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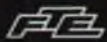
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ON THE COVER

We've got lots of good reading in store for you this month! Top right, illustrating the upper end of the size spectrum of static scale modeling as discussed this month in "Hannan's Hangar" is the incredible 3'-1" Fokker D.VII as crafted by Dick Enos. Middle: Shailesh Patel of Eureka, California returned to the '94 Scale Masters with his huge F-14 Tomcat and took a well-deserved 5th place. Photo by Eloy Marez, whose contest report begins on page 46. Bottom: See page 60 for Bill Forrey's coverage of the '94 CVRC Fall Soaring Festival, the world's largest RC soaring meet. Lower left: Bob Benjamin describes how he installed an Astro 60 electric power system in Dynaflyte's big 81-inch Spitfire to demonstrate the practicality of large electric systems for RC scale models—see page 48.

FEATURES

- 46** 1994 SCALE MASTERS CHAMPIONSHIPS
Eloy Marez
- 48** ELECTRIFYING DYNALITE'S GIANT FUN SCALE SPITFIRE
Bob Benjamin

CONTENTS

MODEL BUILDER

WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

- FEBRUARY 1996
- VOLUME 24
- NUMBER 5

COLUMNS

- 11** MODEL DESIGN & TECHNICAL STUFF
Francis Reynolds
- 20** HANNAN'S HANGAR
Bill Hannan
- 28** PLUG SPARKS
John Pond
- 52** FREE FLIGHT
Bob Stalick
- 56** ELECTRONICS CORNER
Eloy Marez

CONSTRUCTION

- 41** RENARD R-17 PEANUT
Walt Mooney

HELICOPTER WORLD

- 24** 1994 SCHLUTER CUP NOTES
James Wang

PRODUCTS IN USE

- 36** DAVE BROWN PRODUCTS' RC FLIGHT SIMULATOR
Dave Garwood

DEPARTMENTS

- 6** PLANE TALK
Reader Photos
- 12** OVER THE COUNTER
New Product Announcements
- 16** CONTROL LINE
John Thompson
- 32** ELECTRIC POWER
Roger Jaffe
- 60** RC SOARING
Bill Forrey

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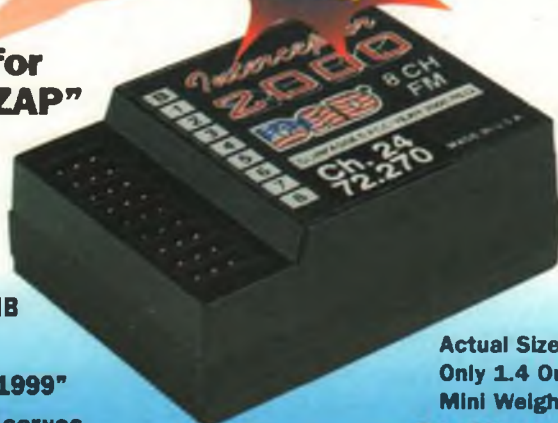


This "could-be scale" Heinkel 88 by Roger Caron is actually a Model Tech Dragon Lady in disguise. The real Heinkel was first flown in 1936 by famous German test pilot Hanna Reitsch. Caron's plane is powered by a Saito 120 and weighs 13 pounds. He reports, "It's a good, stable flier and solid on the controls. Speed and maneuverability are very scale-like." Roger Caron, 2897 Moss Hollow Dr., San Jose, CA 95121.

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The December 1982 *Model Builder* provided builder Rick Dort with Siegfried Gloeckner's Peanut plan for FRED (an acronym for Flying Runabout Experimental Design, a full-size VW-powered homebuilt originally designed by modeler and *MB* advertiser Eric Clutton—see his ad under "P.A.W. Diesels"). Rick followed the plan and needed only a bit of right-thrust to trim it out. He reports, "FRED is a very stable climber and tends to seek its freedom if the day is breezy, so you might wish to limit the rubber size per weather/light conditions. Time spent building FRED was well worth it, and its flights only drive home a firm belief in this little plane." Rick Dort, 1709 Blankenship #8, West Linn, OR 97068.



Roy Didriksen returns to *Model Builder* with a static scale Waco ATO Taperwing, built from Cleveland drawings supplemented by old photos. Like his other recent projects, the Waco will hang from the rafters of the Bayport Aerodrome Society's museum hangar at Bayport, Long Island. Roy, who's been building since the 1930s, writes: "I use a scale of 1"=1' so I can use those wonderful Williams Bros. wheels and Wright and Pratt & Whitney cylinders for the radial engines. Also, even if it's unlikely to be seen, I've put in all the cockpit details, mainly because it gives me satisfaction." The Waco's structure is mostly balsa, with some hardwood and metal parts. Covering is silkspan and dope. The rigging is monofilament fishing line, and the prop is carved from laminated balsa. Roy Didriksen, 123-48 135th St., South Ozone Park, NY 11420.

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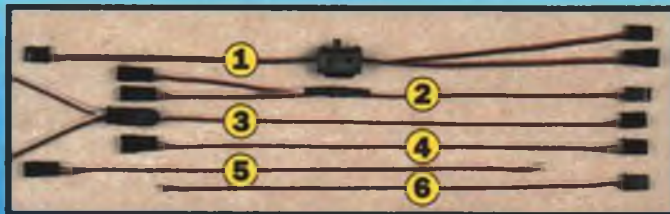
Spec's	Big Daddy [†]	Pro Plus [†]	Pro [†]	Lite [†]	Tina [†]
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A *Model Builder* reader since the beginning—closing in on 25 years now!—Georgia modeler William Cooksey built one of Andy Clancy's Lazy Bees, powered with an older model O.S. .10. (Lazy Bee kits are available through Clancy Aviation—see their ad elsewhere in this issue.) Per the manufacturer's recommendations, William covered his model with Litespan, and used those great Trexler wheels. Flying weight came in at 31 ounces. *William R. Cooksey, 2334 Crawford Rd., Blairsville, GA 30512.*

Eddie Francis' low-wing ship originally started life as a Goldberg Eagle 2 trainer, but after a few flights he decided he wanted something with spicier performance. Accordingly, Eddie moved the wing to the bottom, rounded the top of the fuselage, reshaped the windscreen and covered her with red and yellow MonoKote. "The Low Eagle flies really well on an HB .40 PDP," he notes. "If you can fly a trainer you can fly this low-winger, and the aerobatics are twice as good!" *Eddie Francis, P.O. Box 113, Itmann, WV 24847.*



Tony Peters used Dave Linstrum's plans in our May 1993 issue to build this mostly foam Messerschmitt M.18, photographed here by Gene Scheppers. "There's nothing to compare with the sight of a delicate stick-and-tissue model circling quietly overhead with the sun shining through the tissue," Tony writes. "But the sun isn't always shining, and foam models don't get all sad and wrinkled when they're wet. Also, foam is indifferent to blown motors—when a motor shows those little warning nicks, I transfer it from the fragile tissue model to a more robust foam one. My Messerschmitt has been performing nicely outdoors all summer and seems to be just as happy indoors, where it doesn't have to worry about the sun not shining through its plastic hide." *Antony Peters, 303 W. 66th St., New York, NY 10023.*



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MODEL DESIGN & TECHNICAL STUFF

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• Basic Aero- dynamics

(Continued from
November 1994)

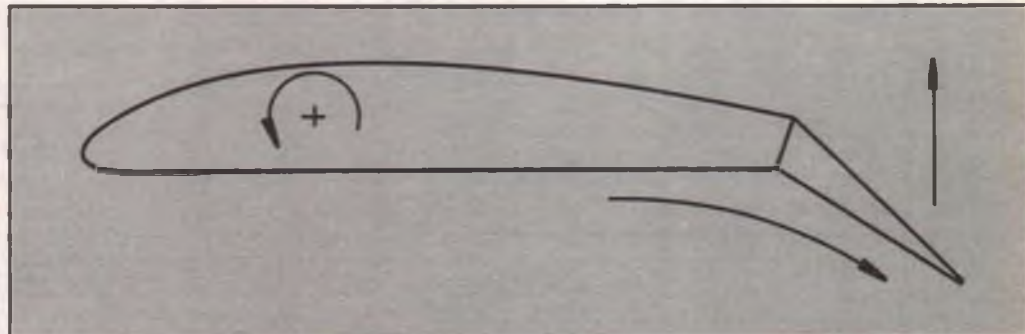
• Flight stand Design

AIRFOIL MOMENTS AND CENTERS

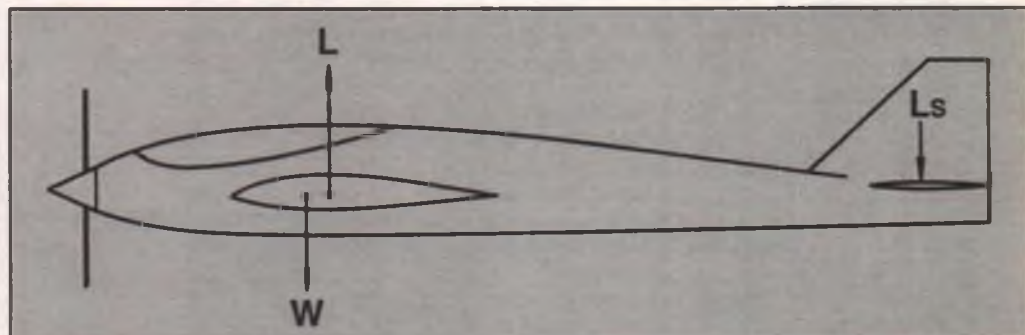
Pitching moment, moment coefficient, center of pressure and aerodynamic center are terms that some modelers understand little or not at all. Let's look into them.

Quoting from *Design for Flying* by David Thurston:

"Most modern aircraft develop relatively low horizontal tail loads by using main wing airfoils having low section moment coefficient values. The section moment coefficient represents the summation of all aerodynamic forces acting upon the airfoil. These are mainly the components of section lift and drag pressures resulting from airfoil curvature, and the surface friction drag imbalance between the upper and lower surfaces acting as an aerodynamic couple. The wing section moment normally acts to rotate a wing leading edge down.



This sketch shows, in a simplified manner, how the airflow on a cambered airfoil or a depressed flap produces a diving moment.



In classic airplane stability, the center of gravity is ahead of the center of pressure, requiring a slight down-load on the stab for balance. For level flight the lift must equal the weight plus the tail down-load.

"The wing section moment acts about the aerodynamic center of the airfoil selected, the aerodynamic center being the locus of all external aerodynamic forces acting upon the wing section. The aerodynamic center differs slightly in location from the airfoil center of pressure, since the center of pressure is determined by summation of only the pressure forces acting upon the wing. As such, the center of pressure is an important indicator of lift movement along the wing chord with variation in angle of attack and airspeed, while forces acting about the aerodynamic center create the torsional loads acting upon the wing structure. For most applications, both centers can be safely approximated at the same location of 25 percent wing chord aft of the leading edge."

A lot of you will have trouble with some of the above terminology and concepts—even the experts continue to argue among themselves over certain points of

basic aerodynamics—so let's get back down to more easily understood facts and rules which we can use directly in our modeling. If the CG of our models is at 25 percent of the chord or less, we will almost always have a stable airplane regardless of the airfoil we use.

One will sometimes see the term "lifting airfoil" when the writer means a cambered airfoil. All airfoils are lifting, otherwise they'd be useless. Cambered airfoils can be made to give more lift (have a higher maximum lift coefficient than symmetrical airfoils before they stall), but cambered airfoils have their disadvantages as well.

The actual balance point of a given model may well be considerably aft of quarter chord, depending on the type of airfoil used, the size of the stab and the length of the tail moment arm (which gives us "tail volume coefficient"), and the kind of flying we want to do. Aerobatic pilots like the balance point far enough aft to give good snap roll and spin

characteristics.

LIFTING STABILIZERS

Most competition free flight models use a large lifting stabilizer in conjunction with a far-aft CG to meet those models' unique climb-and-glide hands-off stability requirements. (If a knowledgeable free flier will write and add to that, I will publish his letter.)

"Lifting stabilizer" is really a misnomer, unless, as in the case of our FF contest ship, the balance is so far aft that the stab actually has an up-load on it in flight. For pitch stability, normal airplanes fly with a forward balance and a slight down-load on the stab. Putting a positively cambered airfoil on a stab but leaving the balance in the normal position doesn't make it a "lifting stab"; it only makes it a less efficient stabilizer. Some designers and some advertising copy writers don't know what they're talking about in this regard. There are few if any advantages to

continued on page 78

over the counter

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 name 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.



TOP FLITE'S BIG C-182

The designers at Top Flite have really outdone themselves with their new 1/5-scale Cessna 182 Skylane, the latest addition to their Gold Edition series of scale kits—and at 81 inches wingspan, it's legal for IMAA events. We had a chance to check out the prototype at the '94 RCHTA show in Chicago and were thoroughly impressed. The airplane is of all built-up wood construction but uses numerous formed ABS plastic parts to give the complex shapes and supply fine scale detail with minimal effort. Engine requirements call for up to a .91 two-stroke or 1.20 four-stroke; working Fowler flaps are optional. This airplane has a list of features and options a yard

long—check it out yourself at your local hobby shop. From Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021.

DU-BRO NEWS



Du-Bro's excellent vibration-absorbing "soft" engine mounts are being produced in

four new sizes: #682 (.45-.80 four-strokes), #684 (.75-1.08 two-strokes), #686 (.80-.91 four-strokes), and #688 (1.20-1.50 four-strokes

and 1.20-1.80 two-strokes). Retail prices range from \$27.95 to \$33.95 per set.

On your next visit to the hobby shop, ask for your free copy of Du-Bro's new 1995 catalog—48 pages listing something over 600 hardware and accessory items, including new products just released. Du-Bro Products, Inc., 480 Bonner Rd., Wauconda, IL 60084; (708) 526-2136.

HANGAR 9'S EASY FLY 40



The folks at Horizon are rightly proud of their new Easy Fly 40, a .40-size ARF trainer advertised as 90 percent pre-built and which comes covered and trimmed with four colors of Goldberg's Ultracote. We've seen one up

close and have to agree that it's an exceptionally well built model. Performance claims include "hands-off" self-righting flight characteristics, gentle stalls, and super stable slow speed flight. Perhaps best of all, the all-wood

construction means the airplane can be easily repaired if damaged—a very desirable

feature of any trainer. Hangar 9 products are distributed by hobby dealers exclusively by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

ZDZ MONSTER TWINS

Big Bird fliers will be interested in the Czech-made ZDZ 80cc inline and opposed two-



cylinder engines being imported into the U.S. by Hobby Lobby. Rated at close to 8 horsepower, these spark ignition engines come equipped with thyristor ignition systems and are set up to run a 25:1 gasoline/oil mix. Both come with exhaust manifolds; tuned silencers are available as an extra-cost option. Both versions of the ZDZ engines are described in more detail, including

performance figures, in Hobby Lobby's Catalog 24, available free from Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444.

KWIK BOND EPOXIES

Global's line of Kwik Bond adhesives has just been expanded with the addition of two high-strength epoxy formulations, Epoxy 5 and Epoxy 30. (The numbers obviously



refer to the approximate working times.) Both are packaged in 9-ounce kits. Give 'em a try, along with the great Kwik Bond line of CA glues. From Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133.

THE LEGEND CONTINUES

With the introduction of Sig's Kadet LT-40, beginning RCers now have a choice of five different Kadet trainers to choose from. The new LT-40 is still an all-wood aircraft featuring the proven Kadet aero-



dynamics, but with modernized construction; all parts are supplied pre-shaped, sawn, die-cut, laser-cut, routed, or whatever it takes to make them ready to install, right out of the box. Also included is a complete hardware package with a combination of quality Sig and Du-Bro products. At 70-inch span, the LT-40 is bigger than most .40-size trainers, but that just means it'll fly slower and will give novices time to think and react to what the model is doing. Check out the LT-40 kit at your favorite hobby shop. From Sig Mfg. Co., Inc., 401-7 S. Front St., Montezuma, IA 50171; (515) 623-5154.

HIGH-PERFORMANCE PROPS

With the newly released

- 10x5, 11x8 and 12x8 sizes,
- Windsor Propeller's line of Scimitar Profile Series props has grown to an even dozen.
- The Scimitars range in size from 8x5 to 12x8, are made of charcoal gray glass-filled nylon, and feature swept-back narrow tips and undercambered blades. For a free catalog of Windsor's products, send an SASE to Windsor Propeller Co., 3219 Monier Circle, Rancho Cordova, CA 95742.

TOM'S RUBBER SCALE CUB

Since first announcing his "Scout" FF rubber model kit (August '94 "Over The Counter"), Tom Herr has been experimenting with lasers for cutting balsa, and has been so successful that the Scout and now his new J-3 Cub kit both feature beau-



- tifully cut parts that should make building a real pleasure.
- The Cub spans 35-1/2 inches (1"=1' scale) and is designed primarily for rubber power, although electric or CO₂ could easily be adapted. To illustrate the precision of laser cutting, Tom designed his Cub's wing ribs with triangular cutouts, so that the finished part looks like

- a full-size rib with its many individual pieces. The kit contains over 130 laser-cut parts, complete hardware, rubber, plastic prop, tissue, decals,

- three-view, two sheets of computer-drawn plans, and illustrated instructions, for a going price of \$34.95 plus \$3 S&H. Kits can be ordered direct from Herr Engineering Co., 5648 Kingman Ave., Portage, IN 46368. A full line catalog is available for \$2 but is included free with each order.

DIESELIZE YOUR .049

- Bob Davis is now offering an improved version of his famous 1/2A diesel conversion head (see photo) for Cox Tee Dee .049s—he claims over 13,000 rpm on a 7x4 prop and a run of 12 minutes per ounce



- of fuel. Also back by popular demand is the Davis 1/2A spring starter first developed back in 1977. These items as well as the complete Davis Model Products line are described in Davis' catalog, available by sending an SASE and \$3 (credited to your first order) to Davis Model Products, P.O. Box 141, Milford, CT 06460.

F3B SUPERSAILPLANE

At the Chicago RCHTA



- show we had a chance to take a close look at the new state-of-the-art Spirit F3B or unlimited class competition sailplane being imported from

Russia by Hobby + Tool of America. This is truly a beautifully built aircraft, featuring all-molded composite construction and your choice of a conventional or T-tail stab design. The 110-inch wing is a three-piece affair featuring the RG-15 airfoil and four pre-installed servo wells for ailerons and flaps. And there's enough room in the glass/Kevlar/

- carbon fuselage for up to a 21-cell electric system, for those who are so inclined. An SASE will get you more details from Hobby + Tool of America, P.O. Box 548, Rocky Hill, NJ 08553-0548; (908) 281-5544.

CANOPY GLUE

- Now that Wilhold's RC-56 glue (long regarded as the best for mounting canopies) has been discontinued, the ZAP gang has come up with something they feel is even better. Their new Formula 560 Canopy Glue is formulated to work on balsa, plywood, plas-





tics, film coverings, fiberglass and any primed or painted surfaces, and dries perfectly clear. Formula 560 comes in handy 2-ounce bottles and is now available at hobby shops throughout the country. Produced by Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

WING SKINS MADE SIMPLER

The tedious job of gluing up balsa sheets into wing skins can be simplified somewhat

by using Precision Model Products' Balsa Edge Sander, which makes short work of straightening the edges of the balsa sheets prior to gluing. The sander is made up of aluminum angle and channel stock; in use, the sander remains stationary and the balsa sheet is run back and forth against a sandpaper fence until the edge is perfectly straight. The unit will straighten sheets up to 4 feet long, and comes with instruc-



tions and provisions for temporary or permanent mounting to your work surface. From Precision Model Products, 14423 Hix, Livonia, MI 48154; (313) 464-8594.

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The Hobby-Vac Deluxe is Vacuum Form's top-of-the-line benchtop vacuum forming machine, unique in that it features a two-stage vacuum system; it uses your standard vacuum cleaner to first pull the hot plastic down fast and



then automatically switches to a powerful 3/4-horsepower second stage pump that boosts the vacuum five times higher—up to 28 inches. This lets

you form plastics up to 3/16-inch thick, or form thinner materials with extremely fine detail.

Vacuum Form also sells less-expensive outfits along with plastic sheets, books and components for building your own machine. Call or write for a free catalog: Vacuum Form, 272-D Dept. 100, Morganhill Dr., Lake Orion, MI 48360; (800) 391-2974.

SURE FLITE'S WACO CABIN

Known for their line of injection molded foam RC sport aircraft, Sure Flite's latest is modeled after an old favorite, the Waco ARE cabin biplane

of the 1930s, designed for up to .45 two-strokes or .60 four-strokes. Specs include top and bottom wingspans of 49-1/2 and 36-1/2 inches respectively, wing area of 620 square inches, and a flying weight of about 4 pounds. Glassing the foam with lightweight cloth and epoxy and then painting

will give the most durable finish; lighter and easier would be to cover everything with a low-temp film, or just paint the foam directly. Supplied complete with cowl, dummy



engine, snap-together wheel pants, hardware and decals. From Sure Flite Enterprises, 571 Crane St., Bldg. H, Lake Elsinore, CA 92530; (909) 245-6343.

CHAPIS MODEL PLANS

The "Skinny Scale" AT-6/SNJ seen in the photo was built from one of several drawings offered by Chapis Plans. First developed for .20-.35 glow engines, this particular

continued on page 66

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This tool is a mini-router in itself. A through hole or an edge is needed for the pilot shaft to follow as it cuts.



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Inspired by Aviation's Golden Era. Although it looks like it's straight out of the 1930's, don't bother looking up this one in your aviation history books. The Spacewalker was designed by Jesse Anglin of Hendersonville, North Carolina, and first flew in 1986! Despite the fact that it is a new design, the Spacewalker manages to capture all the spirit of Aviation's Golden Era.

Now Sig Manufacturing brings you the Spacewalker in 1/3 scale. Every effort has been made to retain the scale features of this charming homebuilt. Plans for the full-size aircraft were scaled down for the ultimate in accuracy. Construction is easy with the pre-formed fiberglass parts and Sig's famous photo-illustrated construction booklet.

In the air, it is certain to please. Designed from the start to handle any kind of sport aerobatics, it has proven to be one of our most exciting models to fly. The big wing, thick airfoil, and long tail moment all make for stable approaches and soft, slow landings. But before coming back to Earth, it will do enough loops, rolls, snaps, and spins to make any sport pilot happy.



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PRACTICE MAKES PERFECT

The concept of practicing is most obviously applicable to aerobatics. Fliers advance toward the goal of flying at the top of the expert class, where the tiniest bobble or angle can mean the difference between victory and defeat.

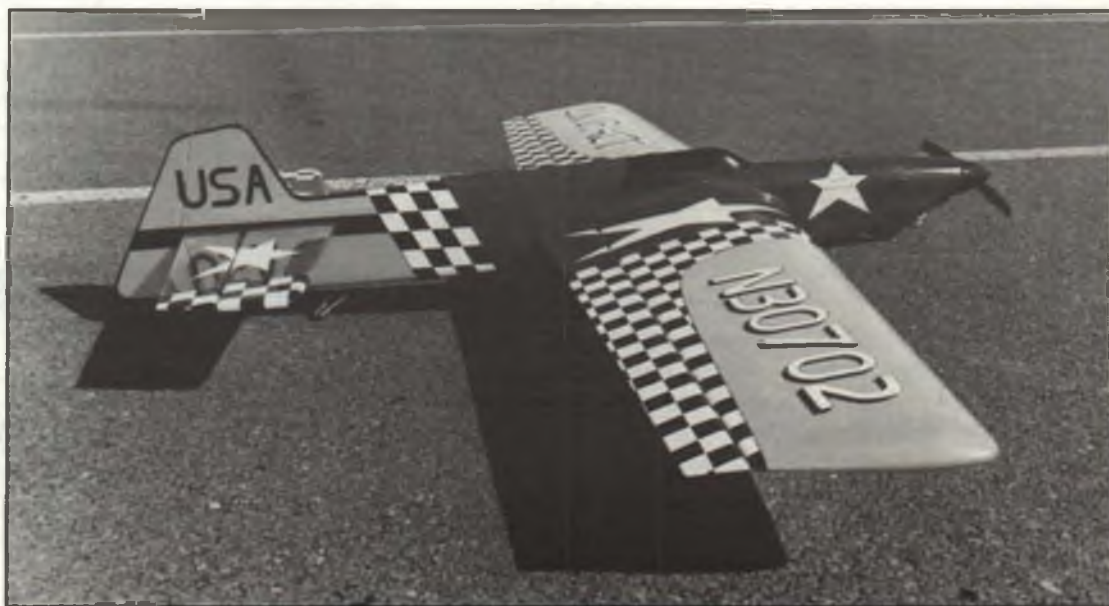


In CL model aviation, perfection may be elusive, even at the highest levels. But we can edit the old saying to something that's indisputable: Practice makes champions.

