MODEL BUILDER

WORLD'S MOST COMPLETE MODEL PUBLICATION

JUNE 1989

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U.S.A. $2.95
Canada $3.95

volume 19, number 208

CONSTRUCTION
SEA FLI XI

Old Timer
LANZO RUBBER STICK

0 74820 08545 5 06

Fan Jets Over England:
THE WOODBRIDGE FAN FLY

Simply Brilliant.

SUPER NARROW BAND 1991 CERTIFIED

Vision is a brilliant new way of looking at R/C systems. Fast, easy to use computer technology lets you customize aircraft setup and fine-tune flight adjustments, in minutes, not hours. State of the art electronic memory allows you to program 3 or 4 different aircraft setups, on one transmitter.

Vision Makes Life Easier

Vision's programmable ATRCS system simplifies the complicated, time-consuming process of R/C aircraft setup and adjustment. This innovative system allows you to easily recall any control or adjustment configurations. You can quickly and conveniently reset or refine your system using precise incremental electronic adjustments.

No More Guesswork

ATRCS programmable memory provides precise control settings and amazing flexibility – in a system that's easier to use than most manually-adjusted radios!

Time-saving built-in templates enable you to quickly tailor the system to your specific aircraft flight characteristics. Vision's electronic adjustments eliminate potentiometers by replacing them with simple yes/no or increase/decrease commands. Minor adjustments, or completely new settings, are right at your fingertips. There are no complicated codes to learn – if you can push a button, you can master ATRCS.

VISION

Vision Of The Future

Airtronics quality, reliability, and flight-proven ATRCS technology are built into every Vision system. The VS8P is designed for pattern, scale and sport aircraft and the VS8SP is specially designed for sailplane applications.

Compatible with Airtronics FM or PCM receivers, Vision features our Gold Label Super Narrow Band Dual Conversion Receiver for reliable operation in 1991 and beyond.

Glimpse the bright future of R/C systems with Airtronics' new Vision.

Vision Series Features:

- User-Friendly ATRCS Programming System
- 16 Bit Microprocessor for superior computing power
- All Electronic Adjustment that eliminates potentiometers
- Easy-to-read Liquid Crystal Display asks only one programming question at a time to simplify aircraft setup
- Multiple Model Memory stores three or four aircraft setups in one transmitter
- Non-Volatile Memory Storage eliminates backup batteries
- Aircraft Templates allow different servo configurations for various types of models
- Four-Level Program Access Protection
- User Selectable Mode I, Mode II or Mode III operation
- Electronic Servo Centering on All Channels
- Servo Reversing on All Channels
- PCM or PPM Operation
- Gold Label FM/PCM Super Narrow Band Dual Conversion Receiver
- High Capacity Modular Plug-In Transmitter Battery
- Audio Low Voltage Alarm for Transmitter Battery

VS8P Features:

- User-Assignable Transmitter Switch Functions
- Memory Storage for three complete aircraft setups
- Three In-Flight Selectable Snap Roll options
- Dual Rate on Aileron, Elevator and Rudder, with option for Auto Dual Rate on Rudder
- ATV on Aileron, Elevator, Rudder, Throttle, and Flaps
- Adjustable Throttle Response Curve
- Linear, VTR or Exponential Response on Aileron and Elevator
- Trim Memory on Aileron, Elevator and Rudder
- Generic Compensation Mixing allows any two functions to be coupled together (2 mixers available)
- Generic Bi-directional Mixing allows any two functions to be mixed together (2 mixers available)
- Aileron/Rudder Coupling
- Flap/Elevator and Elevator/Flap Mixing

VS8SP Features:

- Flight Mode Switch with Camber and Elevator Presets for speed, thermal and launch configurations
- Memory Storage for four complete aircraft setups
- Dual Rate on Aileron and Elevator
- ATV on Aileron, Elevator, Rudder and Flaps
- Electronic Aileron Differential (2 levels available)
- Aileron/Rudder Coupling (2 levels available)
- Crow Landing Option (flaps down and ailerons up)
- Elevator/Camber Mixing
- Aileron/Flap Mixing
- V-Tail, Elevon and Flaperon Capability
- Elevator Compensation for Spoilers, Flaps and Landing Gear

AIRTRONICS INC
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New book "*briefings*" from H.A.

REVOLUTION IN THE SKY. Allen. New, revised edition. Allen tells the exciting stories of all the passenger planes built by Lockheed during the Golden Age—Vega, Air Express, Sirius, Orion—and the pioneers who flew them—Lindbergh, Wiley Post, Amelia Earhart, Turner, Doolittle, and others. Illustrated with 250 historic photos and scale drawings. 256 pgs., 8½" x 11", hdbd. A Reviewer's Choice! 3490C **$24.95**

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WALDO: Pioneer Aviator. Waterman. The true-to-life story of Waldo Waterman, barnstormer, inventor, test pilot. His life as an early TWA pilot, Hollywood flying in the epic of "Hell's Angels" film, winning at the National Air Races and of his perfection of the only successful flying automobile. Captures the flavor, excitement, glory and heartbreak of American aviation 1910-1944. 300 photos, 502 pgs., 6" x 9", slbd. 1440B **$18.95**

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F-8 CRUSADER, D&S #31. Kinzey. Vought's F-8 was flown by the U.S. Navy and Marines throughout the Vietnam war. Covers all fighter and reconnaissance versions. Lots of never-before-published photos of cockpit, camera bays, landing gear, engines, armament, and variable-incidence wing. Modelers section gives kit reviews, decals, etc. 223 photos, many in color, plus 3-view drawings, 72 pgs., 8½" x 11", sfbd. 1157A **$9.95**

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MODEL BUILDER

JUNE 1989

volume 19, number 208

898 West Sixteenth St., Newport Beach, California 92663 Phone (714) 645-8830

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FEATURES

CONSTRUCTION

COVER: Not as close as it looks! Photo by Bill Northrop, taken on closing day of the 1988 Tournament of Champions, Las Vegas, Nevada, sponsored by Bill Bennett, Chairman of the Board of Circus Circus Enterprises. Mel Larson, Executive V.P. of Circus Circus Enterprises, is flying his 1983 Bell Long Ranger in a low pass several hundred yards behind the two Kalt R/C demo helicopters. The yellow-finned model on the left, being flown by Yoshi Nagatsuka, is the new Kalt Excalibur, which is scheduled to be available sometime in June. The other model is a Kalt Omega Pro, flown by Dan Melnik. The full-size Bell heli, co-owned by Bill Bennett and his wife, Marilyn, is powered by a 500-hp Allison C-28 turbine engine, and cruises at 135, with a range of 350 miles.

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Second class postage paid at Newport Beach, California, and additional offices.

EXPERT 1991-New "R.W.E.T.F." Features.

The new Expert® FM seven channel radio system is backed up with twenty-nine years of engineering, designing, manufacturing, and experience.

World Engines technicians and staff have also accumulated over 128 years of experience flying competition pattern, scale, sailplanes, pylon and everyday sport flying.

This experience that combines the workbench and flight line helped us to realize that testing and accountability does not end with the test stand. Testing at World Engines starts with the lab and moves to the flying field - the ultimate test. The concept of testing continuity is called the "R.W.E.T.F." check. **Real World Environment Test Flying.**

20KHz-TX/10KHz-RX

1991

The transmitter is a lightweight, easy to hold design. Both non-slip control sticks are equipped with adjustable spring tension and stick length. Controls for aileron and rudder dual rates, retracts (ch.5), flaps with separately adjustable elevator trim (ch.7), auxiliary (ch.6), Two way Slow Rolling, and coupled rudder mixing, are positioned at your fingertips. Other adjustments which are not needed while flying, such as servo reversing, roll rate adjustment, and all mixing adjustments are securely located under the rear panel on the back of the transmitter.

An extremely narrow crystal filter is used in our new receiver to virtually eliminate outside interference. Its small size and light weight allow it to be used in almost any application. The new Expert® FM receiver has demonstrated its ability to fly at locations that other brands are not considered flyable.

Finally, the new Expert® FM system has one feature that is hard to match, the backing of a dependable service department located here in the central United States.

Make the Expert® FM seven channel system your system for 1989. Why pay for features that you will never use and may even become serious service problems down the road.

NEW! TWO WAY SLOW ROLL SWITCH
Roll either left or right with a simple flip of the switch. Rolling rate is adjustable.

NEW! V-TAIL MIX
Allows the rudder and elevator servos to act as two separate servos or as two servos in parallel. Perfect for gliders, pylon, and models using a V-Tail.

NEW! DELTA MIX
Allows the aileron and elevator servos to act as two separate servos or as two servos in parallel. Use instead of a mechanical elevon mixer.

SERVO REVERSING
The throws for all seven channels can be individually reversed by simply throwing one of seven switches located on the rear of the transmitter.

COUPLED RUDDER MIX
Aileron and rudder mixing allow for coordinated turns in quarter scale and larger models. This mixing feature works from the rudder and the aileron sticks simultaneously.

1991 READY
This system exceeds the 1991 standards set by the AMA. Our transmitter proudly wears the AMA Gold Sticker.

The Expert FM seven channel system comes complete with the new full featured transmitter, our exclusive crystal filter receiver, four weather-resistant S-25 servos with mounting hardware, rechargeable batteries in both the transmitter and receiver packs, switch harness, charger, transmitter neck strap, and frequency flag.

EXPERT®

ENGINEERED FOR THE SERIOUS MODELER

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These products are available exclusively through World Engines' dealers nationwide.

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The Premium Grade Cyanoacrylates Are Here!

Sig CAs have been designed especially for the modeler and that means that we developed them by using the same parameters you would use if you could design your own adhesive system. We have just done it for you. Once you try Sig CAs for the first time you will know what we mean. Check these features and see if you don't agree.

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Bond strength - As good as or better than any cyanoacrylate on the market today. Average bond tensile strength is approximately 4000 psi. Sig CAs will bond nearly anything; balsa, plywood, fiberglass, cork, vinyl, glass, metals, plastics, rubber, stone, and even porcelain. Although they have been developed especially for modelers, they have exceptional applications for any type of arts and craft work.

Tip Clogging - Our special formula and tip design almost completely eliminates this problem. No more picking the ends or constantly sticking a pin down the spout of the bottle while you are using the adhesive.

Low Odor - While there is a definite CA odor, it is at a much lower intensity than other cyanoacrylate products. Because of this, long building sessions will be less fatiguing and many modelers will notice lower levels of eye and nose irritation with Sig CAs.

Long shelf life - 12 months is guaranteed. In shop tests here we have had the adhesive last for up to two years without any problems experienced during subsequent use.

See your dealer first! If not available, call 800-247-5008 toll free for orders only. For domestic orders under $15 add $2.50 postage. Over $15 ppd. Latest Catalog - $3.00

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SIG MANUFACTURING CO., INC. . . . . Montezuma, IA 50171

BYRON ORIGINALS INC.

Modelers Talked . . . and We Listened!

Modelers said: "We need a portable workbench, adjustable from one size model to the next, that keeps our models (boats and planes) off the ground so they won't get damaged while being worked on."

We answered with:

Craft Cuddler

Great for Airplanes, Cars and Boats

- Lightweight • Adjustable
- Durable • Portable

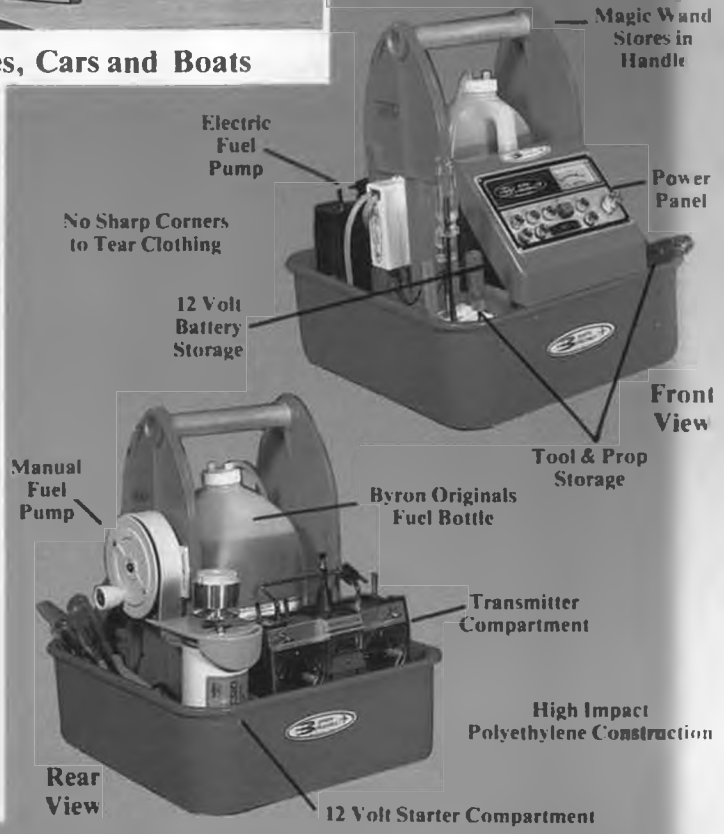
The Craft Cuddler is rugged, lightweight and adjustable from one size craft to another. Strong yet soft straps feature velcro fasteners to securely lock your craft into position during service work. It allows positioning boats or planes right side up, upside down, or on their sides while not allowing stabs, wings, rudders or keels to get damaged. Plus, you can make repairs without fatiguing your back. Fully adjustable in height, width and length . . . perfect for any size model up to 40 lbs.

Modelers said: "We need a field box that is durable, lightweight, holds just the necessities and doesn't rob valuable building time to assemble."

We answered with:

Pit Pal

- Fuel Proof
- Lightweight • Durable
- Compact Design
- Properly Balanced
- Best of all No Assembly or Painting Required



See Your Local Dealer First!

If he doesn't stock Craft Cuddler and Pit Pal, order direct.

Accessories shown with Pit Pal not included in price.

Craft Cuddler Order Information

Order Number	Description	Retail Price	Factory Price*
6130230	Craft Cuddler	$46.50	$34.95

*Add $3.00 shipping and handling for each item ordered for delivery in contiguous 48 states. (HI, AK and overseas, call for quote.) If accessories listed with Pit Pal ordered at same time as Pit Pal, no additional shipping charge for these accessories. Master Card and VISA Welcome. Prices subject to change without notice. Sorry, no COD's.

Pit Pal Order Information

Order Number	Description	Retail Price	Factory Price*
6130220	Pit Pal	$38.50	$29.95
2630380	Power Panel	41.95	24.95
2630379	12V Fuel Pump (glow fuel only)	16.75	14.50
2630377	Six Shooter Fuel Pump (glow)	11.95	8.95
6030643	Auxiliary Fuel Bottle Cap with fuel line and elbows	4.30	3.00

Byron Originals, Inc. • P.O. Box 279 • Ida Grove, IA 51445 • Phone: (712) 364-3165

Construction articles contributor, Ted Schreyer, sent in this photo taken circa 1936 at Sky Harbor Airport, Chicago, Illinois. Ted is wondering what aircraft he was sitting in when the photo was taken. Can anyone help?

from Bill Northrop's workbench

• The WRAM Show, put on by the Westchester Radio Aeromodelers, Inc., returned to its old stomping grounds for the twentieth annual meeting on February 24-26, 1989. For the last two years, while much-needed renovation and expansion of the Westchester County Center was in process, the show was moved to the Yonkers Raceway. Although that facility certainly had it made in parking space, the interior was not the best layout for a model show.

Actually, the renovation at the County Center was primarily a cleanup and paint job, with only a small amount of face-lift. The new floor area was mostly on the north side, and was divided into large rooms with separate entry doors from the main arena. The WRAMS chose to use these rooms for the static model displays, and thus the most noticeable change from previous years was the expansion of the lower floor into a larger manufacturers' exhibit area. There were, in fact, over 60 exhibitors downstairs, and spectators were constantly reminded of this over the PA system throughout the show.

There had been some speculation that the RCHTA show scheduled only one week later in Pomona, California, would cut into the WRAM exhibitor attendance, however, with only one or two notable exceptions, the major exhibitors did not drop out. The public days, Saturday and Sunday, were typical WRAM Show . . . solid humanity in all directions . . . to leave the booth for food or the restrooms took at least a half-hour, even if you didn't stop to talk.

To Frank Devore, and all other members of the WRAM organization, congratulations on another great one!

"HEY KID" BOOK

To those who have inquired in the past, and for the future, Bill Warner's popular "Hey Kid" series that was recently published in issues of *Model Builder* will be available in book form. At this point in time, we're not able to specify who will be putting it together (several sources are under consideration), but it will happen. Please stay tuned.

THINGS TO DO

A 7-cell F3E Contest restricted to Novice and Sportsman fliers will take place in Costa Mesa, California, on August 19 and 20, 1989. Cash prizes totaling $2,000 ($1,000 for First Place, $600 for Second, $250 for Third, $150 for Fourth) will be awarded. The contest, hosted by the Harbor Soaring Society, and cosponsored by Airtronics and *Model Builder* magazine, is open to U.S. resident AMA members only. U.S. FAI F3E team members, or anyone who has qualified for the team selection, are welcome to attend, but may *NOT* enter or compete. Any size model may be used, any size electric motor, and the seven batteries shall be 1.2 MAH or smaller. Winning models will be weighed and measured to assure they're within the FAI (AMA) F3E specifications.

Send for entry (fee is $25) or inquiries to: Felix Vivas, 1800 16th St. H-310, Newport Beach, California 92663.

* * *

The K-W Flying Dutchmen Club will hold its 20th Annual R.C. Scale Rally on Saturday and Sunday, September 9 and 10, 1989, at Kitchener, Ontario, Canada. For further information, contact John Towell, 40 Fran Ellen Crescent, Kitchener, Ontario, Canada N2N 2N5, phone (519)742-5070.

INDUSTRY NEWS

The Futaba Corporation of America is relocating its national headquarters to Irvine, California, effective March 20, 1989. The new address is: 4 Studebaker, Irvine California 92718, or P.O. Box 19767, Irvine, California 92713-9767. The new phone number is (714)455-9888, and the FAX number is (714)455-9899.

This move puts both Futaba and Airtronics "just down the road a piece" from RCMB's office in Newport Beach; about a

Close-up of the Allison engine detail in the big S.T.-powered P-40D by Mike Maniatis. Model was on display at recent WRAM Show.

Also seen at the WRAM Show was this beautifully built 1929 Travel Air Mystery Ship, Model R, by Chauncey Dance, of New York.

Photo taken by Bill Northrop at Whittier Narrows, So. El Monte, California, during gathering of Old Timer C/L stunt grunts for the Vintage Stunt Championships held on February 18-19, and sponsored by the California "Knights of the Round Circle" and directed by Mike Keville, with lots of help from his wife, Joann (on ground in front). Many famous names attended, such as Palmer, Fancher, Wooten, Kirn, and as seen at far right, George Aldrich.

10-mile trip down the San Diego (Interstate 405) Freeway.

BOOK REVIEW

Well, it's more like a booklet, with its 6-inch high by 8-inch wide, soft cover, 48-page format, but "A Complete Guide to O.S. MODEL 4/STROKES", written and illustrated by Graham C. Rice, is something most O.S. four-stroke engine owners will want to have.

The author, from Victoria, Australia, has been an O.S. engine user since 1957, and has held national and state speed titles 12 times. Since 1980, he has serviced all types of O.S. engines, including about 150 four-strokers. The O.S. company plans to use the illustrations and text from Rice's book in a repair manual for its home market.

The booklet, with concise wording and clear, perspective line illustrations, takes you through the complete disassembly, adjustment, parts replacement, cleaning, tolerance checking, and assembly of the O.S. four-stroke. Moreover, the author tells you *why* as well as how you do certain things, which makes it all the more understandable. We started out this review with the intention of flipping through the pages to get a rough idea of what to write about. Instead, we found ourself reading the whole thing, word-for-word, page-for-page, in detail, and enjoying every bit of it.

You can order the booklet directly from the author, for $15 including postage: Graham Rice, P.O. Box 106, Caulfield, East Victoria 3145, Australia.

POSITION AVAILABLE

RCMB Publishing Inc. is looking for someone to assist in the production of its three magazines. The successful applicant must have a command of the English language, and knowledge of magazine production (including graphics design, layout, paste-up, ad production, proofing, and typing). This position offers the opportunity for the individual to grow with the company in an atmosphere of cooperation, with a rewarding future. Experience in model building is a plus. Address your application and resume to Editorial Department, RCMB INC., 898 West 16th St., Newport Beach, California 92663. By the way, RCMB's office is non-smoking.

CORRECTION

In our January 1989 article on the Southwest Fan Fly, incorrect information was published concerning the origin of the Northrop X-4 Bantam shown on page 13 and described in the text. Eugene Martin, Felton, California, who designed the F6C-1 Curtiss Hawk that we published in our May 1980 issue, was the original designer and builder of the X-4. It was first flown at the R.C.B.'s field in Santa Cruz. It was then sold to Dallas Matta, who took it to last year's Byron Fun Fly, where Harry Wood, Long Beach, California, the current owner, bought the model from Matta. One thing for certain, that X-4 sure gets around! •

ADVICE FOR THE PROPWORN
—By Jake

Dear Jake:

I can't get enough up elevator on my Little John biplane. What should I do?

