed. Bob's wife not only supported and encouraged him, but actually was involved in the construction, including the corrugations on the leading edge of the wing—some 586 of them. Tom Hill assisted in the fiberglass and painting. Terry Jenkins helped cover the huge wing (lots of yardage here, folks). Marshall Sims helped with many areas. Pilot John Wisniewski built the tail assembly and the throttle transmitter.

continued on page 77

Photo taken midway through the construction shows the partly built engine module being assembled in place on the wing. Despite the sturdy construction, the finished aircraft has a wing loading of only 32 ounces per square foot—quite low for a model of this size.

The tedious job of adding the corrugations to the wing leading edge was aptly handled by Carol Curtin, Bob's wife. Each of the 586 corrugations was done by gluing a piece of string to the leading edge—whew!

BY RICK LAWRENCE

MM Glider Tech's 'Sorceress' Slope Glider

Capitalizing on the success of their Merlin RC hand-launch glider, the folks at MM have come out with an aileron version that's right at home on even the smallest hills.

When *MB* asked me to review the Sorceress, the newest offering of MM Glider Tech, I accepted immediately. My Merlin (MM's first kit, which I reviewed in the September '93 *MB*) is still going strong, and I was eager to try this new higher-performance slope version. The most significant difference between them is that the Merlin is a rudder/elevator ship with a polyhedral wing, while the Sorceress has an almost-flat wing with ailerons. Like the Merlin, the Sorceress has a two-piece, vacuum-formed ABS polystyrene fuselage pod (main pod and a hatch). A fiberglass arrowshaft connects the tail group to the pod.

The Sorceress kit is complete with machine-cut ribs, shear webs and tail group, spars, leading and trailing edges, aileron stock, and sheeting for the center section. No pushrods, clevises, control horns or hinge material is included in the kit. The cutting and wood quality in my kit was very good.

The Sorceress plans are full size, and the two pages of instructions are enough for an average builder to complete the kit easily. Like the Merlin, the instructions contain no drawings or pictures and do not include basic building techniques. I would therefore not recommend this kit to a new builder unless they have someone help with the building and flying.

CONSTRUCTION

The tail group parts are pre-cut and require only a light sanding on the leading and trailing edges, and shaping the elevator hinge line. I did cut lightening holes in the tail, shown as an option on the plans. Pieces of 1/4-inch triangle stock brace the vertical stab to the horizontal stab and also connect the completed tail assembly to the fiberglass boom.

The Selig 3016 airfoil wing is simple rib-and-spar construction built in four panels, with the ailerons located in the outer panels. Spars are 1/8x1/4 balsa with shear webs

The author and the latest addition to his sailplane fleet. These little ships offer a lot of performance for the money, go together quickly and can be safely flown at sites where you might not feel comfortable flying a bigger, heavier glider.

in between. All ribs are 1/16 balsa except for the 1/8-inch center rib and the ribs at the joints of the tip and main panels. The two halves are joined with both tips 1/2 inch above the board; 1/16 plywood caps are glued to the front and back of the spars, while the center section is sheeted with 1/16 balsa. A strip of fiberglass cloth is supplied for strengthening the wing joint.

Pushrod sleeves need to be installed in the wing prior to covering. No pushrods are supplied, so I purchased the recommended #507 Sullivan 1/32-inch flexible steel cable pushrods. The pre-shaped aileron stock was drilled for lightening and beveled for the hinge line. The installation of ailerons on such a small wing makes for more work, however the effort is worth it.

The two plastic fuselage pod parts are supplied already cleaned up and free of any mold lines or flash. A hole for the boom needs to be drilled in the aft section of the pod; I used a small hand-held rotary grinder. In order to achieve the proper incidence angle, the boom is glued in place level with the building board. Once dry, the two bulkheads are glued in place. ABS plastic sheet stock is supplied for making the bulkheads. The shapes are shown on the plans; I cut them a little oversize and sanded them to fit. The rear bulkhead holds the front of the boom in place, while the forward bulkhead is for the wing rubber band hook. The canopy is also held in place by a rubber band.

The last step in the pod construction is to add small scrap pieces of the bulkhead plastic sheet to the inside of the hatch to serve as guides. I also added a piece to the front of the hatch to help keep it from moving forward.

COVERING

This is a small plane. If you use just one color, one roll of covering will be sufficient. I used Goldberg Ultracoat and found it to be very easy to work with. MM Glider Tech suggests the use of hinge tape for the control surfaces; I used MonoKote Trim. Sometimes I have problems with thin elevator stock warping, so I opted to use Sig's Easy Hinges to help keep them in good alignment.

RADIO INSTALLATION

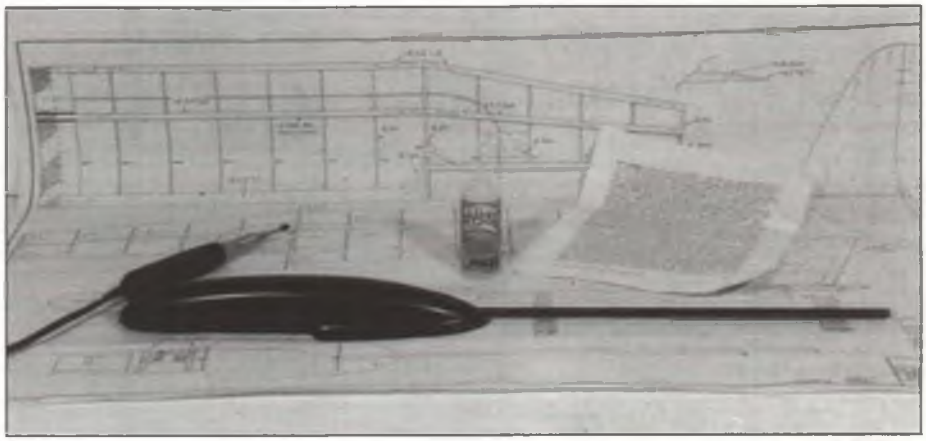
The instructions are fairly clear in this area. I'm using a Futaba Attack 4 radio

MM GLIDER TECH'S SORCERESS

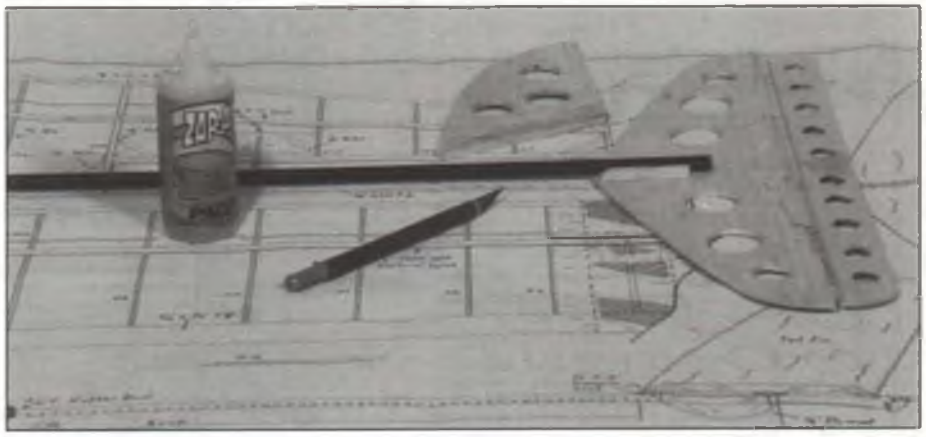
WINGSPAN	50 in.
WING AREA	280 sq. in.
WEIGHT	12.8 oz. as tested.
WING LOADING	6.6 oz./sq. ft.
ASPECT RATIO	8.93
RADIO	Two channels required (ailerons and elevator).
SUGGESTED RETAIL	$36.95 plus $5 S&H.

Produced by MM Glider Tech, P.O. Box 39098, Downey, CA 90239; (310) 923-2414.

The Sorceress kit comes in a very small box that's full of well-cut balsa and plywood parts, ABS polystyrene pod and fiberglass arrowshaft boom, excellent plans and instructions. Hardware is not included, but can be purchased for little extra expense.

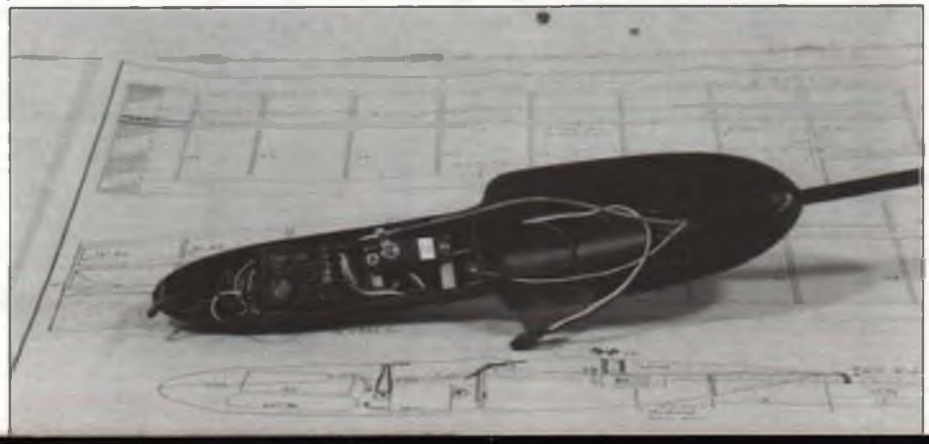


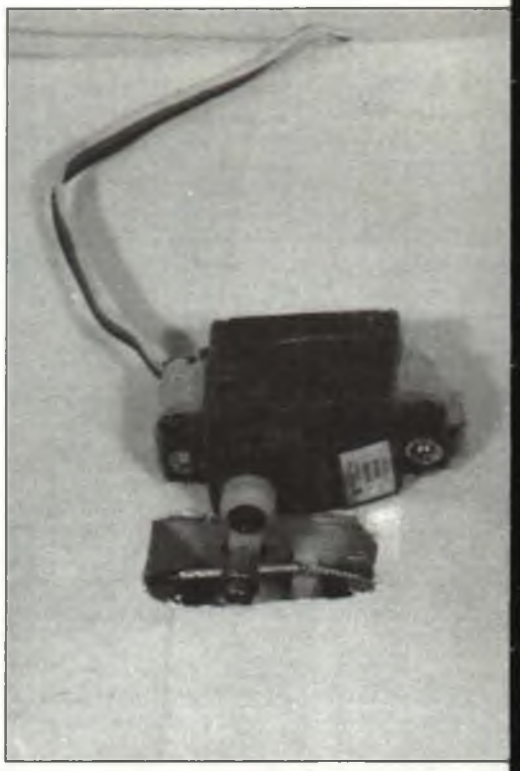
The proper pod/boom angle is easily set by placing the pod on the plans upside down and gluing the boom level with the building board. A small hand-held grinder works best for making the hole in the pod.



The tail components ready for covering; triangle stock is used to brace the fin to the stab and the stab to the boom. Lightening holes are an option shown on the plan and are helpful in keeping the tail end light.

The elevator servo is installed just forward of the front bulkhead; the battery is under the receiver. It's tight, but there is ample room for all of the radio components. Receiver antenna is routed through the boom. The Sorceress fuselage pod is similar to the one used on MM's Merlin, but is molded of black ABS and is actually a bit larger.





The aileron servo is completely external and is installed on the bottom of the wing, just in front of the spar. Rick used two Tower Hobbies TS-11 micro servos in his model.

with FP-R114H receiver, 250-mAH battery, and two Tower Hobbies TS-11 micro servos. Two 1/2A control horns need to be purchased and mounted on the upper surface of the ailerons. MM recommends bending the cables 90 degrees and inserting them into the second hole on the horns, but I used the adjustable clevises that come with the Sullivan cables. I did have to downsize the length of the brass female part to allow enough travel in the cable.