The manufacturing of champions was the business of a serious two-day work session in Eugene, Oregon this past September 10-11, when the U.S. Precision Aerobatics team gathered to prepare for the World Championships, held in Shanghai, China, in October. The site for the practice session was Eugene Airport, the location of the annual Northwest Regionals and the regular flying site of the local club, the Eugene Prop Spinners. Their intense weekend of practice offered not only a glimpse into the making of one country's drive toward the world championship, but a lesson in preparation for

■ Above: David Fitzgerald's Trivial Pursuit stunter waits while Ted Fancher makes a practice flight. All of this month's photos were taken by our columnist at the airport in Eugene, Oregon, where members of the U.S. Precision Aerobatics team gathered recently for a two-day session in preparation for the World Championships.

■ Right: Defending World Champion Paul Walker's Impact, finished in bright fluorescent colors. Features a removable wing for easier transport to and from contests.



any kind of control-line competition. Between flights the pilots took time out to describe their individual at-home practice habits.

There to practice were team members Ted Fancher of Foster City, California; David Fitzgerald of Napa, California; and defending World Champion Paul Walker of Kent, Washington. (Walker, as defending champ, is not a formal member of the team, but is entitled to return as a "free agent.") The only missing team member was Bob Hunt, who was unable to make the trip from New Jersey. (*Stunt News* reports that one more team member has been added: Four-time National Champion Robbie Hunt will compete for the U.S. in the Junior World Championships, to be held in conjunction with the regular championships.)

Along for support and coaching were Bill Fitzgerald, Gary McClellan, Brett Buck, and Bob Emmett. McClellan was the head judge at the U.S. National Championships in 1994. The session also drew a crowd of local fliers to watch (and fly on other portions of the site), and quite a few passing spectators.

The pilots arrived Friday evening and were out at the site early Saturday. A routine quickly emerged. The pilots would fly one at a time, with the coaches and sometimes the other pilots watching as if they were judges. Fitzgerald and McClellan carried clipboards on which they made detailed notes. After the flight, a meeting would convene immediately, usually at the center of the circle. One or both of the judges would go over each maneuver, pointing out the variations from the ideal that may not have been spotted by the pilot. The cyclone fence



Summit meeting in the pilot's circle. Surrounded by expert judges, Ted Fancher (second from right) gets a critique of his aerobatics pattern from Bill Fitzgerald (right) and Gary McClellan (center), while Bob Emmett and Gerald Scharsz (left) observe. Such meetings took place after every flight.

around the Eugene site offered judges an excellent reference in judging the straightness of level flight and the height of the bottoms. The fliers also worked on fine-tuning their airplanes, making minute adjustments between flights.

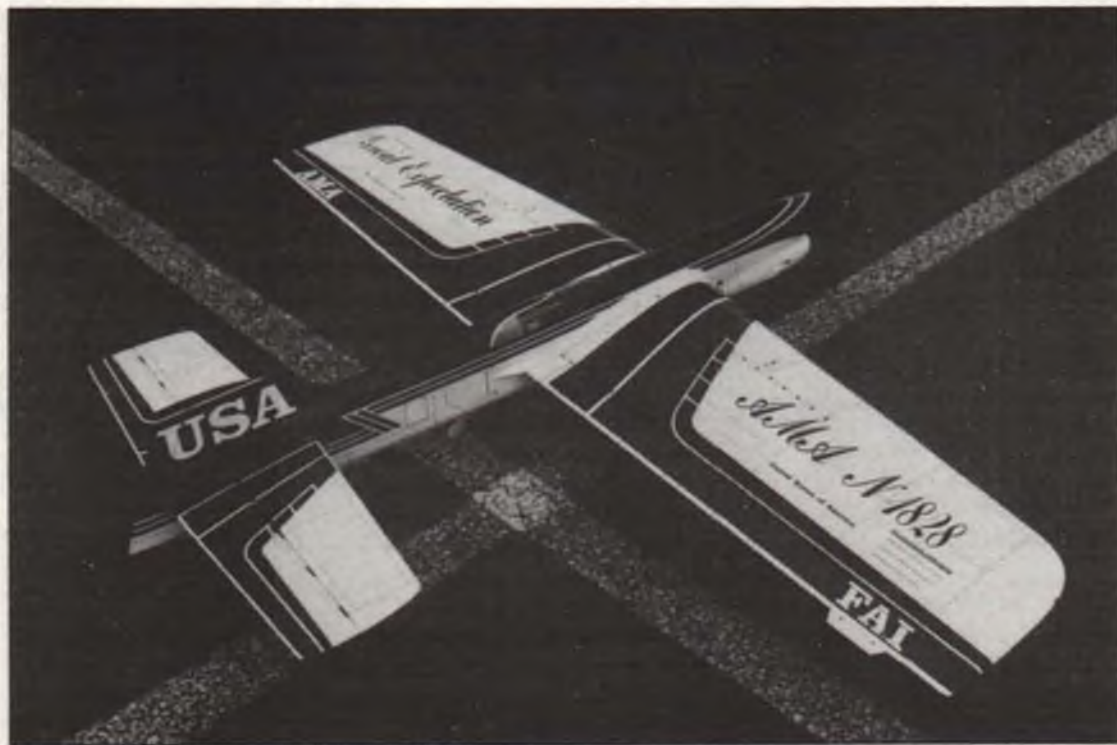
Walker was using his take-apart Impact design with an Aero .40 engine and a Smith four-chamber tuned pipe, which growled a throaty note on its two-blade prop. Fancher was using his latest Trivial Pursuit with an O.S. .46VF with AAC piston/liner, a three-chamber pipe and Brian Eather three-blade prop. David Fitzgerald flew his version of the Trivial Pursuit with an Aero .40, three-chamber pipe and

three-blade prop. Bob Hunt campaigns a Saturn design.

Walker noted that the judges often would remark on variations that the pilots had not noticed and sometimes would be unconcerned with problems that the pilots thought they observed in their own flights, enabling the pilots to focus on the most pressing matters.

"It offers us a chance to get a different perspective on our flying, and to start toward an atmosphere of cooperation, all of us representing the U.S. in a team effort, not as individuals," David Fitzgerald remarked.

The pilots had the good fortune to pick a weekend in Eugene that simulated a wide variety of the kinds of circumstances that might be encountered at a strange site in a foreign country. During the two days, they encountered dead calm, a fairly strong breeze blowing in varying directions (including southerly, the direct opposite of the usual condition), rain and warm sunshine. Such variety was just what



Ted Fancher's design of choice is the Trivial Pursuit, which he named "Great Expectation." A beautiful building job complete with intricate panel line detailing.

they had been looking for.

"U-Control sites tend to be in less-than-ideal situations at the World Championships, with turbulence," Fancher observed. And often practice sites at the championships are hard to find.

Back at home, each of the pilots has a practice regimen tailored to his own schedule. Walker, who has the advantage of living near an excellent flying site, spends the most time working on fine-tuning the pattern. As the World Championships approached, he was out flying seven days a week. On weekdays he would take his airplane and a change of clothes to work with him, stopping by the field on the way home to make six or seven flights. As he flies, he tries to spot and correct consistent mistakes. An example of the level of detail is his ongoing effort to correct his entry into the round loops, which he says is sometimes criticized as too abrupt.

David Fitzgerald, a United Airlines pilot, schedules his model flying sessions between his time in the cockpit. He tries to make it to the field about three days a week, and tries to arrange his work schedule in a way that allows him to fly models in the mornings. He flies at a field in Napa, behind a local community college, and is ready to start his engine at the instant that the clock strikes 9 a.m., which is the earliest that models are allowed in the air.

When they have common days off, Fancher, another United pilot, drives the 70 miles from Foster City to join Fitzgerald in Napa. Bill Fitzgerald, also an airline pilot, and Brett Buck often are there to coach.

After each flier has made a warm-up flight, the critiques begin. "What's really good about this," Fancher said of the team

Fine-tuning was part of the U.S. World Championship team's practice regimen. Here Paul Walker changes the tuned pipe in his Impact. Engine is a Precision Aero .40 from Aero Products.



Another view of David Fitzgerald's stunt. Like fellow teammate Ted Fancher, David favors the Trivial Pursuit design, dubbed his ship "Star Gazer."

practice session in Eugene, "is to get some other eyes. One coach tends to see the same thing."

It would be interesting to hear from some competitors their special techniques for practicing. Send in some ideas and we'll pass them along in a future column. In the meantime, stay tuned for next month's column, where we'll continue

with the topic of practice as it applies to the other disciplines of CL flying.

Questions, club news, contest information, technical tips, photos and other items of interest to control-line fliers is welcomed. Write John Thompson, 295 W. 38th Ave., Eugene, OR 97405. E-mail at 73473.1407@compuserve.com. MB

results continued on page 68



REPORT CARD ON HINGES

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After ten years, everybody thinks that school's out on hinges. Let's grade the competition and see who needs more classes.

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Materials:

Total Thickness	A	D	B	C	A	C+	A
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Tear Strength	A	A	A	A	B	A	B
Surface Treatment	A	F	F	F	F	F	F
Delamination Strength	A	D	D	C+	D	C+	D
Slots or Holes	A	A	A	A	A	D	D
Glue Action: Wicking	A	A	B	F	F	F	F
Delayed Cure	A	C	C	F	F	F	F
Average Grade	A	C+	B-	C	C-	C-	D

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Tear Strength	A	A	A	A	B	A	B
Surface Treatment	A	F	F	F	F	F	F
Delamination Strength	A	D	D	C+	D	C+	D
Slots or Holes	A	A	A	A	A	D	D
Glue Action: Wicking	A	A	B	F	F	F	F
Delayed Cure	A	C	C	F	F	F	F
Average Grade	A	C+	B-	C	C-	C-	D

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NEW! HCZ010 Hacker "FUNNY" A-R-F ... \$79.00
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NEW! PR124 HU/Precedent T240 kit ... \$199.00
 Huge box, huge airplane, fantastic kit, with an incredible amount of included hardware! T240 flies just like full scale light planes — great landings and takeoffs, gentle aerobatics. Transports easily with its 2-piece wing. Fantastic balsa/lightply kit: there's no plan for the fuselage — you just slip the interlocking parts together and alignment is perfect! Incredible hardware includes 5" wheels! 94" span, about 1400 sq.in. wing area, 15 lb. flying weight, for 4 or 5 RC channels (flaps optional), .60-.90 engines.

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NEW! HLA106 Telemaster 2000, with prebuilt structure \$197.00
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HLDS001 Telesport \$89.90
 Great kit, aerobatic airplane to fly after you've learned to fly a Telemaster. Landings are slow. 60" span. For .40 to .61 engines, 4 channel radios. Wide track main gear prevents tipovers even in strong crosswinds.



HLSC232 Scorpio Taurus Plus New Lower Price \$224.00
 This huge airplane comes fully framed up (and beautifully built!) You can cover it and install your RC equipment. Incredible aerobatic giant with 7 foot wingspan, two-piece wing for easy transport. For 4 or 5 channels, .61-.80 two stroke engines, .80-1.20 four strokes.



HLA128 DH82A Tiger Moth \$209.00
 66" span balsa kit with all the details of the classic full scale Moth. Slow landings because of the huge 1300 sq. in. wing area. For .40 to .91 engines. 1:5 scale with a lot of preformed ABS detailed parts like cowls, corrugated fuel tank.



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 95" span, 1330 sq. in. wing area, very light weight. Lands so slow that you can land backwards in a 10mph wind.



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 One of the easiest to fly RC airplanes in history! 73" span, for .40 size engines, 4 or 5 channel radios.



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HANNAN'S HANGAR

BY BILL HANNAN

“Quality is never an accident. It is always the result of high intention, sincere effort, intelligent direction and skillfull execution.”

Our quotation, by Willa A. Foster, from the Glatfelter Insurance Group newsletter, via reader John Walker, certainly applies perfectly to models!

STATIC SCALE SURVIVES

Speaking of quality, check out that 1/4-scale Fokker D.VII! Including virtually every possible detail, it will re-

size spectrum is another Fokker D.VII spanning a mere 3 inches. Judging by its unpainted, slightly rough-around-the-edges appearance, it may have been built by a youngster, possibly during the 1930s when it was available in kit form. The D.VII and 13 other similar-size models were found in a tattered cardboard box at a flea

he was a nine-year-old builder, the models always looked great in his mind, but terrible when completed! Nonetheless, they helped Bill eventually become an expert modeler and fine artist, whose illustrations graced many model airplane publications.

A more traditional size shelf model is Jim Alaback's Fokker D.VIII, spanning 7



■ LEFT: Close-up of Dick Enos' Fokker D.VII reveals the amazing amount of detail incorporated.

■ BELOW: At the other end of the size spectrum, a tiny all-balsa Fokker D.VII by an unknown (probably youthful) modeler sits atop a Kellett KD-1 autogyro kit of similar size and vintage. More information in article. Bill Hannan photo.

main uncovered to permit proper appreciation of its many intricate components. Builder Dick Enos is open to offers for this masterpiece from any interested museum. Certainly it deserves to be shared with the widest feasible audience.

At the opposite end of the

market by Don Campbell of Detroit, Michigan.

Alongside the Fokker is a 1937 Kellett autogyro kit, consisting only of a printwood sheet, construction plan and a block of balsa for the fuselage. The nickel gives an idea of the size, and also of the cost. According to model historian Walt Grigg, these models were marketed at four for 5¢ by such firms as Airway, Ace Whitman and AMCO (Comet). However, Don Campbell and Bob Shalda both remember their local grocers cleverly selling the models individually at 2¢ each, thus considerably increasing profits!

Bill Feeny, of Verona, Wisconsin, also remembers the 3-inch models, saying that when



inches. Jim chose to complete the project in the "good old days" manner of his youth, using talcum powder and nitrate dope to fill the balsa grain, and brushed-on paint for the finish. He even cut the insignia from a copy of the plan, as prescribed in the Aircraft brand kit instructions.

Although Jim resisted the urge to add more details than the kit plan showed, his inherent sense of craftsmanship speaks for itself, and the



This magnificent 1/4-scale Fokker D.VII static scale model was constructed by Dick Enos (left) from plans researched and drawn by Don Dodson (right).



Jim Alaback's 1/4"-1" scale solid model of the Fokker D.VIII was finished employing traditional 1930s techniques. Jim's extensive article about solid models appeared in the August, 1992 Model Builder.

model will be displayed in the San Diego Aerospace Museum History of Model Aviation collection.

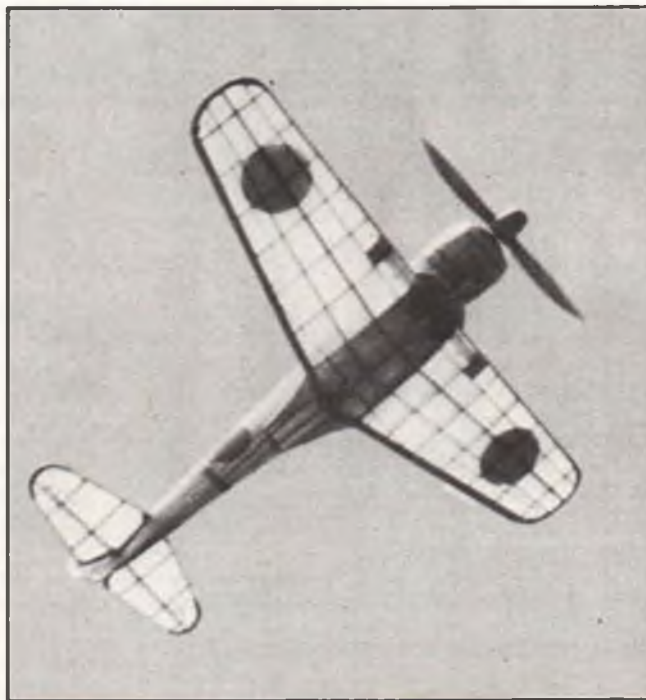
ONE MODELER'S OPINION

Dick Johnson, of Dallas, Texas, says that flying the finished model is not his favorite activity: "I have long known that building was my real passion, with flight performance only of passing interest. I now know that it is the design that pleases me most, and building is less pleasure, with flight-testing almost a dislike." Perhaps Herb Weiss, of Palos Verdes Peninsula, in California, may have the ultimate answer: "I hear that 'virtual reality' can now be tried out in arcades for about a dollar a minute. In about five years it should be possible to put on a headset and feedback-gloves to build and fly models in 'cyberspace'—much more interesting and practical applications of the technology than the 'cyberpunk' stuff the science fiction authors are visualizing.

SAY AGAIN, PLEASE

Bill Kincheloe, of Magalia, California, read our review of the VIP *Double Menace* Twin Mustang book, and had this recollection: "I chuckled and wondered if anyone else had a startling and embarrassing introduction to the P/F-82. In early 1946, while working as

an enlisted control tower operator at Tinker Field near Oklahoma City, I noted that I had only one arrival, Army 745 (or some such number), scheduled for mid-morning.



Nate Sturman's beautifully photographed rubber-powered Nakajima Ki-43-II Hayabusa was built from scratch, and is a very light, stable flier.

When the call came, I replied with the tower litany, 'Army 745 you are cleared to enter left-hand traffic landing runway 17. . . .' In a few minutes I looked out to try and locate the airplane and saw two P-51s in close formation streaking by the south border of the field to enter the

traffic pattern. In those days a formation of planes would be identified only by the call number of the flight leader, so having two planes and one call wasn't unusual. The operations officer had banned 'tactical' approaches at Tinker so I called, Army 745, Tinker tower, break formation and land separately."

RESULTS FROM BELGIUM

According to Bernard Delhalle, the 18th annual international indoor contest in Belgium was very successful, attracting 169 models representing Belgium, the Czech Republic, England, France, Germany, The Netherlands, Japan and the USA. Of the six

ior, an Aichi, a P-40 and a Jodel.

The next most popular class was "Sainte-Formule," rather similar in scope to the U.S. Manhattan Cabin class, which garnered 31 entries. The Pistachio category, which permitted proxy entrants, attracted 23 models.

Space prevents us listing the winners, however, judging from reports received, everyone was a winner, basking in the friendly ambience of this remarkable meeting. Plan now for the 19th annual!

INTER-GNATS

Speaking of Pistachios, Dr. John Martin and his fellow Florida fliers have announced their next contest, to be conducted on January 14-15 at the Dade County Youth Fair. Rules are simple, entry is free, and every entrant will receive a souvenir plaque. Proxy entries are invited, so why not give it a go? For full details, send an SASE (overseas readers send two International Reply Coupons) to Dr. John Martin, 2180 Tigertail, Miami, FL 33233.

AND IN THE NETHERLANDS

While doing your long-range planning, consider Interscale '95, to be conducted on 18-20 August, 1995 by the Aeromodeling Section of the Royal Netherlands Aeronautical Association. This indoor free flight scale model competition will include Pistachio, Peanut, Rubber (larger than Peanuts) and combined CO2/Electric. English and Dutch will be the official languages, and complete information may be obtained by sending two International Reply Coupons (available at most post offices) to 1995 Interscale Organizing Committee, P.O. Box 2060, 6201 CD Maastricht, The Netherlands.

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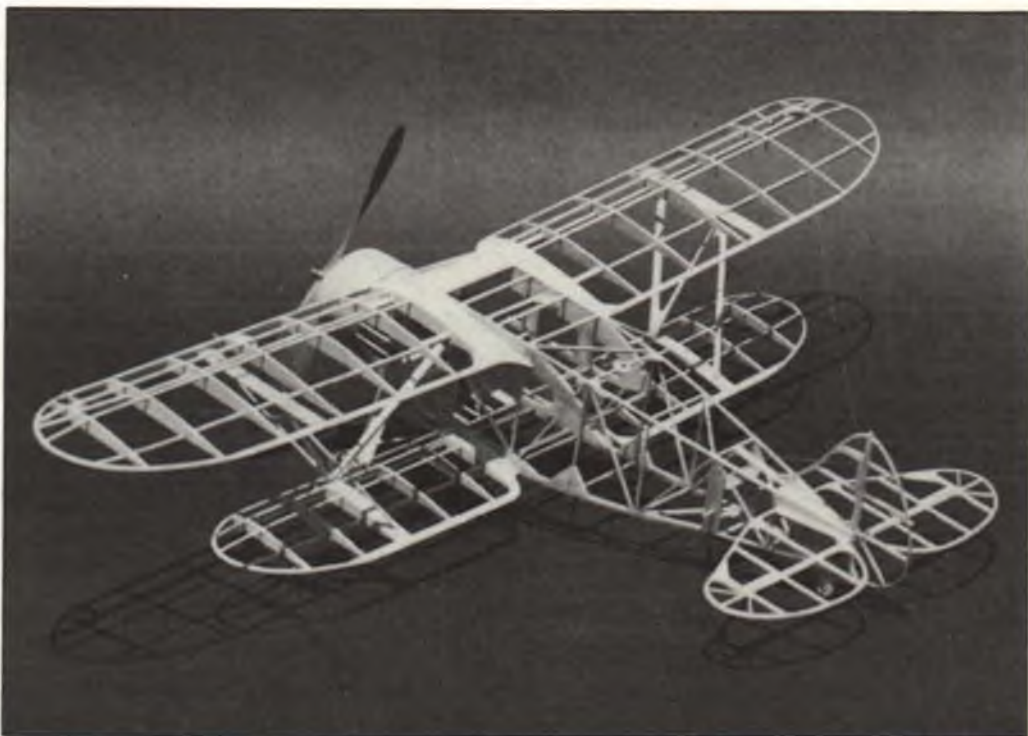
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HANNAN'S HANGAR



The stunning structure of Bob Schlosberg's 31-inch span Waco Coast Guard EQC-6 was based upon an enlarged Comet III plan.

has announced two new semi-kit designs for rubber-powered stick-and-tissue models. Actually it is one design, the Lockheed Vega, in two different sizes. The 26-inch span version includes computer-drawn plans and all patterns, a construction manual, a Peck-Polymers plastic propeller, prop shaft and nose bearing, molded plastic wheels, vacuum-formed wheel pants and your choice of black, red or blue decal markings sheet.

A smaller 13-inch span Peanut Scale variation is similarly equipped, except lacking the formed wheel pants. The customer furnishes the sticks and tissue, and may convert either size to electric power if desired. For additional information about these semi-kits, send a SASE to ScienText, 48 Whitney St., Westport, CT 06880-3753.

THE "BUTTON" DT

Bob Munson, of Wheels & Wings, sent samples of his miniature dethermalizer timers, which are impressive for their tiny size, extremely light weight and fine workmanship. Small and light enough to install in hand-launched gliders, they totally eliminate the fire hazards of DT fuses

and weight and complexity of mechanical timers.

"Buttons" are made of Delrin plastic with stainless steel shafts, and contain a viscous medium which serves the "timer" function. Simple in operation, they are difficult to describe in words. Suffice to say the pull of an elastic band turns an internal rotor through the viscous medium very slowly, unwinding a line leading to the model's pop-up tail or other dethermalizing arrangement.