Rosario in Red Bank, NJ

Dear Rosario:

I don't know, but I apparently have the same problem myself. Just the other day a guy told me that my elevator doesn't go all the way to the top. If I figure out how to fix that, I'll let you know.

Jake

* * *

Dear Jake:

Why are gyros illegal in FAI pattern competition?

FAI Flier in Fernwood

Dear FAI Flier:

Gyros are illegal because spicy sandwiches like that could cause a serious breath problem during subsequent score discussions between the pilot and the judges.

Jake

* * *

Dear Jake:

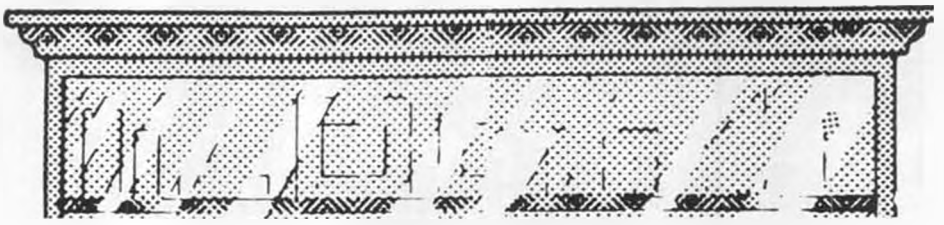
On Wednesdays, Dr. McLaughlin allows those of us without straightjacket or sharp implement restrictions to write letters. They encourage us to write to people or companies that are most likely to send responses back. That way we get more mail, and we have more things to read between shock treatments. I'm writing to you because answering questions is your business, so I figure you'll answer mine.

My question concerns your advice column. Everything you say makes perfect sense to me and I always understand all

Continued on page 107

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 review and/or description of any product by MB does not constitute an endorsement of that product, nor any assurance as to its safety or performance by MB.



• Astro Flight has introduced a couple of new electric power system chargers as part of their 1989 product line. Model 112 is a DC/DC constant amp charger that will work with any DC input voltage of from 11 to 15 volts, and is set up to charge at a constant five amps. It's intended as a replacement for the old Model 102 Super Charger and retails for $119.95. Astro's Model 115 replaces the venerable 4005B unit, and is an AC/DC variable rate charger with a current adjustment range of from one to five amps. Input voltages can be either 12 volts DC or 117 volts AC. With this charger you can safely charge anything from a 250 mAh receiver pack to a monster 4000 mAh boat battery. Suggested retail on the Model 115 is $74.95. Both of these new chargers are capable of handling anywhere from one to twenty-eight cells. A nice safety feature of both is that the input cord is both fuse and diode protected, so if you accidentally hook up the input alligator cords backwards, nothing gets fried except an inexpensive 20 amp fuse. Pop a new one in place and you're back in business. Also, voltage jacks are provided on the aluminum front panels, so you can monitor the charge with a digital voltmeter if you like.

From Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, California 90292.

* * *

Good-looking 1/4-scale Sperry Messenger from Ikon N'wst.

Great Planes Model Distributors is importing the latest O.S. "muscle motor," the .61 SFN-H helicopter engine. This powerhouse is based on the design of the .61 FSR-H with subtle design improvements to further enhance its performance. Bore and stroke remain the same, as does the O.S. 7H R/C carb. The engine looks to be a real brute, and is sure to find favor within the R/C helicopter community.

From Great Planes Model Distributors, P.O. Box 4021, Champaign, Illinois 61820.

* * *

Two new high-performance ducted fan kits recently announced by Bob Violett Models are the F-86F Sabre, which is the first scale jet kit offered by BVM and which proved its fidelity to scale and excellent flight performance by winning Expert Scale at the 1988 Tangerine International R/C Championships; and the Aggressor II, a finely tuned upgrade of the successful Aggressor "performance jet." Modifications to this latter model include improved aerodynamics, a longer and wider landing gear stance, and simplified construction. Timed runs with the Aggressor II at the recent Tangerine Fan Fun Fly showed low and high speeds of 35 and 187 mph respectively. "Performance jet" is right! Both of these new BVM kits make extensive use of molded carbon fiber parts, use BVM's exclusive Magna-Core wing construction, and feature kevlar/epoxy glass fuselages. Special retracts are also available as an option.

Full details on these and the other BVM kits are available by sending $3.00 for the Jet Info Pack to Bob Violett Models, 1373 Citrus

Astro Flight's Model 115 variable rate electric power system charger.

Also from Astro Flight, the Model 112 constant amp charger.

Rd., Winter Springs, Florida 32708.

* * *

Sullivan's new line of "SkyLite" wheels should be just the thing for modelers who like to build light. These low-bounce wheels with nylon hubs are claimed to be 40 to 50% lighter than others currently on the market. Available in six sizes, in 1/4-inch increments from 1-3/4 to 3-inch diameters, with going prices of $3.95 to $5.95 per pair. Included with each pair of SkyLite wheels is a pair of Sullivan's new "ShurLock" wheel retaining clips, which are clever friction clamps that get a real death-grip on your model's axle, yet are easily installed and removed without tools. ShurLocks are also available separately, packaged in bags of six, in both 1/8 and 5/32-inch axle sizes.

For a really secure fuel system that precludes any possibility of fuel lines slipping off of fittings, you'd be hard pressed to beat Sullivan's stainless steel twist-tie clamps, which are lengths of stainless steel wire used to bind fuel tubing to fittings. For complex fuel systems there is also a set of fittings and tees available which are impervious to ali types of fuel.

From Sullivan Products, P.O. Box 5166, Baltimore, Maryland 21224.

* * *

One of *Model Builder's* most gifted and widely-read columnists, Bill Hannan, favored us with a copy of the fourth and latest in his series of *Peanuts & Pistachios* booklets—and we must say that it is one fine piece of work. Coming from Bill, we would expect no less! Excellent quality printing, 16 pages in a full 8-1/2x11 format, full-size plans for both Peanut and Pistachio size rubber scale models, and a number of nicely drawn 3-views (Amelia Earhart's 1920 Kinner Canary is our favorite) make P&P Volume 4 a valuable addition to any F/F scale modeler's library.

Peanuts & Pistachios is published by Hannan's Runway, a cottage industry overseen mainly by Bill's wife, Joan. P&P Volume 4 is available direct from them for $5.50 plus $1.50 postage and handling. Write to Hannan's Runway, P.O. Box A, Escondido, California 92025.

* * *

The diminutive Sperry Messenger, a cute biplane design that dates back to the 1920s and which has long been a popular modeling subject, is now available as a 1/4-scale kit from the people at Ikon N'wst. Designed for .60 to .80 size engines, the model weighs in at 10 pounds and spans 60 inches, which means it's big enough to fly in a realistic fashion but not so big as to be a hassle to transport to and from the field—if you drive a van or large station wagon you could conceivably haul the model around fully assembled. The kit itself is complete with a fiberglass cowl and cable operated flight controls, for $165.50 plus $7.50 for shipping. A catalog describing all of the others in Ikon's kit line is available for $3.00.

From Ikon N'wst, P.O. Box 306, Post Falls, Idaho 83854.

* * *

Anyone who needs parts for older Fox engines had better write or get on the phone or some way or another get hold of one of the antique motor parts catalogs that Fox is making available free for the asking. They recently took inventory of their parts stock and found they had over 76,000 parts for discontinued Fox motors dating back to 1947. Once word of this gets out, you can be sure that engine collectors will come a-running. Get your parts order in ASAP! Catalogs can be had by writing or calling Fox Mfg. Co., 5305 Towson Ave., Fort Smith,

Two new semi-kits from Bob Holman are the Focke-Wulf FW-190A (top) and F6F Hellcat. Bob has an extensive line of kits and plans for all sizes of scale models.

Volume 4 of Peanuts & Pistachios, from Hannan's Runway.

The extra-long electric motor speed reduction gearbox from Leisure Electronics.

The massive O.S. .61 SFN-H helicopter engine imported by Great Planes.

Brigitte and Mary pilot "busts" (left) and Graupner electric motors and folding props imported by Hobby Lobby.

Hobby Lobby's tapered collet prop adapters fit various sizes of motor shafts.

Arkansas 72901, (501)646-1656.

* * *

At the Pasadena IMS trade show a few months ago, we had the pleasure of talking at length with Charles L. Neely, who produces what we believe are some of the finest scale drawings available anywhere. Each is beautifully rendered and it is obvious that much research has gone into each subject. As an example, in the case of the P-51 Mustang drawings (two different sets, covering the B/C and D/K variants, each consisting of four sheets), many of the original North American factory drawings were used as references—and you can't get any more accurate than that!

Most of Mr. Neely's drawings are available in both 1/2-inch and 3/4-inch to the foot scales, with varying prices. Best bet would be to send a large SASE to Charles L. Neely, P.O. Box 3963, Visalia, California 93278, and ask for his illustrated plans list. Be sure to tell him you read about him in *Model Builder*!

* * *

Electric-powered sailplanes need no longer have short, stubby noses to accommodate the bulk of the electric motor. The new extra-long speed reduction gearbox from Leisure Electronics solves the streamlining problem nicely by allowing the motor to be placed farther back, into the wider part of the fuselage. The gearbox by itself measures about 3-1/2 inches from the back of the prop driver to the motor/ gearbox interface. Everything is supplied, including your choice of 2.5:1, 3.0:1, or 3.8:1 gear sets. The gearbox sells by itself for $25.00, or can be bought with either the Leisure stock or LT-50 high-performance motors. Electric scale modelers should also find this new unit helpful, especially when building replicas of turbine powered aircraft, which are notorious for having long, skinny noses.

From Leisure Electronics, 22971 Triton Way, Unit B, Laguna Hills, California 92653.

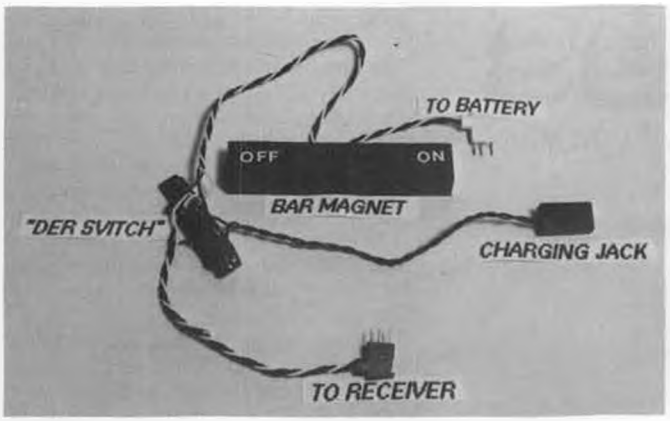
* * *

Not to be caught napping, the good folks at Ace R/C have noticed the increase in R/C seaplane activity and have acted accordingly by bringing out four sizes of quick-building ARF floats, for .20, .40, .60 and 1.20 size models. The floats are molded in white ABS plastic and can be either painted or left as is. Assembly involves merely joining the two halves with the aid of a specially molded joiner strip, installation of end caps and a reinforcement of the step area. Attachment fittings are included that will accommodate just about any landing gear setup. The instructions show how to fabricate an optional water rudder, although no parts or hardware for this are furnished. Float prices range from $34.95 to $54.95.

Ace is also introducing a new single-stick version of their economical Olympic V R/C system, with your choice of the standard Silver Seven receiver ($159.95) or the Model 91 Dual Conversion 1991 receiver ($184.95). Both systems are complete with Ni-Cds throughout but without servos. Servo connectors *are* included, however, and Ace advises that the system will accept any positive pulse servo. The user can install dual rates on up to three channels, and a fifth channel (retracts) is available as an option.

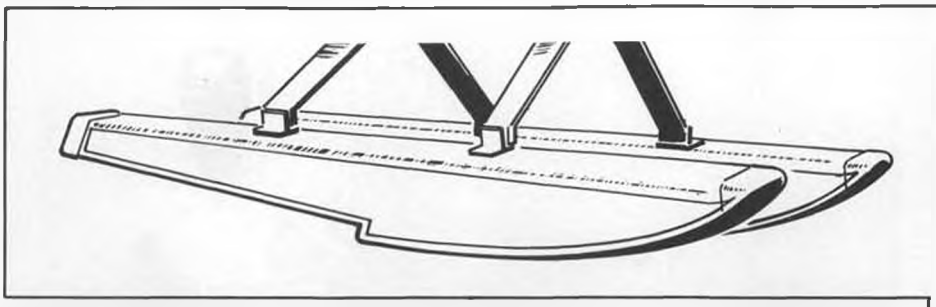
From Ace R/C, 116 W. 19th St., P.O. Box

State-of-the-art ducted fan models from Bob Violett Models include the F-86F Sabre (top) and Aggressor II "performance jet."

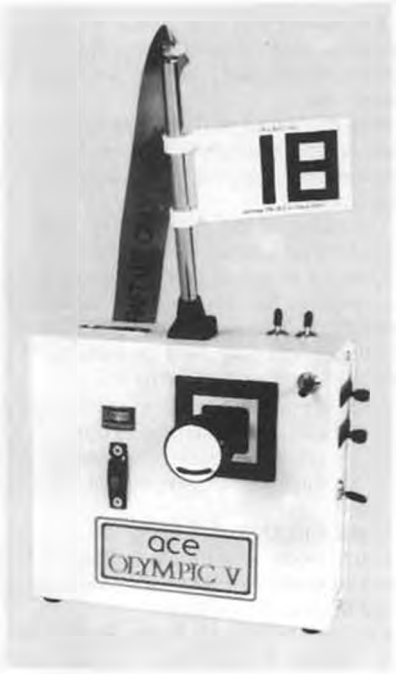


"Der Svitch," novel radio on-off switch, from Ragan/Barker.

Bill Larrabee's trio of cardstock P-51 profile gliders.



New from Ace R/C, four different sizes of molded ABS plastic floats, and an inexpensive single-stick version of the Olympic V radio system.



511, Higginsville, Missouri 64037.

* * *

This next item is one that is long overdue. "Der Svitch" is the name of the clever *magnetically operated* radio on/off switch being offered to modelers by Mr. George Barker, of The Ragan/Barker Group. Der Svitch replaces the existing radio switch harness in your model and requires no holes be cut in the fuselage side like a regular switch does (sailplane and seaplane fliers especially should like this feature). The radio is turned on and off by waving the appropriate end of the supplied bar magnet near the area where Der Svitch is mounted. Sounds simple, huh? The unit even has provision for hooking up an LED that could mount inside a canopy or on an instrument panel, to indicate the radio "on" status.

"Der Svitch" can be purchased as a basic unit (no connectors or LED hookup) for $19.95, or as a deluxe model with connectors (Futaba G, J, and Airtronics are available) and LED socket for $29.95. A red LED with 24-inch leads is offered as an option for $8.95.

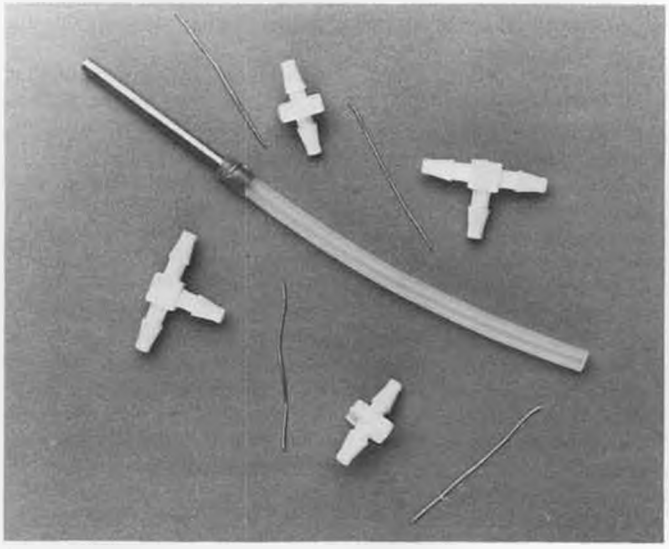
From The Ragan/Barker Group, 5050 Quorum Dr. #741, Dallas, Texas 75240.

* * *

Giving new meaning to the term "pilot bust" are the "Brigitte" and "Mary" hand-painted pilot figures imported from Germany by Hobby Lobby. Brigitte is the bigger of the two. . . height-wise, that is. . . standing about 5-1/4 inches high, while Mary stacks up at about 3-3/4 inches. No doubt about it, either of these girls will put a bit of Teutonic sex appeal into your cockpit!

Hobby Lobby also imports a line of electric motor prop adapters to fit a variety of different motor shaft diameters. The one shown in the photo is for a 5mm shaft and uses a clever tapered collet design to clamp

Continued on page 106



Fuel line accessories from Sullivan Products.

Sullivan's lightweight "SkyLite" wheels and "Shurlock" retainers.

BIG BIRDS

By AL ALMAN

INPUT

A reminder that I need your input. An informative and interesting monthly column comes about only when we pool our resources.

And this input isn't limited to questions only. A lot of you guys out there have some answers that the rest of us would love to hear about.

The name of the game is SHARING . . . because that way we all benefit.

Also, I'd really appreciate being put on the mailing list if your club publishes a newsletter. There's usually good stuff in most newsletters and it'd be a shame to not get "the word" out to everyone.

And in regards to photos . . . they do not have to be black-and-white. Color is okay as long as it's a normally exposed outdoor shot. It's the indoor flash pix that often can't be used.

CAMERA PLANES

Don't know if John Drouillard is interested in scale, but he sure can design and build functional airplanes.

The birds pictured here are just two of the five camera planes he built for UCLA Professor Noble Bisenlauer, and they stood the gaff; number one's been flying for five years.

The first aircraft started out weighing nine pounds, had an eight-foot span with 1440 squares and was powered by a K&B .61. John relates:

"Noble kept adding things, such as a big strobe light, heavy camera and lenses, etc., so I shortened the nose by eight inches and installed a Quadra 35 swinging an 18x8 Zinger. Had no problems whatsoever.

Absolutely gorgeous Gloster IV B Schneider Cup racer by master builder Leo Mariani was also featured in last month's "Brimfield Float Fly" article. At 1/4 scale the model spans 66 inches, weighs in at 14 pounds, and is powered by an O.S. 1.08. No flight reports yet, but stay tuned.

"All-up weight came to 23 pounds, but with over 1400 square inches of wing area she handled very well. The camera, a Cannon AE-1 with autowind, was installed to shoot straight down.

"All these planes used Futaba radios with S-29 servos and, as you can see from the photos, were flown with only three channels: rudder, elevator and throttle.

"We had no engine problems except for replacing plugs. All other parts are original. There were no vibration problems with the camera using the Quadra. Everything worked perfectly. . . and she's still flying.

"For some reason, when you mount the rudder high (as on these planes), it seems to act like an aileron. When flown inverted the rudder doesn't have to be opposite; in other words, even in this position right stick would give a right turn.

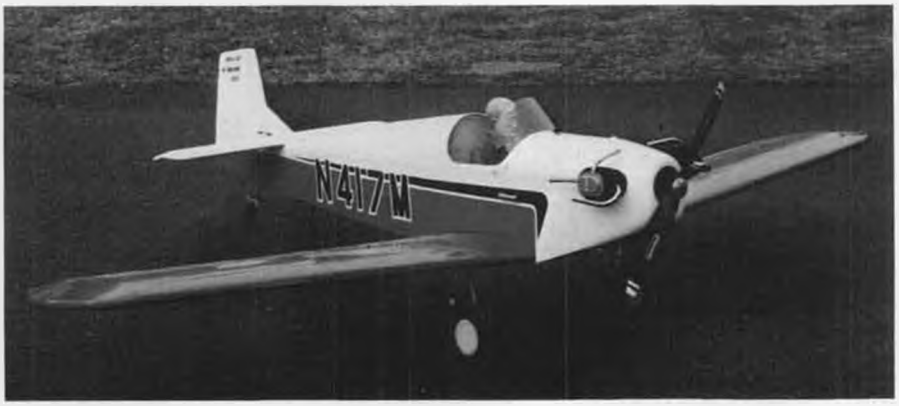
"I did add full-length flaps on two of the planes and they would jump off the ground in a hurry. . . and could make real short landings. We let just about everybody fly these models and no one seemed to have any problems; they flew like big trainers.

"I used foam wings with cap strips and four-inch 3/32 sheets on leading and trailing edges, with 12-inch sheeting in the center section.

"There's a book going into print soon that will be used as a reference for aerial photography by some of the colleges. Much of this book was written by Professor Bisenlauer and should be quite complete."

John's mentioning that inverted flight did not require opposite rudder (needing left rudder to make a right turn or right rudder to make a left turn) reminded me of the "old" days when rudder and throttle (Class I) and rudder, elevator and throttle (Class II) were official AMA events—and if I remember correctly, opposite rudder when inverted wasn't needed because those birds were designed with l-o-n-g, deep rudders that acted like ailerons when flying upside down. Why then would John's camera planes, with high rudders, behave the same way?

Can anyone explain?



Sporting a new fuselage, right wing and horizontal stab, Doug MacBrien's favorite, the Druine Turbulent, flies again after a three-year hiatus. Scratch built from his own plans.

The first of five camera planes built by John Drouillard for UCLA. Original engine was a K&B .61 (shown here), but when cameras and strobe lights were added a Quadra 35 was installed. Still flying after years of trouble-free service. Story in text.

How about the pic of the other camera plane taken apart for traveling? They somehow crammed a lot of airplane into a small box. Guess it was more convenient this way for transporting and storage.