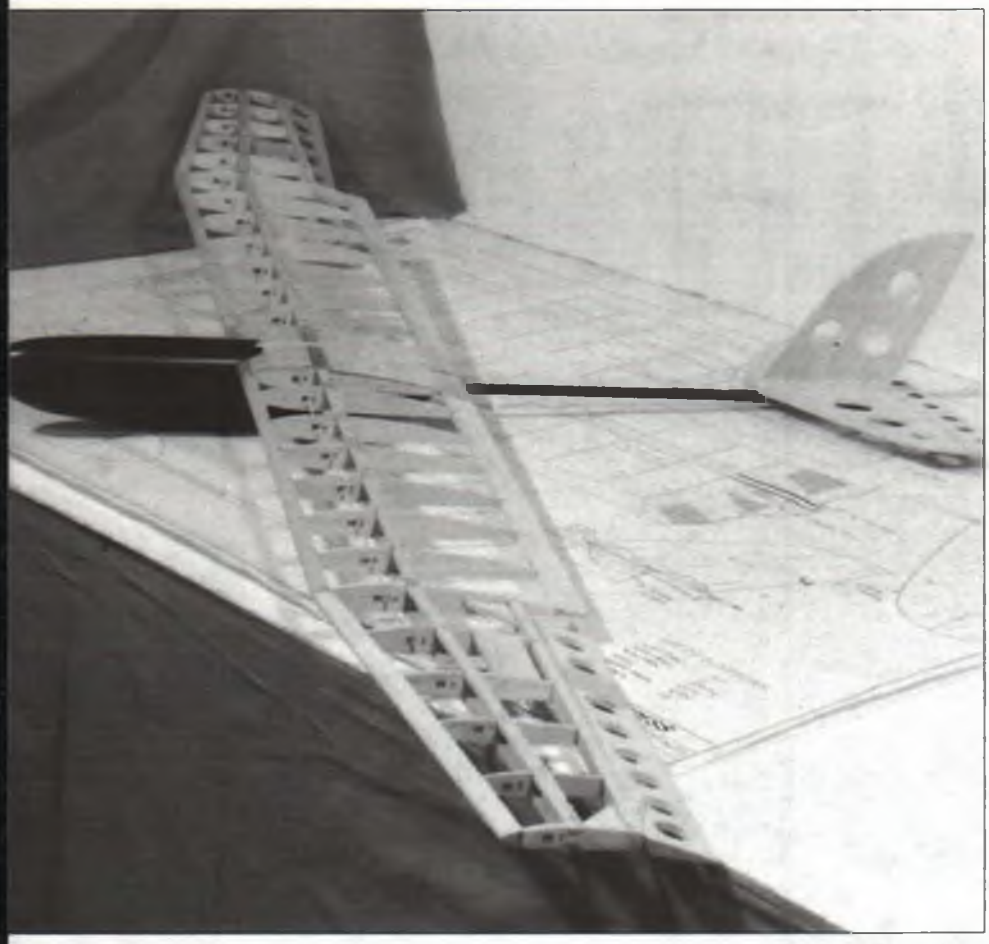
The elevator pushrod (not supplied) should be another #507 Sullivan pushrod cable. The elevator servo is installed just in front of the forward bulkhead on hardwood servo rails.

The weight of the finished Sorceress, with radio, was an incredibly light 12.8 ounces. To balance the plane on the spar, 1/2 ounce of nose weight was needed.

FLYING

The Sorceress was not designed to be a hand launch glider, but my first outing with the plane was exactly that. I found it to be smooth and responsive in flight. Flight times from a hand launch were surprisingly good. The weather conditions were not conducive to great thermaling, but I did get several flights of over 45 seconds. I did manage to find one thermal and keep the Sorceress up for almost 2 minutes.

My second outing was to a local slope on a 50-degree day with winds of less than 10 mph. The Sorceress stayed up quite well despite the light lift. Control response was



The completed airframe prior to covering. Lightening holes in the ailerons are a good idea, as reducing the mass at the wingtip makes for a more agile, quicker turning glider.

excellent, loops were nice and round. I didn't get to try any rolls as I couldn't get sufficient height.

To remedy that, I used a small high-start. This got the plane about 150 feet above the slope and gave me time to be more relaxed about aerobatics. Due to the barn-door ailerons, rolls with ailerons alone were not as axial as planes with full strip ailerons, but with the aid of elevator the rolls softened significantly. I've read that the Selig 3016 airfoil is good for inverted flight, and found that with the conditions I had that day, the plane flew well inverted. The Sorceress' straight line flight and turns are very smooth.

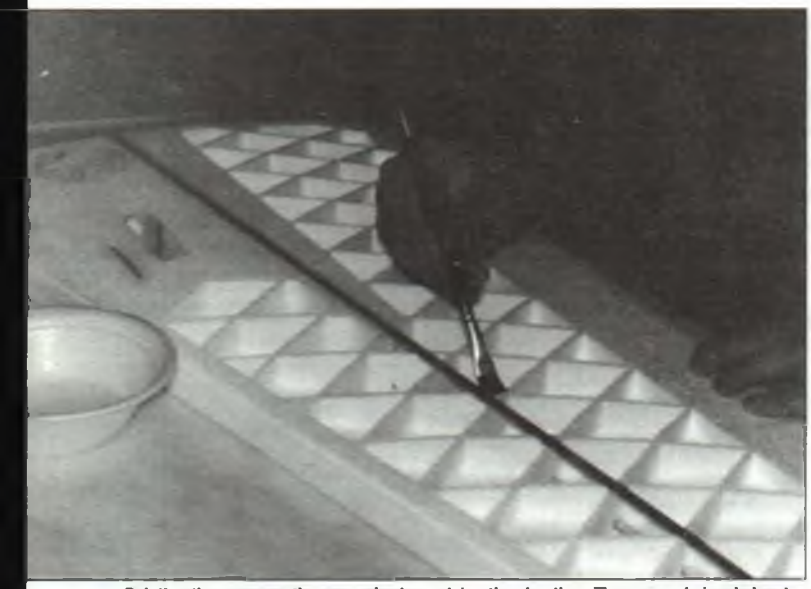
This plane does like to keep moving and will tip stall if you try to slow it down to a mere float. I attribute this to the little amount of dihedral in the wing. I really like the Sorceress for winds around 15 mph.

In conclusion, this is a sharp-looking, compact sailplane that can easily fit, assembled, in any car. The kit builds easily for the average builder. Smooth handling and aerobatic capabilities make the Sorceress a good choice for your quiver. ***MB***

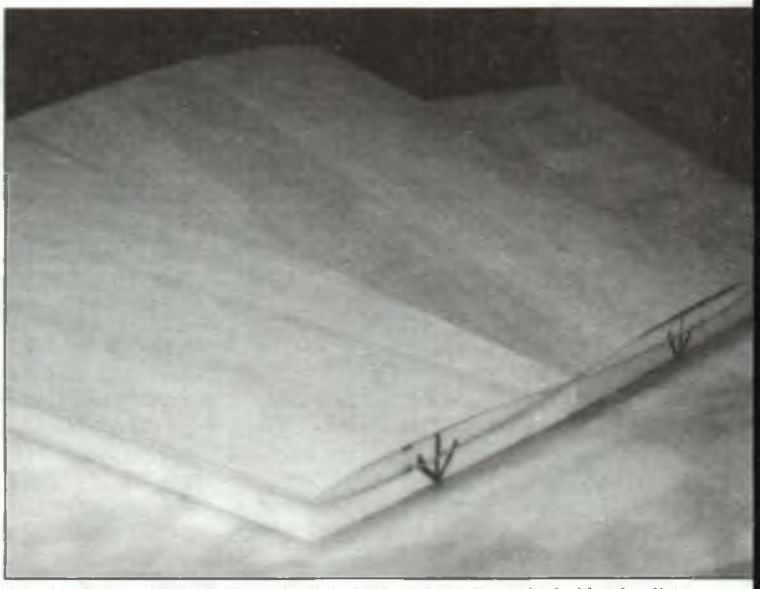
BUILDING FOAM WINGS, PART 2

Now the fun begins! With the cores and skins prepared, it's time to glue it all together and add the leading and trailing edges and tips. Next month: completing the wings.

At the close of last month's episode of The Great Foam Wing Adventure, I left you breathlessly dangling from the crumbling ledge with your wing cores prepped and your wing skins sanded and cut to shape. Fear not, for Step #4 (The Laminating Procedure) has arrived. You may now climb down from that silly rock; we have work to do.



Painting the epoxy on the core prior to applying the sheeting. The epoxy obviously has to have a long working time—Rick recommends E-Z Lam from Aerospace Composite Products.



Here the overhang has been trimmed and the laminated panels are checked for size. Note that the sheeting has been applied with the grain parallel to the leading edges.

The First Commandment, the Prime Directive, and the Mother of All Foam Wing Instructions is this: *work on a flat surface.* The finished product will be only as straight and true as the surface that gives it birth. You will need a flat surface that is really, really flat (give or take a few thousandths of an inch), and strong enough to stay that way with several hundred pounds stacked on it. I use a piece of marble on top of an old drafting table, which works very well. I have seen slate used, and granite, and tempered glass, and steel machinist's blocks (all placed on flat, well-supported table tops to start with). These are all fairly expensive solutions, although the stone is cheaper than you might think. Check with your local stonecutter. Often, you can buy finished piece ends for scrap prices if you aren't fussy about exact sizes and shapes. The expense amortizes; you will use the slabs for years and many, many wings. Good results can also be had (for far less money) with thick, well-supported particle board. You will need an extra piece to place on top of the core to distribute the weight you are going to stack on it, and this piece must be flat and true as well.

The next order of business is obvious. The skins and cores get glued up and bedded down. Exactly how to accomplish this important feat is not so obvious. There are choices of materials, methods, and application techniques which must be made.

Early in the history of foam wings, contact adhesives were very popular. Some products for this purpose are still around. Their advantage is speed of assembly, because the adhesion is instant. There are several disadvantages, and a serious one (you guessed it!) is that the adhesion is instant. A different assembly method is called for: the skin is usually placed flat on the table and the core is applied to it with a rolling motion, trailing edge first. There is no room for adjustment, no room for any mistakes at all. It's also easy for a beginner to misuse these products and wind up with a melted core or a wing skin that lifts a few months later. The brushed-on products are heavy, and the sprays are messy. If you decide on a painted finish, it's possible for the solvents in the paint to diffuse through the wood and loosen the bond. As far as I'm concerned, the multiple cons outweigh the single pro.

I've seen wing sheeting tape used to good effect on blue foam (2 lb./cu. ft.) glider wings, but I don't know of anyone who has used it successfully on white foam (1 lb./cu. ft.) pattern wings. Personally, I'm willing to leave this particular experiment undone.

The current consensus in Patternland is that the adhesive of choice for skinning wings is epoxy resin. Epoxy is familiar, easy to work with, and very strong. It can also be very heavy if applied to excess. The problem is how to cover a large area with resin in a short time without becoming sloppy. All resins have a pot life, and the application and core/skin assembly must be completed while the glue is workable. There are

a number of application techniques to choose from. Whichever application technique is used, the first step is to lightly sand the fuzz from the cores (don't change the shape, and don't try to eliminate all the wire marks!), and then vacuum the skins and cores thoroughly to remove all the sanding dust.

Choosing the right resin is very important. A slow-cure epoxy is needed for adequate working time. Select a low-viscosity (thin and runny) epoxy for good coverage and penetration, and easy application without thick build-up. I use a product called E-Z Lam, available from Aerospace Composite Products, 14210 Doolittle Dr., San Leandro, CA 94577; (510) 352-2022. This resin has a nice consistency, is suitable for brushing, and comes in 30 and 60 minute pot life times, both with about a 24 hour cure. For first-timers, I recommend the 60 minute stuff. You will have sufficient pressure without playing Beat the Clock.

For an average wing half, 3/4 to 1 ounce (20-30 grams) of mixed resin is all you need. A good tip for controlling weight is to mix just this amount and no more, and make it stretch. This doesn't seem like much, but it's really a fairly conservative figure. Henry Piorun of Piorun Models makes absolutely the lightest pre-built wings in the industry, and he uses only 14 grams of epoxy per wing half! Be careful not to use more than half of the batch for the first side, and if it's your first wing, I'd mix the larger amount.

A few builders apply epoxy to both the wing skin and the core. This is a very heavy method, more suited to bridge and dam building than aircraft construction. Many builders just put the resin on the inner surface of the skin with a flat squeegee; if you have a solid core wing, this is a good (if a bit messy) method. Spread the epoxy thinly; the surface of the skin should appear just slightly damp. Work on spread newspapers and be careful not to get any resin on the top (outer) surface of the skin. A little epoxy on the outside can make the core bed difficult to remove later.

An alternative to this method is to apply the epoxy directly to the core surface with a stiff bristled brush. This usually works better for me than the squeegee trick. Again, spread the epoxy thinly so that the surface appears just dampened. Another application method is to use a syringe to lay down a thin ribbon of epoxy. Large solid areas are usually done in a criss-cross pattern with this method, and no attempt is made to get complete coverage of the entire surface.

Brushing or using a syringe to put the epoxy directly on the core is the method of choice for honeycomb wings, as it doesn't make much sense to apply glue to the 60/75 percent of the skin that won't be contacting foam. I use a good quality (not a disposable) 1/4- to 3/8-inch wide short bristle brush to apply the glue directly to the core surfaces that will contact the wood. A light coat is all that's necessary, and the good brush does a much better job of spreading the epoxy thinly and evenly. Work quickly but don't rush. Finish one side, place the appropriate skin (inner side up) in the core bed, and set the core in place, wet side down. Apply resin to the top of the core, cover it with the other skin, and follow that with the remaining core bed half.