Time delays are easily adjustable, and dual-function Buttons are also available, suggesting other possible uses. How about retractable landing gears on small flying scale models? Buttons cost about \$20, a real bargain to prevent your model from vanishing over the horizon. For more details, send the usual SASE to Wheels & Wings, 1908-C Tice Valley Blvd., P.O. Box 221, Walnut Creek, CA 94595. Please tell Bob that *Model Builder* sent you!

SIGN-OFF

Byron Velcro, of Canada, sent in his definition of tact: "The art of telling people where to go, in such a nice way that they actually anticipate the flight." **MB**



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I'm already using its SoftCenter feature, so my flying is nice and smooth around neutral. Next, maybe I'll add a second aileron servo for flapperons—then

start using its flap-elevator compensation capability.

Later on, the 622's switchable aileron-rudder mixing will be perfect for the big Cub I'm building. And maybe I'll even try a helicopter!

What's more, the 622 comes with that dandy little FM receiver that has JR's patented ABC&W circuitry for extra-effective protection from interference.

So before you buy another ordinary radio, ask your dealer to show you an XF622. You may not be a pro either, but after a season or two with your 622, who knows?



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Helicopter World

BY JAMES WANG



Notes From The 1994 Schluter Cup

James talks about some of the neat stuff seen at the seventh running of one of the biggest U.S. helicopter contests.



■ FAR LEFT: The 1993 World Champ and 1st placer at the '94 Schluter Cup, Curtis Youngblood, with his wife, Julie. Curtis is now affiliated with Robbe/Schluter and brought two highly modified Futuras to the Cup. ■ LEFT: Close-up of Curtis' modified Schluter Futura. Power is an O.S. .81 8FN ABC with V-Tech pipe. Cutaway sweepplate and graphite tailboom help to reduce overall weight to only 10 pounds. ■ ABOVE: The huge horizontal R on Curtis' FAI Futura enhances forward flight stability. Note the graphite arrow in R for tail rotor pitch control and the rigidly attached tail rotor hub.

The Schluter Cup, named in honor of Dieter Schluter, designer of the first successful commercial RC helicopter, is one of the biggest helicopter contests in the country. The 1994 meet, the seventh in the series, attracted 56 pilots. The top four placers in each category received a plaque, and all of the fliers and judges were awarded a Schluter medal. Pica/Robbe provided the majority of the prizes, including a Futura kit, two Moskito kits, and many Schluter accessories. Kalt, JR, Horizon Revolution and KSJ accessories lines, Futaba, S&W Fuel, Hel-x, Hobbies & Helis, GS Hobbies, Pica Enterprises, Altech, Higher Dimension, State Line Hobbies and Yale Hobby Mfg. also contributed prizes. No one went away empty-handed! As in the past, the meet was ably organized and run by the West Windsor RC Club of New Jersey.

All eyes were on 1993 World Champion Curtis Youngblood, who was signed on by Robbe/Schluter this past year as a full-time pilot and consultant. In just a three-month period, Curtis won 1st place in three major contests: the HATS, the Gauntlet, and the Schluter Cup.

At the Schluter Cup and also at the 1993 Gauntlet, I had the opportunity to closely examine Curtis' new Futura helicopter and watch him fly. At the Gauntlet I also met his lovely wife, Julie. Julie says Curtis works on his helicopters every day, generating new ideas for Robbe/Schluter. He also makes five practice flights every day. An enviable life!

Curtis' two Futuras are highly modified. He flew one for the FAI routines and the other for the hotdogging demo. The two each weigh only 10 pounds and are identical except for minor

Helicopter World



Miniature Aircraft USA's Ted Schoonard flew his beautiful and very fast X-Cell Pro with the new Windstar Impelage. They got James' vote for the best looking bells at the Schluter Cup.



The huge cropdusting helicopter manufactured in Japan by Hirobo/Yamaha. Rotor diameter is 8 feet, and the flying weight is 100 pounds—too heavy to be permitted to fly at the Schluter Cup. It sells for around \$35,000.



■ ABOVE: The Bell-Hiller main rotor head on the Hirobo/Yamaha machine is a replica of the Hirobo Individual Flapping DDF rotor head design from the 1980s.

■ ABOVE RIGHT: The Hirobo/Yamaha's belt-drive tail rotor hub is a modified Shuttle metal main rotor hub. Each tail blade can flap individually and has a built-in cooling angle. ■ RIGHT: There's lots of equipment under the big bell's hood, including a water-cooled 100cc Yamaha engine, radiator in the nose, special worm gear servos to control the swashplate, etc. More details in text.

setup differences. Both have a graphite tailboom and a solid metal tail rotor hub similar to that on the Schluter Champion. The metal swashplate has been custom machined to eliminate excess weight. On the stock Futura, the flybar sits inside a steel tube at the center of the rotor hub; Curtis' flybar is supported by two ball bearings sitting inside a machined metal seesaw. The main rotor blade grips are new. The thin X-Cell control paddles are used for quick control.

On his FAI Futura, Curtis uses a 10-inch wide fibreglassed balsa horizontal fin to enhance forward flight stability; his hotdogging Futura uses the horizontal fin from the Robbe/Schluter Moskito with the lightening holes left open to reduce the fin's effectiveness. The tail rotor uses NHP's lightweight graphite blades. A torque tube is used for the tail rotor drive. Tail rotor pitch control is via a 1/4-inch diameter graphite arrowshaft. The canopy is Curtis' own design and may eventually be included in Futura kits.

Curtis uses a rotor speed of 1750 rpm in both hover and forward



flight. His engine is a modified O.S. .61 SFN ABC with Don Chapman's V-Tech tuned pipe, running on Powermaster 15 percent nitro fuel. The engine ran so smoothly, it sounded like a turbine or an electric motor. During aerobatics, the model wasn't moving fast at all—I estimated it was doing only 50 mph—but the maneuvers were smooth and graceful.

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Helicopter World

On Sunday, someone brought out a huge Hirobo/Yamaha helicopter for display. This thing is impressive! The main rotor is about 8 feet in diameter, and the engine is a water-cooled 100cc Yamaha. The mechanics are manufactured by Hirobo in Japan. The helicopter weighs 100 pounds and carries half a gallon of fuel, which is good for an hour. The

country for hire as cropdusters. Unfortunately, because of its weight, the machine is not covered by AMA insurance, therefore it could not be flown at the Schluter Cup.

Fourth place winner in FAI, Tom Dooley, had an interesting new power source for his Hirobo Eagle. Tom was using one of the prototype YS .90 Air Chamber four-strokes. The Air Chamber concept forces more air into the engine, but it's not a mechanical supercharger. In flight, Tom's Eagle was cooking! I've flown Robert Gorham's Eagle with the same YS .90; I estimate Robert's was moving at 80+ mph. With the four-stroke engine, the helicopter's main gear ratio must be reduced from 9:1 to about 7:1. Tom says the YS Air Chamber engine has double the fuel efficiency of a standard two-stroke and more torque than a two-stroke .60.

Ted Schoonard of Miniature Aircraft USA brought a pair of gorgeous X-Cell Pros with his new Windstar fuselage. These two had to be the best looking helicopters at the meet. Ted flew them very smoothly, too. Both are powered by O.S. .61 SFN ABCs that Ted modified himself, and use the MA Nitro muffler/pipe and 30 percent nitro fuel. The sleek Windstars were probably also the fastest models at the contest.

Most of the seasoned fliers have beautifully crafted wood crates to transport their helicopters as airline luggage. One chap who works for a major U.S. airline flew to the Schluter Cup from San Francisco, carrying his X-Cell

60 Custom on the plane with him in a duffel bag because, as an employee of the airline, the airline would not insure his luggage. (The benefit is that he can fly coast-to-coast in first class for only \$15!) To fit the X-Cell in the bag, he had to remove the rotor head, main blades, main shaft, starter cone and tailboom. He says he was quite surprised that after he reassembled the helicopter and test flew it, there were absolutely no trim changes needed.

In 1995, we may see more than one Schluter Cup. Pica/Robbe is considering having a Schluter Cup fun-fly. The winner would receive an all-expense-paid trip to participate in the Schluter Cup fun-fly in Germany. I bet that will make the Schluter Cup even more popular! **MB**



Ray St. Onge, a field rep for Miniature Aircraft USA, put on an excellent 3-D hotdogging demo with his X-Cell Custom Graphite during one of the lunch breaks.

swashplate is controlled by three specially made worm-gear servos; standard quarter-scale servos are used for the tail rotor and throttle. A Futaba 153 dual rate gyro is used for stabilizing yaw. The tail rotor is a belt drive setup. The tail rotor hub is a modified Hirobo Shuttle metal main rotor hub. The main rotor head is identical in design to the Hirobo individual flapping DDF rotor head from the early '80s. Both main and tail blades are fiberglass.

The owner of this particular machine is independently wealthy and bought it strictly for fun. However, in Japan, these helicopters are used for commercial cropdusting and photography. About 50 of these \$35,000 Hirobo/Yamaha helis are flying in Japan. Each is operated by a two-man team, and the teams travel around

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PLUG SPARKS

BY JOHN POND

• Readers Write • The Pepperel Godwit .098 • Alan Orthof's "Redwing"

Every so often, in reviewing the various SAM Chapter newsletters, we run across a terrific photo that's too good to pass up regardless of whether or not it will make a complete article. We are specifically referring to the Michigan Antique Modelers (MAM), under the aegis of Karl Spielmaker, who runs the annual SAM 4 Michigan Antique Modelers Contest. Despite a very windy day (up to 17 knots) at the 1994 meet, the turnout and flying times were quite good.

What struck our interest was the MAM newsletter cover photo of Elmer Jordan (Photo No. 1), who exhibits what this writer considers what the SAM movement is all about. The smile on Jordan's face speaks volumes for the sheer enjoyment of the sport. Incidentally, Elmer is a very competitive modeler, entering and flying in five gas events at that contest.

Another reason for reporting this meet is to again emphasize the gain in popularity the Jimmy Allen Races are enjoying at each subsequent meet. Just about the time this writer thinks he has all the Jimmy Allen designs cornered,



Photo No. 1. Think Elmer Jordan is enjoying himself? You better believe it! Karl Spielmaker took this photo at the annual Michigan Antique Modelers contest (sometimes referred to as the "Mini SAM Champs") this past summer.

up pops Ed Branch with a Canadian version of the Sky Raider, known as the "Skokie"—see Photo No. 2. Incidentally, despite Ed's burning of the midnight oil, the model literally flew off the board and placed 2nd at the MAM contest with a fine flight in the heavy wind. (These late-night building sessions are what this columnist calls a "Midnight Ace." Starting early in the evening, a pot of coffee is put on and work does not cease until the model is complete. Man, does this writer ever enjoy those long sessions, especially with company!)

PHOTOS, PHOTOS!

We don't have a leader item this issue, hence, we will fall back on what *Model Builder* readers have been sending in.

Seen in Photo No. 3 is a little-seen Bay Ridge Thermal Magnet as built by Jack Ross of Ohio. Jack faithfully followed the plans even to the installation of a Brown Jr. This attractive design has neverthe-

less failed to find favor with today's O.T. modelers, as the kit was issued late in 1939, well past the Antique cutoff date.

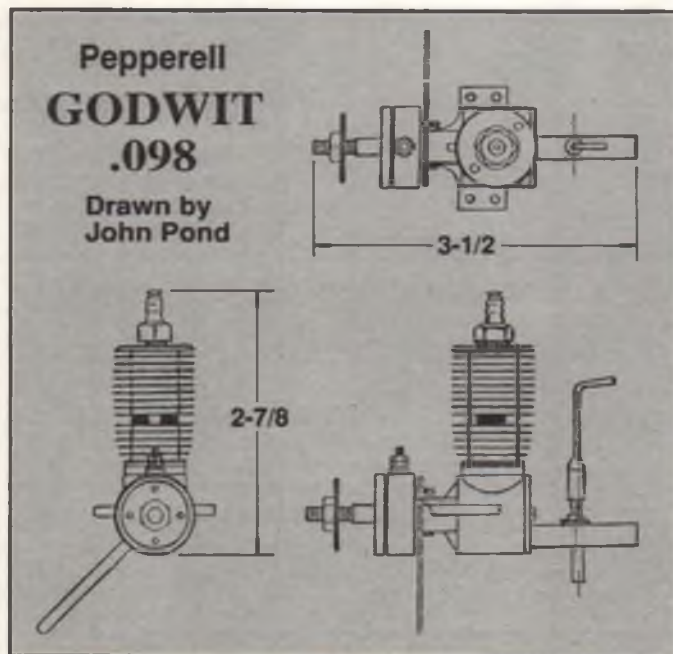
We haven't run a shot of Jerry Persh, of the CAAMA Club in Virginia, in a long time. Jerry has been a regular contributor of photos, primarily of O.T. rubber-powered models such as the Henry Struck Flying Cloud (Photo No. 4). Jerry built the model to 3/4 size because of the small flying fields in his area. Sizing down doesn't prevent flyaways, but there is less chance of it than when flying the biggie. Like the old saying goes, "A good big man will beat a good little man every time" . . . or darned near!

ENGINE OF THE MONTH

It remained for the Australian SAM newsletter *Duration Times* to arouse the interest of this writer about engines made in Australia. For those unaware, Ira "Peps" Pepperel was the Gordon Burford of New Zealand, as he turned



Photo No. 2. Ed Branch shows his Jimmie Allen "Skokie," the little-known Canadian cousin to the J.A. Sky Raider. Despite the brisk winds and the fact that he finished the model on the field that morning, Ed placed an excellent 2nd in the MAM annual's Jimmie Allen event.



ENGINE OF THE MONTH

out countless varieties of spark ignition engines.

The consumption of these engines is incredible when one considers the whole population of New Zealand (two islands) is not much more than two million. However, the drawing appearing in the "Oz" publication served to spur interest.

MECA's Dick Dwyer had made an extensive tour of New Zealand, collecting an imposing array of Pepperell engines in the process, one of which is the Pepperell Godwit .098 illustrated here. This columnist wishes to thank Dick for his unselfish generosity in allowing the writer to use his engine for the drawing.

Ira Pepperell started back in 1945, following the footsteps of his father in producing badly needed engines. (In an effort to promote local manufacture, the Australian government had imposed extremely high tariffs on any imported engines.) One of his first spark ignition engines was the Godwit .098, which incorporated all the features of American

engines—timer housing, needle valve assembly, etc. Bore and stroke were .500 and .625 inch respectively. The Pepperell engine was a rear disc induction type with the intake pipe at the bottom position (somewhat reminiscent of the Forster .29), which could make fuel tank installation a bit awkward.

The Godwit sold quite well until 1946, when the engine designs were changed to diesel and/or glow. The name "Godwit"

was dropped in 1946.

MODEL OF THE MONTH

In 1938 Frank Zaic found that he would be unable to continue with his famous Year Books, which were so outstandingly successful. Several attempts were made by others to produce similar publications, but it remained for Fawcett Publications to put out an annual softbound volume known as the *Model Builders Handbook*, the first of which appeared in 1939. Each issue featured perhaps a half-dozen construction articles spread over the spectrum of model types. Prominent writers/designers were recruited from *Model Airplane News*, *Air Trails*, *Flying Aces*, etc. This was not a problem, as there were always more de-

Among the first free flight designs appearing was the Redwing, a design by Alan Orthof, a regular contributor to *Flying Aces*. Attempting to take advantage of the huge popularity of the Ohlsson .23 engine, this design was aimed at those urban modelers wishing to build a small model that could be flown within city limits.

The Redwing incorporates several features found on earlier models, most noticeably the forward location of the landing gear. Commercially made propellers were not that plentiful, so many builders (including this writer) used this type of gear, as protecting the prop was a paramount concern. The wheels were quite large (3-inch diameter on a 48-inch model!), which reflects the lack of smaller sizes

MODEL OF THE MONTH



Designed by Alan Orthof, published in the 1939 issue of *Model Builders Handbook*, a Fawcett publication. Specifications: Wingspan 48 inches, wing area 325 square inches, overall length 34-1/2 inches, original power was an Ohlsson .23. Minimum required weight for SAM FF events is 18 ounces; 23 ounces for RC. Construction: The Redwing features a typical V-dihedral wing (4 inches at each tip) with a short 2-1/2 inch wide flat center section. The airfoil is an unspecified RAF type section. Three 1/8x1/4 spars are used, and the leading edge is sheathed with 1/32 balsa on top only. The fuselage is a strong box structure of 1/4 square balsa, with 1/4 and 1/8 square diagonal bracing. The nose section is sheathed with 1/16 balsa to just behind the wing. The engine is uncowled on top. Tail surfaces have a symmetrical airfoil section and a single 1/8 square spar through the middle. Full-size plans for the Redwing are available both from John Pond O.T. Plans and *Model Builder Plans Service*.

signs available than could be published in the major model mags.

available at the time. To the best of my recollection, M&M, Trexler and others never

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PLUG SPARKS



Photo No.3. Bucky Walter (left) gets a good grip in anticipation of the tremendous thrust generated by the mighty Brown Jr. in Jack Ross's Thermal Magnet. This 1939 Bay Ridge Models design could be a real sleeper in RC O.T. competition.



Photo No.4. A small field requires a small model. Jerry Parsh of Nokesville, Virginia launches his 3/4-scale rendition of Henry Struck's Flying Cloud.

duced gas model airwheels in sizes smaller than 3 inches. It wasn't until later that Comet, Cleveland, etc. started to produce hard balsa wheels in 2-inch sizes, which fit these smaller models very nicely.

TOM MORRISON'S SUPER CYCLONES

I had no sooner given Tom Morrison a plug for his back-in-production Super Cyclones than I received a phone call from Walter Huhn of Covina, California, who reported Tom's passing on September 4, 1994—just prior to the SAM Champs which he so much wanted to attend.

Tom bought the manufacturing rights to the Super Cyclone engines in 1983, remade the molds and proceeded to turn out excellent engines until severe health problems a few years later brought production to a halt. Tom's death comes as a real shock, as it was only recently that he was feeling well enough to get back in his shop and resume building those beautiful Cykes.

On a happier note, Walt Huhn reports that Anita Morrison (Tom's wife) will continue with the sales of Super Cyclone engines and parts. Walt will be doing the actual machine work and assembly and will be assisting Mrs. Morrison with the production of parts and services needed to get deliveries up to date and restore older engines back to running shape.

Super Cyclone Motors is located at P.O. Box, 1809, Show Low, AZ 85901. Walt Huhn can be reached at Apollo Motors, 665 Chapparo Rd., Covina, CA 91724. This writer is delighted that Super

continued on page 64



Photo No.5. The Super Cyke is back! See text for details.

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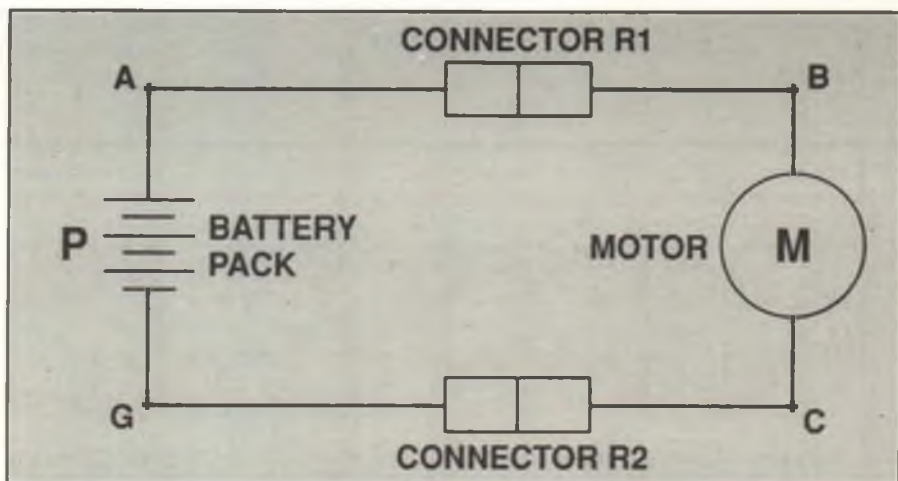
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ELECTRIC POWER BY ROGER JAFFE

AN OHM'S LAW PRIMER

Understanding the basic laws of electricity can go a long way toward getting the most out of your E-power systems. Also discussed: Avoiding the dreaded "E-modeler's rut."



A typical electric motor hookup. The quality of those connectors and the quality of your soldering job can make a huge difference in performance—details in text.

I'm trapped in one of life's most devious and insidious situations—especially so because it involves my hobby! I fell into a "modeler's rut" a few months ago, that particular situation where modeling takes a back seat and other things have to take priority—like work, my wife, my children, home repair and maintenance, etc. A terrible situation!

Every time I think I really should build a new plane, the other (more practical side) of my brain says no, you already have too many things to do already—the kids, school, PTA, Little League, work, computer programming, etc., etc.

Then, just in one day, four things happened that started me thinking about my hobby:

THE NEWSLETTER

An article in the September 1994 issue of the *SEFLI* newsletter talked about the *Fantasy Fliers* newsletter being started by Larry Haralambou. Larry has undertaken the ambitious yet rewarding project of starting a newsletter directed at the young RC newcomer. It will be aimed at this audience with low-tech, instructional articles and will feature at least three projects per issue. He wants to begin publication in the spring and maintain a schedule of six issues per year. He's going to need lots of material—fast! Now's your chance to put in your two cents' worth and expose young minds to what is becoming the wave of the future—electric flight! Be a teacher; send your contributions to Larry Haralambou,

Fantasy Fliers, Inc., P.O. Box 430, Farmingville, NY 11738-0430. You can also write to Larry for subscription information.

THE DURATION FLIGHT

An article in *The Silent Beacon*, the newsletter for the Watts-Up Electric Flyers in San Bernadino, California caught my eye. It was about Jerry Smart, one of the club's long-distance members, who entered a Lanzo Bomber in an electric duration contest. His winning time was over 75 minutes. He uses a Swiss Maxon motor that runs on 9 volts and draws only 1.5 amps (yes!) on an 18- to 20-cell 1250-mAH battery pack. The motor has a 5:1 gearbox and swings a 16x16 prop. Duration is an event I haven't tried yet. It sounds like fun and would be a great challenge.

THE NOISE

That morning, I had gone out to fly at the parking lot of a nearby stadium. The only other pilot there had a brand-new, never-flown Sig Spacewalker (really a beautiful plane) with a large, unmuffled Tartan twin engine. He fired that baby up and being a little bit too scared to fly it, just ran the engine up and down over and over in the pit area, annoying every living thing (and a few dead things too) within a half-mile—including me.

When he finished his throttle exercise, I picked up my Stik-E (the one with the Aveox brushless motor I reviewed a few months ago), placed it on the runway and, in a gesture of friendship and harmony to nature and the people in the surrounding office buildings, silently took off and had a wonderful 8-minute flight around the parking lot.

THE SPECTATOR

During my time at the stadium, there was a spectator taking in all the action. He was just passing by, saw us in the parking lot and came by to investigate. He said he had never flown RC and that started me thinking. Usually, I bring a trainer cord and an extra transmitter with me in cases like this so I can volunteer for a bystander's first flight. This time I had forgotten my other transmitter and wasn't going to be able to offer a "get your feet wet" flight. There have been many times when that gesture was enough to crumble the wall and show potential RC'ers that there's no secret handshake required to participate. Unfortunately, he went his way and I had to go mine, and so he never got the chance to try it out.

HOW TO GET OUT OF THE RUT

Later that evening, as I was doing my best imitation of a couch potato, I got to thinking about my day and why I haven't really been interested in building or flying lately. I've been building the same types of planes, flying at the same field, using the

same radio and motor systems and the same construction techniques for so long that I needed a rest. Like a plant that has gone dormant for the winter, my modeling desire went dormant until something came along to give it a good kick in the pants.

The newsletter is something I've often thought about doing. I've edited club newsletters for many years and something like this would be a great challenge. Of course, doing it for youngsters always gives me great pleasure. Electric duration is an idea whose time has come. Here's an activity where one can apply technical knowledge and skills from many disciplines to do something no one else has done. The beautiful but noisy Spacewalker was pleasant to look at—right up to the time its owner fired up the engine. Of course, the real question was "How can I make that one electric?" And finally, just about every time I fly at the stadium, there's an interested group of spectators. The times that I have brought a plane suitable for training newcomers, I let them fly it, they get this great big smile on their faces and another fish is hooked!