SCHNEIDER CUP RACER

There's nothing quite like passion; it gets you doing things. And unbridled passion really motivates, as Leo Mariana found out.

It seems that he got the overwhelming hots for a one-of-a-kind 1927 Gloster IV Schneider Cup racer. and just had to do something about it. So, armed with only 3-views and some random info from a British publication, he scratch-built this unique bipe.

The bird weighs in at 14 pounds, spans 66 inches and has an O.S. 1.08 up front. She hasn't flown yet, but her debut is planned for the Brimfield Dam Seaplane Meet which falls on the weekend before Memorial Day.

Leo, who lives in Ludlow, Massachusetts, is recognized as a master craftsman . . . and his creative juices must have really been flowing because this is an exceptionally beautiful bird. Hopefully he'll have some airborne pix to share with us this summer. Who knows, he may even make the plans available.

NEW HOSTETLER PLANS

Wendell Hostetler's first *big* scale plans, the Skybolt, were ready in 1979. Since then his goal has been to add one new design per year. And he's done just that. In ten years he's inked ten different aircraft. All of his planes feature traditional box construction using balsa, ply and basswood or spruce—and Wendell flies what he draws.

A new set of plans has joined the Hostetler lineup; it's the 10th Anniversary Special which is a 3-in-1 design that includes the Piper J-3 Cub, the Clipped Wing Cub and the Super Cub. Any one or all three may be built from the plans (two detailed 42-inch x 98-inch sheets) and Mr. Hostetler sez that the three different styles of cowls and heat-treated, shock absorbing landing gear will also be available.

The plans are 30% scale which results in the J-3 and Super Cub spanning 127 inches while the clipped wing version has a 102-inch wing. Power can vary from a 2 to 3.7 cubic inch engine.

And if you want to get the most fun out of your Cub, Wendell will also have a special *amphibious* float design to fit all three Cubs. These floats will have jackscrew retracts for each of the four wheels per the full-scale Edo system. They'll be 60 inches long with 5-inch main wheels and 4-inch front wheels, and may be built with or without the wheels and retracts.

Hostetler plans have proven themselves over the years and all of his planes are excellent flying machines. Besides the new Cub, his lineup includes six other monoplanes and four bipes. The monos are the Piper PA-15 Vagabond, Lindbergh's Lockheed Sirius, Art Chester's Jeep, the Turner Special, the PT-19 and the Wedell-Williams Gilmore "Red Lion." The four bipes are the Skybolt, the Bucker Jungmeister, the Liberty Sport, and the Curtiss Hawk P-6E.

Wendell's got some great birds to choose from and, in case you're not up to scratch building, custom kits of all these aircraft are made by RM 1/4-Scale Specialists, P.O. Box 3091, Riverside, California 92519, (714) 781-3435.

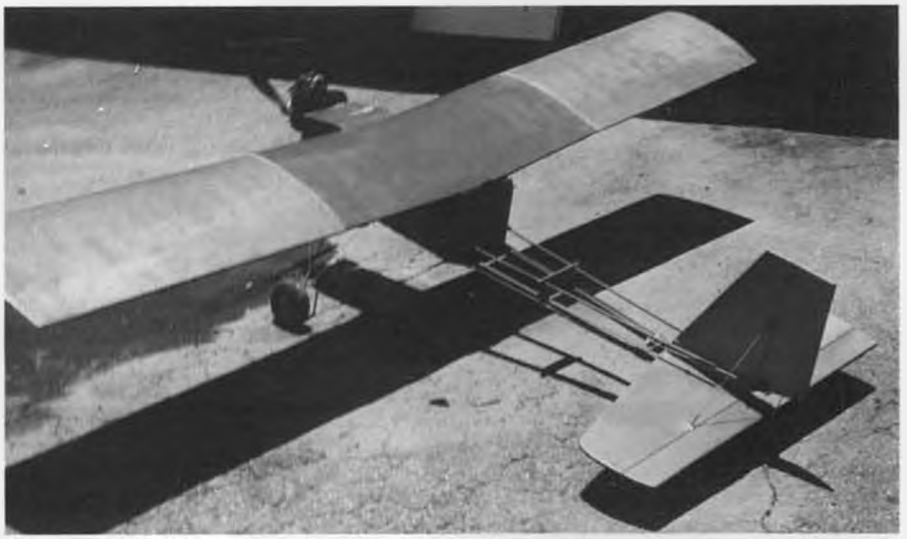
As of April, 1989, all aircraft plans will be $29.50 (folded or rolled) and the new float plans will sell for $15.95. Write to Wendell Hostetler, 1041 Heatherwood Lane, Orrville, Ohio 44067.

REBUILDING . . .

. . .Can be a real pain, mainly because of the time it takes, which often keeps us from working on a new project. Of course this time element depends on the extent of the crash damage, but even when damage is relatively minor we psychologically back off from that particular airplane for a while. After all, there is some grieving to do.

Doug MacBrien, who sells some great scale plans of the Druine Turbulent, Dalotel

Continued on page 70



John's second camera plane is a bit smaller than the first and comes apart for transport in a box measuring 12x40x48 inches. Full-span flaps were later added, but no ailerons are used.

The Woodbridge Fan Fly

By RON SWEENEY. . . A brief rundown on the highly successful ducted fan meet held at the Royal Air Force base in Woodbridge, England. Except for being quite breezy, it could hardly have been a better meet.

• Where on earth is Woodbridge? I hear the question. I have, in my time, traveled the length and breadth of our sceptered Isle and have to confess, when invited by John Richards, to being unaware of its location.

Because it was a fan fly and the third held in 1988 in England, I instantly agreed to attend. I was unperturbed when I eventually discovered where Woodbridge was and found that it required 11 hours of driving. It just meant we set off earlier and arrived home later.

Royal Air Force Woodbridge is an American Air Force base set in the heart of Suffolk, and to my mind, the best location for a fan meeting I could possibly imagine. I was really unprepared for the welcome or the facilities, both of which took me completely by surprise. Being no stranger to American hospitality and friendship, I was still nonetheless delighted by the greeting; toilets, running water, electricity, a barbecue, Coke, American beer, friendly, helpful American accents, and acres of concrete. I had to pinch myself to make sure I wasn't dreaming.

The unpredictability of British weather does add spice to any model meeting and while Woodbridge was the only spot in the country to experience sunny weather, a very strong wind blowing from an awkward angle did tax the skills of all who flew, but it's fair to say the wind couldn't be blamed for the odd mishap that occurred. The timing of the meeting coincided with the holiday season, and this undoubtedly had an effect on the attendance.

Full-size Fairchild A-10 "Warthog" about to touch down at the base.

Most of the stalwarts were there and word will soon spread regarding the success of this meeting, which was hosted by the base model club.

About 25 models were checked in at the flight line, and all but three of these flew, two of those being grounded because of technical problems. Model sizes ranged from Alex Cornish Trestrail's 32-ounce A10 to Dave Nieman's Byron F-15, which tipped the scales at 30 pounds and is powered by O.S. .77s. John Richards, who organized the meeting, flew his scratch-built Saab Gripen in spectacular style. The Thorjet fan, turned by an OPS .45, powered the model at high speed in the difficult wind. Having flown only two or three times previously, the model was still undergoing trimming adjustments and demonstrated the typical

The L-39 Albatross is a popular ducted fan subject in England. This one by Reg Smith is from a Peter Nye kit and uses a Rossi .65/Turbax fan combination.

Left: Pym Smith tunes the K&B 7.5 in his Folland Gnat, built from a John Carpenter kit. Outstanding flier uses a Turbax fan.

Below: An unidentified builder/pilot brought this non-scale Byron Bullet, nicely finished in an equally non-scale but striking scheme.

The larger of the two A-10's belongs to Ron Appleton, was built from Radio Modeller plans, uses a single integral silencer for both engines and is also equipped with an electric fuel pump. The little guy perched on top is Alex Cornish Trestrail's twin Cox .051 ship.

Scratch built F-15 by Alex Cornish Trestrail is powered by two O.S. 25 VR's with Kress 720 fans. Takes off from a steerable dolly and lands on a belly skid — a common setup in England.

delta sensitivity to aileron control. Canard deflection was finally limited to only a few degrees of movement. Any more than this causes instability and control difficulties. Alex Cornish Trestrail and his pilot, Paul Leighton, flew their F-15 throughout the day. The two O.S. .25/Kress 720 power units performed faultlessly. Equally, their diminutive A-10 was thrown around the sky; some maneuvers were performed by the pilot, some by the wind.

The Thorpes once again appeared with their F-20 and ignored the conditions with a typical Thorpe flight demonstration. I have never seen them grounded because of the weather. Our American hosts, although aeromodelers, were new to fan modeling and addressed their enthusiasm and interest in their usual friendly way. A Thermos and soggy sandwiches were soon laid aside when lunch call revealed American beer and hamburgers from the barbecue. I even managed to have my video batteries recharged. Altogether, a very civilized situation.

Two models of particular interest to me were those of Ted Cooke and Phil Bowden. Ted's Me-163 dates back to 1979. It still looks good and flies well, powered by a Rossi .65/Turbax combination. Phil's House of Balsa F-86, powered by the K&B .21/Axiflow, possessed adequate power even in the gusty conditions. Although not quite as old as Ted's model, the F-86 has been around for many seasons. Ted brought along his new Thorpe F-104 powered by a Picco .80 and Thorpe fan. Ted wisely chose to delay the first flight for a more suitable occasion. With 5-1/2 horsepower and 9-1/4 pound weight, the model should have been a spectacular performer; subsequently, it has flown and reportedly has fulfilled its promises. The model is finished in aluminum film and is fitted with retracts—no mean feat considering the diminutive size of the model. Following a rod failure, Ted has re-engined the Starfighter with his faithful Rossi .65, which has subsequently provided more than adequate power to further enhance the spectacular flight performance of this diminutive model.

Dave Nieman's big Byron F-15 took to the skies with a totally realistic performance. Once in the air the open spaces and wide horizon soon changed the onlooker's perspective, and the model was indiscernible from the full-size. Dave is an expert pilot and put the 30-pound model through its paces oblivious of the conditions. The model was soon joined by Reg Smith's MIG-25 Foxbat. Although marginally smaller in size, both aircraft, when in close proximity, could have made an interesting dog fight scenario; however, both pilots were satisfied in merely enjoying the occasion without adding to the risk factor already made tenuous by the weather conditions. Reg was plagued with a sick O.S. .46 and was obliged on two occasions to land from a less than ideal situation with only one engine, much to the enjoyment of the crowd.

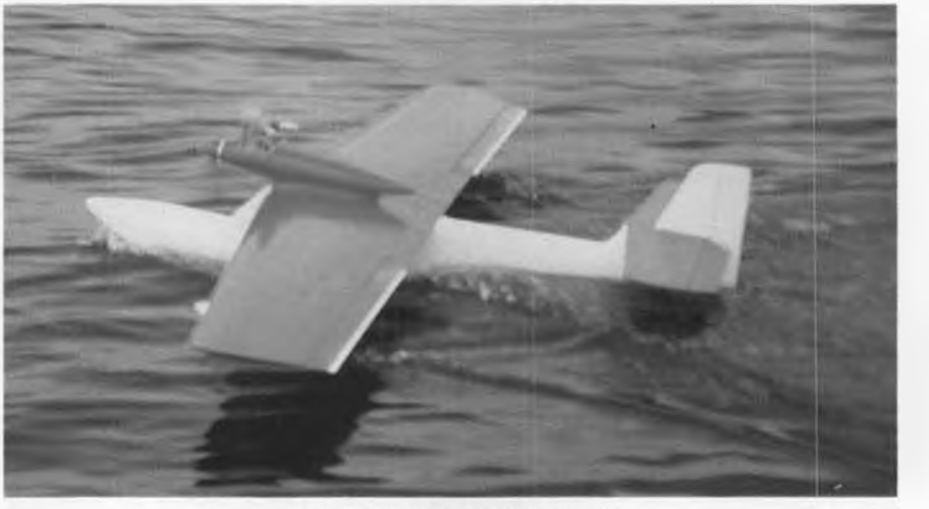
When compared with the Abingdon meeting, this event was not as well attended, but I have seldom enjoyed an event more. My thanks must go to the Base Commander for permitting the event, and to John Richards and his American colleagues for their overwhelming support. I fervently hope that the event will be repeated next year and that some of the base club members will participate with fan models of their own. How about it, chaps? •

Another view of the Folland Gnat built and flown by Pym Smith. Tail end sure sits low to the ground, eh?

Sleek K&B powered Mirage F-1, built by D. Lings from Thorpe plans, is at least four years old and still going strong. Note takeoff dolly.

"If you like the Sea Fli XI's configuration but don't want to work with foam and fiberglass, you can design and build a conventional balsa structure inside the outlines shown."

SEA FLI XI



By FRANCIS REYNOLDS

A .60 to .90-powered R/C flying boat of foam/fiberglass composite construction

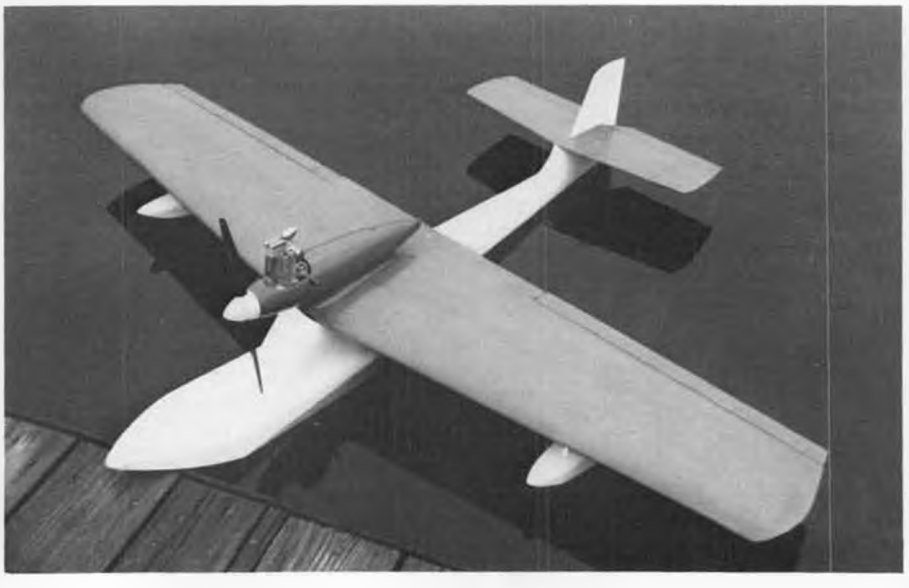
• In my regular column, "Model Design & Technical Stuff," we have been studying composite structures and also seaplane design. This month the column examines the design of the all-composite R/C flying boat which is being presented here to the scratch builder. The author's prototype contains no balsa wood. If you have any curiosity about design, I encourage you to read the column, but whether you do or do not, there are certain things you need to know about this model before deciding to build it.

First, it is not a model for the beginner. The drawings look quite simple, because composite construction requires very few separate parts, but the techniques will be new to the modeler who has built with wood only, and some of the processes require a bit of practice. There have been a few construction articles on all-composite R/C models, but the field is still pretty new and definitely experimental. Also, it takes longer to build than one might suspect. In other words, if you want a seaplane model to fly right away, buy an ARF, but if you are an innovative person interested in working with advanced materials and processes, join me, and let's both learn.

When I read a construction article I always turn to the end of the article first, to see how it flies. I will save you that trouble. The model performs very well in the air and on the water. It is light for its size and quite aerobatic. My prototype carries a four-stroke .60, but it turns out to be a bit underpowered for the way I like to fly, therefore, the plans have been changed to show a four-stroke .90 or two-stroke .60. It tracks well in loops, axial rolls (not very axially), flies inverted easily, snap rolls and spins, but is sometimes a bit slow in getting into and coming out of spins.

On the water it is a sweet dream. It gets off at partial throttle, lands beautifully, and does easy touch-and-go's. It is fun to do high-speed figure eights at zero altitude on the step. I have never succeeded in flipping it, and there is seldom any spray in the prop.

Since you modelers who will be building Sea Fli XI have some experience, I do not



Fresh out of the shop, this "first draft" of the Sea Fli XI differs from the plans in a couple of areas. Plans show the final version as determined by flight testing.

need to tell you to glue stick A to stick B, etc. That wouldn't be applicable to this model anyway, since there are no sticks. But speaking of sticks, if you like the configuration but don't want to work with foam and fiberglass, you can design and build a conventional balsa structure inside the outlines shown.

Some writers of construction articles warn the reader not to make any changes from the design as presented. In this case the opposite is true. This is an experimental model and I encourage you to experiment along with me. There is much room for improvement in this and all other models. Further, using the head and the hands in model building is a lot more fun than hands alone.

If you look closely you will find some areas where the photos of the prototype aren't exactly like the drawings, because as a result of the building and flight testing, I have made changes to improve it and incorporated them into the drawings. These changes have also been made on the prototype and tested, so you are buying few, if any, untried "improvements." I had a boss once who said, "Don't improve it until it doesn't work." I'm pleased to report that most of these changes also improved the appearance of the model over what you see in the photos. Speaking of looks, there were design reasons for the unusual step between the lower and the upper part of the fin. I also like the looks of it, but if you don't, broaden the upper fin. It will fly just as well.

WEIGHT SHEETS

For the past twenty years or so I have been doing something that I highly recommend. For every model I build, I make a tabulation of the weights of all the parts and subassemblies of the model as I build it, as well as the total weight. This is a tool that helps me get smarter so I can build lighter on the next model. I keep a permanent file of these weight sheets so I can go back and look at the weight of any part on any previous model and see how it compares with the weight of the equivalent part that I am currently building on another airplane. For instance, how much should a finished stabilizer without elevators for a .60-size R/C model weigh? From my weights records, I can tell you that a good stab should weigh between 2-1/2 and 3 ounces. If it weighs more than that you can do better with lighter materials, smaller cross sections, or a different design. If it weighs less than that, maybe you are doing very well on strength-to-weight ratio, but better examine it. Is it going to be strong enough and stiff enough for flight and rugged enough for handling?

MATERIALS

The foam cores for the hull and most of the model are hot-wire cut from Dow Styrofoam type SM blue foam. This is available in four-inch thick planks from retailers who stock insulation materials. Don't use white beaded foam for anything but the wing cores; it doesn't have enough compression strength to adequately support the fiberglass skin. The blue foam is heavier (2.5 lbs./cu. ft. versus 1.0 for the white), but its strength more than makes up for the added weight. If you haven't used it before, you will find the blue foam much nicer to work with than the white. Blue foam is more rigid and sands much easier. It can also be carved with a sharp knife or worked down with a rasp much more easily than white foam. It cuts with a hot wire very smoothly, but at a slightly higher temperature than the white.

I used three different weights of fiberglass cloth in the construction of the prototype; .75 oz. (or .6 oz.), 1.5 oz. and 6 oz. You could get by with 1.5 oz. only, but glass cloth is cheap, and you can do a better, lighter, and stronger job with a selection. The hobby shops usually carry Sig fiberglass in these three weights in handy packages. Dan Parsons sells the very light .6 oz. cloth. Speaking of cost, you will probably spend less for materials to build this model than for a balsa model and have a lot of material left over for the next one.

We are going to bond the fiberglass cloth to the foam cores with epoxy. Polyester resin can't be used here because it dissolves the foam. I used some 5-minute and 15-minute model epoxies, but mostly I used a slower-curing epoxy which I bought at a Standard Brands paint store called "Envirotex 1 to 1 Polymer Coating." Let me repeat the warning about epoxy. Some people are allergic to it or develop an allergy from exposure to the material itself or its fumes. This can be quite serious. Avoid breathing the fumes and wash it off immediately if you get it on yourself. Wear rubber gloves if you have a problem.

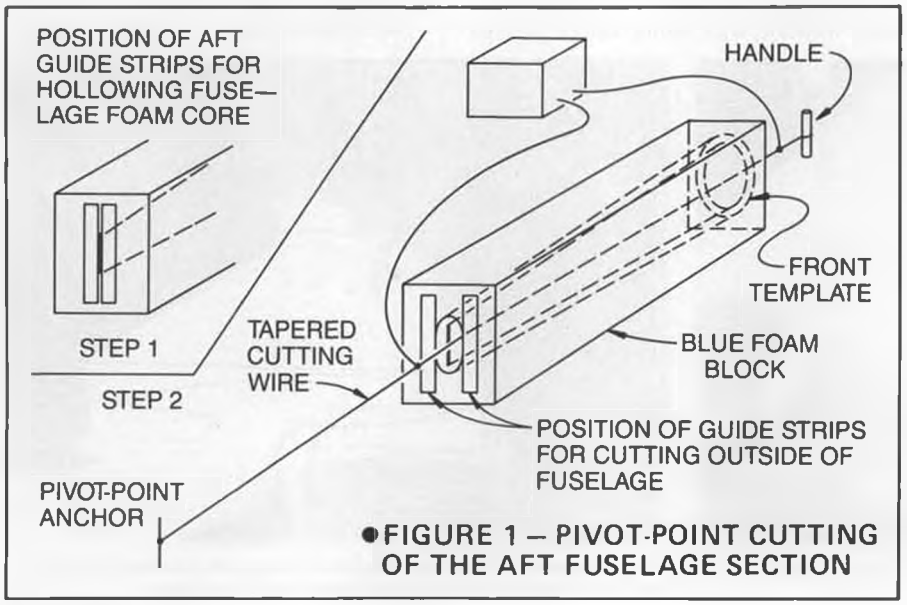
You are also going to need a little more

SPECIFICATIONS

Span	66 in.
Average Chord	12 in.
Wing Area	790 sq. in.
Aspect Ratio	5.5
Airfoil	NACA 0015 symmetrical
Power	.90 four-stroke or .60 two-stroke
Four-Channel R/C	
Weight	6.76 lbs. dry (108 oz.)
Wing Loading	20.4 oz./sq. ft
Wing Cube Loading	.545 lbs./cu. ft.
Disp. Loading	11.7 lbs./cu. in.
Performance Factor	6.36
Beam Loading	17.2 oz./in.