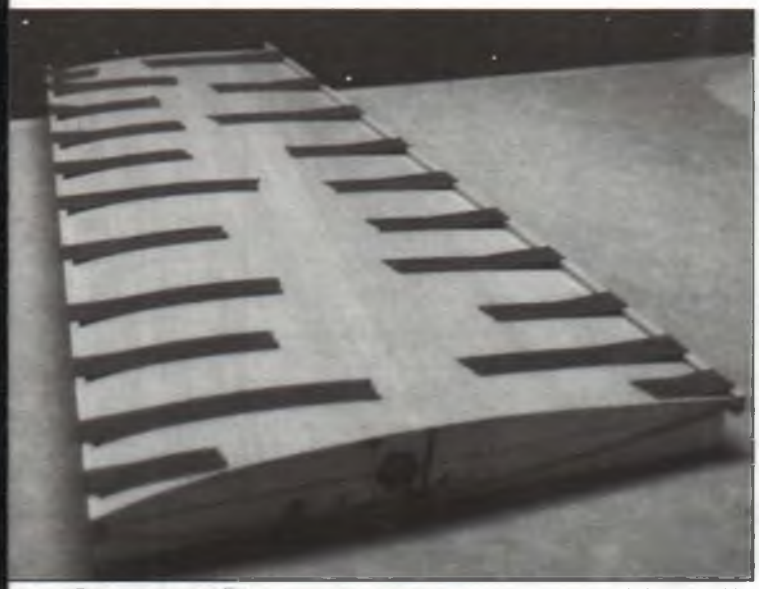
Set the entire assembly on that flat surface you've painstakingly prepared, and line everything up, root and tip, until it's as dead solid perfect as you can get it. Put your laminating board (or stone slab, or glass slab) on top. Drive yourself cross-eyed crazy by squinting at the alignment one more time, and when satisfied, pile all the heavy stuff within reach on top of the laminating board. Don't worry about crushing the foam. Nothing you can lift up there is heavy enough to do that. I use about 150 pounds of cinder blocks, lead weights, jugs full of water, and old college textbooks (and I thought those classes were irrelevant at the time. Ah, the arrogance of youth. . .). Clean your brush (or syringe) well with 91-99 percent Isopropyl Alcohol. Make sure it's at least 91 percent. The 70 percent stuff won't get all the epoxy out, and you'll need another brush on the morrow.

If you have another flat spot and another set of laminating boards, you can repeat the process with the other wing panel. If not, you can build something else, or pour your favorite libation and amuse yourself with back issues of *Model Builder* (or the idiot box) for about 24 hours. Proceed with caution. Brain damage is very possible when using these materials, especially if you read "Dear Jake" while watching MTV.

Once the epoxy has cured, you can unwrap your presents. If this is your first experience, you will be amazed at the light, stiff, and very straight panels. If it isn't your first experience, the panels will still be straight, light and stiff. Either way, Step #5 returns us to the familiar world of balsa.

Make a start by trimming all the overhang from the panel. If you've done a good job of sizing your skins, there won't be much to trim. I do this with a long sanding block while the panel rests in the shuck (core bed). This method keeps the edges square and ensures that I don't take off too much. When you're done, compare the panels tip to tip and root to root to make sure they are both still the same size. Work carefully. Doing things right the first time takes less time than repairing mistakes. You've done a perfect job if the wood is exactly square to the edges of the core and none of the foam has been removed. Don't waste time opening up the wheel wells and gear blocks; all that comes later in the program.

continued on page 59



The leading and trailing edges are glued on with a sandable glue and held in place with tape until dry.

After removing the excess material with a Rabbet plane, the leading and trailing edges are finished with a long sanding block.

We're not talking electric power system fast chargers here, but for practically all other NiCd battery charging needs, look to Ace R/C to supply you with a unit that's just right for the job.

THE ACE R/C FAMILY OF CHARGERS

All electronic equipment has one thing in common: it has to be provided a source of dependable electrical power. As the radio control hobby and its electronics became more and more complex and sophisticated, this power source—nickel-cadmium rechargeable batteries in most cases—has become more important.

Not only the quality of these batteries has become an important consideration, but so has their proper charging. To obtain maximum success and enjoyment, and maximum longevity for his expensive airplanes, the RC modeler needs to learn a bit beyond the "kick the tires and light the fires" approach of the fictional bold full-scale pilot; he has to learn the importance of preflight preparations. And that includes how to care for, and how to properly charge, nickel-cadmium batteries.

The proper choice of a battery charger then becomes an important consideration. Admittedly, the little wall-mounted transformer charger furnished with the average RC system does a creditable job of reviving those tired NiCds.

Whatever kind of NiCd battery you have, Ace R/C has just the charger you need for it somewhere in this pyramid. Clockwise from bottom left: HD (Heavy Duty) 500, DMVC (Dual Metered Variable Charger), AT (Auto Trickle) 2000, Overnighter, FFC (Fast Field Charger), CVC (Constant Voltage Charger), and Chargemaster. Not shown are a variety of simple garden-variety wall plug-in chargers and the Metered Vari-Charger.

However, they can and do malfunction from time to time and their proper operation needs to be confirmed now and then with one of the capacity measuring devices available for this task—more about that later. However, the need for a different charger definitely arises when a change in the original 500-mAH capacity batteries is made, or another size is added.

Say our RCer gets a larger airplane, with the need for larger airborne cells. Or he gets more than one airplane. Then there is the need to charge those batteries for the electric starter, the fuel pump, the glow plug supply, etc. Now we need to look for a more versatile charging source.

Ace R/C is a good place to start your search for a NiCd charger. The selection is varied enough to fill most needs, with the exception of those "the faster you boil 'em, the better" chargers favored by the electric power devotees. Even though some of Ace's chargers can be DC powered, they are all of the lower rate types.

The AT2000 is a versatile multi-system AC charger with dual outputs for one to ten cells. One output provides 50 mA, the other is switchable to 25, 50 or 120 mA. After a 16-hour charge period, the rate automatically reduces to a 10 mA trickle.

Ace R/C charger designs fall into distinct categories:

1) AC-powered only (the AT2000, Chargemaster, CVC, Metered Vari-Charger, the 9.6V Wall Charger, the 120 Wall Charger, two System Chargers, and the Uni-Charger).

2) DC-powered (the FFC and the Overnighter).

3) AC/DC-powered (the DMVC and the HD500).

Don't let those numbers and acronyms throw you; they will be further explained as we go.

Some of these chargers include continuously variable rates; others are programmable by the selection of resistors. Some include trickle rates, either by manual or automatic switching. A few are available as kits, others for 220-volt operation. A few are not shown in the photos, so let's try some word-pictures:

Chargemaster is a multiple-output AC charger with four receiver outputs selectable at 25, 50, 90 or 120 mA, and two transmitter outputs selectable at 50 or 90 mA. Current selection is made by installing resistor values as specified by a chart furnished. Manual changeover to a pre-selected trickle rate is done with individual channel switches.

•9.6V Wall Charger. AC, single output for an eight-cell transmitter pack at 50 mA.

•120 Wall Charger. AC, single output at 120 mA for 1200-mAH four-cell packs. LED indicator.

•System Charger. AC, dual outputs, for four-cell receiver and eight-cell transmitter batteries at 50 mA. The 120 mA System Charger is the same except that the receiver battery is charged at 120 mA.

•Uni-Charger. AC, single output, programmable by resistor selection for one, two, four or eight cells, at 10, 27, 50, 60, 80, 100 or 120 mA. LED indicator.

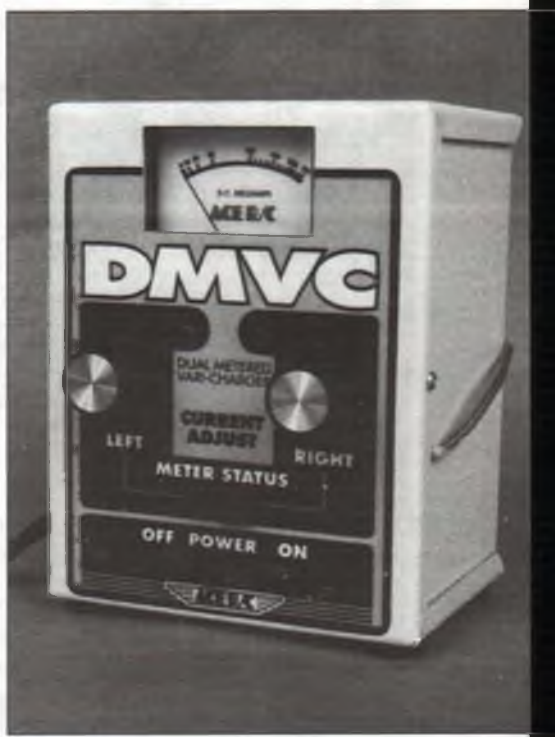
•Metered Vari-Charger. AC, single output continuously variable from 10 to 120 mA, for up to 10 cells. Includes an LED indicator and a small horizontal reading meter to indicate charge rate.

Additionally, the Ace Digipace II, though basically a battery capacity measuring device, includes automatic changeover, after discharging, to charging at 25, 50, or 120 mA rates, and further automatic changeover to trickle after the discharge/charge cycle is complete.

Speaking of trickle, Ace R/C also has a couple of adapters, called "Add-A-Trickle." These can be added to any existing charger, and after the specified time, can be manually switched to a 10 mA rate. Single and double output versions are available.

Ace chargers are furnished without connectors. After all, there's no way for Ace to know what you'll be needing on yours.

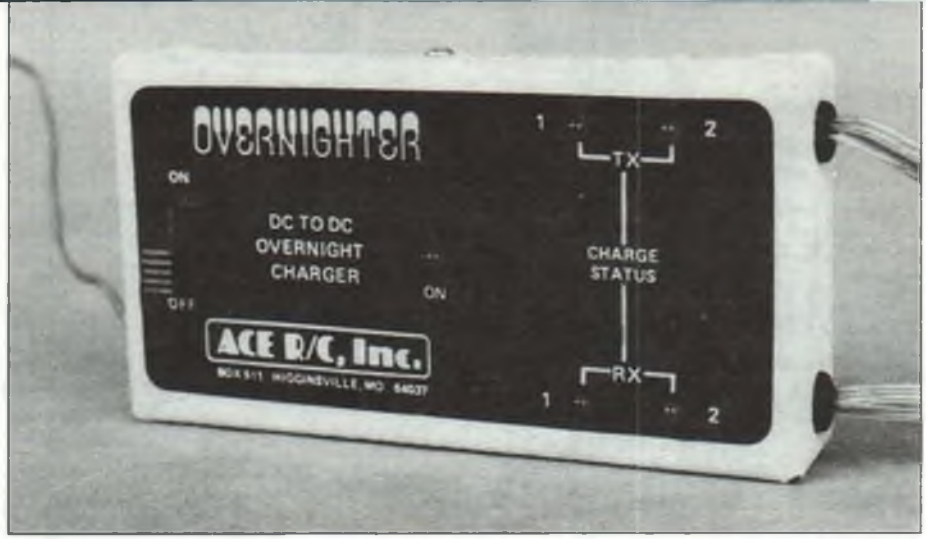
Ace's CVC, Constant Voltage Charger, is intended for use with your 6- or 12-volt starter battery, either wet or sealed lead acid. Initial rate is 400 mA, tapering to 15 mA as the battery charges.



The DMVC, Dual Metered Variable Charger, is probably the best all-around unit. Available in AC or AC/DC versions; the AC version can charge two packs of from one to ten cells individually or simultaneously, variable to as high as 250 mA. The DC version is limited to a maximum of eight cells. Has individual controls for each output; meter switches to read either one. Trickle can be set manually if desired.

However, to ease that particular chore, they stock connectors, both receiver and transmitter, for all the popular (and some not so popular) RC systems.

All Ace chargers come with complete



The Overnighter will charge two eight-cell transmitter and two four-cell receiver batteries from your 12V car battery. Constant current transmitter rates can be programmed at 50 or 90 mA; receiver for 25, 50, 90 or 120.

Ace's HD500 is a heavy duty AC or AC/DC, single-output, metered, variable rate charger. The AC versions can handle from one to ten cells, DC one to eight, at rates as high as 500 mA. Trickle can be set manually if desired.

FFC, Field Fast Charger, a 12V DC powered charger for one four-cell and one eight-cell battery pack. Fast charges at 500 mA to 85 percent capacity, dropping to 35 mA which can be maintained overnight in vans and RVs.

instructions. The charger kits include simple step-by-step assembly and testing instructions, and require only two basic skills to assure success: soldering and reading! All chargers also include a comprehensive sheet entitled "How to take care of batteries"—and for those of you who like visual instruction, there is a video, "NiCd Battery Basics," which tells you in plain language how rechargeable batteries work and how to care for them properly.

One last note to remember. With the exception of the wall chargers, which are classified as constant voltage chargers and which slowly reduce the charge rate as the battery charges, all other Ace R/C NiCd chargers are constant current units. This means that, unless switched to a lower trickle rate, either manually or automatically, the preset current will flow as long as a battery is connected. If left connected for long periods of time, overcharging, with detrimental effects to the battery, can occur. The old advice about "If all else fails, follow the instructions" definitely applies here—in such a case your batteries will be perfectly safe. ***MB***

AEROBATICS *continued from page 55*

The leading and trailing edges go on next. Again, contest balsa is the best choice; lightness equals performance. I use sandable aliphatic resin (white glue) to attach these pieces. It's possible to use foam-compatible CA, but the sanding and shaping to follow will be much more difficult and the hard glue line will very likely show under the covering. Cut the wood slightly oversize, apply the glue to the core only, and use masking tape to strap the pieces in place. While this dries, you can make the wingtips.