These four things have given me that kick in the pants and I am happily pursuing my modeling hobby again. I get to demonstrate an RC blimp at my children's school next month, and I just purchased a rocket-launched RC glider to use with a friend of mine who is doing a model rocketry class at another local elementary school. (It's not electric, but it would make a good kit-bash!). I'm also planning to build a new plane, the plans for which I picked up at last year's International Modeler Show in Pasadena. It features a very low aspect ratio wing—something I've been interested in investigating ever since my flights with an electric-powered Lacey M-10.

AN OHM'S LAW PRIMER

I had a phone call the other day from a reader who needed some information about motor selection and how to match motors to battery packs. On a more basic level, he really wanted to understand the relationship between voltage (number of cells), current and power. As I tried to explain the basic laws of electricity to him, it got a little confusing, so I thought I'd make it a topic for this column.

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$$V = AR \text{ or } A = V/R$$

continued on page 72



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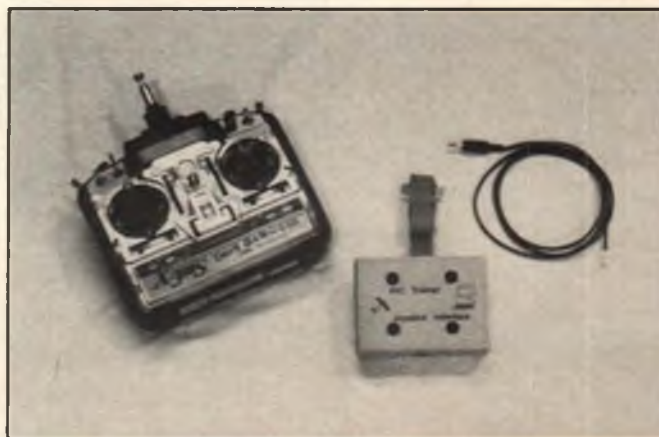
The Dave Brown RC Flight Simulator and Computer Designs RC Trainer/Joystick Interface

The Dave Brown Simulator takes a big leap forward with new features and refinements made to the 10th anniversary edition of the program.



This is what the screen looks like when the program is first started; the high-wing trainer plane (one of 10 pre-programmed airplanes in the system) is shown in default position. The satellite view at the upper right shows the plane's position as a yellow dot at the junction of the two runways.

■ **BOTTOM LEFT:** The complete Dave Brown RC Flight Simulator kit comes with a diskette, a Joybox "transmitter" controller that plugs into your computer's game port, and an instruction manual. ■ **BOTTOM RIGHT:** The Computer Designs RC Trainer/Joystick Interface and cable let you run the RCFS with your own transmitter—in this case, the author's JR X-368S. Cables are available for many transmitters with trainer cord plugs.





The high-performance electric glider on a low pass. The readout along the bottom shows the plane is 20 feet away (DIST), is flying at a true airspeed of 100 mph (TAS) at an altitude of 8 feet (ALT).



The ducted fan model clears the far pylon at 177 mph. The green light on top of the pylon signals that the model has cleared the pylon and can turn.



One of the 10 selectable RCFS-4 helicopters hovering a foot above the ground. Background mountains and compass rose markings in the field help with directional orientation.



The helicopter approaches the pads of one of the two competition course areas in the program; the other features user-adjustable limbo poles.

The battle for the best in model aircraft flight simulators is being actively fought in three or more computer programming shops. Reviewed here is Version 4 of the Radio Control Flight Simulator, programmed by John Kallend and developed and marketed by Dave Brown Products.

I'm happy to report that the features and performance are up and the price is down as compared to the RCFS Version 2.1 I reviewed in the October 1991 *Model Builder*. RCFS-4 looks better, sounds better, and simulates more RC aircraft than the previous version, and positions Dave Brown Products as a major contender for Top Gun in the RC simulator battle.

To triangulate my own impression of the software, I enlisted the assistance of Larry Burwell, an RC simulator fan and RC helicopter pilot; and Bob Powers, an exceptionally steady RC flier with 25 years of airplane, helicopter and sailplane experience.

HARDWARE REQUIREMENTS

While RCFS-4 will run on an IBM PC or compatible 286 computer, a 386 or 486 processor is desirable, preferably with VLB or PCI bus architecture to give a high frame rate for a smoother display with

graphics features switched on. RCFS-4 requires EGA or VGA graphics; CGA is no longer supported. RCFS supports three types of controller input: 1) a "standard" game port—either the one on your sound card or a separate dual joystick card; 2) the Genovation parallel game input that plugs into your printer port; and 3) the Colorado Spectrum serial game port, which plugs into a serial port or the mouse port.

While not required, RCFS supports Sound Blaster, Adlib and compatible sound cards, enabling simulation of engine sounds. RCFS versions are available for Commodore 64/128, Apple II, II+, IIe and IIgs computers, but these versions have fewer features.

Testing for this review was done with RCFS Version 4.0 running on a Packard Bell 1500 computer with an Intel Pentium 60Mhz CPU chip. The machine uses an ATI SVGA video controller card and a Forte 16 sound card, which emulates a Creative Labs Sound Blaster. The RCFS-4 program installed easily and ran flawlessly on this computer.

PROGRAM DESCRIPTION

To get you started quickly, RCFS-4 has pre-loaded 10 different airplanes and 10

helicopters. Visually, six airplane shapes are presented on screen, but the flight characteristics are much more varied and respond to user-settable parameters such as stall speed, roll stability, aileron sensitivity, drag, spin/snap threshold and fuel supply. Settable helicopter parameters include tail rotor mixing, rotor inertia, cyclic roll sensitivity, cyclic pitch sensitivity, and more.

In addition to fuel powered airplanes and helicopters, the RCFS-4 includes an RC rocket glider and an RC sailplane. The rocket launches with a fast and furious blast, then comes down like an aerobatic slope glider. The sailplane is not a polyhedral floater, but a rather high performance aerobatic electric sailplane—a 10- to 14-cell screamer, I'd say. The helicopter shapes are the same, but colors of the parts can be varied by the user. The on-screen presentation is as if you're looking through a video camera at your plane. The view is two-dimensional and lacks peripheral vision due to limitations of small computer systems. To compensate, the program gives readouts of the model's airspeed, altitude and distance from the pilot.

In practice, these data are difficult to read while flying, so visual cues like ho-

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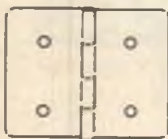
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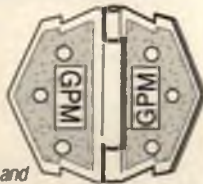
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zizon, scenery and clouds help the pilot remain aware of the speed and height of the simulated plane; the graphic representation of the model itself gives the needed information on its flight altitude and distance away. An additional aid to navigation when the simulated model gets too far away to see is the satellite view, which presents a bird's-eye view of the flying field, showing the dual runway layout and representing the plane as a moving dot. You can get a faraway plane "back to the field" by using this part of the screen display. The simulated model responds accurately to the control inputs given by the user through the special Joybox simulated RC transmitter, or with your own transmitter using a special Computer Designs interface device.

The RCFS-4 instruction manual is clear, concise, comprehensive and well written. The program can be used by people with little or no RC flight experience and modest computer experience.

NEW AND IMPROVED FEATURES

RCFS-4 includes many visual improvements, particularly in the solid images of the aircraft. The mountain, barn and tree scenery adds to the realism. The runways allow landing practice, and the clouds help orientation when the model is above your head. Realism is increased through sound card support; sounds of two- and four-stroke engines, a racing engine and an electric motor are simulated. The program varies the sound volume with distance, and sound pitch with speed and throttle level. Pitch also varies as the plane approaches and departs from your simulated position.

The Instrument Landing System (ILS) landing aid simulates the Visual Approach Slope Indicator (VASI) used in full-scale aviation. When switched on, a box appears above the runway when the model is on final approach. As the plane gets closer to the runway the box descends toward the end of the runway. If you keep the simulated plane in the ILS box, you'll meet the ground at the end of the runway. This feature helps the fledgling flyer set up a proper approach and get the plane back to the runway.

The RCFS-4's ANALYZE utility program lets you specify the numerical parameters of the model you wish to simulate—parameters such as engine size, model weight, wing area, wingspan, dihedral angle, rudder and elevator area, fuel tank size, and more. Default values are suggested, but can be easily overridden. You can refine the settings after flying the simulator a bit. ANALYZE is a terrific improvement over the previous method of just guessing the performance parameters.

THE HOMELY BOX

In contrast to abundant improvements

to the software, the RCFS-4 hardware remains rudimentary. The Dave Brown Products Joybox "transmitter" controller box is a simple vinyl-clad aluminum box with cheaply made sticks and gimbals. The spring tension on the sticks is uneven and the stick feel is poor. The box has sharp edges which irritate the user's hands, especially those who use a thumb-and-finger grip.

On the plus side, the Joybox trim tabs work like real RC transmitter trim tabs and are located in the correct position relative to the sticks. Other RC simulators come with real Futaba or JR radio transmitter shells, but sometimes move the trim tabs to the keyboard—a step away from realistic simulation.

One solution for this comes from an aftermarket vendor, Computer Designs. Systems designer Dan Heide has developed the RC Trainer-Joystick Interface, a device that allows you to use an Airtronics, Futaba, JR, Hitec or Kraft transmitter with trainer cord capabilities to run the RCFS-4, and Dave Brown Products will sell the software separately for use with this device and your own transmitter. During our testing, Bob, Larry and I used both the Dave Brown Products Joybox and the Computer Designs RC Trainer-Joystick Interface, with an adapter cord for the JR X-3885 radio. All three of us preferred running the program with the JR radio, enjoying the famous "JR feel." The Computer Designs unit installed easily, worked flawlessly, and made use of the trims, mixes, and stick rates programmed into the JR transmitter. We have no hesitation recommending the RC Trainer-Joystick Interface as a hardware enhancement to the RCFS-4 program.

(Editor's note: We had a chance to visit with Dave Brown and crew at the RCHTA show in Chicago a few weeks ago, and gave them a copy of this article to review. We learned that "The Homely Box" is presently being redesigned from the ground up. The first improved version, due for release in early 1995, will have much-improved sticks and ratcheted trims mounted in the same aluminum case; a brand-new, ergonomically designed molded plastic case will become available a few more months down the road.)

TESTER COMMENTS AND CONCLUSION

Bob Powers commented about RCFS-4: "It almost sounds real." He felt the stick movements were excessive for realistic control of most of the pre-set planes, and that the lack of peripheral vision was a handicap. He felt the clouds helped in orientation when the plane was overhead.

When Bob tried flying the helicopter he said, "This is real, I can't hold it steady. The stick movements feel like a real one, and it takes a lot of them to keep it

steady—just like a real model chopper." He commented that it was hard to see the helicopter's canopy to see the orientation of the aircraft, but that seeing the rotor disk is a help. "If you keep it in close, it's easy to see, but hard when far out." Bob felt the ILS feature was a good idea that works in the simulation. "It lets me know how far out I am on landing approach."

Larry Burwell comments about the RCFS-4: "The program looks a lot better than before. You now have reference points and I like the way the scenery scrolls nice and smooth, and I like the clouds." He added, "I like the sound, and the way it changes relative to distance and flight direction. The high-pitch two-stroke sound is annoying, but realistic. The improved sound adds more realism to the program."

"The one bad thing is the box—there are no ergonomics. The Joybox is uncomfortable. It has a basic and unrefined feel and the trim tabs have no click stops. I like using the JR transmitter, because when you feel better, you fly better." He added, "The info around the bottom and side is superfluous because you can't read it while you fly. It's like trying to read a newspaper while driving a car—you can do it, but not very well and not for very long. I'd rather see that eliminated and the helicopter image made larger and more detailed."

"RCFS-4 is greatly, vastly improved over the previous version. It's good for training but would require some work to get it set up to fly like your own chopper. All in all, it provides a budding helicopter pilot with a way to fly without damaging his ship."

My own view is that RCFS-4 is a useful supplement to an RC flight training program, for both beginners and experienced fliers who wish to learn advanced maneuvers. The program is worth the cost and is likely to quickly pay for itself in accidents avoided. It also has substantial entertainment value for non-flying days. Both the manufacturer and the three reviewers caution that even with a lot of time on a top simulator, you'll still need to work with a qualified instructor to learn to fly RC airplanes safely, just as in full-scale aviation.

MANUFACTURERS MENTIONED

Dave Brown Products, Inc., 4560 Layhigh Rd., Hamilton, OH 45013; (513) 738-1576. FAX: (513) 738-0152. RCFS program with Joybox, \$169.95; RCFS program alone (no controller box), \$79.95; RCFS program upgrade from previous version, \$34.95

Computer Designs, 8530 N. Montana Ave., Helena, MT 59601; (406) 458-9416. RC Trainer-Joystick Interface with one Tx adapter cable, \$79.95 (specify Futaba, Airtronics, JR, Hitec, or Kraft transmitter model number). MB

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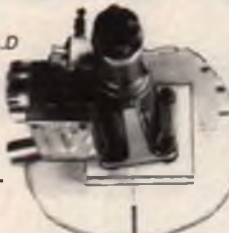
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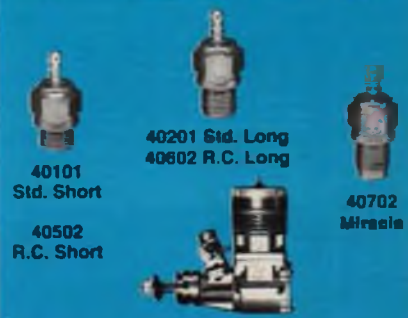
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THE RENARD

R-17

A lesson in how to be boxy with character! Of all the Peanuts that Walt turned out, the almost caricature-like Renard remains one of our all-time favorites. Reprinted from the September/October 1974 *Model Builder*.

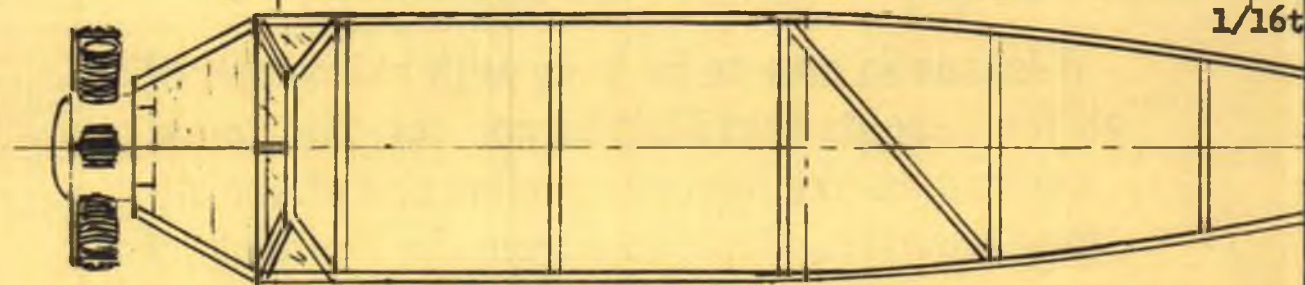
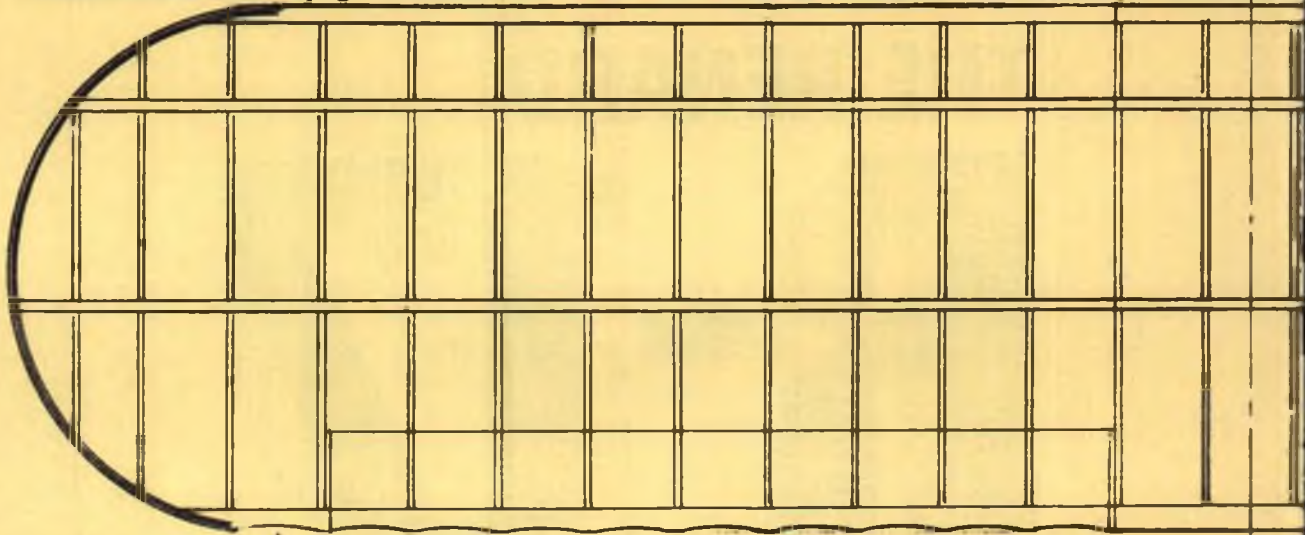
■ BY WALT MOONEY

A few days ago a copy of *L'ALBUM du fanatique de L'Aviation*, No. 55 came in the mail. This translates, I guess, as "The Aviation Fanatic's magazine." That title might even be right. In any case, inside was a nice three-view of the Renard R-17—a Peanut builder's delight. The scale horizontal tail is very small and was enlarged on the model for better flight characteristics, but the rest of the airplane looks like model construction.

The plans presented here are drawn with as scale a structure as possible. Because this results in more structure than is really needed for a Peanut, and because it makes the model heavier than necessary as well as somewhat complicated looking for the beginner, we're going to tell



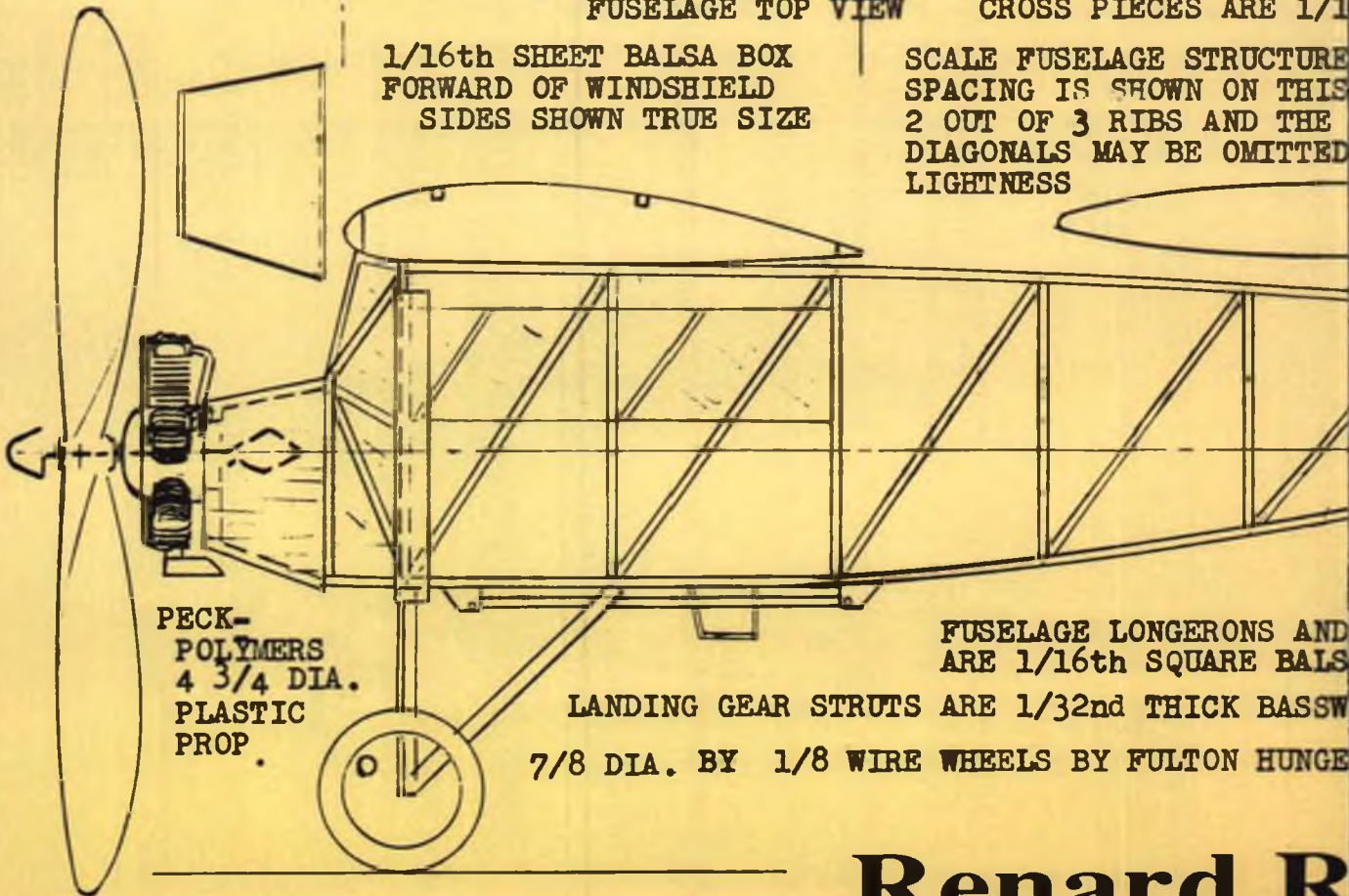
LAMINATED TIPS, 3 LAYERS OF .020 BY 1/16th MODEL RAILROAD BASSWOOD



FUSELAGE TOP VIEW CROSS PIECES ARE 1/16

1/16th SHEET Balsa BOX
FORWARD OF WINDSHIELD
SIDES SHOWN TRUE SIZE

SCALE FUSELAGE STRUCTURE
SPACING IS SHOWN ON THIS
2 OUT OF 3 RIBS AND THE
DIAGONALS MAY BE OMITTED
LIGHTNESS



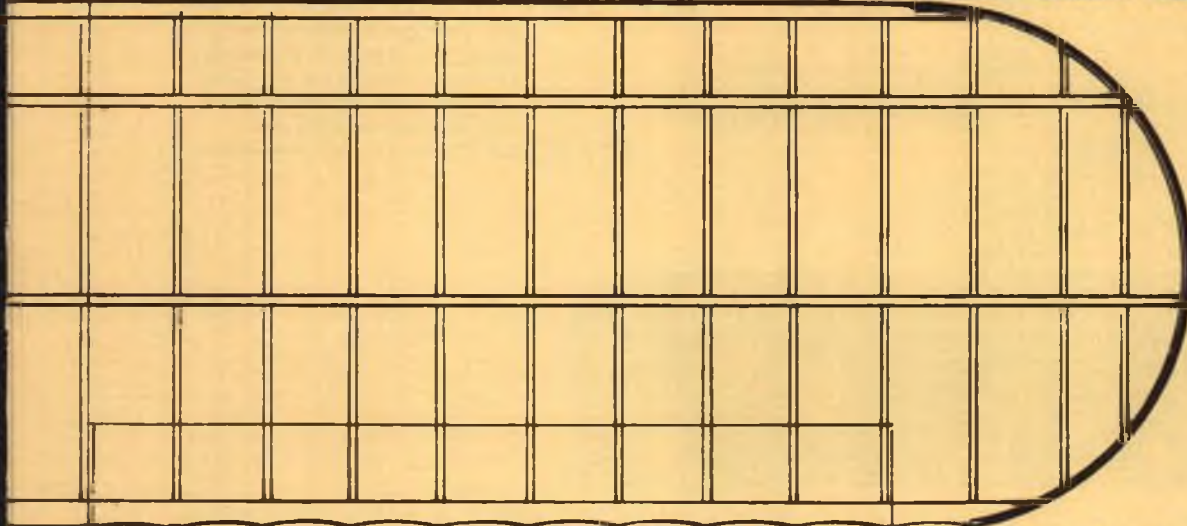
PECK-
POLYMERS
4 3/4 DIA.
PLASTIC
PROP.