ACTUAL WEIGHTS (OZ.)

Power unit (engine, prop, spinner, muffler, mount, firewall, nacelle and tank with hardware)	30.30
Aft fuselage core, hollowed blue foam, unsanded	2.43
Hull core, hollowed blue foam, unsanded	2.47
Complete hull/fuselage cores, total	5.97
Hull, fiberglassed but unprimed and no bulkheads	6.02
Aft fuselage, fiberglassed but no primer or bulkheads	5.93
Hull/fuselage assembly complete and painted, without radio gear	14.11
Radio (battery, receiver, switch and four servos)	12.31
Empennage foam cores, total	1.60
Lower assembly, complete (hull, fuselage, empennage, radio, paint)	35.25
Wing cores, white foam	6.80
Wing cores with plywood inserts, edges, pushrods, etc.	12.62
Wing, fiberglassed, aileron servo, no ailerons or paint	34.22
Wing with ailerons, painted and balanced, plus mounting screws	38.41
Wing floats, painted, complete with mounting struts	2.72
Wing/power unit complete, including wing floats, and painted	72.87
Total flying weight, dry	108.12



•FIGURE 1 – PIVOT-POINT CUTTING OF THE AFT FUSELAGE SECTION

plywood, 1/8-inch regular and 1/8 Sig Liteply in particular. You won't be using much, if any, ordinary CA glue, because it dissolves both blue and white foam. (I have just tried the new foam-friendly "UFO" CA by Satellite City. It is wonderful, but beware, too much accelerator will soften foam temporarily.) Although I didn't use any balsa in the prototype, I don't forbid you to, especially on the wings and for control surfaces.

Use only reinforced nylon props on seaplanes. The spray which sometimes gets into the prop eats wooden ones.

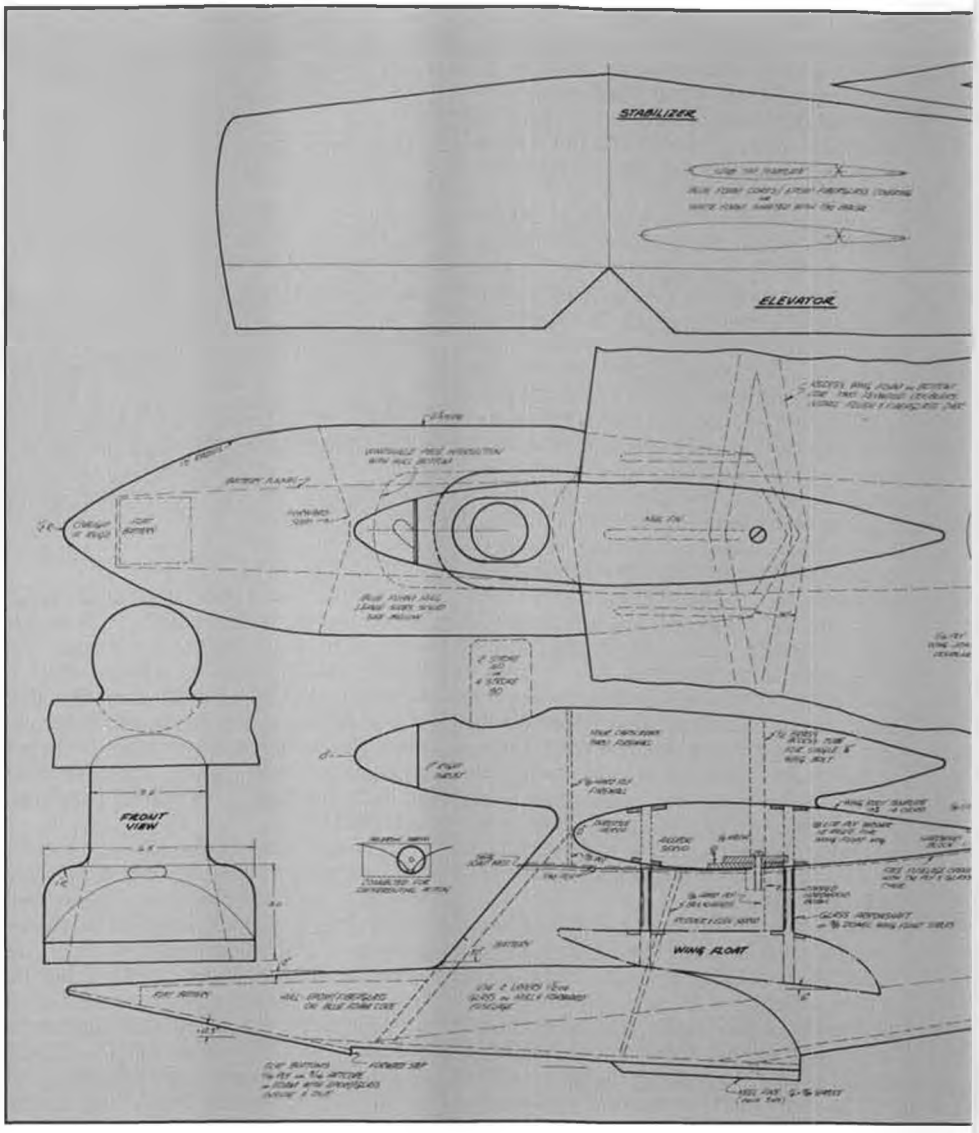
PROCESSES

We have been discussing the methods for using foam and epoxy/fiberglass in my MD&TS column in *Model Builder* since last fall. If you haven't read them, I recommend that you do, since space here doesn't permit repeating all the details of the use of composite materials that I covered over those months. Of special importance to you, as a builder of this model, is MD&TS for January of this year, where we covered epoxy thinning and how much foam and fiberglass to use, and February, with a description and instructions for the pivot-point foam cutting method, tapered-wire cutting, and soldergun foam cutting. The March/April column covered the equally important techniques for fiberglassing and the "miracle method" of fiberglassing. If all of this scares you away, there is always balsa.

HULL

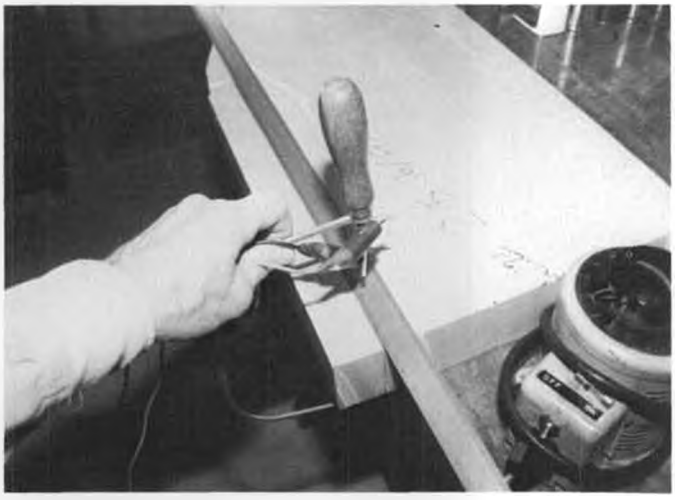
As the drawings show, the hull consists of hollowed blue foam cores covered with epoxy/glass. On my prototype, the core for the part of the hull aft of the step (the aft fuselage) was originally cut with the conventional two templates and a hot-wire bow. It worked, but was difficult and had flaws. I then made myself a tapered wire, rediscovered the single-point or pivot-point foam cutting method, and tried again. What a world of difference! It was a cinch and the result was beautiful. Only one template, no helper needed, and I got the proper wall thickness along the full length with no excess melting at the small end.

The February column describes the pivot-point method of pinching the rudder hinge line area of the fuselage into its narrow vertical section. Figure 1 illustrates the technique. We simply attach two vertical guide strips for the cutting wire to the back end of the foam block. As you can see, it works for both the external and the internal or hollowing cut.

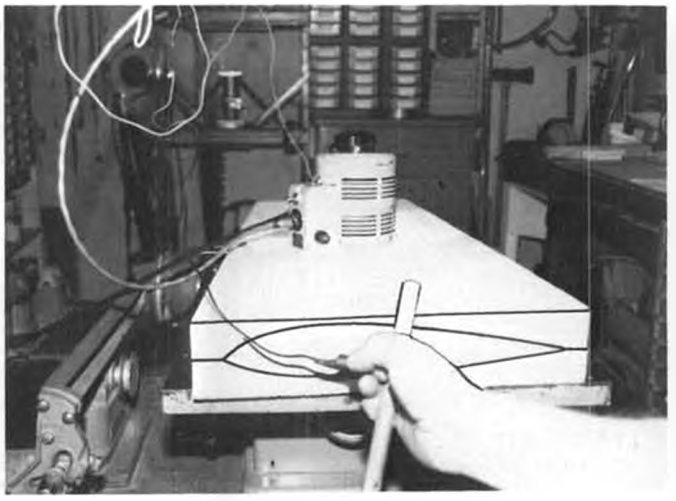


The fin below the stab is done with a wire cutter, inside and out, plus a sharp rasp and sandpaper to contour it to the fuselage. The forward part of the hull is mostly cut with a bow, with the wire riding against parallel straightedges attached to opposite sides of the foam block. The curved parts of the hull are again contoured with rasp and sandpaper. The forward hull is hollowed out using a wire loop set in a soldering gun. The March/April MD&TS column tells how to join the sections of the hull without glueline ridges.

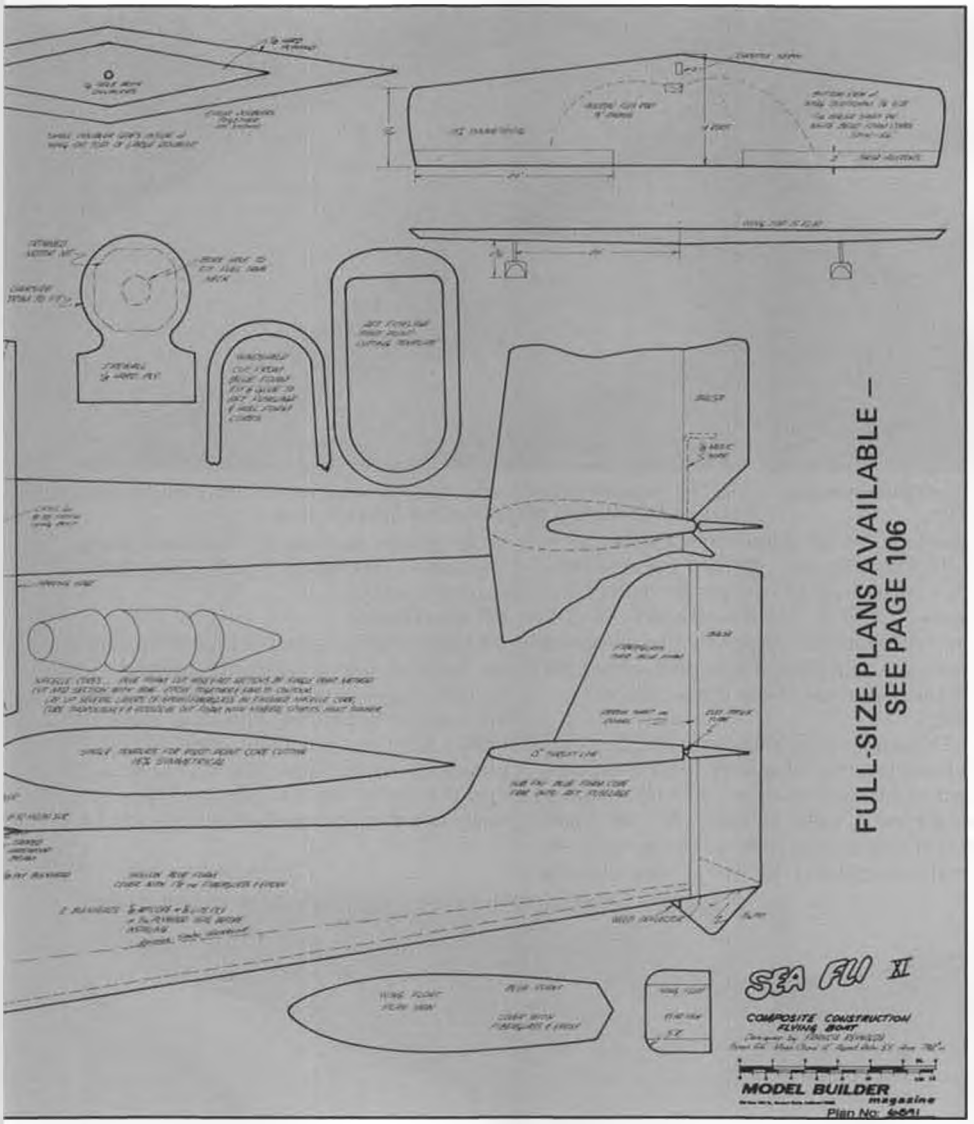
For the planing bottom on my prototype I



Chunks of blue foam can be cut easily and quickly by using a hot wire in a coping saw frame.



Wing cores are cut from white foam via the pivot-point method. Anchor point for the hot wire is at the far end of the shop.



used a sheet of 1/4-inch Artcore foamboard and fiberglassed it inside and out. If you don't have Artcore, a piece of 1/16 plywood will make a good bottom. The March/April column also tells how to stay out of trouble in putting the structural bulkheads in the foam cores.

WING

The wing foam cores are pivot-point or single-point tapered-wire cut from white beaded foam. Do use the pivot point method of cutting. It is much easier, faster, and better than the two-template method! Don't use solid blue foam for the wing cores; it is too heavy. I said don't use "solid" blue foam, because I think there are good ways of making a wing with a blue foam core with major cut-outs, but I don't have a tried and true design to offer you yet. You try it and give me a report.

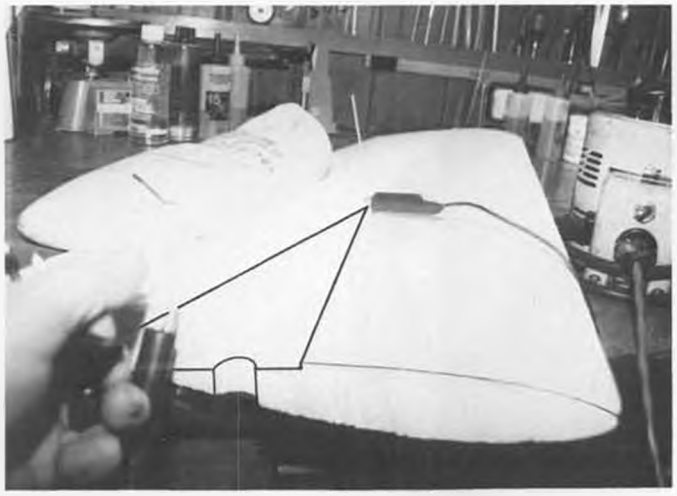
On my prototype I covered the white foam wing cores directly with epoxy fiberglass, but I don't recommend it. It took too long and it was difficult to get a good smooth finish. One half of the wing was glassed and filled and sanded and primed and sanded ad infinitum. In an attempt to get a better job in less time, the other wing panel was glassed by the miracle method (March), which transfers the ultra-smooth high-gloss finish of a sheet of Mylar to the fiberglass covering. This is a wonderful method, but I haven't learned all the tricks yet. My main problem was that I tried to do it without vacuum bagging. Don't.

Noal Rossow of Composit Aircraft Engineering & Supply phoned me the other day. He routinely uses the "miracle method" in making sailplane wings, but uses a vacuum. Noal's company sells a simple vacuum setup called the "Sucker Kit," which was described on pages 41 and 42 of the January issue of *Model Builder*. And Ron and Karen Wagner of Hi Performance Sailplanes and Supplies paid me a visit yesterday. They showed me some beautiful wings made by the miracle method and vacuum. HPS has all kinds of composite materials for sale. They can be reached at (206)487-1721 and are located at 17902 N.E. 156th St., Woodenville, Washington 98072.

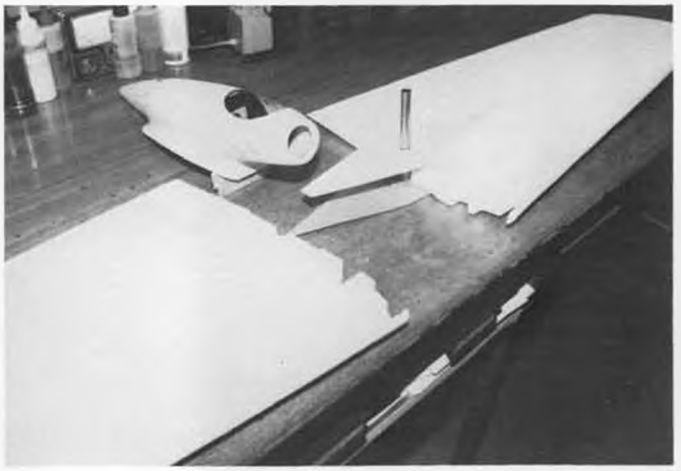
If you have or can get a vacuum setup, go for a miracle wing on Sea Fli XI. But, lacking vacuum, I recommend you build a conventional 1/16 balsa-sheeted foam-core wing and cover it with .6 or .75 oz. glass to keep out the water. Another good choice is 1/64 plywood over white foam cores. The ply is hard enough that it can be primed and painted without covering it with glass, reducing both weight and building time.

WING MOUNT

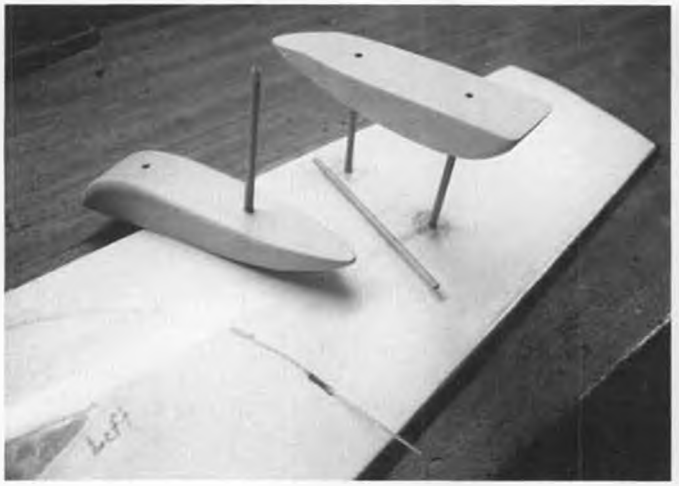
This is one of the unusual features of XI. If you have been following my column you will recall that I believe that wings should be mounted so that in a crash they can come forward, be driven back, or pivot, without damaging either the wing or the fuselage. The wing mount shown was so designed. The 8-32 nylon screw near the trailing edge keeps the wing at right angles to the fuselage, but is designed to shear and



Pivot-point cutting the recess for the plywood wing doublers. Method is explained in detail in MD&TS, February '89 MB.



Tapered plywood joiners provide structural integrity for the wing center section. Tube extends up through nacelle for access to single wing attachment screw.



Trial installation of wing floats. Aileron Nyrod tube and plywood strut reinforcement "washers" show through fiberglass skin.

Tail surfaces are also of foam/fiberglass construction. Use a plastic wallet card to squeegee the epoxy into the glass cloth.

let the wing pivot if a wing tip hits something. The single 1/4-20 nylon screw in the center of the wing supports the entire weight of the airplane. If that scares you it is only because you have been looking at too many models where the wing mount was far stronger than it should have been for crash separation. The main reason for using nylon screws is that they are weaker and will shear. But then too many designers put in too large or an excessive number of screws and defeat the purpose. Which is worse, broken nylon screws or a broken wing and/or fuselage? If you still don't believe one 1/4-20 nylon screw is enough to hold the wing on, consider the numbers. One such screw has a shear strength of 343 pounds and a tensile strength of 317 pounds! Not convinced? My prototype has had many aerobatic flights plus some hard landings and hasn't lost the wing once.

TAIL

The empennage shown on the drawings is fiberglass over blue foam. Again, vacuum and Mylar would be the way to go. On the prototype I used stripped Artcore foam board for the cores of the tail, since it was already smooth and flat. The control surfaces were tedious to make of foam and glass, therefore I recommend well-sealed balsa control surfaces.