Most pattern plane wing tips are 1-2 inch wide balsa blocks carved to a symmetrical shape. I like to construct my tips on a 1/32 plywood center spline. This makes them easy to carve and sand to shape, adds strength, and makes them extremely ding resistant.

The finished wing panel with the tips added and all final shaping and sanding done. Finished weight of the approximately 450 square inch panel is just 7-1/2 ounces.

Start by making a template of the exact tip shape. The tip is constructed as a balsa/ply/balsa sandwich. Use light balsa blocks a little more than half as thick as the finished tip. Use the template to cut the pieces, cut out the interior of the plywood spline to save weight, and glue up the assembly. I use thin CA here, but any glue will do. When things are dry, stack the tips and use a sanding block to square them up.

Back to the leading edges. Strip the tape from the dry wing panels and use a #5 carving blade or a small rabbet plane to remove excess material from the edges. Work down to about 1/32 inch from the skin. Finish the job with sandpaper; the long block with 100-120 grit that you used for the skins is a good choice. Work with the core in the shuck, and use the sanding block to shape the edges to the core. Follow the core shape and work carefully to just eliminate the glue line. Don't break the edges to the final airfoil shape. When you've finished, you should have a glue line you can't see, and nice square edges front and rear that merely extend the symmetrical shape of the core to the new perimeter. At this point, many people find that it helps to extend the marked centerlines of the root and tip to the new edges. Use a ballpoint and a long straightedge to do this if you like.

Glue the tip on with aliphatic resin, making sure that the spline lines up on the centerlines, front and rear. Strap it down with masking tape. When the assembly is dry, use a carving knife to remove the excess wood and extend the airfoil shape of the core to the tip. Finish it off with the sanding block, again leaving the edges square. When you've finished, you should have something that looks like the photo. To this point, everything has been pretty mechanical, but now the squinting and whittling begins.

Starting with the leading edge and sanding the full length of the edge with the grain, break the edges at a 45 degree angle with the long sanding block. Do one edge first and then the other, keeping the shape symmetrical. Then use the full length of the block across the grain in a rolling motion to bring out the final curved shape of the edge. Work back and forth, and always use the full length of the block; this will help you avoid sanding a saddle into the edge. This is very much a "feel" thing, and the first time or two, that marked centerline will definitely help. The trailing edges may be rounded in a similar fashion, or left squared off—it's up to you.

Finally, use a carving knife to roughshape the tips top and bottom, and finish them up with the block. Simple statement, and a hard job, I know. I wish I could help more, but block carving is a skill all of us learn on our own. The basic principle is to remove everything that doesn't look like part of an airplane. The center plywood spline will help by giving you a true centerline to work with.

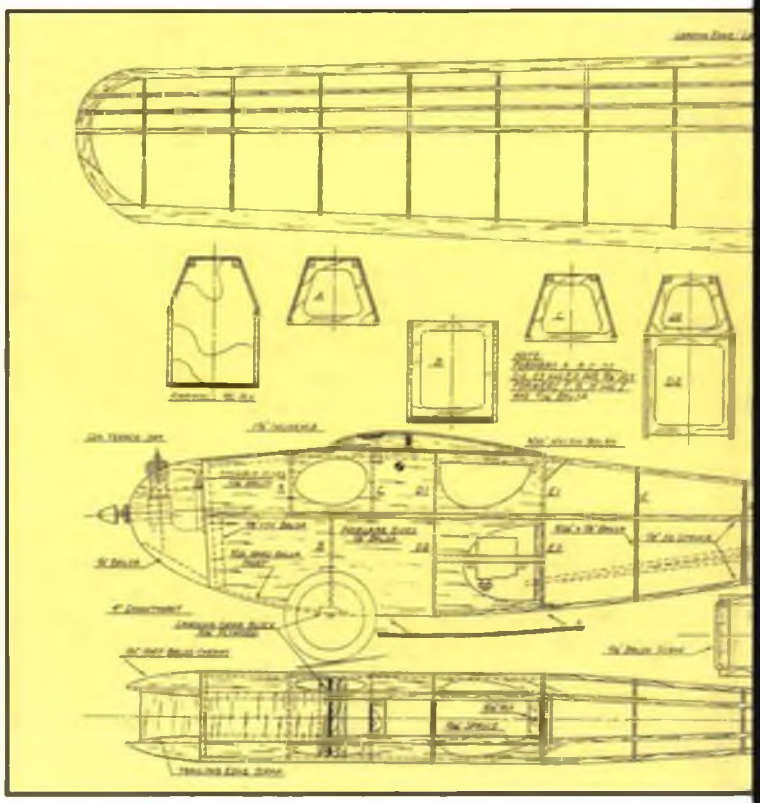
Next month we'll cut and edge the ailerons, install servo boxes, finish up the wheel wells, and generally put it all together. ***MB***

THE MESSERSCHMITT M.17 FOR 1/2A TEXACO SCALE

With its clean, glider-like layout, this 1925 ultralight two-seater can be a real contender in scale duration events.

BY VAN HEREFORD • PHOTOS BY GEORGE DWYER

■ ABOVE: Designer Van Hereford is rightly proud of his little bird. The inspiration for this model came from the Peanut version by Dave Linstrum, published in the January '93 *Model Builder*. ■ RIGHT: The M.17 floats by at the end of another long flight. In order to perform well on such low horsepower, many aircraft of the early '20s relied on efficient, high aspect ratio, glider-like planforms, and therefore make excellent choices for scale duration models.



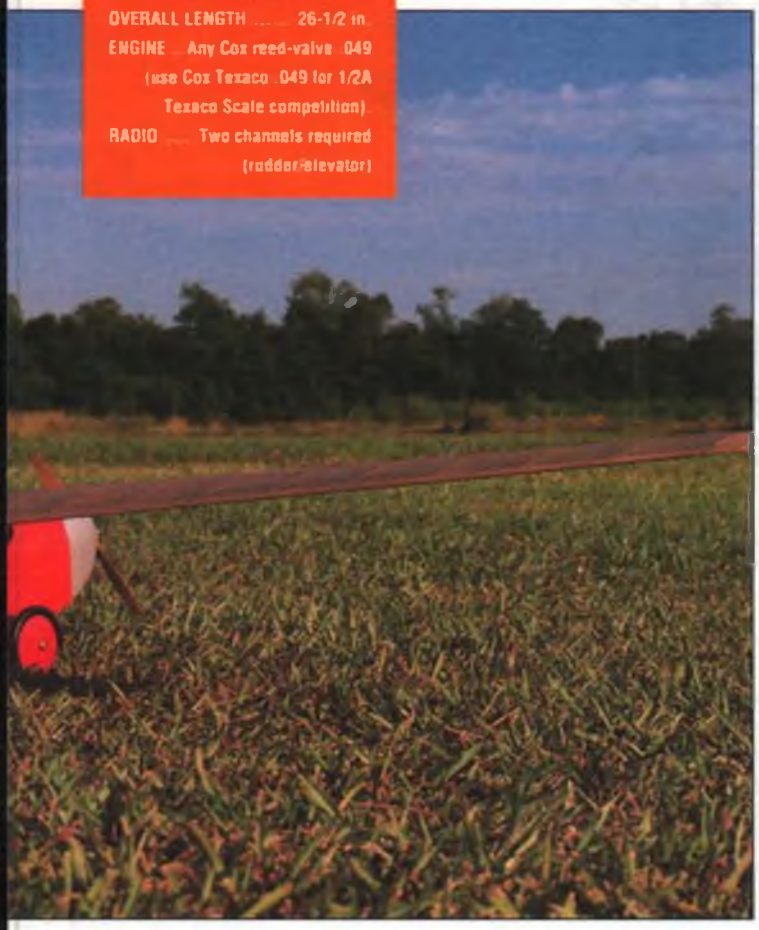
MESSERSCHMITT M.17

DESIGNED BY VAN HEREFORD

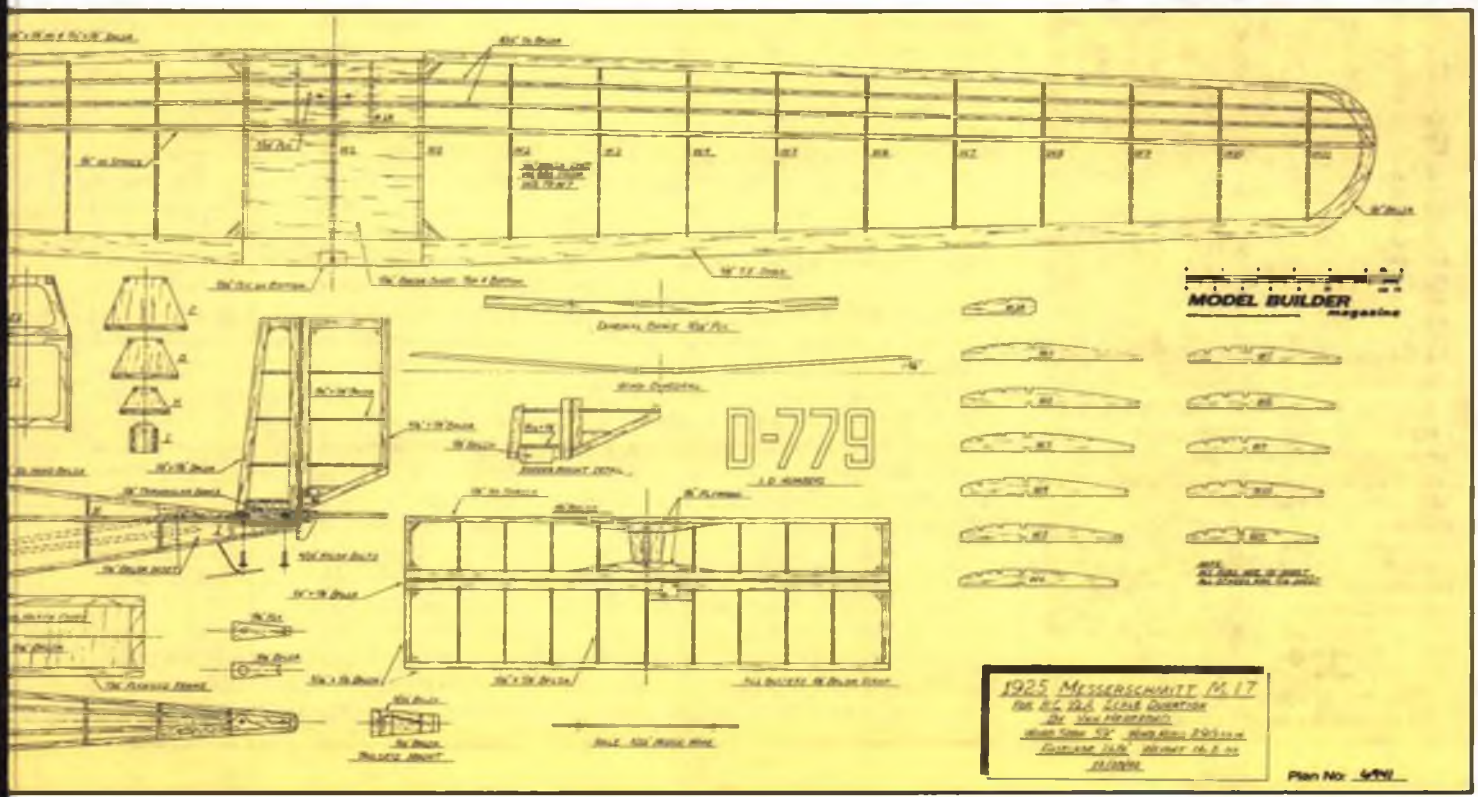
WINGSPAN	59 in.
WING AREA	290 sq. in.
FLYING WEIGHT	16.2 oz.
WING LOADING	8 oz./sq. ft.
OVERALL LENGTH	26-1/2 in.
ENGINE	Any Cox reed-valve .049 (use Cox Texaco .049 for 1/2A Texaco Scale competition)
RADIO	Two channels required (rudder-elevator)

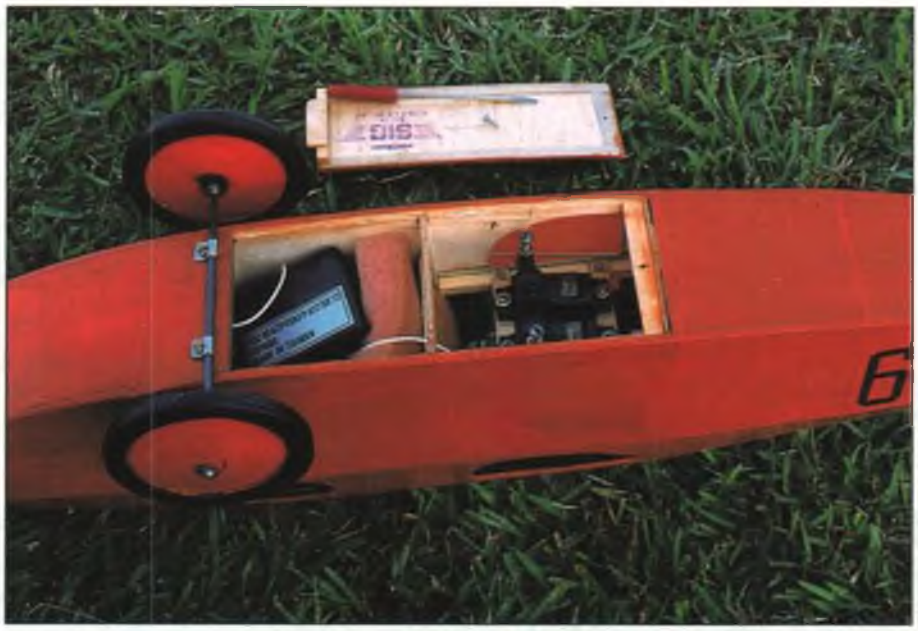
Late last year our club held one of its Radio Control Duration "Climb and Glide" meets (AMA provisional events #702 and #703), and several of our friends from Houston attended. One of them, Ben Beerbower, entered the RCD event flying a 1/2A Texaco Scale model of the English Electric Wren.