FUSELAGE LONGERONS AND
ARE 1/16th SQUARE BALS
LANDING GEAR STRUTS ARE 1/32nd THICK BASSW
7/8 DIA. BY 1/8 WIRE WHEELS BY FULTON HUNGE

Renard R

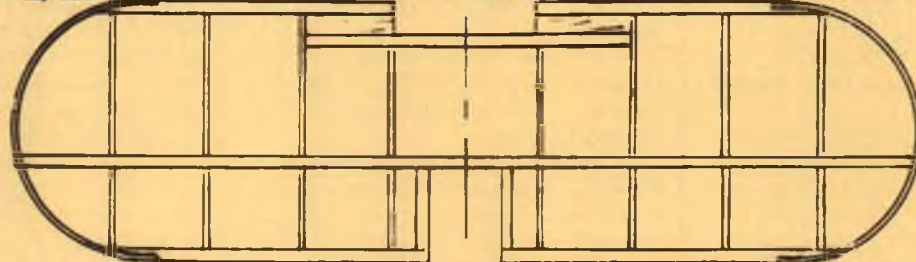
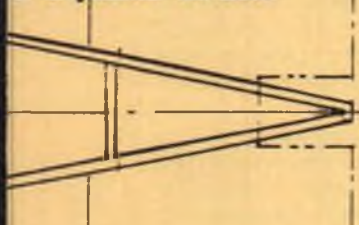
3/32nd BY 1/4 Balsa LEADING EDGE

1/32nd SHEET Balsa RIBS



h SQUARE SPARS

1/16th BY 1/8th Balsa TRAILING EDGES-NOTE SCALLOPS

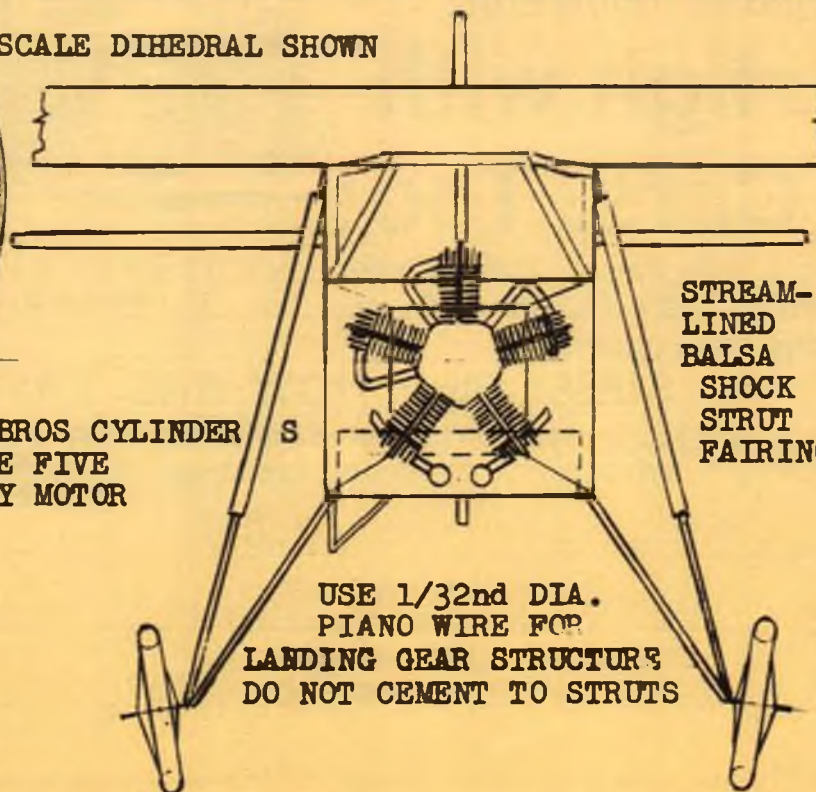
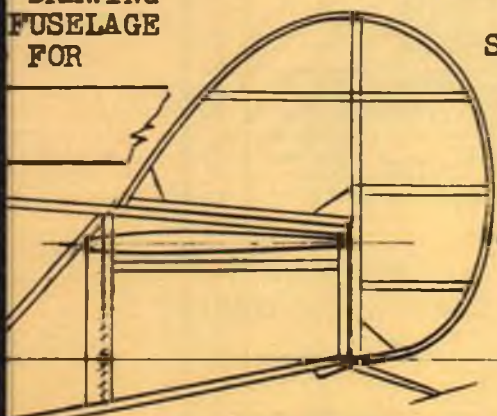


6th SQUARE

AND RIB
DRAWING
FUSELAGE
FOR

TAIL TIPS TWO LAYERS OF .020 BY 1/16th BASSWOOD
TAIL RIBS AND SPARS 3/32nd THICK BY WIDTH SHOWN,
AFTER ASSEMBLY SAND TO STREAMLINED AIRFOIL SECTION

SCALE DIHEDRAL SHOWN



USE WILLIAMS BROS CYLINDER
TO MAKE UP THE FIVE
CYLINDER DUMMY MOTOR

STREAM-
LINED
Balsa
SHOCK
STRUT
FAIRING

UPRIGHTS

OOD OR EQUIVALENT
RFORD

USE 1/32nd DIA.
PIANO WIRE FOR
LANDING GEAR STRUCTURE
DO NOT CEMENT TO STRUTS



Don't worry about the lack of dihedral, the Renard flies well without it. Walt designed it with scale rib spacing and a very nearly scale structure, but explains how you can safely eliminate some of it to make a lighter and therefore longer flying model.

you how to simplify and lighten it.

First, there are many diagonals in the fuselage structure. These may all be omitted. The tissue covering of a Peanut model is more than adequate to take the shear loads that the diagonals took in the full-size airplane.

Second, scale rib spacing is shown in the wings. Starting with the two center ribs, two out of every three ribs may be omitted in the wing. This will leave a rib spacing which is plenty strong and still looks OK on a Peanut.

Third, the same approach can be used for the tail as for the wings. And if you want to save even more weight, pick some light balsa.

Fourth, the dummy engine can only be simulated with something simple, like lengths of soda straw painted black, or something similar.

None of the above changes will affect the looks of the model in flight significantly, but of course, in a scale contest, one built with all the detail will out-point a simplified one in the scale judging. The

simplified one will fly better or at least will fly longer, because it will be lighter.

The Hungerford wheels shown are delightful, but since the wires on the full-size aircraft were fabric covered, simple balsa or hardwood solid wheels can certainly be used.

The color scheme on the original appears to have been overall silver with black trim and registration numbers. The trim consisted of a black stripe along each longeron.

Have fun flying your Renard R-17! **MB**

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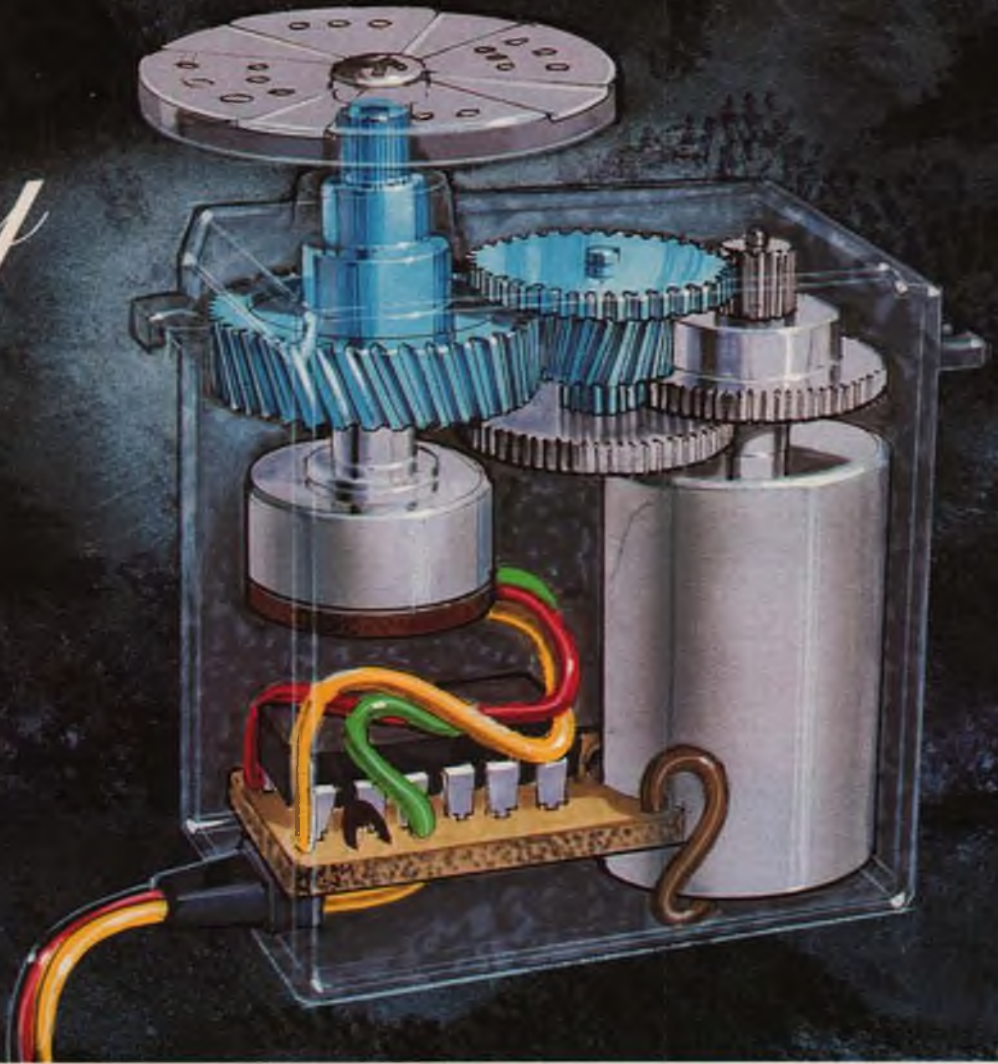
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HS-101 HS-101MG*	Mini servo Metal gear	24 oz/in 24 oz/in	.20 sec .20 sec	NONE	1.3x0.6x1.2	.93 oz 1.07 oz	RCD920 3 servos
HS-205BB HS-205MG	Super mini Metal gear	44 oz/in 44 oz/in	.20 sec .20 sec	TOP BALL BEARING	1.3x0.6x1.3	1.1 oz 1.3 oz	none
HS-300	Std. Sport	42 oz/in	.19 sec	TOP NYLON	1.6x0.8x1.4	1.57 oz	RCD905 4 servos
HS-422 HS-425BB*	Std. Pro Ball Bearing	43 oz/in 43 oz/in	.20 sec .20 sec	DUAL OILITE DUAL BB	1.6x0.8x1.4	1.55 oz	RCD910 4 servos
HS-605BB HS-605MG	Ultra Torque Metal gear	77 oz/in 77 oz/in	.16 sec .16 sec	DUAL BALL BEARING	1.6x0.8x1.5	1.73 oz 2.12 oz	RCD605 3 servos
HS-615MG	Super Torque Metal gear	107 oz/in	.21 sec	DUAL BALL BEARING	1.6x0.8x1.5	2.12 oz	none
HS-700BB HS-705MG	Giant scale Metal gear	133 oz/in 161 oz/in	.22 sec .27 sec	TOP BALL BEARING	2.3x1.1x2.0	3.5 oz 4.0 oz	RCD915 3+1 servos
HS-75BB	Retract servo	90 oz/in	.50 sec	TOP BB	1.7x0.9x1.0	1.3 oz	none
HS-725BB	Sail Winch 4 Turns	161 oz/in	1.62 sec 360 deg	TOP BALL BEARING	2.3x1.1x2.0	3.8 oz	none

* Denotes servo only available with Hitec/JR connector. All other servos available with FUT "J", AIRT and Hitec/JR connectors. Please specify connector type when ordering. All servo packs come with switch harness.

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THE

A REPORT ON THE 15TH RUNNING OF

1994

SCALE MASTERS

BY ELOY MAREZ

Championships



Scale Masters flying is far from repetitious and boring! Here we see the two extremes in entries: 1st place winner Terry Nitsch and his F-86 (which also won Top Gun earlier in the year); and September '94 MB cover subject, Mike Barbee and his 10th place winning DH-82 Tiger Moth.

■ BELOW: LEFT Mel Santmyer's entry was this immaculately built and detailed Super Corsair racer, modified from a Byron Idt. The airplane spans 6 feet, weighs 28 pounds and is powered by a 60cc Sthl engine. ■ BELOW RIGHT: Jeff Foley's colorful "Red Knight" Lockheed T-33 earned him an excellent 4th place overall. The model spans 85 inches, weighs in at 24 pounds, uses an D.S. .91 and JR PCM 10 radio.



RC SCALE MODELING'S MOST PRESTIGIOUS COMPETITION

September 8-11, 1994—once again, a large group of some of the country's most talented model aircraft builders crept out of their respective cellars and garages into California's sunshine for what can truly be called a Gathering of Eagles, the Scale Masters Championships.

This event is the epitome of RC scale model competition, and is not for the faint-hearted, undedicated or unskilled. As such, the number of entries is not high, but then again, everyone who runs doesn't go to the Olympics. Scale builders of this caliber are few, but they came from all corners of the U.S.—and had there been an award for the longest distance traveled, it would have gone to Eduardo Esteves, who was here from Brazil for the second year.

The opening event took place at the Chino Airport "Planes of Fame" museum on the first day for judging, socializing and, for a few lucky raffle winners, rides in full-scale antique aircraft. Top high points in scale judging were awarded as follows:

Terry Nitsch, Columbus, OH—F-86F Sabre, 97.50.
Dennis Crooks, Big Rock, IL—Learjet 35A, 97.00.
Ernie Harwood, Arlington, TX—SE-5A, 97.00.
Jeff Foley, Roanoke Rapids, NC—T-33A, 96.50.
David Hayes, Roanoke Rapids, NC—Ayes Thrush, 96.50.
Diego Lopez, Corona, CA—Skyraider, 96.50.
Shailesh Patel, Eureka, CA—F-14, 96.50.
Earl Thompson, Livermore, CA—DH-89A Rapide, 96.50.
Eugene Job, Santa Rosa, CA—Sea Fury, 94.50.
Michael Barbee, Columbus, OH—Laser 150, 94.00.
Doug Crumley, San Pedro, CA—Decathlon, 94.00.
Dennis Welty, Boring, OR—Nieuport 28C-1, 94.00.
Gene Barton, Garden Grove, CA—Skyraider, 93.00.
Roger Shipley, Springfield, IL—T-33, 93.00.

The flight portion of the '94 Scale Masters took place at the Marine Helicopter Air Station in Tustin, California, in the shadows of the huge blimp hangars for which this facility is famous. Base Commander Col. W. L. Hammerle and his Marines were gracious hosts, providing us not only with as good a runway as anyone could ask for, but all the facilities necessary for the proper and efficient operation of an event of this class. They certainly earned not only our appreciation, but a salute as well.

Frankly, I find the flying at events involving look-alike airplanes and look-alike flights more than a little boring! Yes, they may be being flown by top fliers, but that's part of it—all the

Beautiful C-130H Hercules is a consistent performer for builder/pilot Dave Lovitt. The model has four O.S. .25s, spans 102 inches and weighs only 20 pounds. Features a lot of the detail found on the full-scale airplane, including the Fulton Recovery System, intended to recover downed personnel on fly-by.



flights are alike! Not so at the Scale Masters. Yes, the fliers are all good, and the flight patterns somewhat similar, but the variety of aircraft does not lead to repetitious flights. The sky is often being shared by a WWI biplane ambling along at a snail's pace compared to the sleek jet that just streaked by, while on final approach we see a four-engine transport with wheels and flaps down, reaching for the runway just as they do daily in full size in all parts of the world. This is model aviation at its best, and if we ever become categorized as a spectator sport like baseball and football, it will be scale models that do it!

Three full days of flying very sophisticated, high performance aircraft, and not a single one crashed or was even damaged beyond continuing in competition. I see this as a measure of how far all associated technology has progressed, not to mention the high degree of building and flying skills present.

At Saturday night's dinner, where we were once again guests of the Marines at the base Officers Club, the following awards were made:

High Static Points: Terry Nitsch, F-86F Sabre.
Best Military Aircraft: Terry Nitsch, F-86F Sabre.
Best Civilian Aircraft: Dennis Crooks, Learjet 35A.
Best Scratch-Built Aircraft: David Hayes, Ayes Thrush.
Best Plans-Built Aircraft: Earl Thompson, DH-89A Rapide.
Best Built-Up Kit: Ernie Harwood, SE-5A.
Best Engineering and Design: David Hayes, Ayes Thrush.
Pilot's Choice: Ernie Harwood, Proctor SE-5A.

After the last flight was safely down and had taxied off the runway, the following winners were announced (name, flight points, total points):

continued on page 76



■ ABOVE: Although Lou Proctor has left us, he lives on in the large number of his designs still seen at scale events across the country. Most of these big bipes flown at the Scale Masters were built from Proctor kits. ■ BELOW: David Hayes readies his Ayes Thrush cropduster for flight; it won the "Best Scratch-Built Aircraft" award and 8th place overall. Model is equipped with an O.S. .91 and a JR radio system.



GIANT Fun Scale Spitfire



Electric fliers are always on the lookout for "gas" kits that will convert readily to electric power. The author, a recognized expert in electric flight, explains how he modified Dynaflite's big Spitfire for an Astro Cobalt 60, with outstanding results.



Dynaflite's Spitfire paints a pretty convincing picture in flight, especially with the gear tucked up. Tailwheel is fixed as per full-scale. If you'd like to see a video showing this model in action, contact Model Video Productions at 1-800-789-7886.



The outlines have been simplified, but there's no question that it's a Spitfire! Pictured here in its original configuration, Bob has since added wing root fairings and split flaps (see sidebar), a dummy radio antenna mast, 20mm cannon and gun port tapes on the outer leading edges.

When I first saw the ads for Dynaflyte's Giant "Fun Scale" Spitfire, it was immediately apparent that I was looking at an excellent conversion project for Astro Flight's big Cobalt 60. Many electric fliers have never seen an Astro 60 fly, and the Spitfire conversion appealed to me as a good way to get the word out on this very versatile motor. The Astro 60 in its "Sport Wind" configuration closely approximates the power of a good four-stroke .90 when matched with the right prop and battery. It's this motor that I'm using in the Spitfire, running on 28 SR 1500 Max cells and either a 14x10 or 15x10 prop.

A prime consideration in any gas-to-electric conversion is a lightweight structure, a criteria which Dynaflyte's Giant Spitfire meets admirably. And while the demanding construction needed to accurately duplicate the scale outlines and

cross-sections have been eliminated, the simplified design leaves not the slightest doubt that this airplane is a *Spitfire!*

The kit as marketed is intended strictly for glow engines, with no mention of electric power on the plan. With a span of 81 inches, an area of 1150 square inches and an advertised weight range on the order of 10-1/2 to 12 pounds, the model is recommended for .90 two-stroke and 1.20 four-stroke engines. A lot of lite-ply is used in the fuselage, and the all-balsa wing and stab are of lightweight open-bay construction. While the balsa provided in the kit didn't come up to hand-selected, contest-grade standards, it was certainly suitable for the task at hand. I found no need to replace any material in those areas where I retained the original (gas model) structural design.

Because the Spitfire's structure is already lighter than normal, no dramatic re-engineering is necessary to produce a

practical electric airplane. My modifications were as follows: 1) The lite-ply fuselage sides were replaced with 1/8-inch sheet balsa, with the lightening holes in the aft end eliminated to increase rigidity. The plywood nose doublers were retained (with substantial trimming) to provide dimensional stiffness and a broad wing mounting base, as well as to retain the function of locating formers during construction. 2) The stout balsa tail surface outlines were cut down by about 35 percent on the inner edges, and lightening holes were cut in the fuselage formers. 3) All of the engine mounting structure was eliminated. 4) A motor battery mounting tray and mounting rails were added. 5) The cowl was made removable for motor access, and provision was made for motor/battery cooling by adding an air intake opening in the cowl and an air outlet on the belly ahead of the tailwheel. 6) The entire structure was

THE FINISHING TOUCH

After I had about 20 flights on the Spitfire, I decided to add split flaps. This airplane loves to fly so much that unless it's really slowed down, it can float right off the end of the strip. A little checking confirmed that full-scale Spitfires had the same habit, and used their small split flaps as airbrakes.

I removed the covering from the bottom center section of the wing and cut openings for the flaps, adding a sub spar at the leading edge of the flap well to stiffen the bottom sheet and serve as a flap hinge base. The flaps are 1/32 aircraft ply, as are the stiffening ribs.

The flaps drop about 60 degrees. I have them set up on a proportional channel so they can be lowered smoothly rather than snapped down, but I don't use partial settings. The procedure I use is to lower the gear on downwind, with the airplane at moderate altitude, and reduce power to a high idle. Unless it's really windy, I pull the power all the way off on base and smoothly add full flap as soon as the airplane is lined up on final. My airplane responds to this with a very gentle nose drop, which sets up just the angle of descent I prefer without having to fuss with trim. Adding a little power as needed to overcome wind or smooth out bumps results in really smooth, slow three-point landings.

I also added large wing root fairings to improve scale appearance. I built up the fairings on a base of 1/32 ply glued to the fuselage, roughed in the contour with blocks of urethane foam sanded to shape and finished with polyester resin and micro balloons, then painted the fairings to match the rest of the airplane. The entire flap and fairing project brought the total model weight up to about 14 pounds. I can't see any difference in takeoff or top end flight performance as a result of the added weight.

Shortly after adding the flaps and fairings and other small details, I took the Spitfire to the Kitsap ARCS Scale Championships in Bremerton, Washington over Labor Day weekend, 1994, and won 1st place in Expert Sport Scale over all the gas jobs. Most of the guys I flew against had never before seen any sort of serious electric airplane fly, and their preconceptions were blown away in a hurry! **MB**



■ ABOVE: Bob's Spitfire now sports large wing root fairings and split flaps; the latter help greatly in getting this lightweight floater back on the runway. ■ BELOW: Underside view of the flap installation. Because the wing was already built, it was easier to install an individual servo for each flap; starting from scratch, it should be easy enough to work out a reliable single-servo installation.





■ TOP: Fuselage sides ready for assembly, with formers F-1, F-2 and F-3 opened up for weight reduction and improved cooling air flow. The 1/8-inch lite-ply fuselage sides supplied in the kit have been replaced with 1/8-inch sheet balsa; the 1/8-inch ply nose doublers have been retained but have been lightened considerably by removing material from the center. Note the 1/4x3/8 spruce rails for the battery tray. ■ BOTTOM: The tail assembly, complete and ready for covering, with the rudder and elevator temporarily in place. Quite a bit of material was removed from the tail surface outlines to lighten them up. Still plenty strong.



The Astro Cobalt 60 in place on a custom mount built from plywood and fiberglass. There is no factory standard mount for the 60, however, most electric modelers are accustomed to making custom mounts.

landing gear installation designed around a Robart 605HD pneumatic system, which is what I used in my conversion. I went a step further and added a set of Robart shock-absorbing struts for improved appearance and smoother landings on our grass runway. I estimate that the retractable landing gear adds between 5 and 8 ounces over the weight of a fixed gear. The airplane handles the weight easily, and the aerodynamic cleanup in flight as well as the much-improved appearance more than justify the effort and expense.


sanded aggressively.