WING FLOATS

Quite simple, really. The blue foam cores are sanded smooth and fiberglassed. To bore the holes in the foam of the floats and the wing, sharpen the end of a piece of brass tubing and use it like a drill. Note the plywood washers built into the wing and into the top of the wing floats. These are necessary to distribute the load out into the

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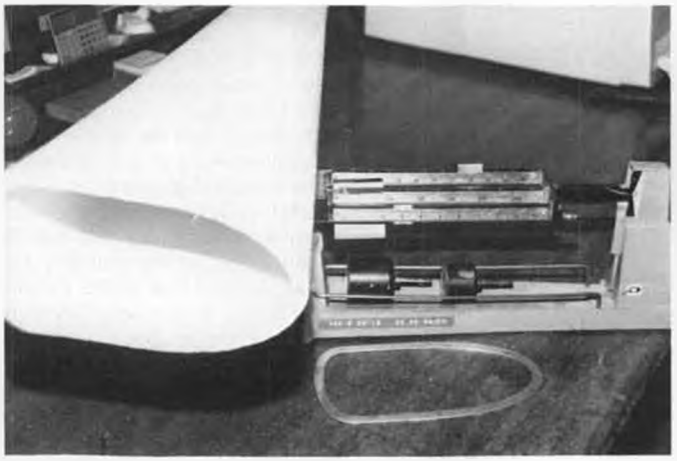
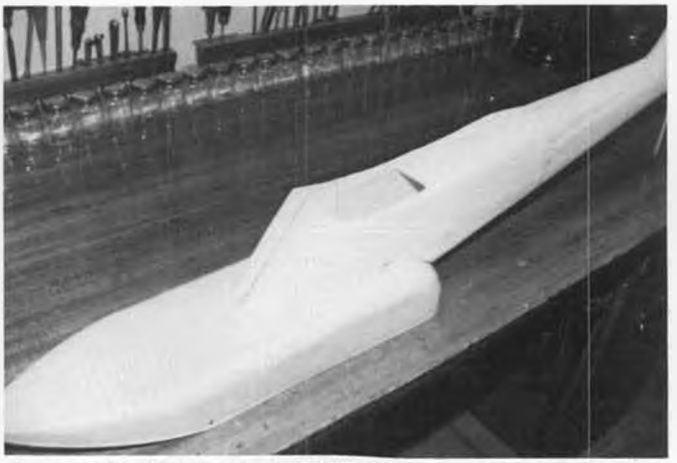
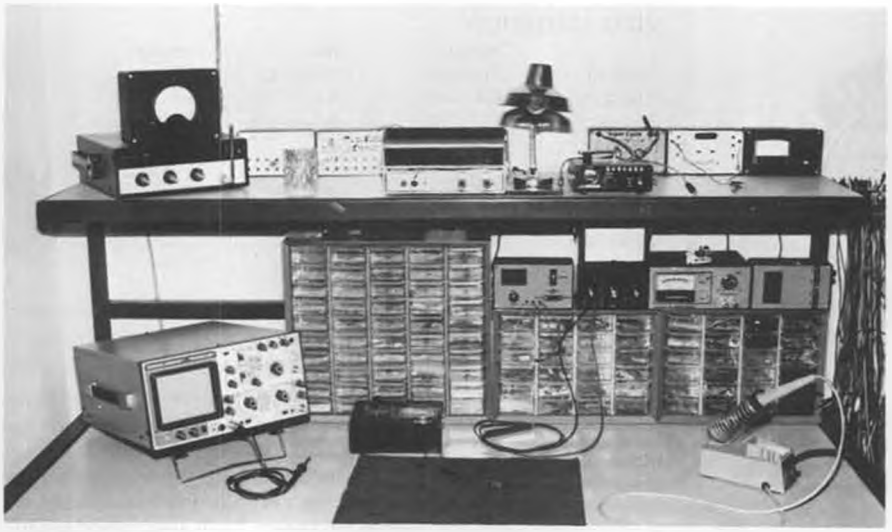


Aft fuselage core, cut by the pivot-point method, weighs 73 grams. On the bench is the only template required.



The assembled all-composite hull. This is the initial configuration; compare it with the outlines shown on the plans.

Nacelle core is made of blue foam, turned on a lathe. Airfoil-shaped base guarantees proper fit to wing. After glassing, the foam is dissolved with paint thinner, leaving a finished part (right).



Electronics Corner

By ELOY MAREZ

• In last month's column I promised you that we'd discuss voltage regulators this time around. The subject came to mind since I have received a lot of mail lately asking how to operate a low voltage device from a higher voltage supply. Generally, the question is what size resistor to use, which is an acceptable method only in those cases when the load is fixed. A varying load of any sort cannot be properly powered through a dropping resistor; the voltage will change inversely to the current. There are no set rules, as some circuits are not greatly affected by varying input voltages. But other circuits are more voltage critical and can disrupt the entire operation of the device of which they are a part. The answer in this case is not a dropping resistor, but an internally complex, though extremely easy to use, voltage regulator IC.

You've probably seen them, and might even have used them. Often they look just like a transistor, being available in the quite common to TO-92, TO-3, TO-220 packages, though a few come in flat DIP (dual in-line) packages and look more like a proper IC should. Voltage regulators come in basic designs, fixed and adjustable output, and positive and negative types. But first, a little more background.

In sheer numbers, probably the most-used IC's belong to a group called "digital" circuits. Following that, the next most used is the family the voltage regulator is part of, the "linear" type, so named because their outputs are linear to their inputs. The linear voltage regulator can be used to convert an unregulated DC voltage to a regulated output which will remain at a given design level under varying load conditions. While the same results can be obtained with circuits composed of discrete components, the three-terminal IC makes the job so simple that there is actually little reason to use any other method.

In the selection of a voltage regulator, or VR, three things must be considered. First are the input and output voltages, and then the maximum output current rating. With the widespread use of low-voltage solid state devices, most VR's are also designed to work at relatively low voltages, both input and output. The only requirement is that the supply voltage be higher than the regulated voltage, an easy-to-meet requirement since one of the main reasons for considering a VR is to lower a high voltage.

Now for the current rating. The rule of

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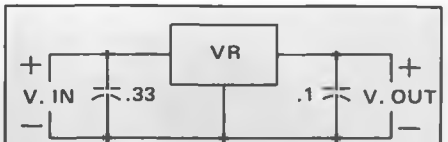
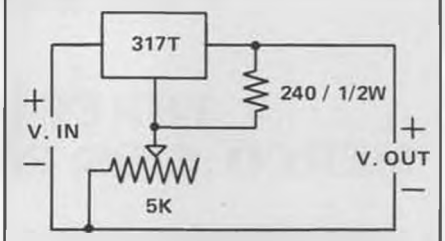
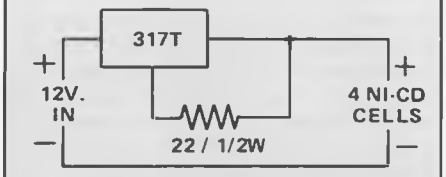


Basic voltage regulator circuit IC is quite simple. Fixed regulators can operate to as high as 35 volts, with output voltages at most common values and current capacities as high as three amps.



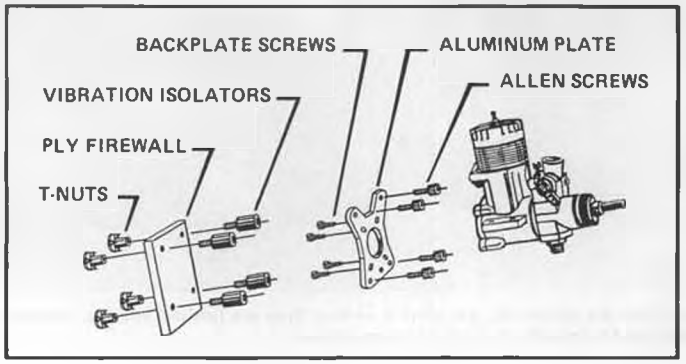
The versatile LM 317 adjustable voltage regulator can supply from 1.2 to 37 volts at up to 1.5 amps. The 5K pot shown can be replaced with fixed resistors of the proper value once the required value is known.



A simple 50 milliamp flight pack charger operated from 12 volts DC. Current can be varied by inversely adjusting the resistor. Heat sinks are sometimes required if the voltage regulator runs hot.

This is the very impressive Seidel ST 770 four-stroke radial being produced in Germany. A smaller five-cylinder version is also available. Specs and performance listed below.

TYPE	ST-540	ST-770
BORE	.88 in.	.88 in.
STROKE	.78 in.	.98 in.
CYLINDER DISP.	.48 cu. in.	.60 cu. in.
TOTAL DISP.	2.40 cu. in.	4.25 cu. in.
WEIGHT	3.94 lb.	5.88 lb.
HORSEPOWER	2.5	4.0
MAXIMUM RPM	7000	6000
OPERATING RPM	2600-6000	3900-5600
PROPELLERS	18x10-20x10	24x10-28x8
OUTSIDE DIAMETER	7.88 in.	9.0 in.
LENGTH TO PROP REAR	5.7 in.	7.5 in.



"Flex Mount," a vibration dampening motor mount from Planes & Things, is recommended to keep damaging vibration away from your model's electronics. See text for details.

ENGINES OF THE WORLD
...by Stu Richmond

VITAL STATISTICS:

	Merco	Fox	Saito
Made in:	England	America	Japan
Purpose:	C/L Stunt	R/C Racing	?
Porting:	Loop Scav.	Schnuerle	Schnuerle
Disp.:	.61	.40	.60
Wt. (Oz.):	12.8	13.2	19.9
Muff. Wt. (Oz.):	1.8	3.5	1.8
Piston:	Alum. w/ring	Alum.	Alum.
Cylinder:	Steel	Chromed Brass	Chromed Alum.
Ignition:	Glow	Glow	Spark

UNIQUE FEATURE: All three of these engines are unique limited production from today's contemporary manufacturers.

THREE OF A KIND: MERCO .61SS, FOX "Q," SAITO G60F

• Part of the challenging fun of writing this column is in *finding* truly unusual engines to feature. This month, from around the world, we study three modern engines from factories that are regularly producing for us—but most of you will never see one of this month's engines in your modeling lifetime!

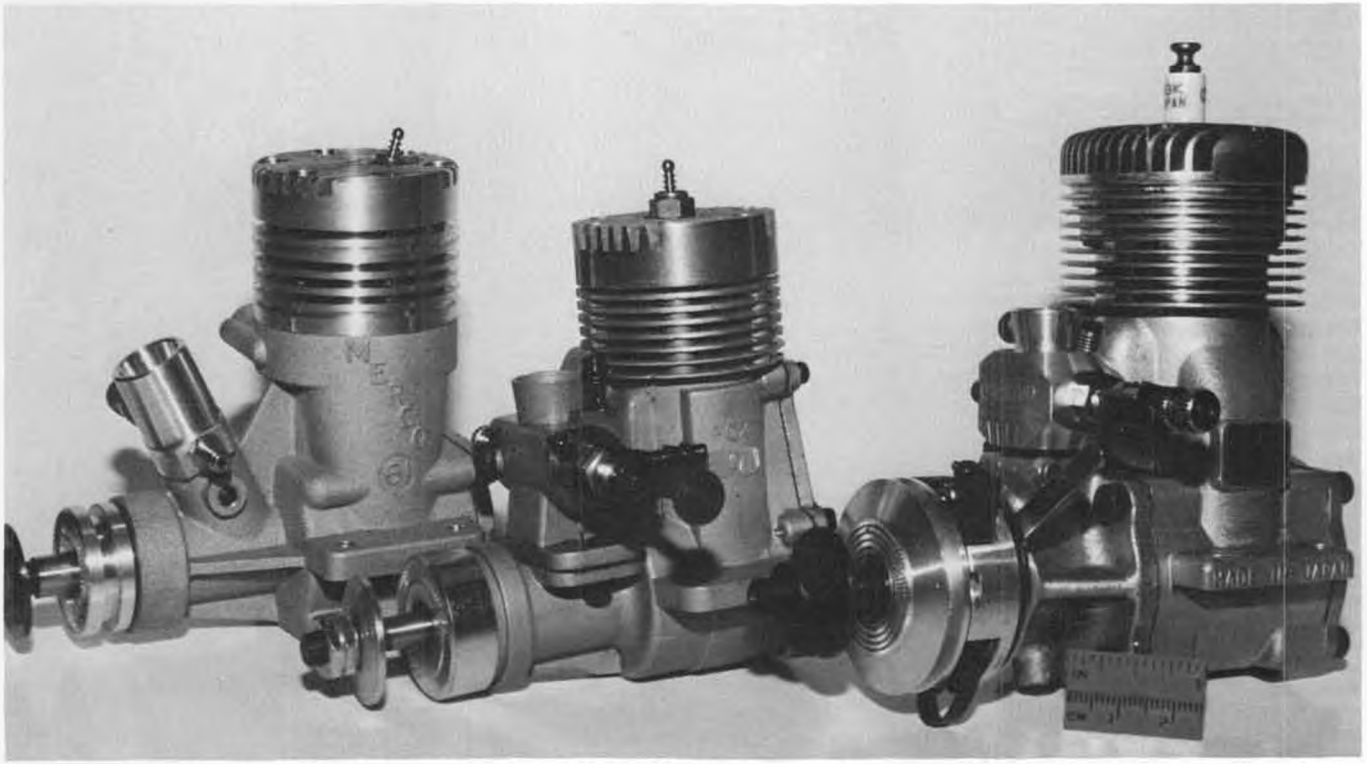
All engine producers make prototypes that are part of their research and development process—they are run and test flown for evaluation, are often redesigned, and when they reach the hobby shops only minor changes are made as production continues. Probably the longest-produced American R/C engine is K&B's front intake side exhaust .40 (#4011 for aircraft and #4012 for boats). This evolved from a successful racing .29 speed engine built about twenty years ago and only the crankcase casting looks familiar today from its introduction. Another engine sure to enjoy an equally long production life is Cox's newly introduced Queen Bee R/C .074. But the "three of a kind" we see this month are not prototypes—these are limited production engines from long-established factories.

MERCO

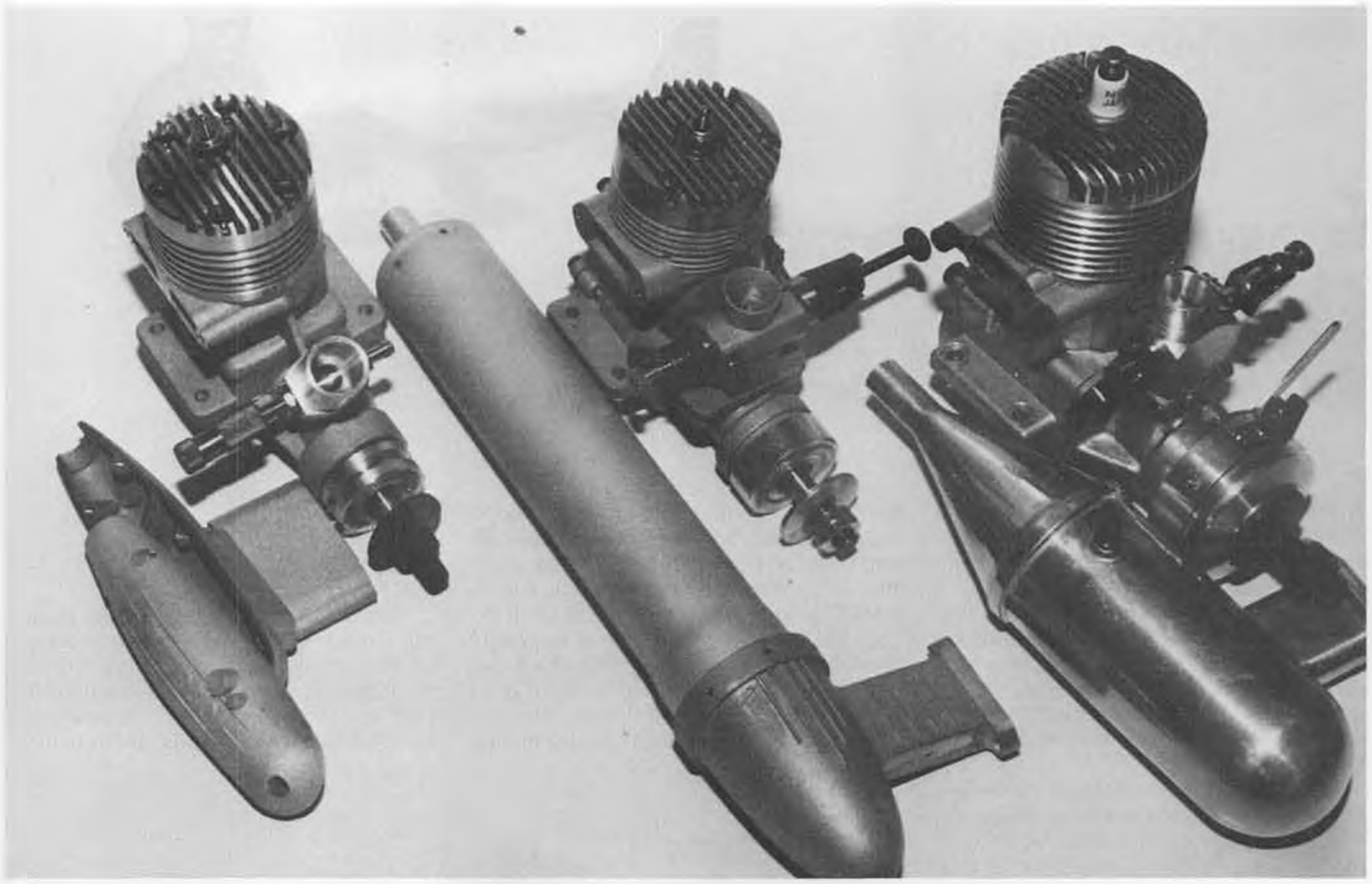
The Merco .61SS is their Super Stunt model specifically made by Forest Engineering in England for control line precision aerobatics flying. Originally designed by Bill Morley, Merco engines arrived in the U.S.A. during the days of reed radio sets. When their .49 appeared it was an instant R/C success and the .61 appeared later in the .49's case to enjoy even greater popularity. One outstanding feature of the Merco .61SS is its ability to perform the standard contest flight routine on less than four ounces of fuel, whereas the Super Tigre .60 C/L Stunt engine will use six. Scott Bair, a research engineer at Georgia Tech, was involved in determining the porting "numbers" on the Merco for optimum performance on fuel, as well as venturi diameters. With less than 136 degrees of exhaust timing this special engine allows more time per combustion cycle for the fuel to burn and convert to power. Scott also proved the idea of locating the glow plug at the rear of the cylinder head—in the "hot spot" to help prevent oil fouling the plug during the rich/lean running required in C/L stunt. The Merco .61SS uses a baffle atop its piston and related porting that has proven optimum for stunt. A Schnuerle ported engine is *not* suitable in stunt flying. The Merco .61SS engines are specially produced for Tom Dixon, who regularly advertises them here in *MB*.

FOX

Those of you who own a Fox .45 or .50 will swear the one in the photo is like yours—but it's a specially developed and limited production Fox "Q" .40 high-performance engine made exclusively for Quickie 500 R/C pylon racing in the U.S.A. It is stamped "Q" on the case where the size normally appears, features Fox's first ABC production and was built in the larger .45-.50 case to withstand pylon racing rigors



This month we feature a Merco, a Fox, and a Saito that are unrelated, yet similar in that they are limited volume specialty engines from major established manufacturers. Most likely, you'll never get to actually see one of these engines.



Even the matching mufflers are unique. The Merco .61SS has a three-part cast silencer (left), the Fox "Q" has a nine-inch muffled tuned pipe (center), and the Saito G60F has a beautifully spun and polished welded sheet aluminum muffler with pressure tap (right).

that go with being propped for ranges around 19,000 rpm! Its actual I.D. is "Fox # 24097 Quickee 500" and Duke told me enough were produced to fill all existing orders on the initial production run. The unique resonant muffler is tuned for high speeds and there's simply no way to sport fly this engine with satisfaction—it's a special purpose engine! ABC piston/cylinder units have an optimum fit at only one small rpm range (usually at the highest possible speed for racing) and should never be bought by sport fliers who think they're getting more by spending more money! Fox likes unique creative engineering—the brass cylinder of the "Q" engine has a totally different round recessed area at the inlet window of the front and the rear port . . . it's a place for the fuel/air mix to gather and wait for the piston to come down and open the ports. The greater the throughput of fuel/air mix, the greater the engine's power potential. Clever. The pictured Fox "Q" will be raced in my own model during 1989's race season.

The Fox "Q" brass cylinder has round recessed areas machined at the front and rear fuel/air inlet ports. Engine is designed for all-out Quickee 500 racing.

SAITO

The rare, limited production Saito G60F is a modern engineering enigma—a puzzling unknown from Japan! My letter to Gen Saito was never answered and other help in Japan was unable to get accurate background for print. The problem is a basic language barrier.

The engine is a modern Schnuerle .60, comes with a beautifully welded aluminum muffler, a four-way wrench, spark plug wrench and a custom made puller for the prop's drive washer. Saito originated the AAC piston/cylinder that is so successful—the G60F has an aluminum piston running in a chrome plated aluminum cylinder—and the cylinder slides into a die-cast aluminum crankcase that has beautifully machined cooling fins, unlike their fine four-strokers we regularly see. This is a spark ignition engine fitted with a ten millimeter CM-6 plug by NGK of Japan. The ignition timer housing is machined from barstock and it's absolutely elegant, whereas the front casting that holds the crankshaft is a low-production sand casting. I queried all three U.S.A. Saito repair stations and each kindly answered they had no parts for this engine, had never seen a G60F. . .and never knew the engine existed! *MB* reader Chuck Newton bought this engine in a Canadian hobby shop. Chuck is a S.A.M. old timer builder and was intrigued by this engine's spark ignition and modern design . . . he traded it to me for a McCoy .60 ignition engine. •

The Saito G60F is a modern spark ignition engine with exposed points and enclosed timing cam and follower. Note timer arm position marks on carb.