What a beautiful little plane! I was particularly impressed with the way it flew against our non-scale models, which were designed specifically for the RCD event. He took home a 2nd place trophy! I decided that I had to try my hand at



An easy hand launch sends the mini-Messerschmitt is on its way skyward. R.O.G. takeoffs from level ground are no problem with that narrow wheel tread and low CG. Who will be the first to do a scaled-up version for electric power?





Access to the radio is through a hatch on the bottom of the fuselage. Straight-axle landing gear is secured with straps cut from an aluminum beverage can.

designing one of these 1/2A Texaco Scale models. But what should it be? During the next few weeks, I thumbed through a large number of my old model magazines looking for a proper subject. There were so many good candidates to choose from. What about a Heath Parasol or an Aeronca C-3? The Corben Super Ace has always been a favorite of mine. But then, the Bristol Brownie, with its low wing, would make an unusual subject with good flying qualities.

I finally narrowed my choices to Les Long's Wimpy, a beautiful low-wing homebuilt, and the Henderson Longster, which was an attractive parasol homebuilt. Then the January 1993 issue of *Model Builder* arrived, and I saw Dave Linstrum's Peanut Scale model of the Messerschmitt M.17. This was the one! It had a relatively streamlined fuselage, simple square tail surfaces, a straight axle landing gear, a beautiful tapered wing with an aspect ratio of over 11, and best of all, no wires or struts.

The M.17 was Willy Messerschmitt's first aircraft to be produced commercially. It was a two-seat, all-wood monoplane with open cockpits. For power, it could be fitted with either a 24-hp ABC Scorpion or a 30-hp Bristol Cherub. It had a top speed of 93 mph and a landing speed of 40 mph.

The M.17 was a very successful design and won several sport flying events in 1924 and 1925. For those of you who want more information on Willy Messerschmitt, go to your local library and ask for *Messerschmitt, Aircraft Designer*, by Armand van Ishoven, Doubleday & Co.

CONSTRUCTION

Care should be taken in choosing the wood for this model. Mine came out at 17 ounces. I made no particular effort to build light, and I'm confident that with a little care, you will be able to hold the weight at or below the required minimum of 16.2 ounces.

The M.17 is simple to build for a scale model, and anyone who has built two or three models should have no problem building this one. Do take the time at the hobby shop to carefully pick out your wood. I usually go through the whole supply of each size I need, looking at each piece to make sure I get pieces that are straight and of the proper strength and weight. Carefully study the plans, reading all the notes, before beginning construction.

A step-by-step description of the construction sequence would be of little use here, but a few notes may be appropriate. When building the wing, note that the leading edge is laminated from a strip of 1/16x1/4 balsa and a piece of 1/4 square medium balsa; the 1/16x1/4 strip goes on the bottom. The 3/4-inch trailing edge stock is tapered to 1/2-inch at the tip. Be sure to notch the trailing edge, as shown, for the ribs. Most important: *Do not substitute balsa spars for the spruce spars, and be sure to include the vertical grain 1/16 sheet webbing as shown.*

This wing has a high aspect ratio, and you want it to be able to withstand a rapid descent in case you find your M.17 a speck in the sky and rapidly getting smaller. Note the 3/32 ply reinforcements that fit under the upper balsa planking between the center rib W1 and the sub-ribs W1A; these are for the two forward 6-32 nylon wing bolts. Drill the holes slightly oversize so the bolts slip in easily. The countersunk nylon bolts look much better than rubber bands.

The vertical and horizontal stabilizer could not be simpler. Once again, be sure to cut notches for the 1/16x1/8 ribs. The only thing unusual here is the use of nylon bolts to mount the tail unit on the fuselage. I began using this method of attaching the tail surfaces on my Shadow RCD designs

quite some time ago and find it to be very neat and practical. It comes in handy when it's necessary to make changes in the stab incidence, just like we used to do with free flight models when using rubber bands. It is also very handy to be able to remove the tail surfaces when making repairs.

The fuselage is also quite basic. The forward fuselage sides are medium 1/8 sheet balsa with 1/8 square spruce longerons top and bottom. The longerons are joined at the rear by a scrap of 1/8 sheet that runs from former I to the rear, and the grain is vertical. The second side is constructed on top of the first to insure that they are identical. After taking them up, add the 1/16 sheet balsa insets between the last upright and former I. These add greatly to the stiffness of the fuselage and provide an anchor for the elevator pushrod tube on the right side.

These models can often get to extreme altitudes and, therefore, require a great deal of concentration. Never take your eye off your model.

Join the two fuselage sides with formers B, D2 and E2. Make sure everything is square. Pull the fuselage sides together at the rear and glue them to the 1/4x3/16 tail post. Add all cross members, bottom and top. When dry, you can add the firewall and the rest of the formers and upper longerons. The axle is mounted to the landing gear block using two 1/4-inch wide aluminum straps.

Empennage assembly is held on with two 6-32 nylon bolts, can be quickly removed for safe transport.

Pin the wing to the fuselage, taking very careful measurements to make sure the wing is aligned squarely. Run a 1/8-inch drill through the three holes in the wing and drill through the 3/16 ply blocks in the fuselage. Take the wing off and tap the three mounting holes using a 6-32 tap.

The original M.17 had a very simple color scheme of amber (a dark honey color) and natural fabric. The fuselage, wheel hubs, and the leading edges of the wing, rudder and stabilizer were amber. The cowl was aluminum, and the identification numbers were black. I used silk on my model and tried to simulate the natural fabric by mixing a small amount of tan in the clear dope. Since I had a can of orange Aerogloss, I used that instead of trying to mix the amber color for the fuselage and trim on the wing and tail surfaces. Of course, other coverings such as MonoKote or Micafilm will do just fine. We've found that dark opaque finishes are best for keeping these models in sight at high altitudes. I would suggest that the bottom of the wings, fuselage and stabilizer be sprayed or covered with a darker color.

FLYING

Before the first flight, make sure the model balances just ahead of the main spar, as shown on the plans. The original balanced perfectly with the battery pack in the compartment in front of former B and the receiver between formers B and D2. The wing should have the same amount of washout under each tip—use at least 1/4 inch washout. Lay each wing on a flat surface to make sure there are no unwanted warps.

Test glide the model by giving it a firm toss into the wind slightly nose down. Use shims cut from a matchbook cover under the front or back of the stabilizer until you achieve a smooth, flat glide. Now you're ready for a powered flight. I used an APC 7x6 prop on my model. Keep it in a shallow climb until you're at about 100 feet, then begin to feel out the controls. The M.17 is extremely easy to fly and has exhibited no bad habits. Stalls are gentle and straight ahead with no tendency to fall off on either wing.

These models can often get to extreme altitudes and, therefore, require a great deal of concentration. Never take your eye off your model, even for a moment, unless you have a partner who has it in sight. A friend of mine was flying once, turned around to sit down and when he turned back, his model had vanished, never to be seen again.

Another "It will never happen to me" issue concerns the receiver switch. Turn it on before launching! Since we are flying without throttle control, it is very easy to overlook this essential detail while starting the engine and preparing to launch. Make a habit of moving your controls just before each launch as a double check.

I'm sure you will enjoy flying your M.17 as much as I have. If you decide to build one, I would be pleased to hear from you and see a picture. My address is 1855 S. Woodhaven, Baton Rouge, LA 70815.

Good luck! **MB**

Kyosho's Mini-Chopper: The Concept 10

James has been having a ball with this, the smallest of the engine-powered Concept helis, and found that in many ways, it performs much like its bigger brothers.

BY JAMES M. WANG

The Kyosho Concept 10 is one of most enjoyable helicopters I have ever owned. It may not be big and powerful, but its performance is far beyond what I expected.

The Concept 10 is powered by an O.S. CZ .15H engine with a built-in recoil start system. Box-stock, it will do 50 mph in level flight. It accelerates out of a hover almost as fast a .30-size helicopter. It has an extremely effective tail rotor control rate and can do pirouettes at greater than one revolution per second.

With the swashplate maxed out, it can complete an axial roll in 2 seconds or less. This is not extremely fast, but good enough for general hotdogging. The fore/aft cyclic is responsive enough that the model can do tight loops. When all the controls are maxed out, this is one fun machine!

Stability is surprisingly good for a little helicopter. Even in a 15 mph wind, the Concept 10 hovers better than some

Our author's flying buddy, Fred Schneider, hovers the Concept 10 for a photo. James found the model to be super stable, sleek and reasonably fast, considering its diminutive size. Main rotor diameter is 38 inches, engine is the O.S. CZ .15H with recoil starter.

This is how the Concept 10 arrives—about 60 percent pre-assembled by the factory. Even with careful building and setting up, it took James only seven hours to complete.

of my older .60-size models. In hover, the model does not drift by itself. It is very predictable.

In forward flight, the Concept 10 does not pitch up abruptly. If the rotor speed is too slow (less than 1650 to 1700 rpm), the helicopter will porpoise slightly in level flight, and it may pitch upward after a steep dive. I like the large horizontal and vertical stabilizers, as they help forward flight tracking.

When a yaw command is given, the Concept 10 yaws instantly. The tail rotor is driven via a toothed drive belt. The belt does not require high tension, thus the drive friction is quite low, and the main and tail rotors spin freely.

Vertical stability is superb. The Concept 10 has minimal up-down heaving oscillations. The overall feeling I got from flying this model is that it has a good balance between stability and controllability.

There is very little slop in the control linkages. This is because they are very short and direct, and the controls have very good geometry. Good geometry implies good mechanical advantage, which means it's easy for the servo to move the control surfaces, yet difficult for the control surfaces to feed loads back to the servo.

The Concept 10 is about the same size as the Hirobo MH-10 that was reviewed in the September '91 *Model Builder*.

I used Futaba 9601 ball bearing, coreless motor mini servos; they contribute greatly toward minimizing slop. The only control slop I found was in the collective pitch slider ring, a plastic unit similar to that on the Concept 30 DX. For more demanding aerobatics, I recommend replacing it with the optional ball bearing pitch slider (KYOE9328).

The cooling system on the Concept 10 blows air directly over the cylinder head. In the 60 or so flights I've had with the Concept 10, the engine has never overheated or quit once. The included O.S. muffler and O.S. #8 plug work extremely well.

The hingeless steel flapping beam design on the Concept 10 rotor head is almost identical to that used on the electric-powered EP Concept. The soft flapping nature gives good stability, but it is just stiff enough as to not cause blade tracking problems. The flybar is in the same plane as the blades, which reduces aerodynamic drag.

The foam blades work reasonably well. The symmetrical airfoil shape gives good stability and speed, but they are not the best in finish or durability. The leading edge and blade tip have a rough mold release line that requires careful removal with a sharp X-Acto knife. Use 150-grit sandpaper to smooth out the leading edge, tip and trailing edge. This will improve the performance by as much as 10 percent. Be careful not to remove too much material, otherwise the foam surface skin may delaminate at the leading edge.

The hingeless main rotor head is the same as on the electric-powered EP Concept. The thin steel flexbeam gives soft flapping and thus a docile hover, but is still stiff enough for aerobatics.

Check the blade root periodically for cracks in the foam skin. The skin is mostly for cosmetic purposes; the centrifugal load is carried by the internal spar. After the foam skin on my blade root began to crack, I peeled off the inboard 1-1/2 inches and covered it with lightweight fiberglass cloth and epoxy. Since the blades weigh only 38 grams each, the centrifugal load is much less than on .60-size machines. It would be wonderful if someone could make high-quality wood blades for the Concept 10 with the same symmetrical airfoil.

The kit was super easy to build; it took me one evening (seven hours) to assemble it! The vast majority of the model is assembled at the factory. The main frame, servo tray, engine, muffler and transmission package come completely assembled. The main rotor head and tail rotor gearbox are also prebuilt. You just have to fit these three groups together and add the landing gear and blades. The most time-consuming job for me was cutting and adding the decals.

Due to its ease of assembly and highly illustrated instructions, not much can go wrong. I feel the Concept 10 is suitable for first-time beginners. There is not much room to make drastic mistakes. Plus,

it is easy to hover. I am surprised that Kyosho recommends it for intermediate to advanced pilots.