Aside from the modifications necessary to mount the electric motor and the elimination of most of the lite-ply, the most important aspect of the conversion is close attention to carving and sanding. Part of the Spitfire's character is in its multiple compound curves. Short of using complex and expensive moldings, the only way to achieve those shapes is to carve and sand balsa. If you build this kit, do justice to the Spitfire—sand those blocks and square edges as long as needed to let the classic form emerge, then sit back and take pride in a job well done.

The plans show an optional retractable


Control is provided by an Ace MicroPro transmitter working with the newly released DAD All-Pro eight-channel receiver. This new American-made unit is advertised as a practical, economical duplicate or replacement receiver for use with Ace, Airtronics, Futaba or JR transmitters. My model is equipped with a variety of servos, ranging from ball-bearing giants on the rudder and elevator to minis on the landing gear switch and tank drop functions.

A plastic film covering would work well on this model and would add the least weight, however, I have a preference for painted fabric finishes on my models, and chose to go that route on the Spitfire.



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5.7 X 3	1.59	8.75 X 7.0	5.39	11 X 7	2.49	12.5 X 13	7.95	14.4 X 13	12.95	20 X 12	25.00	24 X 12	55.00		
6 X 2	1.59	8.75 X 7.5	5.39	11 X 8	2.49	13 X 6	4.25	14.5 X 14N	12.95	20 X 14	25.00	24 X 14	55.00		
6.3 X 4	2.39	8.75 X 8.0	5.39	11 X 9	2.49	13 X 7	4.25	14.5 X 14.5N	12.95	20 X 16	25.00	24 X 16	55.00		
6.5 X 2.9	2.39	8.75 X 8.5	5.39	12 X 6	2.89	13 X 8	4.25	15 X 8	12.95	21 X 12	25.00	3 Blade Hub 17 - 18'	54.00		
6.5 X 3.7	2.39	9 X 4	1.99	12 X 7	2.89	13 X 9	7.95	15 X 10	12.95	22 X 8	31.00	3 Blade Hub 20 - 21'	66.00		
6.5 X 5.0	3.39	9 X 5	1.99	12 X 8	2.89	13 X 10	7.95	15 X 11	12.95	22 X 10	31.00	3 Blade Hub 22'	78.00		
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6.5 X 6.5	3.39	9 X 8	1.99	11 X 12	7.95	13 X 13N	9.95	15 X 14N	12.95	22 X 16	31.00				
7 X 3	1.59	9 X 9	1.99	11 X 12W	7.95	13 X 13.5N	9.95	15.5 X 13N	12.95	24 X 10	38.00				
7 X 4	1.59	9 X 10	1.99	11 X 13	7.95	13.5 X 9	7.95	16 X 8	12.95	24 X 12	38.00				
7 X 5	1.59	9.5 X 6.5N	5.39	11 X 14	7.95	13.5 X 10	7.95	16 X 10	12.95	24 X 14	38.00				
7 X 6	1.59	9.5 X 7.0N	5.39	11.5 X 4	8.289	13.5 X 11.5N	7.95	16 X 12	12.95	24 X 16	38.00				
7 X 7	1.59	9.5 X 7.5N	5.39	12.25 X 3.75	8.349	13.5 X 12.5	10.295	16 X 13N	12.95						
7 X 8	1.59	9.5 X 8.0N	5.39	12 X 9	7.95	13.5 X 13.3	10.295	16 X 14	12.95	2 Blade Hub 18 - 19'	30.00				
7 X 9	1.59	9.5 X 8.5N	5.39	12 X 9W	7.95	13.5 X 13.5	10.295	16 X 16	12.95	2 Blade Hub 20 - 21'	35.00				
7 X 10	1.59	9 X 6.5	5.39	12 X 10	7.95	13.5 X 14	10.295	16 X 16	12.95	2 Blade Hub 22'	40.00				
7.8 X 4	3.95	9 X 7.5	5.39	12 X 10W	7.95	13.5 X 14W	10.295	9 X 6P	Pusher 3.95						
7.8 X 6	6.39	9 X 8.5	5.39	12 X 11	7.95	14 X 5N	12.95	10X 6P	Pusher 3.95						
7.8 X 7	6.39	9.5 X 4.5	11.229	12 X 11N	7.95	14 X 6	12.95	10 X 7P	Pusher 3.95						
8 X 7.3	5.39	10 X 3	2.29	12 X 11.5	7.95	14 X 8	12.95	10 X 8P	Pusher 3.95						
8 X 4	1.79	10 X 4	2.29	12 X 12	7.95	14 X 10	12.95	11 X 6P	Pusher 3.95						
8 X 5	1.79	10 X 5	2.29	12 X 12.5	7.95	14 X 11	12.95	11 X 7P	Pusher 3.95						
8 X 6	1.79	10 X 6	2.29	12 X 12N	7.95	14 X 12	12.95	14 X 6P	Pusher 12.95						
8 X 7	1.79	10 X 7	2.29	12 X 13	7.95	14 X 12N	10.295								
8 X 8	1.79	10 X 8	2.29	12 X 13N	7.95	14 X 13	10.295								
8 X 9	1.79	10 X 9	2.29	12 X 14	7.95	14 X 13N	10.295								
8 X 10	1.79	10 X 10	2.29	12.5 X 9	7.95	14 X 13.5	10.295								
8.5 X 5	4.39	10.5 X 4.5	11.229	12.5 X 10	7.95	14 X 13.5N	10.295								
8.5 X 5.5	4.39	11 X 3	2.49	12.5 X 11	7.95	14 X 14	10.295								
8.5 X 6.5	5.39	11 X 4	2.49	12.5 X 11.5	7.95	14 X 14N	10.295								
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Bob used a Robert 60SHD pneumatic retract setup, the same as recommended on the Spitfire plans for the gas version. Wheels are Sullivan Sky-Lites. The stock wire gear legs were later replaced with Robert's compression struts—see text.

The entire fuselage and the wing center section to just outboard of the landing gear were covered with 3/4-ounce K&B fiberglass cloth and polyester resin, later block sanded to remove all resin above the level of the cloth. The flying surfaces were then given a coat of Coverite's Balsarite and covered with Sig Koverall (a polyester fabric), followed by two coats of Sig nitrate dope. After priming with K&B Super Poxy primer and carefully sanding most of it off, I was left with a light, smooth, sealed surface, ready for color.

The final finish is a very lightly sprayed series of custom-mixed K&B Super Poxy colors. The squadron code letters and vertical fin stripes were masked and sprayed. The RAF roundels were ordered from Vinylwrite Custom Lettering. A very light coat of matte clear K&B epoxy was sprayed over the markings to dull them.

Ready to fly, my airplane weighs a little over 13 pounds, for a wing loading of 27 ounces per square foot. I would guess that using plastic covering and a fixed gear would take about a pound off this figure; substituting hand-selected light balsa might remove another half-pound. The choices are yours to make.

So, how does it fly? In a word, docile! I characterize it as a big trainer that looks like a fighter. While it's not a hands-off airplane, this Spitfire has no bad habits. It adds just a bit of positive stability to a go-where-you-point-it nature, with no twitchiness at low speeds. In smooth air, I can slow it almost to what seems like walking speed for landing. On our field's mowed grass, it will take off at less than

continued on page 77

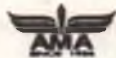
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FREE FLIGHT

BY BOB STALICK

•“Zip-A-Do, Too” Catapult Glider •Texas Timers News •Bunt Systems

Recently, I read in a car enthusiast's magazine about the concept of “Special Instructions.” The article detailed the author's experiences with an aging British sports car and came to the conclusion that nothing with the car was standard and everything demanded special instructions.

In many ways, it is this concept of special instructions that intrigues free fliers. I've seen some FAI types with huge checklists of things to do before an official flight, and since each model is a bit different, each one may have its own instructions.

I recall sending a Pee Wee 30 to the first San Diego Orbiteers postal contest. Along with the model, I sent along a three-page, single-spaced set of instructions for the proxy flier—just for a Pee Wee 30! Is it any wonder a newcomer finds it difficult to get going in the hobby? Just listening to the special instruc-

tions would test his patience and understanding.

Maybe Special Instructions are the reason why the Builder of the Model rule has been followed fairly consistently by free fliers. Each of us is an individual. Each of us has our own brand to place on the model, our own distinctive touches. We want to be the builder of the model. It's only been lately that FAI models are being custom built and sold to fliers. These “cookie cutter” models are the FF equivalent of the RC ARF model and have found a small but enthusiastic band of supporters. In these cases, the models have little need for special instructions. After a flier has mastered one model's idiosyncrasies, all of the others are the same. No room for glitches. No room for error. No room for individuality.

Personally, I like the variety and the special instructions. But as I get older, I find myself writing even more down on notepads. Now I just wish I could remember where I put those darned pads!

FEBRUARY THREE-VIEW: The “Zip-A-Do, Too” Catapult Glider

Catapult Glider is getting to be popular in free flight competition. Although it hasn't yet edged out HLG for participation, many of us are no longer willing to tolerate the several days of pain after a weekend of tossing a glider into the air and are looking at Catapult with more interest. Vic Nippert's “Zip-A-Do, Too” is the top dog of outdoor catapult gliders, having won the event at the 1992 Nats.

If you've never flown catapult, the event is simplicity itself. As you can see from the attached drawing, Vic uses a loop of 1/4-inch rubber tied to the top of a dowel. The dowel is held firmly in one hand, the model is attached to the rubber band by the hook on the nose. Stretching

the rubber band the same distance for each flight is important, as is the bank and launch angle of the model. When you let go the model streaks into the sky until it gradually loses energy and transitions into a circling glide.

I've found that a right/left or left/right pattern works best. Vic didn't specify which he used, but the washout on the right wingtip leads me to think he flew with left power and right glide.

Although the three-view is not full size, the dimensions should help you construct an accurate replica. As with any outdoor glider, it pays to put a sealer or smooth finish on the surfaces in order to minimize damage and keep out excess moisture. Good luck and good flying!

FEBRUARY MYSTERY MODEL

You'll have to go back about 20 years to find this ship. It's a Wakefield model designed and flown by an outstanding northwest free flier who has since passed away. This design is also one of the earliest to use a variable pitch prop.

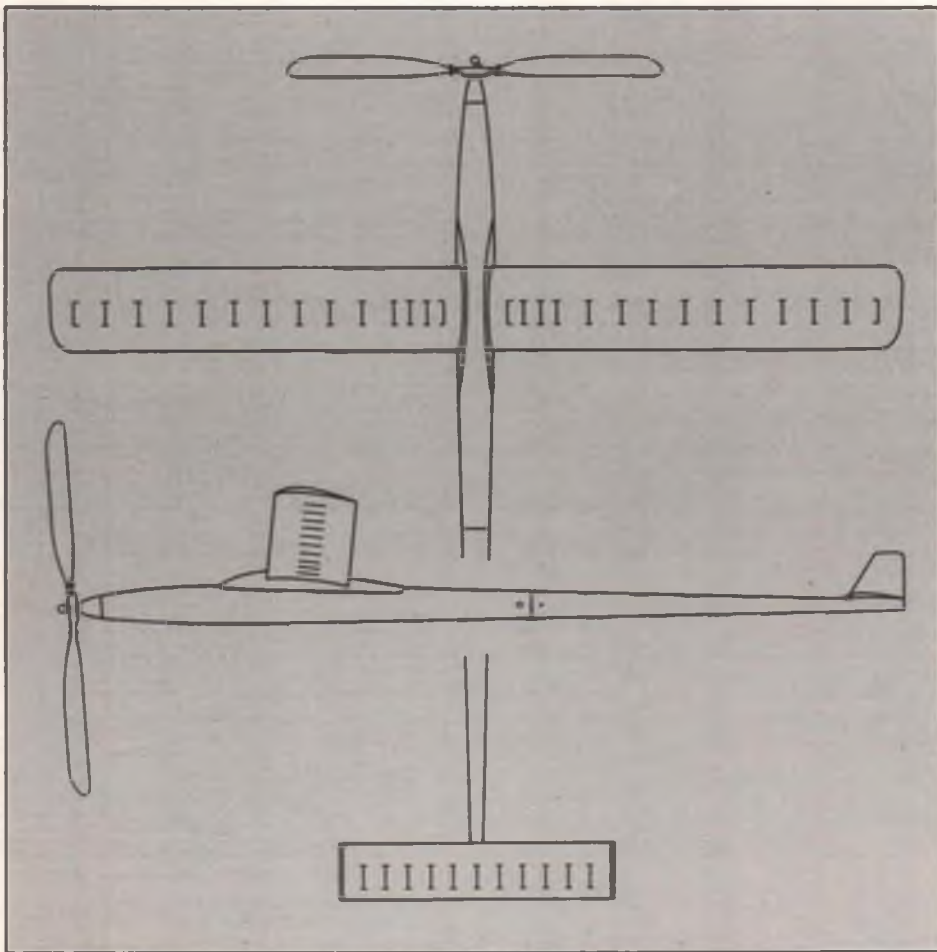
You know the drill, right? Send a card or letter to the magazine (not me!) with the name of the model, and if it's drawn from among the correct guesses, you'll get a free one-year *Model Builder* subscription. Simple as that! Do it now.

NOVEMBER MYSTERY MODEL WINNER

It was almost 23 years ago—the May 1971 issue of *Flying Models*, to be exact—that VTO, aka Dave Linstrum, published his “Go-Cargo,” designed specifically for his then-12-year-old friend Bob Hayes (now a well-known indoor flier) to build and fly at the '68 AMA Nats in Olathe, Kansas. As it turned out, Bob's model lofted a full 16 ounces, placing 1st in Junior and also



Mel Lyne is a well-known Canadian CL speed flier who recently took up free flight. Here's Mel launching his 1/2A Nostalgia Spacar at the 1994 Northwest Free Flight Champs.



FEBRUARY MYSTERY MODEL

besting all of the Senior and Open fliers in the process! Out of the seven correct entries received, Jerry Barnette of Fredericksburg, Virginia was drawn as the winner of the free MB sub.

NEW FROM TEXAS TIMERS

Hank Nystrom continues to improve and add to his line of Texas Timers. Recent correspondence with Hank has centered around a combination engine run and DT timer, which he calls the Texas Max III. The intent is to provide a combo timer for the Cat II and III market. This timer has a small faceplate (1.7x.8 inches) that will fit practically all of the 1/2A designs on the market. It weighs 18.66 grams

and comes with a wire trip switch that allows for an exact and positive on/off arrangement.

Also new from Hank is a bladder tubing tank setup. If you haven't begun using bladder tubing instead of pacifier tanks, you're missing a bet. Tubing is easy to use and provides steady fuel pressure for any size engine. Hank sells the tubing and a matching polypropylene plastic fitting. I've used both and find them to be the most efficient and the lightest fuel system I've ever used. The tubing sells for a buck a foot and the fittings sell for 50¢ each. Two bucks covers postage regardless of the order.

Since the trip wire on/off switch is an old standard that

is now available only on the Texas Timers, Hank offers to alter any of the old Summersett and Starline cutoff timers to this more desirable system. If you are looking for top quality in timers, these are the ones to get. Send an SASE to Texas Timers at 3317 Pine Timbers Dr., Johnson City, TN 37604 for a price list and ordering information.

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Last winter, fellow club member Ron Hoag suffered a complete loss of all of his

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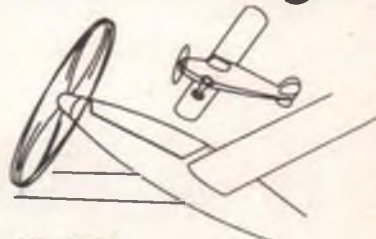
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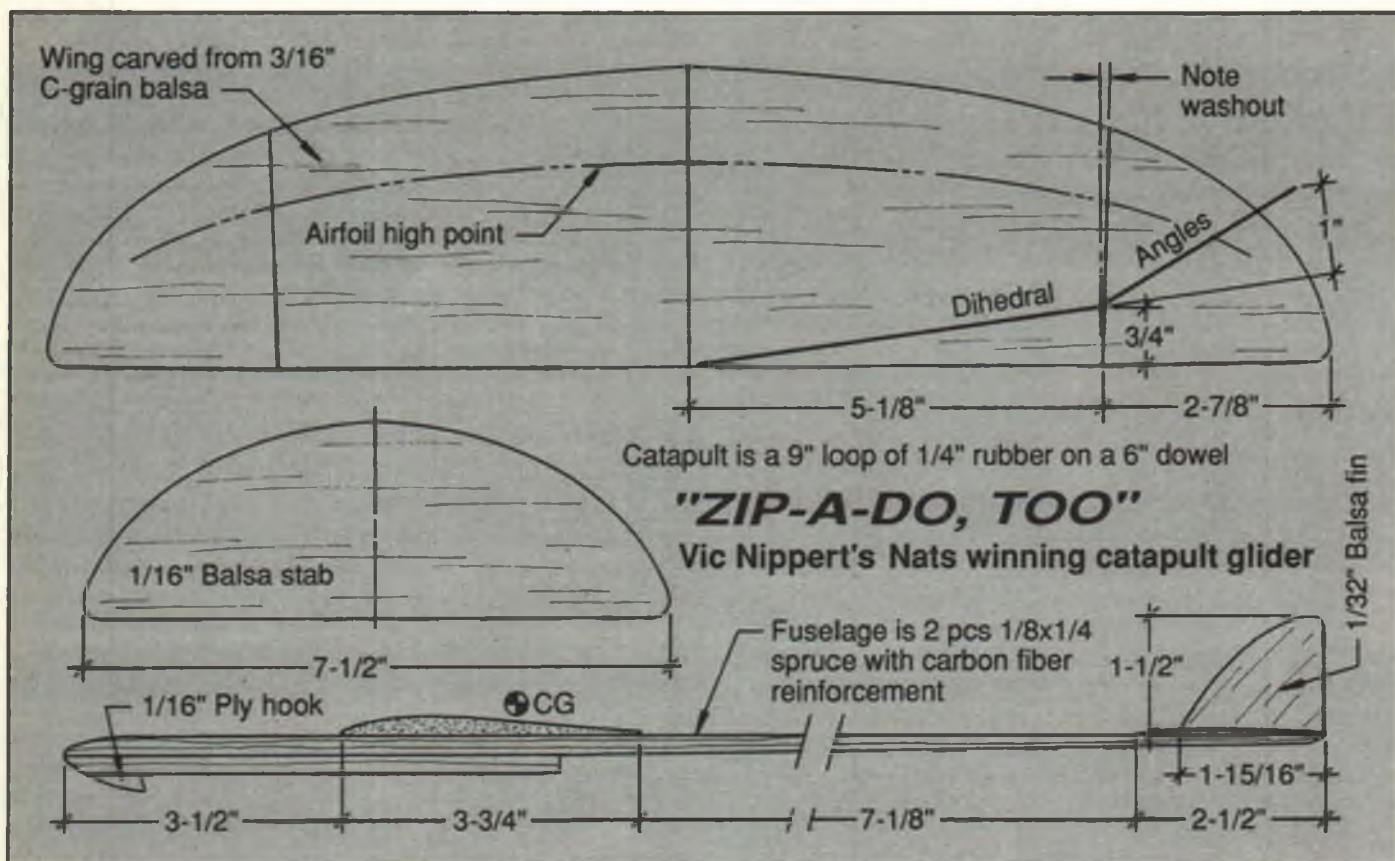
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FREE FLIGHT



Too many experts! The model is a Goldberg Sailplane and belongs to Bruce Augustus, who isn't even in the picture. Some of the experts include: Clarence Bull (far left); Bill Harburg (who appears to be praying); Matt Mason (emulating Rodin's "The Thinker"); and Robin Mason (pointing at the ground). Another photo from the 1994 Northwest FF Champs.

possessions when his house burned to the ground—including all of his models, kits, plans, tools and supplies. At a club meeting afterwards, Ron showed us the pieces of aluminum that were once his small cache of engines and timers. After several contacts with the AMA insurance company, he eventually received a check for the maximum \$1,000 to cover some of his loss. Since he had no homeowner's insurance, it was the total of his recompense. Collections taken from fellow club members eventually replaced some of the plans, materials and hardware. Northwest modelers came through with some tools and the like. Sure enough, Ron was out on the field this summer with a couple of new models ready for competition.

Don't ever tell Ron that AMA membership and insurance doesn't pay!

GIL MORRIS ON BUNT SYSTEMS

Gil Morris is a highly competitive free flyer from the midwest, who just recently won a place on the U.S. FAI Free Flight Team in F1C. The following article appeared in a recent *CIA Informer* news-

letter and is entitled, "Fast, Straight-Up and Bunt Demands Strong Wing and Thin Stab."

"About 10 years ago, the Russians first used the high aspect ratio wing and bunt transition in their FAI power models. They were exceedingly successful! Now, nearly all FAI power models follow this lead, and it's now beginning to spill over into AMA designs. But, all is not vanilla unless you understand and prepare for the consequences.

"The bunt was a necessary tool to successfully transition a model with a high aspect ratio wing from power to glide. High aspect ratio wings are nearly impossible to roll out on top consistently—they go into hammerhead stalls. The bunt solved the problem by rotating the wing about its axis. The familiar corkscrew roll-out requires rotating the wing about the fuselage axis, which long wings resist. Short wings roll about the fuselage axis OK.

"Now, if you bunt, there's no need to corkscrew—just go straight up and bunt. Right? Herein lies the trap. Going straight up, the wing is at zero lift, and at zero lift,

most common airfoils produce a forward pitching moment which tries to wash out the wing. The faster the model moves, the more likely the wing is to twist and force the model 'over the top'—it becomes speed sensitive. But, if you were to corkscrew, the wing would be at a positive angle of attack and lifting. This greatly reduces the pitching moment and likely overcomes the 'over the top' problem.

"If you plan to fly fast straight up, you must have a very rigid wing. If the condition is borderline, you might get by with added downthrust and increased decalage to break the zero lift and the forward pitching moment.

"Furthermore, if you are going to fly very fast under power, you will need a stabilizer with little topside camber, otherwise you will experience 'over the top,' the same symptom as the weak wing. As the speed of the stab increases, separation of the air over the top of a highly cambered airfoil lessens and the stab becomes more efficient, which lifts the tail end and forces the model 'over the top.' The highly cambered airfoil is speed sensitive. Lower the stab top camber and use a semi-sym-



Check Gode has been experimenting with computer-generated markings printed directly on Japanese tissue using a Canon color printer and doped in place on the model. The tissue is Scotch taped along one edge only (the edge that enters the printer first) to a sheet of regular bond paper and fed through the machine. The printer ink is not affected by dopes or thinners, but it is NOT waterproof, so don't try to water shrink it. Makes for great looking markings without the tedium of cutting out individual characters and dopping them in place.

metrical or even a symmetrical stab airfoil to achieve necessary structural strength.

"If you have one of those overpowered bunters with a weak wing and a fat stab, have heart—it might be just the thing for 3 and 4 second flyoffs—just forget about the 7 second engine runs." MB

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DuraCraft Founder

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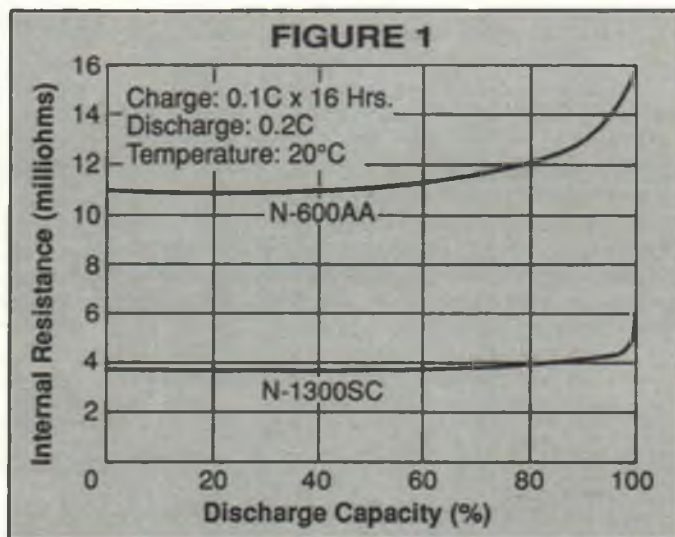
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ELECTRONICS CORNER

BY ELOY MAREZ

• More on NiCds—Cell Types, Trickle Charging, Self Discharge, and Lifespan



NiCd batteries have always been a major item in my incoming mail, and this month we have three interesting letters on the subject. Some of my answers apply to more than one of these letters, so we'll read them all first and combine the information. First heard from is Charles Castaing, of New Iberia, Louisiana, who asks: "Please explain the basic differences between the three types of nickel-cadmium batteries that are advertised, i.e. standard, high capacity and fast charge. Also of interest would be the advantages and disadvantages of each. Are the new 'hydroxide' batteries destined to replace NiCds?"