MODEL DESIGN & TECHNICAL STUFF

By FRANCIS REYNOLDS

• This month we are going to design a model airplane. It will serve as a practical example or exercise for you students of our little one-room school of model design. It will tie together much of the technical stuff that we have been studying here over the past eleven months. Also, through the kind cooperation of the management, we are presenting a construction article in this issue, on the model we will be designing here.

And what kind of model will we design? One that interests me, of course. Since you readers represent many different areas of model plane flying, no single model type would be of direct interest to all of you. This one ought to appeal to many of you and it is in the mainstream of my expertise (if any) and current interests. (Actually, I don't qualify as an expert. An expert is one who has made all of the mistakes that can be made in a given field. I'm still making lots of mistakes, therefore I am still learning.) Also, this design uses the material we were discussing last month on seaplane configurations, and in previous months on composite structures.

Speaking of mistakes, I made my usual number of mistakes in designing this airplane. I will discuss some of these here so you needn't make the same mistakes, but this raises a question with respect to the accompanying construction article. Should I present the design as it was first drawn and built, or change the drawings to incorporate improvements that became evident as a result of building and flying it? I choose the latter. There is a saying in aerospace engineering circles that every design is obsolete the moment the prototype rolls out the door. Very true, so let's build the least obsolete airplane we can.

I have mentioned Paul Weston in this column several times in the past. Let me tell you about this guy. I met him three or four years ago when I heard and saw an R/C seaplane flying over Lake Sammamish about a half mile from my place. It was an original design of Paul's: very unusual, and a hot aerobatic flier. It was soon evident that Paul and I were both interested in design, particularly seaplanes, and in the technical aspects of both full-scale and models. Paul is an architect and builder by profession, but he has taught himself at least as much aerodynamics as I had in college. His hobby before getting into airplane models was designing, building, and racing scale and full-size hydroplanes. This has given him rare theoretical and practical knowledge of planing boat and seaplane hull design. I had designed a number of successful model seaplanes before meeting Paul, but after meeting him I started to learn a lot more. I may not mention it every time, but any recent seaplane design of mine, including this one, has a lot of Paul Weston in it.

Author's Sea Fli X (foreground) and XI, placed side by side for direct comparison. Besides the obvious differences in configuration, they differ structurally in that the X uses a lot of balsa and a plywood covered wing, while the XI is 100% foam and fiberglass construction.

For lack of space, I can't repeat much of what we have covered in the past, so I will frequently be referring you to back issues of this column. To keep these references short and simple, the code, (July '88) will mean, "If you don't fully understand what I am talking about at this point, please refer back to MD&TS for July 1988 where we discussed this subject in detail."

OK, let's get down to work. Our first job is to establish the objectives and ground rules for the design (April '89). Since I'm the guy poised over the keyboard, I guess that is my job.

Objectives

To design an attractive, light, rugged, medium-speed, non-absorbent, sport-aerobatic, mid-size R/C flying boat that will operate well from relatively rough water.

Ground Rules

1. Four-stroke .60.
2. Four channels.
3. No balsa.

That is enough. Unnecessary ground rules place too many restrictions on our creative design thinking. However, I'm sure that "no balsa" strikes you as an unnecessary and highly restrictive ground rule. Granted, but I have reasons for this particular decision. Part of the reason is that balsa sops up more water than any material short of a sponge, and "non-absorbent" is one of our objectives. I have had balsa seaplanes that absorbed as much as two pounds of water, and were very reluctant to give it back. More importantly, we have been investigating composite structures (Oct. '88 through March/April '89), and we need to put this information to work. Prohibiting balsa will encourage us to use composites.

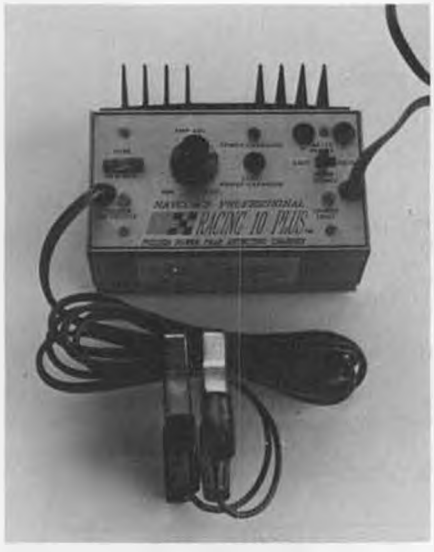
I've used flaps on some of my seaplanes, and even had retracting floats (May '89), but four channels is enough for a good basic airplane. Let's keep it simple. The reasons for specifying a .60 four-stroke are that I have one that isn't busy, and it is quiet so my neighbors are less apt to try to put an end to my flying on the lake. A Davis Diesel conversion and/or a good muffler on a two-stroke is also an option. More on that some

Continued on page 74

ELECTRIC POWER

By MITCH POLING

• Off-road and on-road car racing is a very strong area of advancing technology. I have mentioned some of this before, such as stock off-road 05 (100 watt) motors that approach the power levels of cobalt motors, pulse peak charging, and motor maintenance techniques. Now there is a new technique on the scene: *super fast charging*. Most of us are accustomed to charging at somewhere between three to four times the rated capacity of the cells. Often this is referred to 3C and 4C rates; C is the capacity of the cells. A 1.2 Ah pack would be charged at 3.6 to 4.8 amperes. This will take twenty to thirty minutes, depending on the charger, for most 1.2 Ah packs, because the charge rate drops as the pack voltage goes up. Super fast charging is done at six to ten times the capacity of the cells, so a 1.2 Ah pack would be charged at 8 to 12 amperes. This reduces the charge time considerably, down to twelve minutes at 8C, eight minutes at 12C.



Navcom's Racing 10 Plus charger used for super fast charging. Details in text.

This time reduction was not the reason for going to super fast charging though. Super fast charging resulted in winning races; the cars ran faster and longer. Now just about every competitive racer is using super fast charging. Tekin, Novak, and Navcom are some of the manufacturers that sell super fast chargers. I have the Navcom Racing 10 Plus charger, which can charge up to eight cells from a 12-volt car battery, at up to 12 amperes. It retails for $120 and has pulsed output, current regulation, and peak voltage detection. I have been using it on six-cell Sanyo SCR packs, SC packs, and the Gates 1.4 GE Max 1.4 Ah packs. I am impressed! This charger is beautifully made, in a strong gold anodized aluminum case. The current regulation is rock solid and once the current is set, it stays there. Peak detection is perfect, it has never turned off prematurely or failed to turn off at the peak. It just charges time after time, with solid dependability. This has become my favorite charger! You can set the current at whatever value you want, up to the 12 amp max. The charger never gets hot; it has huge heat sinks on the back, but they have hardly even been warm. There are voltmeter probe jacks on the front, with a switch labeled amps/volts. This switch is clever, just set the voltmeter on volts (20 volts for a DVM) and read volts directly. When it is switched to amps, the voltmeter will read amps/10 on the voltage scale (8 amps will read .8). This means you do not have to have an ammeter or a high amp setting for your voltmeter, since very few can show 12 amps!

Old Timers make great subjects for all sizes of electric power systems. Colin McKinley built this big ten-foot Carl Goldberg Valkyrie for an Astro 60 cobalt with 24 cells.

Battery Packs Charged At Very High Rates

DSC 075 motor, 7x3 Graupner prop, Navcom Racing 10 Plus Charger

	Astro SCR (1 yr. old)	Sanyo SC (1 yr. old)	Gates 1.4 Ah (new)
10	A charge	8A charge	8A charge
0	11,300/14A	10,700/13A	11,000/13A
1	10,900/13A	10,200/12A	10,400/12A
2	10,900/13A	10,100/12A	10,100/11A
3	10,600/12A	10,100/12A	10,100/11A
4	10,600/12A	10,100/12A	10,000/11A
5	10,500/12A	10,000/12A	9,900/11A
6	10,200/11A	9,700/12A	9,800/11A
6.5	9,600/10A	9,600/12A	9,600/10A
7	0	8,700/10A	9,400/10A
8	0	0	8,800/8A
	79 Am/1.32 Ah	83.5 Am/1.39 Ah	86.5 Am/1.44 Ah

There are some requirements for super fast charging. You must have a very stable voltage source. A car battery in good condition is satisfactory, a small motorcycle battery is not. This charger draws a little more current than it delivers, so the battery should be able to hold a steady voltage under a draw of 10 amps. I use a car charger on a lawnmower battery in the shop or at the indoor car track. This is a very reliable voltage. The car charger is rated at 8 amps; I may get a stronger one, but so far it has held up. Do not try to charge using the car

Continued on page 71

Mean looking "Diabolo" is a German design, built by John Foley from Hobby Horn plans. A five-footer, it really moves out with an Astro 15 cobalt on 12 cells.

R/C SOARING

By BILL FORREY

• Three issues ago this column featured a piece entitled "Wood Fuselages: Where's the Strength?" Bob Bayard of the South Bay Soaring Society was annoyed by a tendency of his Airtronics Olympic 650 and Olympic II fuselages to break near the tail. The subject of this short segment was an experiment that Bob Bayard conducted to find a cure for this malady. He suspected that the cross-grained Olympic fuselage tops were weak and therefore to blame, so he set out to determine which of two fuselage construction methods was stronger; those with cross-grained fuselage tops (and bottoms) or those with lengthwise-grained tops and bottoms.

His test beds were 18-inch balsa boxes with cross sections that were 3/4 X 1 inch. This is about the same cross section as the Olympic fuselages near the tails. He built two with cross-grain tops and two with all the grain running lengthwise. He then supported each box at the ends and applied a force to the center until each broke. He concluded that the lengthwise-grained boxes were about 70% stronger.

What was not addressed was whether the modified Oly fuselages continued to break just in front of the tail, or whether the mods actually solved the problem.

Jim Adams, president of the Society of Antique Modelers and a 40-year veteran of North American Rockwell, considers himself an "amateur stress engineer." Jim wrote a five-page letter which explains the reasons why the cross-grained fuselage sides have been used historically in kit designs, and what can be done to beef up the area just in front of the tail. I will not be able to run the entire letter, but instead will attempt to edit it down to its essential highlights.

"I read your piece about 'Where's the Strength in Wood Fuselages' in the February issue and decided to send along my comments.

"Firstly, let me explain that fuselages were first sheeted crosswise to increase the rigidity through the cross section, not to increase the longitudinal fuselage strength. To clarify, let us imagine a fuselage or box as you described and test it by applying a load at the bottom or top center, or a second test by applying loads to the sides of the fuselage as shown in the sketch. (See Figure 1.)

"The crosswise sheeting is really there to replace cross members or bulkheads and to provide the strength to resist rough handling by the modeler. Crosswise sheeting was first added to the bottoms of models to resist the impact of small rocks and pebbles on landings.

"To see why the Oly fuselage (or any other glider) breaks just forward of the tail, let's look at a crash scenario. The model is landing and the tip of the horizontal stabilizer strikes an object. A sharp load is transmitted to the point of attachment to the fuselage. (See Figure 2.)

"One of two things can happen: either the stab tears off, or if the stabilizer-to-fuselage attachment is strong enough, the load is converted into bending in the aft fuselage. Because the smallest (and probably weakest) cross-section of the fuselage is just forward of the tail, it breaks. One side is put in tension and the other in compression. The two sides are only supported by the top and bottom of the fuselage, and because these were not sized to take this load, they fail.

FIGURE 1.
The typical kit-type fuselage.

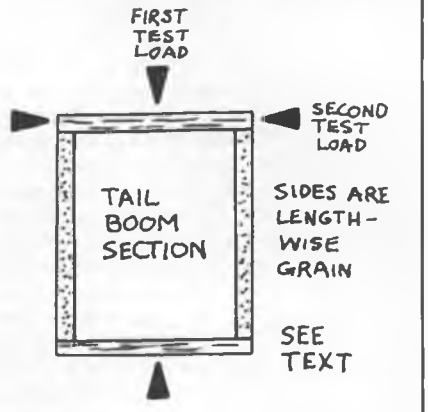
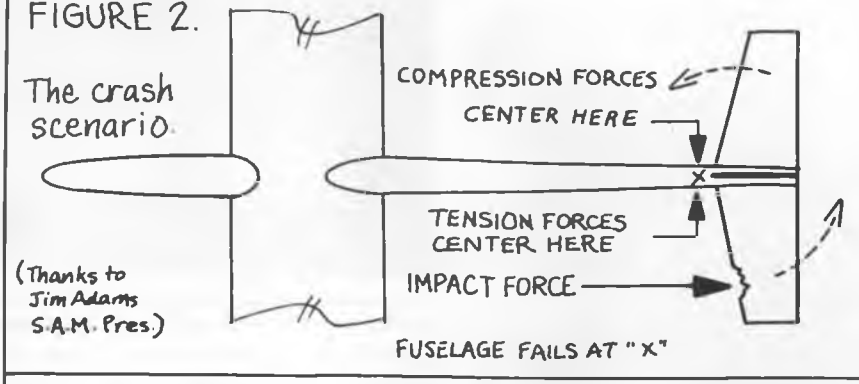
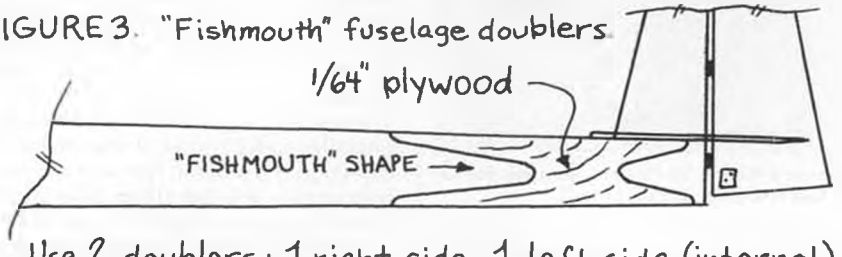


FIGURE 2.
The crash scenario.



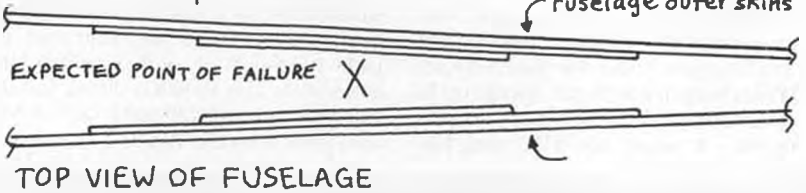
(Thanks to Jim Adams S.A.M. Pres.)

FIGURE 3. "Fishmouth" fuselage doublers



Use 2 doublers: 1 right side, 1 left side (internal).

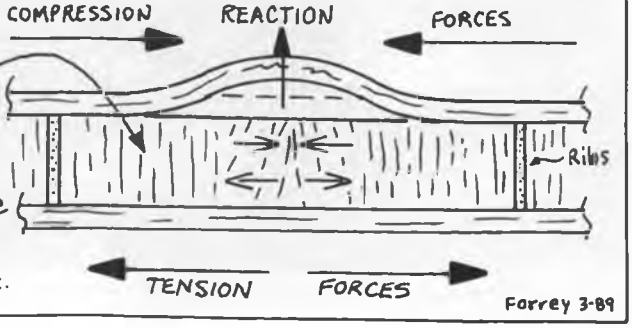
FIGURE 4. Tapered Doublers



TOP VIEW OF FUSELAGE

Vertical doublers may be joined by horizontal webbing for maximum strength.

FIGURE 5.
Shear webbing holds spar caps together. Spar caps are analogous to fuselage sides in a crash where stab is hit.



Forrey 3-89

"This is inherently the weakest spot on any model airplane. If you increase the thickness of the sides, top, and bottom, and substitute plywood for balsa, the next point to fail would be the adhesive or the stab itself. If you are really worried about this point only one thing remains, and that would be to make this point flexible. This may sound unreal, but in the past this has been tried by FAI Nordic fliers.

"The design problem of increasing the strength of the fuselage at this point can be solved in several ways. One way would be to increase the cross section to equal the rest of the fuselage. This is obviously disagreeable to most of us. Another way is to add sheeting to the area. None of these are failsafe, and I have found that you have to overdesign the structure (strength-wise) when trying to overcome impact loads that are much stronger than air loads. You are really trying to design for loads of almost impossible size.

goes back to the days of the T-6. All of the welded tubing fuselage joints were made in that fashion.

"If you want to visually experience this stress concentration, build a balsa tube much as Bob Bayard described before. Add a doubler to the tube, then load as before with the support under each end and the load applied on the top near the center. If the doubler is strong enough to resist the impact of the load, failure will occur at just the end of the doubler.

"A tapered or layered doubler is often used in full-size practice to get the most strength into a section. The ideal doubler design would be one with a tapering thickness down to the point of infinity. A simple design would be one as shown in Figure 4.

"On the very latest design that I worked on at North American/Rockwell, the Space Shuttle, we made use of tapered splices on the large diameter Kevlar ducts that were only a few thousandths of an inch thick.

cause a splitting action in the web. (See Figure 5.)

"Now ask yourself the question: would the wing be stronger with the grain of the web running crosswise or running parallel to the spars? I elect for the crosswise direction just from my experience with balsa wood."

Thank you, Jim, for your insight into the problem.

I hope that I can shed a little more light on the subject. In the case of the stab striking an immovable object, the stab acts as a lever to bend the tail boom of the fuselage (usually sideways away from the object). This load is equivalent to the bending load placed upon the wing spar in the above example with the highest level of energy concentrated closest to the stab itself. In this instance, the fuselage sides are analogous to the top and bottom wing spars, and the fuselage top and bottom are analogous to the wing's shear webbing. The fuselage top

Above: The Mistral is a high-performance thermal duration ship, kited up in Canada by ASTECH Models. Big ten-footer is of all-wood construction. See text for kit availability, and also for the interesting results of experiments using this sailplane to test various airfoil sections.
Right: Three Mistral fliers with three of the airfoil test models, from left: Robert Schenk (E392), Bruce Taylor (E374), and Alex Reinhardt (E193).

"In the case of a narrow and not very tall fuselage such as an Oly or a Paragon, I have found that plywood doublers cemented inside the fuselage will do the most good. Remember, to really be effective against all the possible loads, you must double the top and bottom as well as the sides. In the case of the Paragon where there is very little room inside the fuselage, I use two vertical plywood doublers and let the ply take the sideways bending loads. Don't forget to taper the doublers (see Figure 3) in order to avoid a stress concentration at the point where the doubler ends. I also use fiberglass on the outside surface.

"I am an amateur stress engineer, but having spent 40-plus years working in and around the design department at North American/Rockwell's engineering department, some of it was bound to rub off on me. The 'fishmouth' design of the doubler

"All of the doublers will do no good unless the section is supported by adequate shear webs. The top and bottom of the fuselage will suffice providing they are securely attached. A lap glue joint such as we do on our fuselages is perhaps the best. The shear webs that we put in between the spars on our wings are only as good as the butt glue joints that many use.

"Take a hypothetical design that we're all familiar with: two wing spars. One is on the top and one is on the bottom of the wing. Join them with a shear web and assume that the glue joint is perfect. The compression forces are acting along the top spar, and the tension forces are acting along the bottom spar. When the wing is bent, what happens? The top spar tries to pull away from the shear web. Because the glue joints are perfect, the shear web is subjected to loads in two directions at once. This will usually

ends at the stab (usually), so at this point the stab itself acts as the shear web. Because the stab is usually thicker and stronger than the top sheeting in front of it, a stress concentration point is created, and this is where the break will occur in most cases.

There is a way to combine the best of both worlds in the lengthwise versus crosswise argument. I say, why not run lengthwise top and bottom sheeting of 1/8-inch (or thicker) B or C-grain balsa? These grains are stiffer and stronger than A-grain for this application and are able to resist dings and squeezes. At the same time, the lengthwise grain would provide great longitudinal strength, as Bob Bayard's experiments have shown. Many British designs feature top and bottom lengthwise grain fuselage sheeting as thick as 1/4-inch. This also allows for rounding of the fuselage corners, which helps eliminate the "boxy" look.

EPPLER AIRFOIL EXPERIMENTS USING A SINGLE SAILPLANE DESIGN: ASTECH MODELS MISTRAL

I first met Alex Reinhardt of Winnipeg, Canada, at the 1983 FAI/F3B World Soaring Championships in York, England. He was a member of the Canadian team. Although we didn't really get to know each other that well in 1983, over the years through correspondence between Alex, Jim Holland (also of Winnipeg), and myself, news went back and forth and a kind of friendship grew. Then in (I think) 1987, Alex flew down to Los Angeles on business and we planned a meeting at a slope race and later had lunch (with 1985 U.S. F3B team flier, Mike Reagan) and got to talking sailplanes—what else? The following letter from Alex picks up from there:

"Dear Bill: It's been a long time since we spoke last at the Hughes Hill slope race that got rained out a couple of years ago. At that time I mentioned that we had been flying our Mistrals with several different airfoils, and that I would write you and tell you about the results. Well, this is that letter.

"I wanted to wait till now because we added a couple more airfoils to the fleet this summer. It's also timely because I just read your article in the December edition of *MB* discussing some of Selig's results on the Eppler 387, E214 and E205/S3021. The results are interesting to say the least. As a side note, I am currently setting up Eppler's computer program myself and hope to be doing some airfoil design soon. It's about 3,000 lines of code so it is a lot of typing!