I have not yet crash-tested my Concept 10, so I can't say how crashworthy it is. The canopy is made of the same material as the one on the Concept 30—you can throw the canopy against a wall and it won't break. The side frames are also very rugged. But the tail boom is fragile; you can bend it with your fingers. An optional tough carbon fiber tail boom is available for about $20 (KYOE9321).

I've used 15 and 30 percent nitro fuel in my Concept 10. The 30 percent definitely produces more power, and is the fuel I recommend. It may cost $20 a gallon, but with the tiny 4-ounce tank you can get over 30 flights per gallon! Each flight lasts about 12 minutes. You don't even need to buy an electric starter; the supplied recoil starter system has always started my engine in fewer than 10 pulls. All you need to bring to the field is a battery for the glow plug and a squeeze bottle of fuel.

The Concept 10 defines the term "traveling light." The supplied muffler is fairly quiet, so the model can be flown at a neighborhood park. The compact size permits doing aerobatics at small fields. With all these benefits, plus its agreeable flying characteristics, you can see why I like the Concept 10 so much.

For aerobatic flying, I suggest maxing out all the controls. Mine has -9 to +11 degrees of collective travel. Pick a day with a breeze of at least 5 mph to try an autorotation. Listen to the rotor sound during the glide. It makes a distinct "whishing" noise when you are descending at the proper rate. If the fall rate is too rapid, the rotor speed may actually slow down. Play with the collective to maintain an optimal descent rate.

Try an autorotation on the Concept 10 only if you have routinely performed autos on other helicopters. After you become adept with your Concept 10, it can be upgraded with the carbon fiber tail boom and an optional, mostly metal aerobatic main rotor head (KYOE6401). The steel flybar paddle holder that comes with the kit can be replaced by an optional lightweight aluminum unit (KYOE9326) to further enhance the cyclic response. I prefer the stock heavy black holders because they provide more stability.

The plastic frame and servo tray assembly. Collective control is via a push-pull setup to the servo. For precise control and light weight, James used Futaba S9601 ball bearing, coreless motor servos all around. Note the recoil starter for the O.S. engine.

After I put 10 flights on mine, I called my friend Tanacit Siriluck in Philadelphia and recommended he get one. He was skeptical at first, but gave in and bought one. Boy, was he happy after he first flew it! He called me immediately and ecstatically described it as "awesome!" The following paragraphs are part of what Tanacit wrote to me:

"In stock form, the Concept 10 is a wonderful small machine which you can take to the flying site with minimal tagalongs. At first I was concerned whether it would be able to fly even in a mild wind, but after only a few flights, I came to realize that the Concept 10 flies just like the .60-size machines! The cyclic response is mellow, thanks to the soft individual flapping main rotor blade design, but the mellowness does not take away from the aerobatic capability.

"After a dozen flights or so, the clutch spring broke, so it was replaced with a stiffer Kyosho RC car spring (KYOC3045 or AB-17). This spring is similar to the helicopter spring, but is slightly smaller in diameter, thus it is firmer. This allows a higher idle speed before the clutch engages.

"I marked the tail boom at the root with permanent ink so I can tell if the boom begins to creep into the boom holder, causing the belt tension to loosen. Also, early

Concept 10s came with rotor blades that had a smaller blade root internal structure (the blades have to be put under a light to see it). The new ones have twice as much material, i.e. 2 square inches at the root.

"I tried to keep my Concept 10 as light as possible, so a 225-mAH receiver battery is used. This will last three flights. I mounted the gyro an inch in front of the main shaft to prevent nose heaviness. The receiver and battery are mounted with double-sided foam tape on the front tray.

"I use K&B 500H fuel and get plenty of power. The climb rate is impressive. After sanding my blades to a smoother leading edge and sharper trailing edge, I painted them with a fuelproof paint. With the painted blades (45 grams each instead of 38 grams stock), it now flies with crisper control, faster speed, and best of all, it feels like it's on rails.

"There is a cheaper way to get power than using 30 percent nitro fuel. An RC car tuned pipe made by Duratrax (product number DTXG1100), which comes complete with header, pipe, pressure fitting, silicone coupler and nylon straps, was added. It's designed for O.S. .12 engines, but it also works well on the CZ .15H. On the first flight, two adjustments were needed: opening up the needle valve and reducing the hovering throttle. With the K&B 500H fuel, the motor really sang. The climb rate improved considerably, and most importantly, the flight envelope was expanded. I later tried the combination of tuned pipe with 30 percent nitro and found no significant difference.

The Concept 10 uses a belt drive tail rotor. The sliding ring tail rotor control is similar to that on the Concept 60 and X-Cell. High tail rotor speed gives quick yaw response.

"In conclusion, I love this little chopper and find the price very attractive. One thing I'd like to see is better blade quality control; my three pairs of blades all have different thicknesses at the trailing edge. I've finally found myself a favorite model and I know I am not alone!"

The bottom line is, I think advanced fliers who already have .30 or .60 size helicopters will find the Concept 10 a really fun, low-cost machine that can zip all over the sky. Properly set up, you won't believe such a little heli can do so much. It's a fun machine! ***MB***

PLUG SPARKS

BY JOHN POND

What's This? O.T. Indoor!

Various SAM chapters have been attempting to come up with something new in the competition events, and SAM 8, headed up by Ed Lamb, is no exception. The boys have again put on the Old Timer Indoor Challenge meet at the Kibbie Dome at Moscow, Idaho, for the third straight year.

Many other indoor events were staged in this huge facility at the same time, but the Old Timer event still managed to attract 10 entries. This may seem like a small turnout, but considering it was an indoor event, this is quite a feat!

Ed Lamb, of Bellevue, Washington, enjoyed a considerable amount of publicity from the October 1993 issue of the *Northwest Prime Time Journal*. According to the reporter covering the meet, the Old Timer event was the most interesting, as it covered dates from 1927 to January 1936. These were the *real* stick-and-tissue models, as microfilm covering had yet to make a big mark.

Photo No. 1. The recent Old Timer Indoor Challenge at the Kibbie Dome in Moscow, Idaho attracted 10 entries, 1st place being taken by Carl Stokes with this classic Megow R.O.G. Turned in a time of 4 minutes, 7 seconds.

It takes a real old-timer to win the indoor Old Timer events. The winner, Carl Stokes, is no stranger here as drawings of his indoor models were featured in the 1935 Zaic Yearbook. He was a winner and record holder then—things haven't changed much in 60 years! A tribute to the dedication of a real modeler.

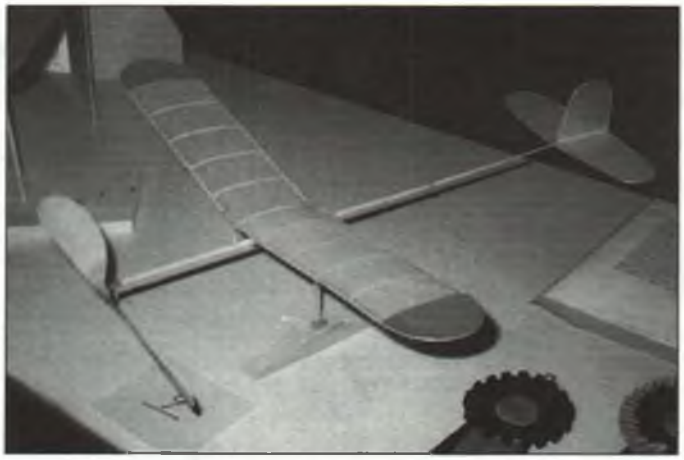


Photo No. 2. Best flier at the O.T. Challenge was John Lenderman's "Generic," which won the duration part of the contest with the amazing time of 9 minutes, 45 seconds.

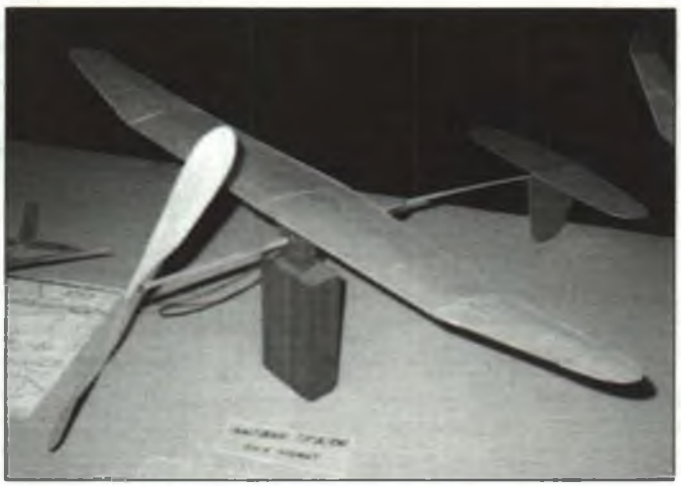
This contest was run on the "Mooney" system, where the places taken in duration were added to the scores of the static judging. A 1st in static and 3rd in duration was enough! Seen in Photo No. 1 is Carl Stokes' Megow R.O.G. on the display table along with his documentation. All entries were placed on a long table where they could be judged for authenticity and workmanship.

For a commercial kit design, this paper-covered R.O.G. made the excellent time of 247 seconds. The 1st place winner was a later design of 1936 called the "Generic" as cobbled up by Bill Winter. John Lenderman's model of this design won with a time of 585 seconds over Dick Stuart's 2nd place Baby R.O.G. time of 293 seconds.

Lenderman's Generic is seen in Photo No. 2. It boasts more modern indoor tractor lines with large propeller and tail boom (something started by Joe Culver of Oakland with his 1931 AMLA win). Regardless, Lenderman is a peerless flier and probably could have won with any of the models entered.

Dick Stuart showed up with several models, one being the Joe Kovel Tractor (yes, the same Joe Kovel of K-G gas model fame) seen in Photo No. 3. For various reasons, Dick was unable to register an official flight with it. Another of Stuart's models was the early 1927 Baby R.O.G. (Photo No. 4), plans of which appeared in the October 1927 issue of *American Boy* in

Photo No. 3. Joe Kovel's indoor model faithfully reproduced by Dick Stuart. Everyone flew rubber in those days!



the first of a series of AMLA columns written by Merrill Hamburg, a real pioneer in model aviation. The Baby R.O.G. was offered in kit form for the price of 65¢. What a great way to start in those days!

Photo No. 5 is an example of how the models were displayed. Seen on the table are the official entries with appropriate documentation. Of particular interest to this columnist is the single-stick pusher, this design first appearing in November 1927 issue of *American Boy*.

What most modelers don't quite understand is why pushers are so stable. As the Wright Brothers so successfully found, is that in a stalled position, the forward elevator is the first surface to stall. This results in a gentle stall whereas the tractor versions generally fall off into a violent turn or spin. This was one of the major problems in the early days.

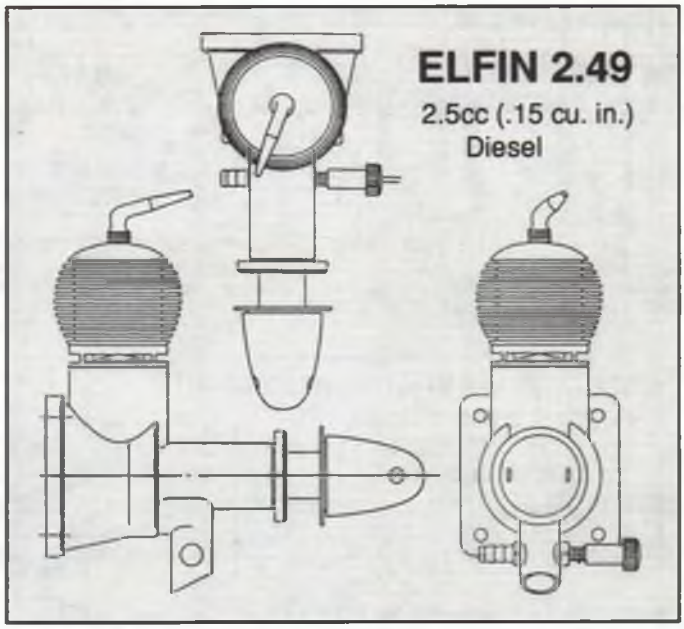
So it is with indoor pushers which can be made to fly in tight circles without stalling or spinning in under power. This kind of model is ideal for the beginner in indoor flying. This writer's earliest recollection of this type model is my seven-year-old son flying one of this type to a 1st place win in the Plymouth Regional Indoor Meet.

ENGINE OF THE MONTH

The English-made Elfin 2.49 diesel was an exceptionally good running engine. It first came on the scene in 1949. An almost instantaneous hit with FF and CL modelers, this engine was used for quite a few years.

Today's SAM competition rules state that a diesel engine produced prior to 1950 gets the same engine run as a spark ignition engine. With no batteries, coil or condenser to carry around, a good performing diesel can be a real asset. Original Elfins being in short supply, it was inevitable that replicas would be made, beginning with the Dunham company in England. This was followed by Elfin replicas from Gordon Burford in Australia, John Targos of Argo USA, and now being featured, the CS Elfin as manufactured in China and marketed in the U.S. by Dave Platt, 1306 Havre N.W., Palm Bay, FL 32907; (407) 724-2144.