Sidney Sharp, of Hanford, California, wants to know: "How many hours per day of 1/10 rate charge to maintain a battery pack? Assuming a loss of 1 percent per day, with a 500 mAH pack this would be a 5 mAH loss. Standard trickle rate is 10 mA. If so, that would be a 2 percent charge to 'replace' the 1 percent loss, which seems sensible with efficiency losses and abundance of caution.

"If I were to use a standard 1/10 rate charge to maintain capacity after a normal 16 hour charge, I assume I would

want to put in the same 2 percent of capacity. Of course, this would take much less time because the rate is 1/10 of 50 mA, instead of 1/50 of 10 mA. Simple math would cause me to believe that since the 1/10 rate is 5 times stronger than the 1/50 rate, I would charge 1/5 of the day (4.8 hours) instead of all day as with a reduced rate trickle charge

"However, I have in the back of my mind that one should only use 1 or 2 hours at 1/10 to maintain a full charge. Help! Is my math, my analysis, or my memory correct?"

And last but certainly not least, Don Typond, of Warwick, New York, writes: "Do NiCd batteries have a useful life measured in years? For instance, it's conventional wisdom that wet-cell batteries like the one in your car expire in about four years, give or take, even if they've been carefully maintained. I have a Futaba 1000 mAH receiver pack that I bought in 1982. When it was new, it produced a 1200 mAH reading on my L.R. Taylor Power Pacer cyclor. I used the pack for a couple of seasons within its first few years, but since then it has been on the shelf. The

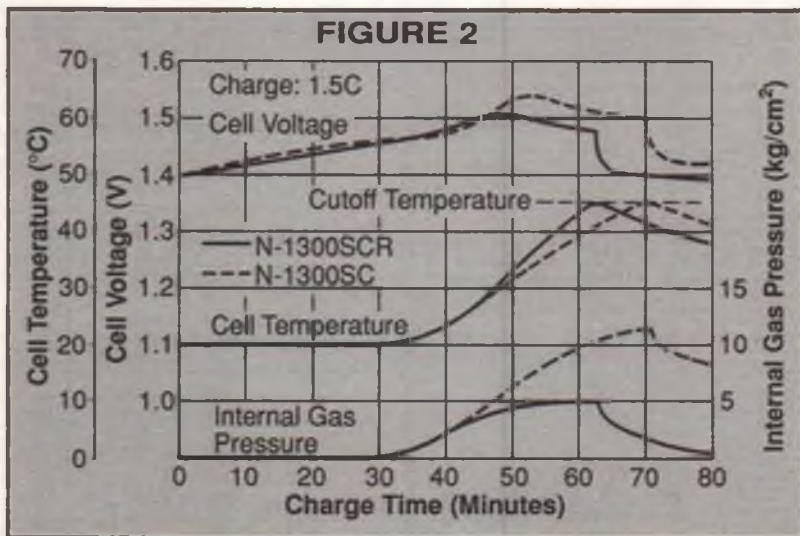
pack is now 12 years old, and it still gives a reading of 1100 mAH immediately after charging and about 800 mAH when measured a week after charging. Question: Is this pack still good? As long as it takes a full charge and does not self-discharge in a short time, is a NiCd pack safe to use regardless of age? I'm sure I'm not alone in having NiCd packs that are more than five years old but still seem to function. Should we arbitrarily scrap them because of age, even if they seem to be working okay?"

To start with Charles' question, all NiCds are no longer created equal, as they were in the early days of RC. To compound the situation, not all that we read in the model press agrees with the real experts on the subject—no, not yours truly, but the battery manufacturers themselves.

According to General Electric, Panasonic, Sanyo and others, the so-called standard cell is our old friend, the NiCd cell intended for "overnight" charging and for relatively low discharge rates. Sanyo brands its standards as the "N" (N-600A) or "KR" (KR-1300SC) series, rating them for .1C (1/10 capacity) charge and .2C discharge—see Figure 1. This is also a relatively high resistance cell, which, if you exceed the above ratings by much, will signify is displeasure by getting hot.

Conversely, the fast charge battery is intended for just that application, Sanyo designating them with the suffix SCR, i.e., N-600SCR. Sanyo's chart (Figure 2) indicates charge information at the 1.5C rate. Note that in this case, they also specify the allowable cell temperature and internal gas pressure, the latter being the results of elevated temperatures. The lower internal resistance also allows higher discharge rates without the heating problem mentioned.

As for cell resistance, the N-600AA is rated at 12



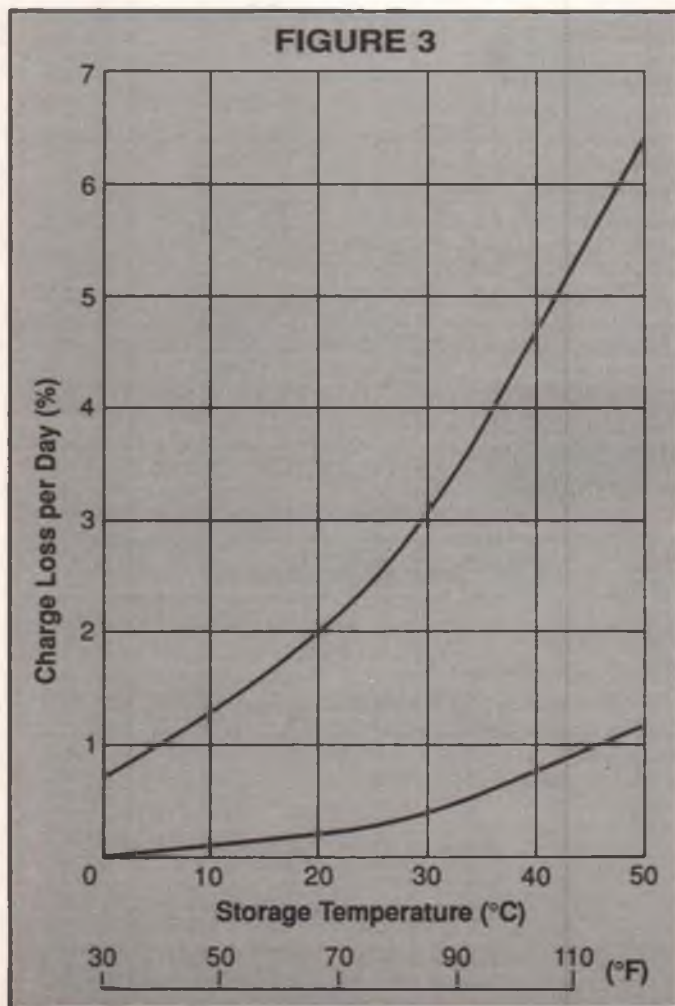
mOhms (milliohms) while the N-600SCR is only 5.5 mOhms.

High capacity? This is in

reference to the newer technology cells, in which the makers are able to pack more capacity in a given package

size. In the case of AAs, a major retailer of Sanyo batteries lists an 800 mA cell the same size as the older 500. This feature is important in those cases when one is looking for a bit more flying time—or when proper care is not given to the installation and the batteries are being discharged unnecessarily!

Advantages of each type? Most system chargers and most of our experience is with the standard overnight-charge type of cell. Unless a good reason exists, I would advise sticking with them. Fast charge cells are definitely in order when field charging is required, after extended flight times, or when electric powered models are being flown. High-capacity cells are obviously the answer when longer



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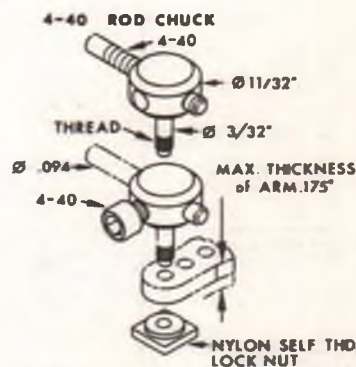
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operating time without field charging is a requirement. Note, however, that the normal system charger might not revive them completely; a higher rate charger is definitely called for.

Nickel-metal-hydride (NiMH)? At this point, based on their energy density (watt-

hours vs. weight and cube), they seem to have a lot going for them. However, I'm concerned about proper charging. In a good example of model press misinformation, we are reading that the common RC system charger is adequate for NiMH batteries; however, in all battery literature

intended for non-RC commercial application, completely different charging procedures are recommended. There is also a rapidly growing group of "battery management" ICs now available, intended to simply the design and manufacture of very sophisticated battery chargers, and every one of these includes different parameters for NiMH than those given for NiCds. I, for one, am holding off on NiMH until more experience and information is available.

Re Mr. Sharp's questions, every battery maker's first comment on the subject of self-discharge is that the ambient temperature is a critical factor. Figure 3 is a chart from G.E. showing the wide variations to be encountered. Note that the self-discharge rate increases as does the temperature, and that in this case, at an average room temperature of 70 degrees F, the self-discharge rate is listed as being 2 percent per day. Looks like our best advice would be to store your airplanes in the freezer, where a zero rate is to be encountered. Note that in Don Typond's example, his 1200 mAh pack is losing close to 4 percent average per day.

With that variation in mind, Sid's math is otherwise correct, with the exception that instead of basing it on a 24 hour charge time, I use the recommended 14-16 hour period. Actually, charging for one day, or for "14-16 hours" as is generally recommended, can lead to overcharging. A better figure is 110 percent of the amount of capacity that was discharged, but keeping track of that presents some real problems. Modern NiCds are more forgiving of overcharging than they used to be—a few extra hours don't seem to

continued on page 75

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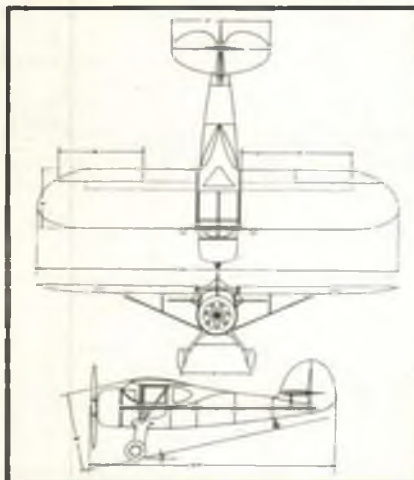
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THE 21ST ANNUAL VISALIA CVRC FALL SOARING FESTIVAL

The FSF has grown from 30 pilots in 1973 to a record 245 in 1994, attracting the best pilots and sailplanes in the country.



Northwest Sailplane Products is marketing the Opus, a design based heavily on the original Opus by none other than Michael Selig himself. NSP's Sal DeFranco flew the Opus at the FSF. Contact Sal at (802) 858-8482 for full particulars regarding the Opus, and tell him you saw it in MB!

Every year, always on the first weekend of October, I attend the CVRC Fall Soaring Festival in Visalia, California. And every year I'm even more thoroughly impressed. It gets bigger, better, and more fun every year! Still, in spite of its annual growth and unqualified success, the Visalia meet has through the years somehow retained all of the good old-fashioned, down-home friendliness and warmth that it started with.

This year, for the first time in 21 years, the CVRC broke out of its characteristic humility and did a little overdue boasting. There it was in print in bright colors on their official event T-shirts: "1994 21st Annual CVRC Fall Soaring Festival, the largest radio control soaring event in the world! Visalia California USA." And so it's been for many years. Now it's something even the CVRC guys recognize pub-

licly. Well-deserved kudos to CVRC!

This year the FSF was limited to 245 fliers, 34 of whom came from outside of California. States represented were Virginia, Vermont, Illinois, Tennessee, Alabama, Utah, Nevada, Arizona, Washington, Texas, Colorado and Florida. Although we had no fliers from Europe (actually this is unusual), the guys from Guatemala, "Team TACA" as they are sometimes called in reference to the international airline which they promote, came again this year and as usual, were a lot of fun to fly with.

CONDITIONS

Weather is rarely a problem at Visalia. Located in California's San Joaquin Valley, Visalia has ideal soaring weather all year long—or so it seems. This year's weather was fantastic for soaring, with

If you can place in the top 40 at the FSF, you're good. If you place in the top 10, you're a world-class pilot! Here they are and what they flew, from left: 1st, Roger Lackey (Make); 2nd, Joe Wurts (Peregrine); 3rd, Jim Skinner (modified Prism with Thermal Eagle fuselage); 4th, Scott Meader (Genesis); 5th, B.J. Weisman (100-inch Super-V); 6th, Fred Sage (original wings and V-tail, Thermal Eagle fuselage); 7th, Ben Clerx (Make); 8th, Cody Robertson (2M Super-V won in last year's raffle!); 9th, RCSD colonel Fred Rottig (114-inch Super-V); and 10th, Ron Vann (Spectrum F30).





■ ABOVE: Good shot of Pete Olson (85th place) launching his new Airtronics Peregrine, which was highly visible in white and dark blue with chrome leading edges. Look for a review of the Peregrine in MODEL BUILDER soon. ■ ABOVE RIGHT: New from LJMP is the 180-inch span Viper; Dennis Brandt holds one of the two prototypes flown at the FSF. Looked very nice and flew well enough to satisfy Dennis, who tends to be a perfectionist builder and flier. More info in text.



temperatures at a very pleasant 89-90 degrees with light, variable breezes of 2-5 miles per hour. It was common to see 12-18 sailplanes in a single thermal! What a sight that is!

The contest ran even more smoothly this year than in years past. In spite of the record number of pilots flown, there were no major delays or problems. We finished on time both days—Saturday in time for the on-site Barbecue, and Sunday in time for the Giant (\$15,000+) Raffle.

MODELS FLOWN AT THE FSF

This year there didn't seem to be any one design that pilots preferred. Yes, there were Airtronics Thermal Eagles around, but the numbers of other designs—Mako, Peregrine, Super-V, Synergy, Genesis, Saturn and the newer Spectrum, Prism and the like—seem to be spreading out pilot interest to a delightful variety. Of course, a few sailplanes out there are merely subtle variations on a popular "Allen-esque" design theme, however, even

these clones offer some relief from the almost one-design contest mega-trends of the recent past. Long live experimentation and original thinking!

Larry Jolly Model Products will soon be coming out with a very attractive V-tail, multi-swept and tapered, slightly polyhedral 100-incher called the Viper, which made its debut at this year's FSF. Not only was it entirely new, it is *not* a foam core model. It's a more traditional balsa-wing model that I think will find favor with those modelers who bemoan the loss of the Airtronics Sagitta,



Ross Thomas launches his "stretched wing" Mako. The bottom of Ross's wings and struts are solid black, as is the fuselage. Visibility was much superior to others with mostly unfinished (non-colored) wood showing. Ross finished 94th out of 245—not bad considering it was a new plane for him.

COME FLY AT THE 1995 MAYAN SOARING MATCH

The Asociacion Guatemalteca de Aeromodelismo (AGA) and its sponsor, TACA International Airlines, is pleased to invite one and all to the 1995 Mayan Soaring Match, to be held in March in Guatemala City, Central America. This will not only be your chance to fly with the descendants of the Spanish explorers, German immigrants, and Mayan Indians, but also to see some of the greatest wonders of the ancient and mysterious Mayan culture.

Trust me, I've been there and done that—it's terrific, and I can't wait to go back and do it again. My 10-year-old son, Matt, went with me when he was nine and loved "Guat" so much he cried when we left! By all means, get your passports together and go with us the second time. It looks like there will be quite a group going to this, the first-ever soaring meet and tour group of its kind.

Contact Enrique Mertins, Suite 51-187, 444 Brickell Ave., Miami, FL 33131 for full details—or try calling your international long distance access number (011 in the U.S.) followed by the country code (502) and 2-347906. FAX: (011) (502) 2-323909. E-Mail (via Internet) try: farzu@uvg.edu.gt. (Sounds like you'll get Frankie Arzu at that number care of the University of Guatemala.) Come to Guat and let's go see the ruins of Tikal (like on Star Wars) and throw a hand-launch glider off the top of a temple!

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A Beechcraft Baron afforded this meal photo of the FSF crowd just after the pilot's meeting on Sunday morning. The shot shows only a fraction of the models and pilots, but shows the landing (center, low), launching (right) and CD's tent and radio impound areas pretty well. Full catered meals, clean toilets and on-site camping help make the FSF a very easy meet to fly.



Most points for drama goes to Duwayne Lane and his Spectrum/Prism hybrid, which suffered a mid-air collision, went out of control and dove straight into the top of a parked RV. The occupant, taking a nap and fast asleep under the point of impact, was rudely awakened, but unhurt. It just so happened that Jerry Rouillard, AMA Executive Director, and Rich Hanson, District X VP, paid the FSF a visit that day... need a witness for the claim?

Cumic and Cumic Plus, Oly, Legend, etc. (Bob Renaud at Airtronics says some of these may be making a comeback soon thanks to modern laser wood cutting technology.)

The Viper features an epoxy fiberglass fuselage with the now almost standard removable nose cone, a built-up balsa and spruce D-tube wing, and a built-up V-tail. Control surfaces included ailerons, flaps and mixed V-tail "ruddervator."

Lary's number one prototype was built a little too lightly and didn't survive the practice session on Friday. However, Dennis Brandt's number two prototype was built slightly heavier and flew the two-day meet without complaint or mishap. The slight amount of polyhedral in the wing along with the sweep in the tip pan-

els aids tremendously in spiral (turning) stability, making the Viper a great looking sailplane with handling characteristics that are a cross between aileron and poly ships. The Viper joins the 2-meter Volant and 1.5-meter Vagabond HLG in LJMP's new V-tail lineup.

As far as the hundreds of other models flown at this year's FSF, the less I say here, the more pics you'll see, so I'm going to say bye for now and let you browse through 'em!

If you'd like to share your latest creation or soaring "discovery" with the readers of *Model Builder*, I'd welcome that info and photos at my home address: 3610 Amberwood Ct., Lake Elsinore, CA 92530, or give me a call at (909) 245-1702. MB

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PLUG SPARKS *cont. from page 30*

Cyclone will be available once again. I bet Tom is, too.

MICRO AND MINI ELECTRIC STUFF

The above heading is used by Dick Miller as part of his business card. As a follow-up to the report carried in the October '94 issue of *Model Builder*, Dick has produced another info sheet spelling out in detail where to find the items necessary to get in on the fun.

Dick also sent a photograph of John Delagrang, SAM 100 president, seen in Photo No. 6 adjusting the fuse DT on his electric-powered Korda Dethermalizer. Believe it or not, these low-powered electric models fly well enough to lose!

One particularly interesting thing about the model is that it uses the original-size 18-inch folding propeller, which is turned by one of Dick's MM-1 motors equipped with a 25:1 gear reduction. The electric motor swings the prop at about 1200 rpm. A very short "rubber motor" connects the

Photo No. 6. John Delagrang has been having a ball with his Korda Dethermalizer, powered by one of Dick Miller's little MM-1 electric motors with a 25:1 gear reduction and swinging an 18-inch balsa folding prop. Just think of the advantages: No worries about the wildly varying quality of the rubber, no exploded fuselages, no blast tube to mess with, no rubber tube splattering all over the inside of the fuselage . . . hmmm, this electric stuff could catch on!

electric motor to the prop shaft, allowing the prop to engage its stop and fold the blades when the batteries run down. Dick sez a number of rubber-power modelers on the field were duly impressed.

For those who missed Dick Miller's opening offers on the MM-1 motor, Dick also offers the reduction gears. All of this info is available from Dick Miller, 193 Huntzinger Rd., Wemerville, PA 19565. Send a large SASE to receive his complete guide on motors. *MB*



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Don Anderson, founder of Great Planes Model Manufacturing, on what it takes to make a great company...

"When I started Great Planes in 1982, I wanted to create easy-building, easy-flying planes for the average R/C modeler. As an active modeler myself, I knew the frustrations of trying to build a poorly made kit, and I knew what I wanted to see changed—things like better design, higher quality parts, more accurate instruction manuals and easier flying characteristics.

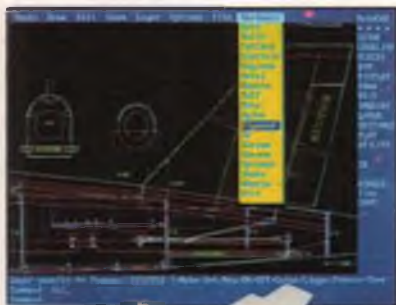
"People often ask me how Great Planes, being a fairly new kid on the R/C block, has managed to accomplish so much. I tell them that all you need are three key ingredients."

Great Technology

"When I first started shopping around for equipment, I was stunned to find the only cutting machines available were those designed for making cabinets and other furniture—there were no machines designed to cut model airplane parts. So I decided to make my own. With my background in engineering (I received my B.S. in mechanical engineering from the University of Illinois) and the hands-on experience of a well-known machine designer, I was able to create several unique cutting machines. To this day, you won't find anything else like them.

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"One of the first things I wanted to design was a trainer—one that would encourage people to try R/C, not scare them away. This resulted in the PT-20 being a fairly radical departure from most conventional trainers. Its extreme amount of dihedral and washout in the wing panels gave it the excellent self-recovery habits that other planes only claimed to have. Several years later, the PT-40 became the first-ever American-made plane to be named International Model of the Year.

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"I feel fortunate to have created a company that is so successful and so much fun. At Great Planes, we're a team with one simple goal in mind. We take pride in our work...so you can take pride in yours."

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model is equipped with a geared Astro 25 running on 14 cells. (Separate plans are available for both versions.) Construction is all wood with the exception of the fiberglassed foam nose bowl and wheel wells, which makes for a reasonable flying weight of about 5 pounds for the electric model—and that's complete with retracts and standard size servos installed. Full details on this and the other plans in the line-up are listed in Chapis' illustrated catalog, yours for \$1 from Chapis Plans, Rd. 5, Box 848, Seaford, DE 19973. **MB**

ELECTRONIC MODEL SYSTEMS ACQUIRES JOMAR

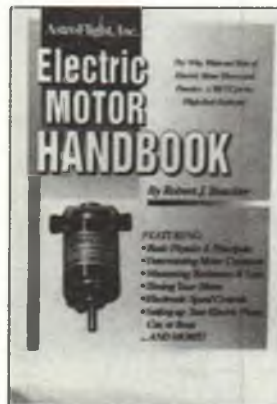
In a flyer we picked up at the RCHTA show, Mark Schwing, founder and owner of Electronic Model Systems, announced that an agreement in principle had been reached to acquire Jomar Products Corp. of Cincinnati, Ohio. Jomar is a highly respected manufacturer of numerous electronic accessories and electronic speed controls for the hobby market.

By the time this appears in print, the Jomar inventory and manufacturing facilities will have been moved to California. Jomar's founder and chief designer, Joe Utasi, will continue as a consultant to EMS during the transition phase and will assist in new product development over the next few years. The Jomar name will continue as a division of EMS.

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All models must be operable & RC controlled. Trophies and/or prizes to be awarded. VCR's to be awarded in three categories: "Best-in-Show" flying, "Best-in-Show" cars and "Best-in-Show" boats. Top of the line RC systems for 1st place in each category. Trophies for other winners.

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SPECIAL NOTE

This year there will be no restrictions in the number of built-up models a registrant may place in the Swap Shop.