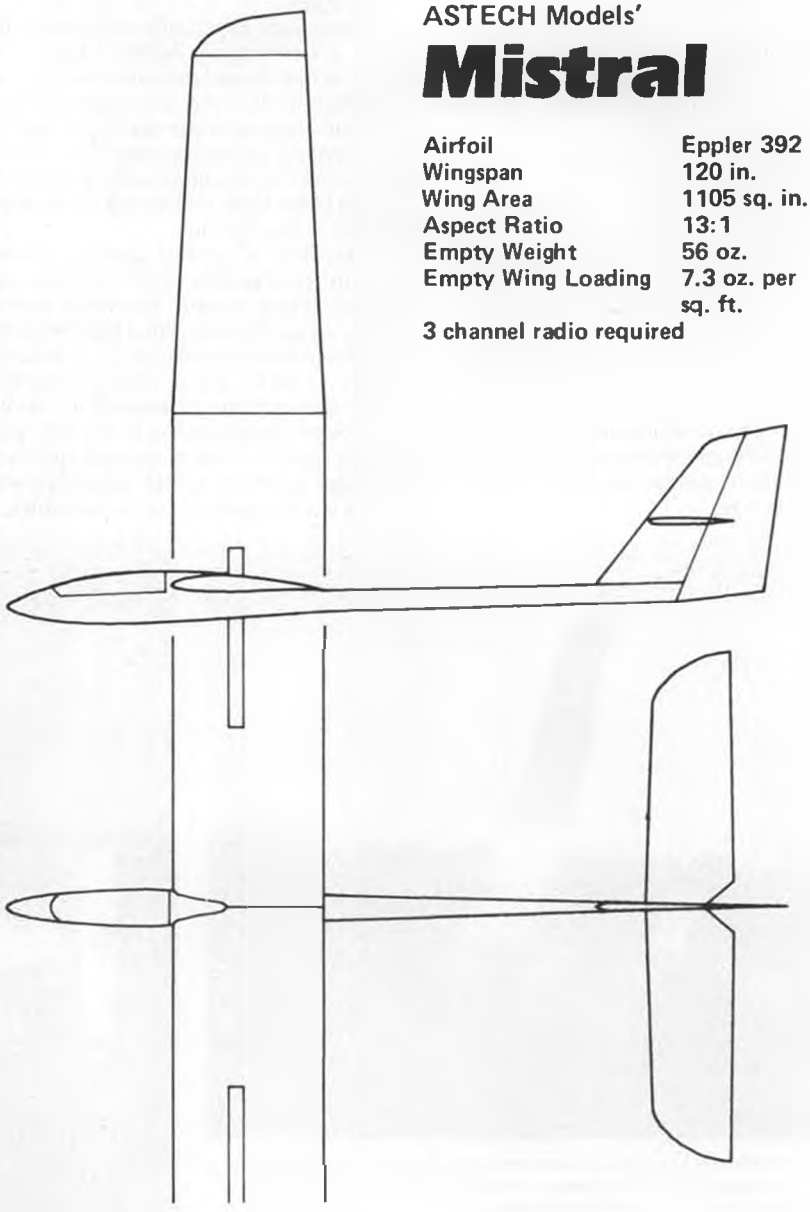
"First some background on the Mistral. I designed the airplane back in 1984 and have been flying it since. I also won the Canadian Nationals with it in '84 against some stiff competition from Sagittas and a very well flown Windsong which ended up second. In 1986, Bruce Taylor and I formed ASTECH Models in order to kit the Mistral and other high-performance sailplanes. To date, the Mistral is our only kit but we are now looking to kit another airplane. Currently, there are about 12 Mistrals flying in this area. Quite a few have gone to the U.S. east coast, and there are a few in California and Texas. The all-wood kit retails for U.S.

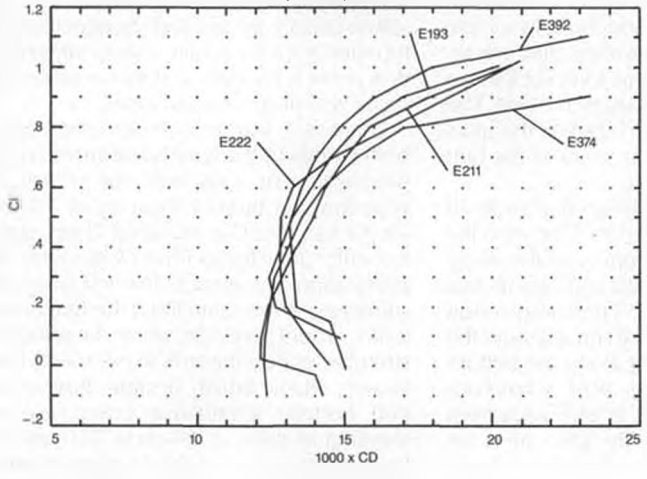
ASTECH Models'

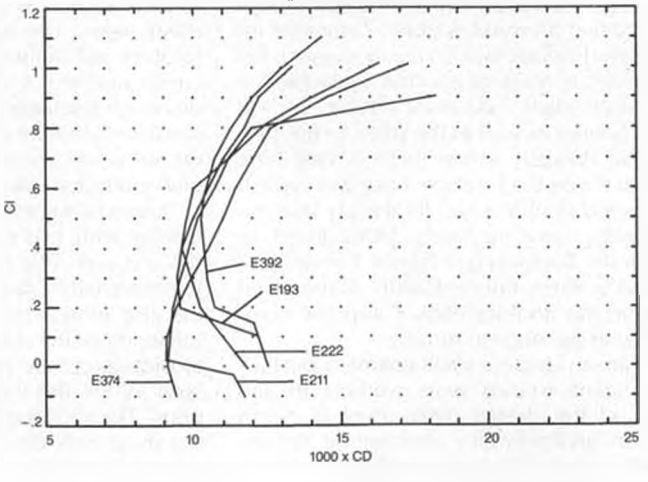
Mistral

Airfoil	Eppler 392
Wingspan	120 in.
Wing Area	1105 sq. in.
Aspect Ratio	13:1
Empty Weight	56 oz.
Empty Wing Loading	7.3 oz. per sq. ft.

3 channel radio required







$105.00 plus U.S. $20.00 for shipping UPS to your door (this includes all taxes and duties). It comes complete with hardware, machine-cut ribs and parts, full-size plans, etc.

"The Mistral was designed to be a high-performance thermal duration competition sailplane. Specific attention was paid to the handling traits of the airplane. It's very stable, which means you don't have to fly it all the time. This gives you time to look around, observe the conditions, and see where everyone else is—very handy in contests. This also helps a lot when it comes time to land. Many airplanes I have flown get very squirrely just when you don't need it: 'on the spoilers,' 50 feet away from the spot, and all lined up!

"The Mistral's basic dimensions are 120 in. span, 1105 sq. in. area, 7.3 oz./sq. ft. loading, with an empty weight of 56 oz. All the airplanes we have heard about are between 54 and 64 oz., the average is approximately 57 oz. The stock airfoil is the Eppler 392 and the wing is of standard D-tube construction. The wing is a 3-piece affair with the center panel bolting to the fuselage.

"When I talked to you last, you were interested in the trailing edge. It uses 1/16x1 sheeting top and bottom with a 1/8x3/8 spruce strip glued to the 1/16 sheeting. The spruce is then planed to the proper shape and provides a fair bit of strength and dent resistance to the T.E. The undercambered shape of the T.E. is maintained by the construction technique used.

"To date, five different Eppler airfoils have been used on the Mistral: the E392, E374, E193, E222 and the E211. These are not just different wings but are five complete Mistrals. This allows direct comparison of airplanes since they can be flown against each other. This has been done for the past several years and includes many contests.

"The choice of airfoil stemmed from the particular qualities we were looking for at the time. Computer based aircraft performance predictions, using Eppler's theoretical lift/drag profiles, of the airplane were used as the basis for each selection. The E392 was originally chosen due to its exceptional low speed and reasonably good high speed characteristics. This provided the minimum sink and rate of climb desired directly, i.e., flaps would not be required hence reducing weight and complexity.

Two views of the stock Pierce 970 built by Fred Hacke. This Pierce Aero Co. kit saw only limited production and was replaced by the Paragon, which was much superior. Fred later added a set of unturbulated D-tube Paragon wings and saw a real jump in performance.

Penetration in high winds would be achieved through the use of ballast. This has proved very successful.

"Shortly after the E392, an E374 version was built. The intent of this airfoil was to provide more penetration or ground covering capability. Its shortcomings in minimum sink and rate of climb in thermals would be tolerated since more ground could be covered, providing a good chance of finding acceptable lift. This choice was driven by the fact that it is normally windy in this part of Canada, 15 to 25 mph is quite common, especially during contests! Again, this proved successful.

"While the E374 works well in the wind, it gives up much in the low speed regime compared to the E392. An effort was made to find a better compromise between high and low speed performance. As a result, three other airfoils were tried, the E193, E222, and E211. These airfoils proved to be between the E374 and the E392 in high and low speed performance respectively, and all worked well. This was exactly as predicted.

"The real interesting thing in this regard is that the subtleties in the behavior of these airfoils (i.e., the slight differences in the computer predicted lift/drag profiles) were indeed found in practice. Figures 1 and 2 present the theoretical lift/drag profiles for these airfoils at Reynolds numbers of 100,000 and 200,000; slow and pretty fast respectively for the Mistral.

"It must be understood that these differences are relative and not absolute in nature, as we have no way of determining the absolute performance of the airfoil in numerical terms. Therefore, the first key result of these comparisons is that Eppler's computer program seems to predict at least the differences between airfoils pretty well. It will be very interesting to see how the theoretical lift/drag profiles compare to the wind tunnel data obtained by Selig and Donovan. I'm not sure if he has tested all of these airfoils, are you?

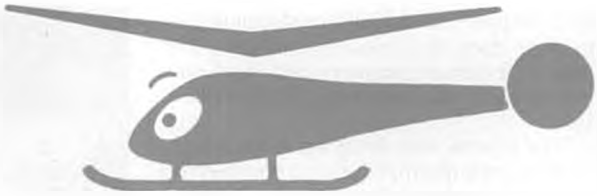
(I only know for sure that test models of the E193, E374, and E211 were built for the tunnel. The E222 and E392 appear to have been overlooked for more popular sections.)

"The other key result, or conclusion, or

Continued on page 103

With sites like this, it's no wonder that slope soaring is so popular up in Canada. This is Quappelle Valley, in Saskatchewan.

CHOPPER CHATTER



By JAMES WANG

• This month I will explain some of the theory behind a two-bladed main rotor system. Elsewhere in this issue of *Model Builder* I have also prepared a review of the new Kyosho Concept 30 helicopter. The Concept review goes very well with this month's column because it serves as an excellent example of rotor head design. The two-bladed rotor system is used on most model helicopters because it is the simplest of all main rotor designs. Even when you crash, you will at most break two blades. A two-bladed rotor is a lot easier to balance than three, four or five-bladed systems. Let's take a look at the rotor system in general.

All helicopter main rotor blades must have three axis, or degrees, of freedom, which means each blade must be able to move freely in three directions. It must be able to flap up and down, swing fore and aft, and rotate to change its pitch angle. These three degrees of freedom are called flapping, lead-lagging, and feathering. They are illustrated in Figure 1. In a classical helicopter main rotor design, these three degrees of freedom are obtained by using three hinges. The hinges are supported by ball bearings or needle bearings to permit smooth blade motion. When a main rotor possesses three independent bearing assemblies for each blade, it is called an *articulated rotor system*. The sequence of the hinges can be very important in determining the main rotor aeroelastic stability. For example, on the Concept 30, the flap hinge is inboard, then the feathering hinge, then the lag hinge is the most outboard.

An excellent example of two-bladed main rotor design is the Kyosho Concept 30, reviewed in this issue on page 32. Model features an articulated rotor with mild flap hinge offset.

Almost all of the full-size helicopters manufactured in the U.S. are of the articulated main rotor design. The advantage is that each blade can freely flap up and down and freely lead-lag fore and aft, thus giving the passengers a very smooth ride. The fuselage rides smoothly because the blades can move freely and hence are less affected by gusts and turbulence. Also, because the blades can move freely, main rotor vibrations are not solidly transmitted to the fuselage. The drawbacks of articulated main rotors is that they are bulky, heavy, and provide low control response. They are bulky and heavy because there are three sets of bearings for each blade (see Figure 2). The control response is low because when the pilot inputs a command to do, say, a right turn, he moves his cyclic stick right to cause the main rotor to tilt to the right, which points the rotor thrust to the right to pull the helicopter right (see Figure 3). Since the blades are attached freely to the main rotor hub, you can imagine that the helicopter is unlikely to do a good axial roll because full right stick will simply cause the main rotor disk to tilt to the right, and is not likely to tilt the dangling fuselage to the right. Helicopter designers have discovered that by locating the flap hinge away from the main shaft, say about 5 to 10% of the blade radius, the rotor flapping action can transmit a rolling movement through the main shaft to help roll the fuselage. This is called an *offset flapping hinge*. This discovery made articulated rotor helicopters aerobatic. Hirobo/GMP's DDF rotors as used on their SST, Stork, and Shuttle are the first collective pitch R/C helicopters to use the offset flapping hinge. The new Concept 30 also employs an offset flapping hinge. Typically, U.S. full-size helicopter designs employ 5 to 8% flap hinge offset.

In the '70s a new main rotor design appeared on full-size helicopters which was called the *hingeless rotor*. As the name implies, the flap hinge has been removed. The hingeless main rotor design has been borrowed by Kalt for their Baron 28, 30MX, and Cyclone. It is shown in Figure 4. Note that

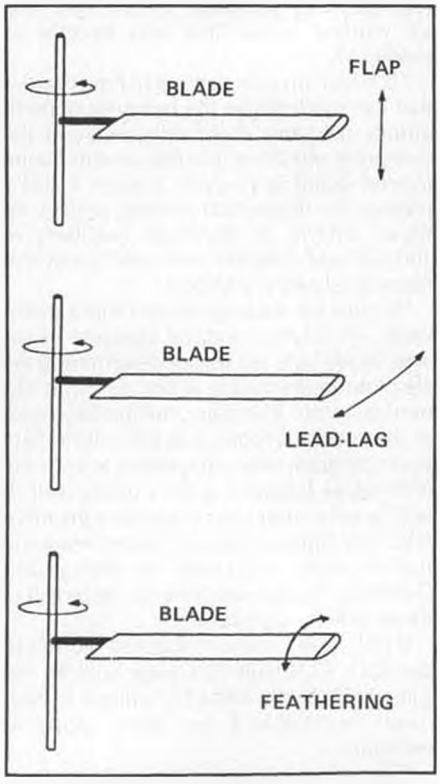


FIGURE 1. The three degrees of freedom on any rotor blade.

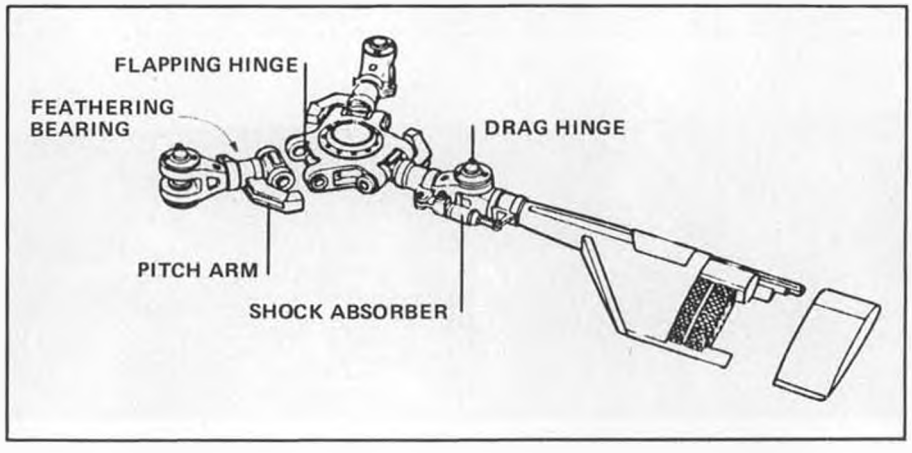


FIGURE 2. Full-size articulated rotors are bulky, heavy, and a mechanic's nightmare.

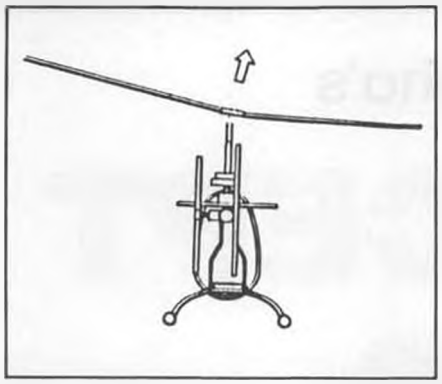


FIGURE 3. A helicopter moves to the right by directing its main rotor thrust to the right. The fuselage does not roll with the rotor disk because of the freely attached rotor blades.

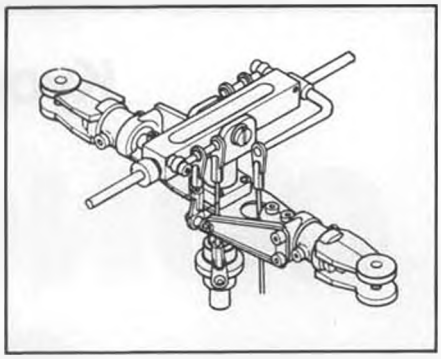


FIGURE 4. The hingeless main rotor on Kalt's Baron 28 replaces the mechanical flap hinge with a flexible steel plate.

only the flap hinge has been removed and replaced by a spring steel plate that can flex to permit the blade to flap up and down. The advantages of the hingeless rotor are its lighter weight, simpler design, and the fact that it can be designed to have excellent control response. It can do fast rolls because the spring steel plate has spring stiffness, thus as the blades flap up and down, the rotor disk tilt can transfer a rolling movement through the shaft to the fuselage. The result is the same as having the flap hinge offset on an articulated rotor. A soft spring steel plate will be equivalent to 4 or 5% hinge offset. A stiff spring steel plate will be equivalent to 8 or 10% hinge offset. The designer can choose the stiffness to give the desired pitch and roll response. But he must realize that as he makes the head stiffer (any equivalent flap hinge offset greater than 8%), the main rotor vibrations can more readily be transmitted through the shaft to the fuselage. This is annoying for the passenger. For model helicopters, this might damage the servos, receiver, or loosen the bolts. The Kalt Baron 28 and Cyclone have very soft and docile control response because they have a relatively soft spring steel plate (equivalent to only about 5% flap hinge offset). You can make the Cyclone more snappy by installing a thicker replacement steel plate, or installing an extra steel plate. The other great advantage of a hingeless head is that there are no flap bearings, so there can be no slop.

In the early '80s, a new design called a *bearingless main rotor* began to appear in the full-size helicopter community. As the name implies, this time all three bearings, flap, lead-lag and feathering, have been removed. Figure 5 shows a bearingless main rotor design. The obvious advantage is its extreme mechanical simplicity. The main rotor hub is no longer made of steel or titanium, it is made of space-age composite. The composite hub has kevlar or other fibers layed up in a predetermined direction, and imbedded in epoxy. The specially layed-up fibers allow the main rotor hub to elastically flap, lead-lag, and feather. These long, flexible, finger-like arms are called flexbeams. Peka, of West Germany, makes a 2, 3, 4, and 5-bladed bearingless main rotor system for R/C helicopters. Again, the designer can design the flexbeam to be stiff to provide the desired control response for air-to-air combat, or he can make a soft flexbeam for a smooth passenger transport. Similarly, model helicopter designers can design a stiff main rotor for aerobatics and hot-dogging, or a very soft head for beginners. Bearingless main rotor systems are not yet incorporated on any production helicopters because they are still relatively new technology. Unlike model helicopters which crash and can be rebuilt, full-size helicopters have humans in them!

All helicopter main rotor systems fall into three categories: articulated, hingeless, and bearingless. However, there is a special rotor design that doesn't really fall under any of the above three categories; it is called a *two-bladed teetering rotor.* This is similar to

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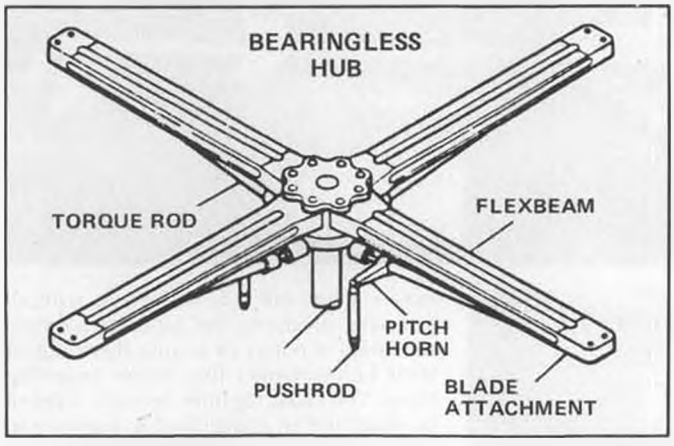


FIGURE 5 (left). A bearingless main rotor does away with all three mechanical hinges; blades attach to flexbeams that are designed to bend or flex in the necessary directions.
FIGURE 6 (below). A lead-lag damper is used on the full-size Bell Huey to prevent resonance. On models this effect can be had by properly tightening the blade attachment bolt.