Photo No. 4. Indoor flying was pretty crude in 1927. Dick Stuart entered some of the oldest vintage indoor models, among them this "Baby R.O.G." from the October 1927 issue of *American Boy*.



ENGINE OF THE MONTH

The Elfin engine needs little introduction to Old Timer enthusiasts, as it quickly established itself as an engine to be reckoned with. This columnist was one of the first to use a Dunham Elfin at the first SAM Champs at Lawrenceville. From then on, interest and demand for Elfins has far outstripped all production efforts. The Elfin has become **the** engine for Class A Ignition in both FF and RC events.

In a recent announcement, Dave Platt is now distributing the CS Elfins in the U.S. In that respect, we are fortunate to have a drawing of the engine as supplied by Platt, as well as a photo of one of the production items. Specifications are the same as for the 1949 original: 115 grams (4 ounces), 2.49cc (.15 cubic inch) displacement, and a 1-inch square radial mounting bolt pattern. According to Platt, the engine he's flying was turning a 9x4 APC prop at 12,000 rpm, on only its second run! Nevertheless, four hours of break-in are recommended to attain maximum performance. Send Dave an SASE for full particulars and price info. He says he has engines in stock, and spare parts are available if needed.

MODEL OF THE MONTH

This month's model is one of the best known Old Timers.

continued on page 74

Photo No. 5. Part of the static display featuring O.T. indoor models. Ed Lamb entered three models, including a 1927 Megow Tractor (on pedestal) and AMLA Single-Stick Pusher. Note the documentation.

MODEL MARKETPLACE

SCALE 3-VIEW DRAWINGS

PB2Y-5 CORONADO .....58"
PB4Y-2 PRIVATEER .....74"
CULVER CADET .....54"
KNIGHT TWISTER .....51"
FAIRCHILD AMPHIBIAN.....74"
SORRELL HYPERBIPE .....72"

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Feature of the Month

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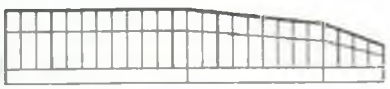

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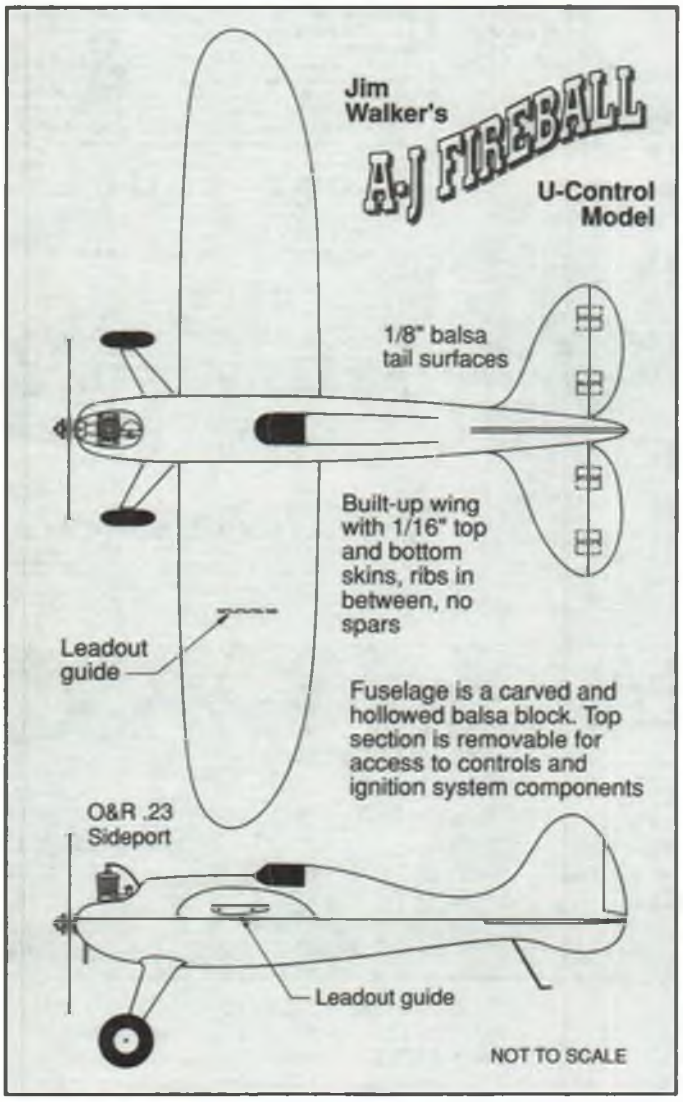
We are referring to the American Jr. Fireball as designed, promoted and kitted by Jim Walker. "U-control" (as coined by Walker) was a terrific shot in the arm, as four years of WWII effectively cut down free flight activity. But control line kept gaining popularity during this time so that by the time the war ended, the control line craze really broke on the American modeler.

MODEL OF THE MONTH



The Fireball originally featured the Ohlsson .23 for power. However, most modelers preferred a little more zip in their maneuvers, hence, the Bunch Tiger was seen more often than not.

The Fireball kit came with pre-carved fuselage, ready-made motor mount, pre-formed landing gear with wheels, and all control equipment. The wing construction was simplicity in itself, consisting of two sheets of wood glued together with ribs in between. In less than a day, you would be finished and painting the model.

Jim Walker died within a year after losing his patented control line system to Cox, and the business, lacking a real leader, folded shortly thereafter.

In recent times, Frank Macy, a dedicated Fireball and Jim Walker admirer, put the Fireball back into production. Many of Walker's original rubber and glider ready-to-fly models were also again produced to the delight of those fliers who remembered them so fondly.

Macy's first love was the Fireball, and he proved this by staging the first Jim Walker Annual in Portland, Oregon. At this meet were seen all versions of the Fireball—standard, low-wing, biplane, seaplane, and several other variations. This annual (attended by this columnist) was truly inspirational as a tribute to Walker's activities in modeling.

Having not heard for over a year on Frank Macy's progress, we will leave it to the interested modeler to contact him at 5200 S.E. Jennings, #11, Milwaukee, OR 97222. Notes in my "Rogues Gallery" of important people lists his phone number as (503) 653-7436.

Photo No. 6. From Dave Platt comes this photo of the new Elfin 2.49cc diesel replica being produced in China by CS. Details in text.

AUSTRALIAN NOTES

If this column seems to lean heavily towards SAM events in Australia, it is because of the way they run their meets, their rules, and most of all, their attention to detail. Through the

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Photo No. 7. A DeHavilland Leopard Moth by Allen Laycock of Australia, built for the 1/2A Texaco Scale event.

efforts of Allen Laycock of McGregor, A.C.T., a computerized list of eligible Old Timers has been made up that features just about all the information you could desire on any particular model.

Laycock also sent several photos taken around his swimming pool at home, the first showing a 1/2A Texaco Scale DeHavilland Leopard Moth (Photo No. 7),

Photo No. 8. Another lovely model by Allen Laycock, a Schumacher "Candid" powered by an O.S. 26 Surpass.

the follow-on to the Puss Moth. This model is a real pleasure to view as it follows the scale outline closely, rather than the notorious Lanzo Puss Moth where scale seems to be an afterthought.

Photo No. 8 shows Laycock's excellent reproduction of Dick Schumacher's 1938 "Candid" gassie, which has turned out to be a real performer with an O.S. .26 Surpass. For those not familiar with Schumacher's designs, it is to be noted they were, for the most part, powered by "Little Dynamite" engines designed and manufactured by Jim Brown, a local machinist.

Most of the Oakland boys—Culver, Doyle, Schumacher and others—were using Baby Cyclone engines at that time. Because the Baby Cykes had a tendency to fracture the front portion of the crankcase, it didn't take long for the boys to get Jim Brown to make up a new design crankcase that was exceptionally strong. These engines turned out to be very popular for a .37 cubic inch displacement. ***MB***

DO-X *continued from page 49*

With the '93 London Bridge Seaplane Classic approaching, Bob kept me informed by sending photos of the progress of each major component. On November 10 the aircraft was taken to Lake Pleasant near Phoenix for the maiden flight. The lake was glass-smooth, but for some reason, the Dornier refused to fly. Bob had promised he would bring it to Lake Havasu, so undaunted, he rented a 24-foot moving van for the trip.

On November 13, I accompanied Bob, Carol and a small army of advisors, technicians and helpers to a secluded location near the London Bridge for assembly and photos. This location didn't remain very secluded for long. It's difficult to hide a monster of this size from view, and everyone who saw it was overwhelmed by its size. Once the pictures were taken, it was decided to taxi the Dornier back to the Nautical Inn beach—a mere 1/2 mile of open water. Its arrival brought over a thousand pilots and spectators to the shore.

Shortly after the Schneider Cup heat, the frequencies were cleared and the DO-X was allowed to taxi outside the event boundaries and make an attempt to get airborne. Still no luck. She was brought back in and the brain trust went to work. Why won't she lift off? Everything checked out OK. Then Bob Curtin said, "Change the props!"

The group determined that cutting down the APC prop tips had destroyed their efficiency. Several modelers from the London Bridge Seaplane Classic came forward with six 14x10 props and the Dornier was soon ready for another try. Tension was at a fever pitch for those involved.

The Dornier taxied out, throttles were advanced two-by-two and as graceful as a swan, the big ship lifted off and began to climb. The collective gasp of the few hundred contestants and spectators announced its departure from the water.

John brought her around and began the first of several passes by the beach. Bill Reed was busy pulling back on the power as we on the ground marveled at the huge flying boat with its six engines purring in unison. Oh, how magnificent it must have been to have seen and heard the original! Alas, that can never be. But those of us present were witnesses to a historic event of its own that we will all treasure forever.

As the sun was beginning to set on this beautiful day, the Dornier began its graceful descent back to Lake Havasu. As she gracefully kissed the water, she must have known this would be her one and only flight, as she gently rose back into the air for a moment and then settled into the clear water to prepare for the taxi back to shore.

Those of us present and those who read this story and see these photos can bless your lucky stars that modeling and people like Bob Curtin and his dedicated team can bring us sights, sounds and experiences that we can in no other way experience. ***MB***

ELECTRIC *continued from page 18*

parameter. It is found by dividing the traditional wing loading (ounces per square foot) by the square root of the wing area (square feet).

Let's look at the Piper Cub as an example. Francis claims that every J-3 Cub from a very small model to a full-size one will have about the same wing cube loading. Let's test him! A full-size Cub has a wing area of 178 square feet and a typical flying weight of 1,100 pounds (17,600 ounces), therefore, the wing loading figures at 98.876 ounces per square foot; dividing this by the square root of the wing area (13.34) equals 7.41 ounces per *cubic* foot.

My ElectriCub model weighs 50 ounces and the wing area is 429 square inches. Plugging everything into the equation gives a WCL of 9.72 ounces per cubic foot. The Goldberg Anniversary Edition Cub (gas power) has a wing area of 744 squares and a ready-to-fly weight of 120 ounces; its wing cube loading is 10.2 ounces per cubic foot.

Although it may appear that the WCL parameters diverge between different size aircraft, let's tabulate the WCL alongside the traditional wing loading:

Plane	WCL (oz./cu. ft.)	Wing Loading (oz./sq.ft.)
ElectriCub	9.72	16.8
Goldberg Cub	10.20	23.2
Full-Scale	7.41	98.9

The difference in WCL numbers is insignificant compared to the difference in wing loading numbers, particularly between the two models and the full-size plane. As you can see, Francis has normalized the size difference between planes of the same type.

Next, using his aeronautical background and his experience, Francis categorizes planes according to their wing cube loading:

Type of Aircraft	Wing Cube Loading
Gliders	4
Trainers	6
Sport Aerobatic	9
Pattern	11
Racers	12
Scale	10-15
Full-Scale	15-20

Computing the WCL parameters for various models as shown in Figure 1, I have to agree with Francis in his analysis of wing cube loading because each plane's type and its WCL category are consistent.

THE NEW APR

The APRs of many of the planes gave an indication of performance but were not accurate in judging the *degree* of success or failure. So, let's take this WCL thing a step further and compute a new Aircraft Performance Ratio using the WCL parameter instead of the wing loading—I'll call this the WCL-APR, found by dividing the power-to-weight ratio by the WCL (not the wing loading as before). The WCL-APR fixes a couple of inconsistencies with my previous numbers. (For comparison, the old APR numbers are also shown in Figure 1.)

For instance, my 1/4-scale Lacey was very powerful and would literally jump off the ground, yet the APR was only 0.348. The WCL-APR parameter is much higher—0.920—which agrees more with the actual flying characteristics. Remember that this plane has a very low aspect ratio and lots of wing area. The WCL parameter appears to take this into account. The Toot-E was also very powerful for its size. Its WCL-APR is now 0.508 (from 0.257) and agrees with its actual flying performance.