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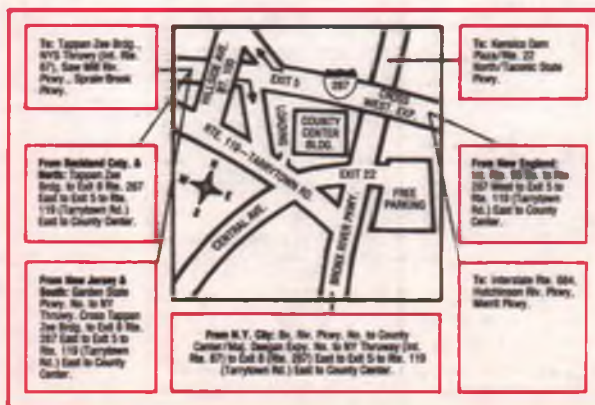
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CONTROL LINE *cont. from page 18*

WORLD CHAMPS RESULTS

Unofficial results from the 1994 Control Line World Championships, just held in Shanghai, China, put the United States in either 3rd or 4th places in all events. England, China and Switzerland captured the top individual spots.

•F2A Speed, individual standings:

- 1) Peter Holman, UK 302.7 kmh
- 2) Billon Guard, France 302.3 kmh
- 3) Tomasz Rachwat, Poland 300.3 kmh
- 10) Sohn Newton, USA 293.8 kmh
- 20) Tommy Brown, USA 288.8 kmh
- 21) Carl Dodge, USA 288.6 kmh

•F2A Speed, team standings:

- 1) UK
- 2) Russia
- 3) Spain
- 4) USA

•F2B Precision Aerobatics, individual standings:

- 1) Han Xin Ping, China 6653.5
- 2) Niu An Lin, China 6525.0
- 3) Wang Jian Zhong, China 6251.5
- 4) Paul Walker (defending World Champ) 6339.5
- 5) Ted Fancher, USA 6320.0
- 8) Bob Hunt, USA 6284.5
- 9) David Fitzgerald, USA 6243.0

•F2B Precision Aerobatics, team standings:

- 1) China
- 2) Japan
- 3) USA

•F2C Team Race, individual standings:

- 1) Borar/Cesaro, Switzerland
- 2) Titov/Yugov, Russia
- 3) Fischer/Stramiak, Austria
- 7) Kasik/Brown, USA

•F2C Team Race, team standings:

- 1) Russia
- 2) France
- 3) USA

•F2D Combat, individual standings:

- 1) Mervyn Jones, UK
- 2) Viacheslav Belajev, Russia
- 3) Boris Faisov, Russia
- 10) Mike Willcox (tied with 5 others)
- 16) David Owen, USA (tie)
- 16) Chuck Rudner, USA (tie)

•F2D Combat, team standings:

- 1) Russia
- 2) UK
- 3) Czech Republic
- 4) USA, Ukraine (tie)

In addition, Mark Rudner of California became the new Junior World Champion in Combat, and Robbie Hunt placed 3rd in the Junior Precision Aerobatics competition. We'll try to have more info for you next month, so stay tuned! MB

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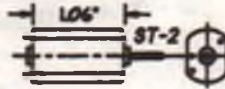
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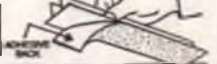
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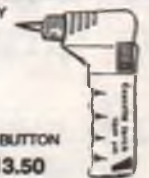


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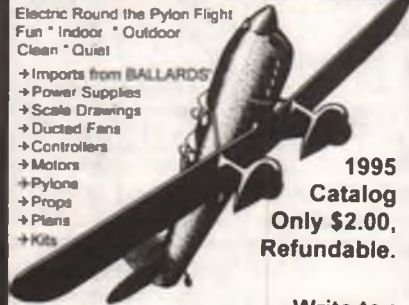
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ELECTRIC POWER *cont. from page 33*

Additionally, the formula for computing power is:

$$P = VA$$

where:

V = Voltage (figure 1 volt per cell under normal load of 20-30 amps);

A = Current (unit of measure is the Ampere, abbreviated as Amp or A);

R = Resistance (unit of measure is the Ohm);

P = Power (unit of measure is the Watt, abbreviated as W).

Amperage is the rate at which electrons flow through the circuit. Voltage is the force with which the electrons are pushed along the conductors. Resistance describes how much the circuit resists electron flow. With these two equations and given any two of resistance, current or voltage, we can compute the other parameters. Now, let's analyze a circuit.

The sketch shows a typical circuit that we might use in our planes. P is the battery pack, M is the motor and R1 and R2 represent the circuit's connectors—one source of electrical resistance. (Every circuit has to have some resistance. Since all of our components are imperfect—i.e. they all have some very small amount of resistance—we need to include their resistance in our computations to make a full analysis. We'll assume that R1 and R2 are the

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only two source of resistance, just to keep this simple.)

Notice that these components exhibit a fixed resistance which doesn't change under any operating conditions. For example, the wire will always have the same amount of resistance to electron flow no matter how much current is passing through it or how big a prop you have on the motor. Motor resistance works a bit different because of the way the motor operates. For now, let's just say the resistance changes as prop size (or load) changes.

Let's illustrate how we can determine what the power loss is with all of the various connectors. With our motor setup, let's assume that the current has been measured at 20 amperes (amps) and the voltage across the battery terminals while the motor is running is 12 volts. This means that 12 volts of force are pushing 20 amps worth of electrons through any given point in the circuit. In electrical theory, the current is always the same at any point in the circuit. This makes sense, since the number of electrons passing through one portion of the circuit—say a short length of wire—must equal the number of electrons passing through the next portion of the circuit.

The voltage level at different places in the circuit changes. For example, the voltage between point A and G (G will be used as a common reference point—called the "ground") will be 12 volts, as stated above. The voltage between B and G will be somewhat less because the resistance of the connector will take away some of the electrons' force. Similarly, the voltage between C and G will be even less. Logically, then, one can deduce that since the voltage drops after each component, the component uses up some of the force to overcome its resistance. Measuring the voltage across each component will give us the voltage drop for each one. Knowing the voltage drop and the current, we can use Ohm's law to compute each component's resistance.

Working in a different way, we can illustrate the importance of low-resistance wire and connectors. We can calculate the voltage drop across each component in the

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circuit using Ohm's Law. For example, let's assume again that we have a 12-cell pack, therefore there are 12 volts starting out in the circuit. The current is 20 amps, and let's say we've measured the resistance of connector R1 at 2 milliohms (0.002 ohms). Using the first law $V = AR$, the voltage drop is:

$$V = 20 (0.002) = 0.04 \text{ volt.}$$

More importantly, the power we've lost because of this connector is:

$$P = VA = (0.04) 20 = 0.8 \text{ watt.}$$

Since we have two connectors, our total power loss is 1.6 watt. The mathematicians among you will notice that we can write the power formula as:

$$P = VA = (AR)A = A^2R.$$

Since the power of the entire circuit is:

$$P = VA = 12 (20) = 240 \text{ watts,}$$

we've only lost a small portion (1.8W/240W = 0.66 percent) of the power through the two connectors.

Now let's say our soldering job is really bad and the resistance for these sloppy connectors is 0.1 ohm each:

$$P = A^2R = (20)(20)(0.1) = 40 \text{ watts.}$$

We have two connectors so the total power loss is 80 watts—1/3 of the available power. Not good! The important point here is that on the surface, it would seem that 0.1 ohm would be too small a resistance to dramatically affect the circuit. Obviously, it has a tremendous effect. It is very important to make your solder joints as clean as possible.

Batteries have resistance also. It's called "internal resistance" and it's one of the parameters that describe the characteristics of the battery. The ideal electric flight battery is one that can be charged quickly and discharged at very high currents—20-30 amps is not uncommon, and if you fly pattern and contest ships, you may draw as high as 80 amps for short periods of time. Generally speaking, if the internal resistance of the battery is high, the current available from the battery is low. This would make sense, since the current in a circuit depends on the resistance (remember Ohm's Law: $A = V/R$). The internal resistance of the battery also contributes to the overall resistance of the circuit; the higher it is, the less current there will be for a given voltage. In addition, because of the other law $P = A^2R$, the higher the battery's internal resistance, the more power that is lost. This wasted power turns into heat—that's why your battery pack gets hot.

Before I wrap up, let me remind you of the Electric Modeler's Mail List. If you want to contact E-modelers in your area and/or you wish to be added to the list, please drop me an SASE. My address for this and all other comments is 6462 Sunny Brae Dr., San Diego, CA 92 119. My daytime phone number is (619) 463-4453, and my CompuServe address is 74164,3237; Internet users can find me at 74164.3237@compuserve.com. **MB**

ELEC. CORNER *cont. from page 58*

harm either their capacity or their lifespan.

However, due to the troublesome logistics of charging at any given rate for any given period during the day, I prefer to charge constantly at a lower rate. Nothing to keep track of, no timers, etc.—just plug in and forget. G.E.'s information on what it refers to as "Standby" or "Trickle" charging specifies a rate from 0.01C to 0.04C, with no charge control being required. Being wary of overcharging, I long ago settled on the lower figure, which for 500 mA cells would be 5 mA. All of my unused batteries are constantly on charge at that rate, and any failures that have occurred I have attributed simply to old age or pure bad luck. Regardless of all these formulas and impressive charts, Murphy is still out there waiting to apply his laws!

There is some relief on the way for all these perplexing problems. I've read that Eveready Battery Company, in cahoots with National Semiconductor, an IC manufacturer, is working on "smart" rechargeables, which will include an internal SC to monitor battery condition and charge rate.

Which brings us to Mr. Typond. This one we've got to fly by the seat of the pants. I haven't seen any manufacturer data that specifies cell life in years—only in the number of charge/discharge cycles,

which generally ranges from 500 to 1000. (Who keeps track, right?) We can only go by years, and as Don is doing, by the measured capacity, though a definite indication of the loss of electrolyte is the gray fuzz that appears around the positive terminals in batteries that have vented or otherwise leaked. Such cells are definitely questionable.

Twelve-year-old cells I would save for Ugly-Sticks and those fun-fly things. Even with new battery technology, I would not go over four years with batteries that are in constant use (no six months idle periods without charging) and otherwise test OK. If I were flying Scale Masters-quality

airplanes, or otherwise in serious competition, I would re-battery every two years. Cermark lists four-cell packs like Don indicates at a measly \$13. What's that compared to the cost of an airplane? No contest. Use the old ones in your flashlight or your child's toys, but don't fly with them.

To save you having to ask, Cermark Electronics & Model Supplies Co. is at 107 Edward Ave., Fullerton, CA 92633; (714) 680-5888, with another branch at 551 Mulberry Ct., Buffalo Grove, IL 60089; (708) 808-0145.

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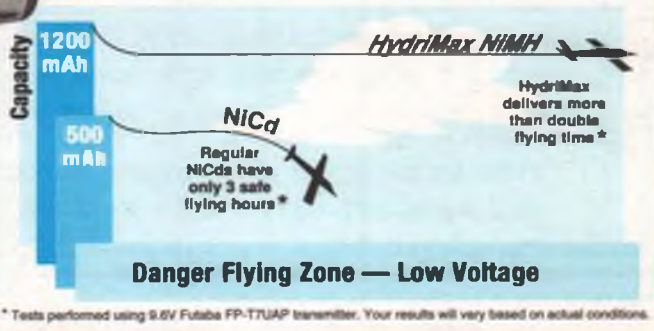


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SCALE MASTERS *cont. from page 47*

1. Terry Nitsch, 93.250, 190.750.
2. Dennis Crooks, 92.583, 189.583.
3. Diego Lopez, 92.083, 188.583.
4. Jeff Foley, 91.417, 187.917.
5. Shailesh Patel, 90.417, 186.917.
6. Eugene Job, 91.083, 185.583.
7. Gene Barton, 90.500, 183.500.
8. David Hayes, 84.917, 181.417.
9. Roger Shipley, 88.167, 181.167.
10. Michael Barbee, 86.500, 180.500.

Notice that this was not exactly a fly-away for any of the top winners, there being less than 1 point difference between any of the top six places, and just over 10 points between the top 10.

I'm never quite sure what impresses me the most at these meets—the airplane, the flying, or the man himself. As a builder, though far from this category, I'm aware of the many hours and dedication needed to produce a Scale Masters class of airplane. We must also consider that in many cases, these are no longer young men (I calculated the average age as being just under 50); arthritis begins to make itself felt, and the eyes are not what they used to be. Still, the results of their efforts



The award for Best Plans-Built Aircraft went to Earl Thompson and his fantastic DH-89A Rapide, which he flew at the 13th FAI World Champs in Holland as part of the U.S. team. Power comes from two K&B .40s, guidance from Airtronics. Photo by Robert Ramirez.

are impressive to one and all; those of us who can't compete in their class can only admire and respect those who do.

The 1994 Scale Masters was undoubtedly a success, but as with all such events, it didn't just happen. We must recognize and thank all of those who worked hard to make it happen: Harris Lee, founder and Chairman of the Scale Masters Program; Diego Lopez, Contest Manager; Gordon Truax, Contest Director; and Chief Judge Kent Walters. An extra special vote of thanks must go to Scale Masters' primary sponsor, Pacer Technology (Zap, etc.), in the person of Herschel Worthy, and to all the others who helped out—Dry-Set Model Markings, Futaba, Hansen Scale Videos, Hobby Shack, Horizon Hobby Distributors (JR), and Robart. Now look at the pictures, drool, and go burn your Ugly Stik! **MB**



■ TOP: Inside view of the Spitfire's gear. Compressed air tank for the Robart pneumatic retract is mounted with Velcro in a cradle between the rudder and elevator servo; motor battery tray is 1/8-inch thick, attached with screws to two 1/4x3/8 spruce rails. The four seven-cell packs are held to the tray with Velcro and a heavy-duty nylon cable tie. ■ BOTTOM: Removing the motor batteries and air tank reveals the receiver, radio battery and speed control—all neatly mounted with Velcro to a 1/8-inch balsa platform glued to the fuselage formers.

full power, and it will cruise level at half power or less. Great big loops are easy with no tendency to fall off, and the roll rate is, in my opinion, very scale-like. Flight time ranges from five to seven minutes, with power left after landing.

If you think I'm enthusiastic, you're right! If kit manufacturers will take a good look at what has been proven to be practical and will provide the modeling community with more kits like this one, and especially with kits intended from the outset for electric power, we can look forward to a lot more big, impressive electric airplanes. MB

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TECH STUFF cont. from page 11

real or imaginary lifting stabs for most RC models, but several disadvantages.

If you feel the need to put a cambered airfoil in the stabilizer of an RC model, install the airfoil "upside down," so that it will be "lifting" down most of the time. A cambered stabilizer section in an RC model is usually pointless, however, since the aerodynamic forces on the stabilizer are very low in level flight. The deflection of the elevator provides the effective variable working camber of the horizontal tail for takeoff, landing and maneuvers.

AIRFOIL STABILITY

Any cambered wing airfoil will have a diving moment coefficient, and also the



One of this month's topical deals with model aircraft flight stands—what works and what doesn't. Our columnist offers this 25-year-old original design as the best he's seen yet. Fully described in text.

center of pressure will move forward as the angle of attack increases. Wings with cambered airfoils are unstable by themselves; a stabilizer is required to make the airplane as a whole stable. The greater the wing airfoil's camber, the greater the instability of the wing alone.

Quoting now from *Elements of Practical Aerodynamics* by Jones: "When such a wing is balanced at one angle of attack, if the angle of attack is momentarily increased by a gust of wind or otherwise, the forward movement of the upward resultant force tends to tip the leading edge of the wing upward still more. This increase of attack angle moves the center of pressure still farther forward, tending to increase the nosing-up still more, so that a stall would eventually result." The converse is also true, leading to a "tuck under" and dive. This is pitch instability.

Symmetrical airfoils have two advantages: they lift as well inverted and in outside maneuvers as upright, and they have zero moment coefficient about the quarter chord point and practically no center of pressure movement. Symmetrical airfoil wings are therefore neutrally stable. For the same stability margin, they

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permit the use of smaller stabilizers and/or shorter tail moment arms than cambered wings.

FLYING WINGS

As one might predict, a cambered airfoil used upside down is stable. We can even have positive stability with a *positive* camber over most of the airfoil but with the camber line reflexed upward near the trailing edge. Slightly reflexed trailing edges on cambered airfoils are sometimes used to give near-neutral stability, yet retain some of the higher lift of a camber.

On a flying wing, since we have no stabilizer to correct for wing instability, we need to use a stable airfoil. This can be a cambered airfoil with considerable trailing edge reflex, or a symmetrical airfoil with a slight reflex.

Some of us have built and flown aerobatic flying wing models with symmetrical airfoils and no reflex—and they were stable. How could this be? It isn't much of a mystery. We had to balance the model fairly well forward, and it therefore required a little up elevator or up elevons to keep it level. That slightly up elevator was acting as a reflexed trailing edge to make the system stable. When the ship was inverted, slight down elevator (actually up, then) was needed, again giving us the required airplane stability.

FLIGHT STANDS

In about 1968 I designed and built the flight stand shown in the photos. I still use it every time I fly, and love it. The configuration has many advantages, and I highly recommend it.

First the question: "Why bother with a flight stand?"

Most of us feel a flight box of some type is necessary, to carry fuel, primer bottle, starter battery and starter, glow lighter, glow plugs, props, tools, etc. A flight stand is a flight box with legs and a cradle to support the model. The legs allow us to stand on *our* legs. No rocks digging into tender knees, no having to kneel in wet grass, no dirty pant legs, no sore backs. The older I get, the more I appreciate comfort, but I never did like working down on the ground.

But human comfort is only part of the reason for using a flight stand (or table). Most of us don't bother to use intake air filters on our engines. In flight we usually don't need them, because the air in most places isn't particularly lumpy. But on the ground we do need them; the ground is almost always dirty, and any wind (like that from model propellers) kicks up dust like mad.

We really shouldn't even leave our model on the ground at the field with the engine off, because drifting grit will settle

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in the intake and be sucked in to readjust the piston fit when the engine is started. Three feet off the ground, however, the air is usually much cleaner.

My stand has three legs, so it doesn't rock on irregular ground. The two rear legs fold up alongside the sides of the box. The box sides are angled in 15 degrees at the top, so that the legs angle out 15 degrees for good lateral stability. The stops on the rear legs are set so the legs also angle aft and the front leg angles forward about 15 degrees, making the unit very tip resistant in all directions. The stand shows no sign of tipping over while hold-

ing a .60-powered model running at full throttle.

The front and rear cradle members bolt on with wing nuts and can be rapidly changed to fit different models. These are lined with foam wing-seating tape so as not to mar the models' finish. The use of a single adjustable cradle at each end also looks like a good approach.

The portion of the box directly under the model holds a gallon of fuel, the fuel pump, starter battery, and bottles of glue, accelerator, priming fuel, after run oil, and model cleaner. The rest of the box, which extends out on one side, contains spare

props, plugs, fittings, balance weights, tape, fuel line, Band-Aids and other sometimes-needed. This part of the box has a sliding cover to keep things clean. The cover can be used as a worktable both when the box is closed and when it's open.

The dividing wall between the two sections of the box has a row of vertical holes of various sizes to hold screwdrivers, glow plug lighter, Allen wrenches, pliers, etc. A holder for a roll of paper towels is mounted on the outside of the rear wall.

There's at least one flight box on the

continued on page 82

ADVERTISER INDEX

This Advertiser's Index is provided as a service to readers. Due to last minute changes, we cannot guarantee correct page numbers or listings of all advertisers

Acme	72	Futaba	40	North American Tarp Co.	77
Aerocruiser/Dare Designs	79	Great Planes	7, 26, 32, 38, 65	Northeast Aerodynamics	72
Aeromodeller Magazine	69	Gyro Kite	68	Ohio RC Models	74
Aerospace Composites	34	Hangar Design	78	O.S. Engines	35
A.M.A.	51	Herr Engineering	73	Pacer Technology	Inside Front Cover
Astro Flight	34	Hi-G Products	78	P.A.W. Diesels	70
Aveox	22	High Sky	53	Peck-Polymers	76
Badger Air Brush	63	Hiline Products	71	Pierce Aero	82
Bob Hooper	74	Historic Aviation	3	Precision Aero	70
Bob Smith Industries	Back Cover	Hitec RCD	31, 45	R&R (Model Aviation Technology)	51
B&P Associates	76	Hobby Lobby International	19	Radar Sales	72
Carlson Engine Imports	70	Hobby Shack	5	Rahm's Winches	57
Century Helicopter Products	58	Horizon Hobby Distributors	23	Riteco	77
Challenge Engineering	70	Indoor Model Supply	39	Robart	63
Champion Models	77	JDM	14	Rocket City	57
Chuck Anderson	71	Jim Walston Retrieval Systems	33	Ross Models	79
Clancy Aviation	72	John Pond O.T. Plan Service	77	Scande Research	71
Computer Designs	34	J'Tec	39, 71	Scientext	71
Cox Products	66	K&A Models	33	Skonk Works	71
CS Flight Systems	70	K&B	71	Sig Manufacturing Co., Inc.	15, 18
D.A.D.	6, 8, 10	K&S	73	Slimline USA	62
Dave Brown Products	68	Landing Products	50	Strand Products	70
Dave's Wood Products	34	Micro Fasteners	76	Superior Props	71
Davis Models Products	72	Micro-X	53	Team, Inc.	75
Dicky Bird Models	70	Millcote Corporation	78	Technopower	79
Diel's Engineering	70	Miniature Aircraft	Inside Back Cover	Teleflite	58
Du-Bro	9, 64	Minimax Enterprise	73	Toledo (Ohio) Hobby Show	27
Duraplans	55	Model Marketplace	70-73	Top Flite	31
Eastern Tool & Supply	71	Model Aircraft Labs	71	Unique Model Products	66
Edjer Co.	76	Model Covering Company	70	Vince Miller Designs	81
Flightsmith	71	Model Electronics	72	Vintage Aircraft	71
Fourmost Products	34	Model Research Labs	70	Woody Bartell	71
Fox Manufacturing	39	MM Glider Tech	78	WRAM Hobby Show	67
				Zap Hall of Fame	59

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You'll have a ball with this control line profile model of a carrier-based WWII Japanese autogyro. Bill Darkow developed this unusual model primarily for CL Profile Navy Carrier events, but it makes a great sport model as well. Not difficult to build, just a bit different. Requires a throttle-equipped 3S and a three-line throttle bellcrank.

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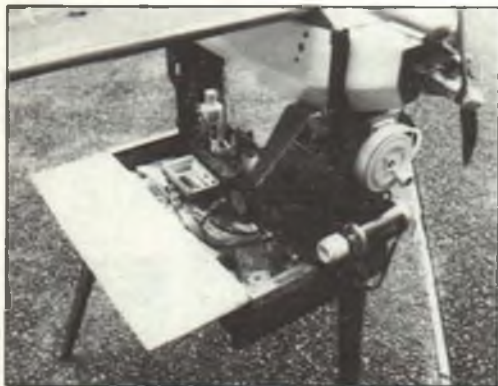
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TECH STUFF *cont. from page 80*



The main drawer in Francis' flight stand has a sliding top that can double as a worktable even in the open position as shown here. Fuselage cradles can be quickly changed to suit different models.



One of the best things about our columnist's flight stand is that it folds up easily for storage and transport. The two rear legs fold up alongside the box; single front leg is separate and plugs into a socket.

market with short folding or detachable legs, but the box is still too low. One commercial design has a big box with a door on one side that swings down; the model sits on a cradle on top of the box. My objections to this configuration are that the

swing-down door ends up too low to be used as a worktable, except on one's knees; and the goodies in the box can also only be seen and reached on one's knees or while bending down.

I like my design better than any other

I've seen. Everything is accessible from above while in a full standing position. After using it for 25 years, I haven't found much I would change. I was either a very foresighted designer or made some lucky choices!

At age 75 I can still carry it fully loaded with no trouble, with the legs either folded or down. At 95 I may have a problem. I've considered putting two wheels on it so it can be wheeled as a cart, but at this early stage of my deterioration, wheels appear to present more complications than they would be worth.

This description plus the photos should enable you to make one, or will serve as a baseline to deviate from. I waive all rights to the design. I hope some entrepreneur sees fit to build them for the market.

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

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


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