The HiLiner had an APR of 0.128 but a WCL-APR of 0.169—a small increase. However, the performance is still marginal—changing my method of judging performance hasn't fixed that! Obviously the performance characteristic ranges need to be adjusted. Looking at all of my data (including data from many planes that are not listed here), I think the correct ranges should be like this:

WCL-APR	Performance
Less than 0.150	No-Go
0.150—0.170	Marginal
0.170—0.200	Fair
0.200—0.300	Good
Greater than 0.300	Excellent

I like the WCL parameter; Using the WCL and the WCL-APR parameters for my electric aircraft analysis is more accurate than the regular wing loading parameter because it does what Francis says it's supposed to—normalize the size variations of aircraft.

ROD MOORE'S METHOD

Rod Moore of Canoga Park, California and I have carried on a lively debate about this subject since my last set of articles. His aircraft performance number uses a different set of parameters that I want to share with you.

To compute Rod's performance factor, first compute the input power-to-weight ratio (in watts per pound) and then multiply it by the ratio of estimated flight speed and estimated stall speed. The estimated flight speed in miles per hour is found by multiplying the prop pitch times the prop speed and dividing by 1,000. The estimated stall speed in miles per hour is found by taking the square root of the wing loading and multiplying by 3.7. Rod categorizes his performance factor numbers like this:

Performance Factor	Performance Description
0 - 79	Back to the drawing board
80 - 109	Modest
110 - 149	Good
150 - 189	Very Good
190 - 224	Excellent
225+	Superior

Figure 1 lists Rod's performance factor for each of the planes—as you can see, it's right on the money. This is another electric aircraft performance factor that works very well in judging flight performance.

KEITH SHAW'S METHOD

Renowned electric flight master Keith Shaw has his own method of evaluating

aircraft performance; it was published in the July 1987 issue of *Model Builder*. It is more of a design tool, since it's used in the early stage of designing and analyzing an electric model. It's too long to fully restate here, but if you want the full details, look up the issue or send me an SASE and I'll send you a copy. Summarizing, here's how he does it:

Using Keith's guidelines, choose a suitable wing loading appropriate for the design and size of the model you want to build. With this wing loading value, compute the finished weight by multiplying wing loading by the wing area. Also using Keith's guidelines, compute the power required to fly the plane, then the static current drain and the battery cell count. Next, decide if you should gear the motor or stick to direct drive. Now you can estimate the proper flying speed and stall speed and the correct propeller diameter and pitch. Finally, after subtracting the weight of the motor, batteries and radio from the estimated ready-to-fly weight, ask yourself if you can build the model for that amount of weight.

COMPARING THE METHODS

Now that we have three methods from which to choose, let's take a look at the similarities and differences between them. With Rod's and Keith's methods you need to know the rpm and the prop pitch for the kind of motor you want to use. This isn't so hard to do, particularly if you've been reading the electric columns for a few months. Not a month goes by that there isn't some motor and prop speed data. I've compiled a list of motor and propeller data I've saved over the years—it's yours for an SASE. Of course, if you really don't have any idea about the speed and power of your motor, you can always test the system on your workbench.

Rod's predictor is different than my new predictor (using the WCL-APR parameter) in a couple of ways. His uses weight to the 1-1/2 power whereas mine is weight squared, making mine more sensitive to changes in weight. Increasing the weight will make my predictor less favorable than his. Also, Rod's predictor uses the square root of wing area; mine uses area to the three-halves power ($A^{3/2}$). Changing the wing area will reflect more in my predictor than his. Therefore, my predictor is more sensitive to changes in weight and wing area. For the most part this is all right, but in some cases my method fails because of its sensitivity.

Rod's method and my method take the known and estimated parameters from a given plane (wing area, finish weight, motor power, etc.) and compute a performance indicator. Keith's method turns the whole analysis around and first asks what kind of performance you want from your plane, then determines what the parameters should be—the wing loading, how

continued on page 82

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TECH STUFF *cont. from page 12*

you, they just took chances and learned. A lot of their airplanes weren't any good, but they only published the plans on the good ones which they designed after they learned how.

"I've had a number of my designs published over the years, but here in MD&TS the goal is promoting design and development by readers. Design your first airplane, build it, get it to fly, take a photo of it, tell me about it, and I'll put it in the column.

"If you get stuck on some of the design decisions, look at other successful models and plans, talk with your flying pals, and try to make a choice. If you are still stuck then, write and I'll try to help you."

My letter is in no way a criticism of Ted or of any other modeler who has never tried his or her hand at design, but is an invitation to all modelers to review the nature of their involvement in this model airplane hobby of ours. I don't know yet whether I lost a reader as the result of that letter, or gained a design convert. Designing isn't for everyone, but you won't know if it is for you unless you try it. If you try it and like it, you won't go back to building other people's designs.

Designing and inventing are closely related activities. If you create a model whose features are all similar to one or more other models, you designed it. If you create a model that is markedly different than any other model in one or more ways, you invented it. The following item concerns the invention of a new type of model.

FIXED-GEAR AMPHIBIANS

This heading isn't apt to make sense to you, unless you remember reading my construction article entitled "Sesquiphib" in the December 1986 issue of *RCM*. Inventions frequently don't seem to make sense, except to the inventor. As the inventor in this case, let me explain.

I formerly lived on Lake Sammamish, east of Seattle, and flew mostly seaplanes from my own dock. I also had a fairly large lawn facing the lake, and sometimes took land models off from the lawn, flew out over the lake, and landed back on the lawn. Then I thought it would be interesting to have an amphibian RC model so I could take off or land on either medium at will.

Designing and building a conventional amphibian didn't appeal to me, however, because such planes are heavy and complicated. I practice "simplicate and add lightness." Then it occurred to me: Conventional rubber-tired wheels can't be left down when operating on water, but who says we have to be conventional?

With that observation, I was off and running. Conventional wheels would have a lot of drag in the water because they are wide, but wheels don't necessarily have to be wide, particularly on a model airplane. If I made the wheels out of sheet material of some kind, the resulting thin disks would act like simple fins in the water, with little drag. Therefore the wheels could be left down all the time. This simplification would reduce weight, improve reliability, and eliminate the need for a fifth channel and another servo to retract the gear.

The photos show my resulting amphibians. One was called "Sesquiphib" because I chose a sesquiplane configuration, and it

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was an amphibian. (Sesquiplanes are biplanes where the lower wing is roughly half as long as the upper wing.) The sesquiplane configuration allowed me to get some useful lift out of the float-support structure.

The thin disk wheels could have been made of waterproofed plywood, metal, fiberglass, or plastic. I made them out of clear .080-inch thick polycarbonate plastic. The fact that the wheels are clear makes them disappear in the air, so the models appear to be straight floatplanes, until they land on the ground.

On Sesquiphib there were slots in the middle of the float bottoms, and the disk wheels were mounted in these slots. The floats served as wheel pants. Only about a third of the diameter of each wheel extended below the bottom of the floats. The wheels were 5-1/2 inches in diameter. The .080-inch wide "tires" provided adequate bearing area on the lawn.

Later I just mounted the disk wheels beside the floats on the inboard sides. These also worked perfectly. (The transparent wheel was outlined on the photo for visibility.)

V-TAILS

I quote from a letter I sent to Dan Fulmer of San Francisco last October, in answer to a letter from him:

"Dear Dan,

"You asked my opinion of V-tails. I don't care for them, but I'm no expert. I've only designed and built one V-tail plane, and that was a rubber-powered model in about 1934. It didn't fly well, but I suspect now that I had the CG too far aft.

As to the dihedral effect of a V-tail, remember that the stab on a conventional airplane usually works with a slight down load for stability, so the V-tail would act as anhedral or roll destabilizing. However, the short span of the stab compared to the wing, and the light load on the stab, make such effects minor.

Regarding V-tail design, I quote from Stinton's *The Design of the Airplane:* "V-tails need more tail volume than the conventional arrangement [he shows more projected area in planform and more in side view, and presents a formula for sizing them]. This means that such tails are not necessarily the answer for efficiency. An upright V increases lateral stability, while an inverted V decreases it."

He therefore seems to disagree with what I said about dihedral effect. Dihedral really has two actions: greater projected area on the low side in roll, and greater effective angle of attack on the forward side in yaw. He is right in that the V increases the lateral or coordinated turn stability, but I still say an upright V with a download is less stable in roll. It is peanuts at any rate.

Since both halves of the V are acting as fins (like a twin-fin plane), we would seem to have more yaw stability and control than needed, but Stinton shows about 20 percent more lateral projected area for the V than the area of a conventional fin and rudder.

As to whether the tail is in the wake of the wing, yes, a V gets part of the stab above the wake, but putting a flat stab on top of a vertical fin gets *all* of it out of the wake, if that is important to soarers.

In theory, I guess a V-tail could be a little lighter, but not enough to compensate for the disadvantages as I see them. I don't own a computer radio. A couple of my transmitters have mixing, but I've never used it. Mixing, as I see it, is another complication that I would just as soon avoid if I don't have to have it.

You have a point on drag. The V should have about 2/3 as much interference drag with the fuselage, but again this is a minor point.

My friend Paul Weston likes inverted V-tails on some designs, claiming they help make coordinated turns.

V-tails definitely seem harder to design. For one thing, the angle must be chosen to get just the right fin effect and the right stab effect. If one decides the model needs more or less fin area after flight tests, it's much more difficult to change than a conventional tail. To heck with them. They're more bother than they are worth, if they are worth anything.

CARBON PUSHRODS

For years my favorite pushrod has been a 1/16-inch diameter mild steel (gas welding) rod, with a Z-bend at one end and a threaded fitting for a clevis soldered to the other end. This simple rod is light, but is not stiff enough to use without support. Since most of my fuselages have bulkheads and my wings have ribs or foam cores, frequent support for the pushrods is already there.

If you don't want to lay out the hole locations for the pushrods and drill the bulkheads or ribs before assembly, they can be easily line-drilled after assembly. For a 1/16-inch pushrod, use another length of welding rod (3/32 or 1/8) as a drill. For drilling through foam, simply grind a conical point on the rod, chuck it in an electric drill, line up for the desired hole, and "drill." No chips, no rough edges, just a smooth round hole. For drilling through balsa ribs or bulkheads, grind or file a crude flat point on the drill rod, and it will drill fine.

Gas welding rod is available in many diameters at welding supply stores, and is useful material for many jobs. But what I really want to tell you about is a much lighter pushrod than my traditional 1/16 wire rods. Bob Violett sells .050-diameter carbon composite rod. It is obviously lighter because it is somewhat smaller diameter than the steel, and the density of carbon-epoxy is a fifth of the density of steel.

Since carbon is much stiffer and stronger than steel, the smaller diameter carbon rod is nearly as stiff, and much stronger in bending than the 1/16 mild steel rod—yet weighs a tenth as much! By using .050 carbon pushrods in my latest model I saved an ounce and a half.

To use the .050 carbon rod for pushrods, insert the ends in Du-Bro #111 threaded couplers and CA glue them. The .050 carbon rod is also very useful for various structural applications in our models. It is available from Bob Violett Models Inc., 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333. Their part number #1405 buys you 8 feet of the .050 carbon rod for $9.00. Yes, reducing weight often costs money.

PARTING WORDS

Measure twice, cut once.

Francis Reynolds, 3802 127th Ave. N.E., Bellevue, WA 98005-1346. SASE please. (206) 885-2647. **MB**

ELECTRIC *continued from page 79*

much it should weigh, how many cells to use and what size prop to swing. Obviously each method has proven its worth, since all of us have used them to accurately predict aircraft performance.

COMPUTER PROGRAM UPDATE

My computer program has been updated and a new version should be available by the time this column is published. It now includes the WCL and WCL-APR computations and Rod Moore's performance predictor. For those who have an older version, the update is available by sending $2.50 (to pay for photocopying the new operating manual, and postage) and your *original* diskette to me. If you don't have the old version and would like to buy the new version, send me $15 and I'll mail it out to you along with an updated manual.

UPCOMING CONTESTS

I received word from Jerry Smartt that the Kansas City Regional Electric Meet will be held on June 25th and 26th. If you would like to attend this event, contact Dick Hinckle at 6406 E. 140th Terrace, Grandview, MO 64030; (816) 763-7207.

According to Gene Norman, the 4th Annual Southeastern ElectriFly will take place on June 4 at his club's field near Dallas, Georgia. Pylon racing, climb-and-glide with spot landing and fast-and-slow speed are the featured events, but Gene assures me that there will be plenty of open flying time. For details, contact Gene Norman, 1031 Pinecrest Dr., Forest Park, GA 30050; (404) 960-0863.

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Keep the mail coming—I love to hear from you. Roger Jaffe, 6462 Sunny Brae Dr., San Diego CA 92119; (619) 463-4453 between 8 a.m. and 5 p.m. Pacific time Monday through Friday. **MB**

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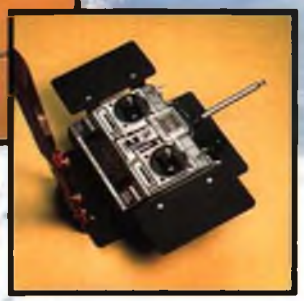

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