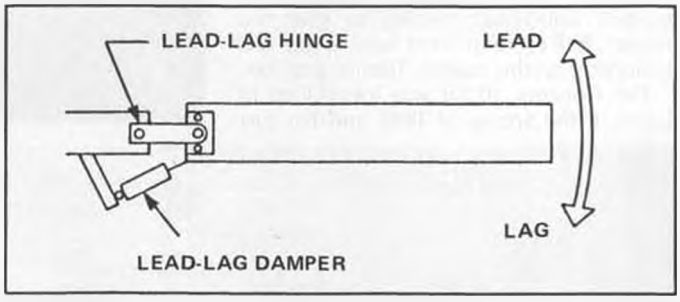


FIGURE 7. Close-up of the main rotor on a full-size Bell UH-1 Huey. An example of a two-blade teetering rotor.

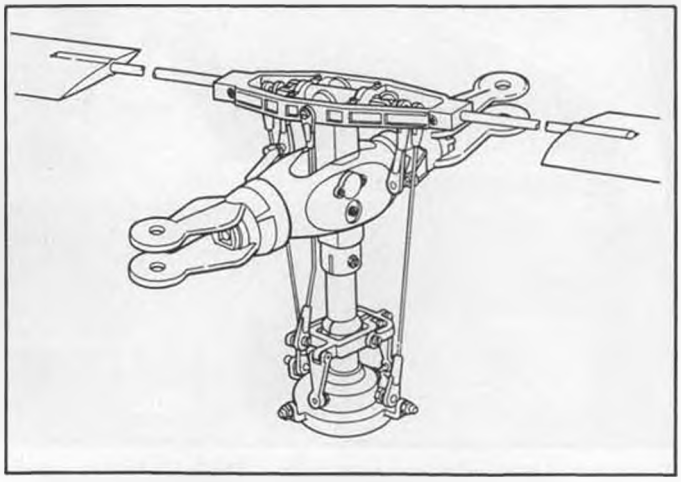


FIGURE 8. Hirobo/GMP's Prohead bears a strong resemblance to the Huey rotor shown at left.

By JAMES WANG

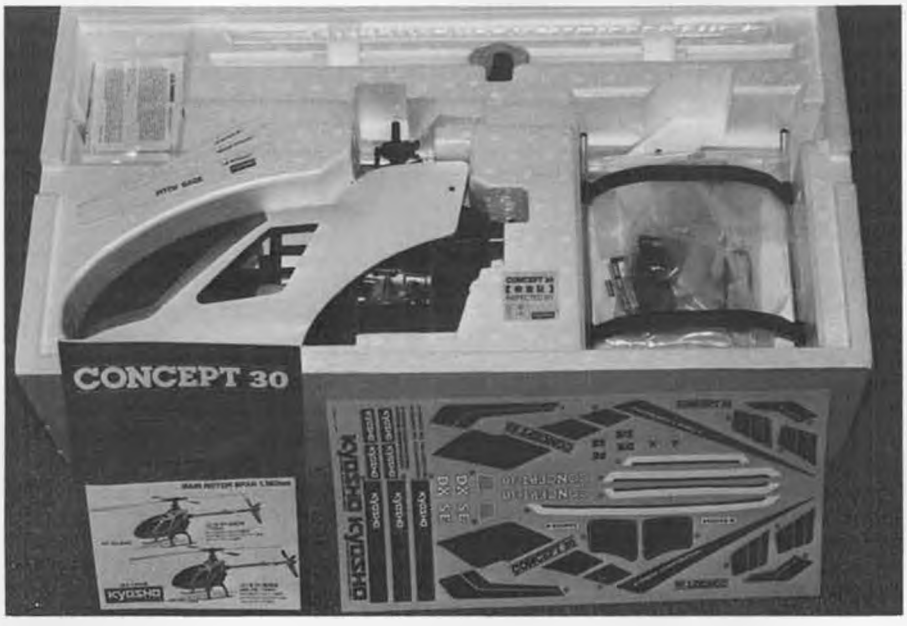
Kyosho's CONCEPT 30 R/C Helicopter

• Anyone who follows the R/C helicopter contest circuit will be familiar with the name Shigetada Taya. He is the winner of the first F3C R/C Helicopter World Championship held in London, Canada back in 1985. At that time he was working closely with TSK, a small Japanese R/C helicopter accessory firm that specialized in manufacturing precision quality aftermarket components for competition helicopter modelers. Mr. Taya won the Championship with his original design TSK mechanics in an Augusta A-109 fiberglass fuselage. Circus Hobbies now offers this beautiful fuselage to U.S. modelers through mail order. In recent years, Mr. Taya has been working closely with Kyosho, the world famous Japanese manufacturer of 1/10-scale electric R/C cars and motorcycles, boats, and electric ready-to-fly planes, to produce the new Concept 30 R/C helicopter. Since Kyosho has accrued vast experience in small, high quality molded plastic parts, it is natural that the Concept 30 is almost completely constructed from high quality molded glass-filled nylon parts.

The Concept 30 is a very compact and cute looking R/C helicopter. I think the design is very impressive. It is more of a revolution than evolution in design because it has many features that are unique only to this helicopter. I guess Mr. Taya must know what he wants, and he knew what he was doing because he didn't need to scrounge ideas from other helicopters. For example, the main rotor blade is of unique construction to give forward chordwise CG and soft torsion. I think this is the only R/C helicopter with the engine mounted inverted. It has an ingenious washin-washout scissor with built-in Bell-Hiller mixing to give the highest Bell-Hiller mixing ratio of any R/C helicopter on the market. The list goes on.

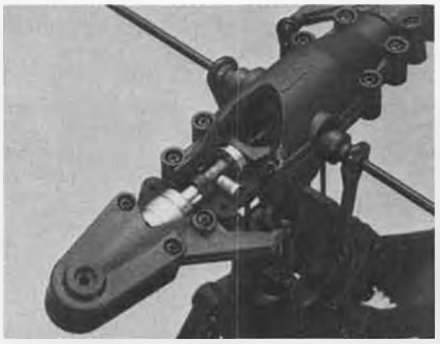
The Concept 30 kit was introduced in Japan in the Spring of 1988 and has just now reached the U.S. market. As with all Japanese products, the Japanese companies have a policy of testing them out in their home market first before exporting them. The usual lag time between a debut in Japan and an appearance in Europe and North America is about six months to a year. Very often, about half of the high-tech products never even reach foreign markets. So, if you are a high-tech toys freak, then you must take a trip to the Akihabara district in Tokyo. Don't leave home without your American Express card because you will be stepping into a tiny one square mile zone laden with hundreds of electronic, audio, camera, and model shops. Teenagers can spend a whole day at Akihabara and run your charge card to the roof, especially since the dollar is weak and the yen is strong now. The U.S. dollar has depreciated to half its value against the yen during the past four years.

Mr. Taya has designed the Concept 30 for both beginners and experts. He wanted a rugged design so the Concept employs a structural "truss" style design. The truss de-



This is how it looks when you open the box. This is the factory-assembled DX version with the O.S. .28FH engine already installed, which is the one our author recommends for beginners. Only six hours after this photo was taken, the machine was assembled and flying!

Our author felt so comfortable with the Concept 30's flight characteristics that he continued flying after sunset — in a well-lighted area, of course.



Cutaway of the main rotor hub reveals the inside of the Concept 30's articulated, 5% flap hinge offset rotor design. Soft flap stiffness gives very smooth flight characteristics.

This is the one-piece molded bearingless tail rotor that is available in Japan, but not here in the U.S. Our author is nuts about it. Appears to work on the "live hinge" principle.

tical beams reinforced with diagonal cross braces. Almost all the R/C helicopters on the market use two plates as side frames to provide the bulk of the helicopter structure. The disadvantage of plate style side frames is that they will bend in a crash, which can cause distortion and ruin the engine shaft, main shaft, and tail drive alignment. The truss design was first used by Heim. It is strong and light weight because rather than using a complete aluminum plate, truss construction uses thin beams.

To make the Concept sell, it must have good hands-off stability. But to make it attractive to the expert, it must have good agility and controllability. Any helicopter designer knows that to have a stable *and* agile helicopter is asking a lot. You are asking it to be hot and cold at the same time. But, with care it can done, just like Chi-Chi's fried ice cream. Of course, you must know the recipe. Either by luck or wisdom, Mr. Taya has hit close to the jackpot and designed an R/C helicopter that is very docile for the beginner and quite agile for the expert. However, he did have to bring out two Concepts to capture the two extremes. There are two versions of the Concept kit: the DX version for the beginners, and the SE version for the intermediate to advanced flier. The difference is that the DX has 18 ball bearings and heavier aluminum Hiller paddles for improved stability. The SE version has 31 ball bearings and lighter plastic paddles for agility. In the U.S., the Concept 30 is imported by Great Planes Model Distributors. Suggested retail prices are as follows:

1. Concept 30 DX unassembled and without engine for $349.95.
2. Concept 30 DX assembled but without engine for $419.95.
3. Concept 30 DX assembled and with O.S. .28 F-H installed for $529.95.
4. The special edition Concept 30 SE unassembled kit for $429.95.

The assembled DX with O.S. .28 F-H engine is evaluated here. This is the version I recommend to beginners. You almost can't botch up this way. From the photos, you can see the packaging box is extremely attractive. The Japanese are well known for pretty external packaging whether the internal good is expensive or not. Inside my DX box, there are very few items because the helicopter is 80% pre-built. The helicopter fuselage and transmission come already assembled. Only the tail boom, landing gear and main rotor hub need to be installed. All these components come in a well protected foam box. Most important of all, there are no parts missing at all! It can drive a modeler up the wall when, at midnight, he discovers that he is missing a tiny L arm. There are only three small plastic bags of items such as screws and pushrods. For the assembled version, the ball joints have already been installed onto the pushrods. They are all of the right length, too. Upon test flight, I only needed to turn some of the ball joints two or three turns to perfectly

Continued on page 88

For traveling, the tail boom can be removed quickly and easily by loosening four screws and unsnapping the tail rotor pushrod at the point where the boom joins the fuselage. This photo shows the ingenious washin/washout scissor unit with 95% Bell-Hiller mixing ratio.

PLUG SPARKS

By JOHN POND

• Starting a column is quite often a problem, but in leafing through the material received in the last two months, I ran across the SAM 1 newsletter as so ably edited by Art Grosheider. Art suggested the letter from Joe Elgin on the origin of the Playboy would be of interest to the modelers.

This writer can't help but agree. Art says he felt the Playboy might be classed as the all-time number one model airplane design. If one were to single out the one design over the many years, it would be hard to beat the Playboy for elegant looks and good flying ability.

Not many modelers know who the designer of the Playboy is; hence, this letter from Joe Elgin, who, as a young 20-year-old at the tag end of the Depression, had no idea how successful and beloved his design would become. With a bit of editing, let's hear what Joe has to say in those "Golden Days" of gas modeling. (Just to get the idea of how simple and functional a Playboy Senior is, Photo No. 1 shows the model's framework as built by this author.)

"I was fortunate to live in northern Ohio, where so much talent was shared. We had two model clubs. One from the west side, and one from the east side of Cleveland. I belonged to both the American Airlines Gas Model Club (west) and the Balsa Butchers Club (east). They were large clubs and numerous meets were held in the thirties and forties. Dick Korda, Chet Lanzo, and George Reich were just some of the great gang we had when I belonged to the Balsa Butchers.

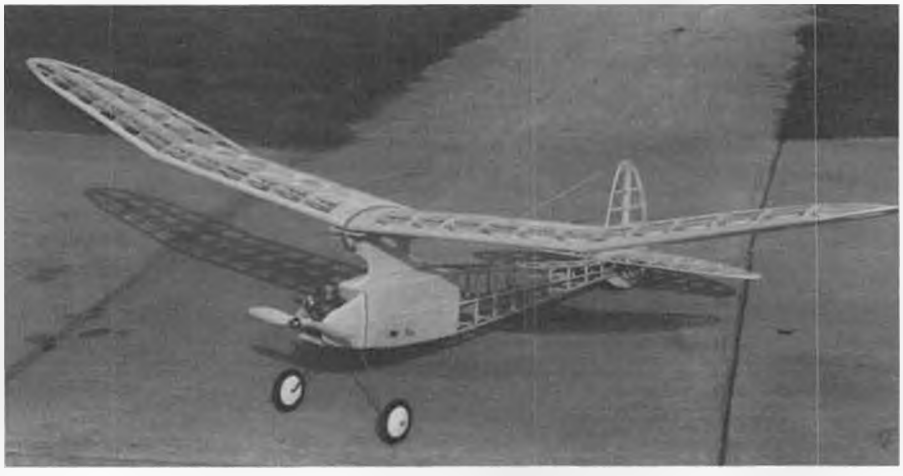
"Goldberg's Zipper, Mercury, and Sailplane were really the sensations in 1938-39. The first Playboy was a B ship with an Ohlsson .23. It flew very well, and I had won some meets with it. Unfortunately it was lost. We flew without dethermalizers.

(Columnist's note: The Playboy Jr. was actually the first of the Playboy series to be kitted in 1939 by Cleveland. Photo No. 2 shows the original slab-sided version. This version has proven to be an excellent 1/2A Texaco model.)

"I started working for Cleveland Model and Supply Co. in the late summer of 1939. As you probably know, Cleveland Models was famous for its scale model designs. We lived fairly close to the shop, and bought most of our supplies there. I knew that in early 1939 their chief designer and draftsman had left. The Depression years were getting better, and there were better jobs to be had. When we went to the model shop, I would bring a model to show Fred Pachasa, who was the retail store manager, and he would ask Ed and Will Pachasa to come down to look at them. I suggested that Cleveland Models should get into free flight which was really getting to be very popular.

"The Condor, Eaglet, and Fleetster were three of the airplanes that got them interested. I designed the Condor and Eaglet. My brother designed and built the Fleetster and had given it to me. It was built in 1937, and I flew it once. It was a very light ship, very fragile, and wisely I put it away. It weighed sixteen ounces with an O&R .23 ready to fly. I sold it to Cleveland Models for forty dollars. I think these three models finally ended up with them, offering me the job that I had sought for several weeks. My brother was a scale builder and had built several models for Cleveland. He was several years older than I and I can only say that if it wasn't for him I don't think I would have gotten the bug. I remember the days when I was only ten or twelve years old and flying those simple rubber sticks, and from those to more complicated ships.

"I started working in the fall of 1939. The Condor, Eaglet and Fleetster were drawn, followed by the Playboy Jr., a B ship that I had lost earlier in the year. I lost the ship and won the event and another O&R .23. The Playboy Sr., which was next, was designed to compete with the newly introduced Goldberg Sailplane. We really looked over this design and kit. It was a superb kit with all the die-cut ribs and parts. This certainly wasn't reflected in the Play-



1. The framework of the prototype Tyro Models Playboy Sr. as built by John Pond himself. This month's column contains a lengthy and very interesting letter from Playboy designer Joe Elgin regarding the origin of this and other Cleveland Models designs.

3. The addition of elevators to the Playboy's horizontal stab for R/C flying is a fairly easy job.

2. The original slab-sided Playboy Jr. is a popular choice for the F/F 1/2A Texaco event.

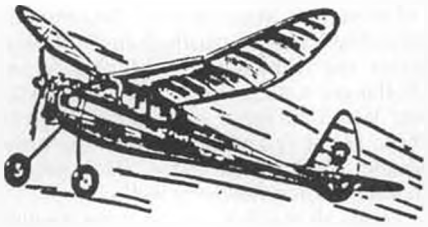
4. The Cleveland Viking was another Joe Elgin design. This .020 powered version was built by our columnist years ago for the old .020 R/C event.

boy kit. The airfoil section was very similar to the Sailplane, and it was no accident. I had seen the Sailplanes fly, and will never forget those test glides. . . that was some airplane!

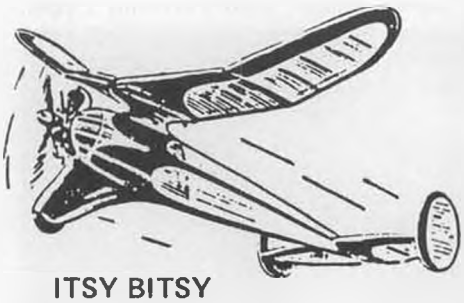
"The Playboy Sr. was drawn and kitted. We did not have a prototype to photograph for ads or labels for the first kits. They used a pen-and-ink illustration for ads and the labels were drawn by Jim Powell. I got permission to give two kits to Bill Schwab, an old friend and active modeler. It was midwinter and testing was hardly possible. In the spring of 1940, Bill was flying the Senior and the model was quite successful, winning many of the local contests and as the ads show, was very successful for several years at the Nationals.

(Columnist's note: What Joe and the rest of the modelers in those days didn't know was what a natural the Playboy is for O.T. R/C. As seen in Photo No. 3, the elevator is very simply cut from the stabilizer. Don't need more than 20% of the stab area for effective control.)

"In my opinion, the two small gas models that were created for the Atom engine, the Baby Playboy and the Itsy Bitsy, were too small. There were also provisions to power the Baby Playboy with rubber by extending



CLEVELAND VIKING



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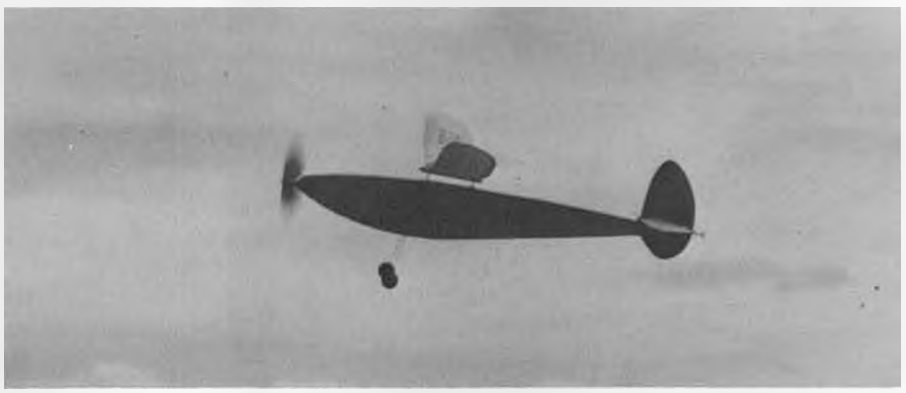
the nose slightly. I wish that at least they were 225 to 250 sq. in. of wing area. It was impossible to get these models to 8 oz. per sq. ft. I built two Baby Playboys; one for the store and another for a customer who asked to have one built for his son. We never flew the prototype and never did find out if our customer successfully flew his model. Any old timers out there who built one of these, did you have any luck? Airframe, without motor, coil and batteries weighed in at about 3 ounces—a very fragile plane. If it survived the first flight, one was indeed very fortunate. The kit price was one dollar—a great price! Recently I built a scaled-up version of about 500 sq. in. powered with a K&B .19. It is a real performer. It is, however, not as an attractive a plane as the Playboy Sr. The Itsy Bitsy is a good-looking plane, streamlined fuselage with twin rudders. I often thought that it too would be a good plane for R/C assist, but putting rudder control into twin rudders is a problem. Too complex for me.

"I was an avid indoor and outdoor rubber flier, and as a result the Wakefield Gull and the Thermalier were added in the free flight program. In 1939, Dick Korda won the Wakefield Trophy and it was beginning to be a very popular event. I built and flew that model at a few meets in 1940. I didn't break any records with it. The Thermalier is a class C outdoor stick at just over 100 sq. in. and was a good beginning plane. It didn't take much rubber and flew quite well.

"About the most interesting program involved the six nature series planes, called the 'Fantasy of Flight' series. Ed (Pachasa) Packard had this idea for some time. With illustrations from Jim Powell, an excellent artist, we came up with six small rubber powered models. Lack of rudder made V-tails a must. They weren't mile-fliers but made good conversation. I built all six, and we

5. An interesting "Monsoon Clipper" as originally produced by Country Club Aero Supply. This one belongs to Karl Spielmaker, who says it's a tricky one to launch on water.



6. Pretty 1940 Nelder Moffett Winner by George Armstead is ten years old and still going strong. Full-size drawings are available from MB (No. 782-O.T., $6.50).

could get them to at least fly across the room.

"The 'Tribute to Brave Nations' series was six free flight designs using the same printwood (wing and stab were same in all six). Five were rubber and one a glider. These were named for the nations of World War II that were overrun by Germany starting in September 1939. As small models just over 100 sq. in. (class C) they could possibly be used in a new category for SAM. I think I saw the Norseman at the '88 SAM Champs in Indiana. The Flying Dutchman, a true rubber stick, is one I will never forget. It was an amphibian with Japanese tissue covered pontoons heavily doped to be waterproof. The plan failed to show the width dimensions on the pontoons and a lot of letters resulted asking for the dimensions.

"Indoor flying was very popular in Cleveland. We had a beautiful armory in downtown Cleveland, which was open to all indoor fliers at any time as long as there was no military activity. We at Cleveland Models, I think, were the first to kit a class A R.O.G. microfilm model with complete instructions showing how to make microfilm.

"Three hand launch gliders were kitted, two class A indoor and one class B indoor.

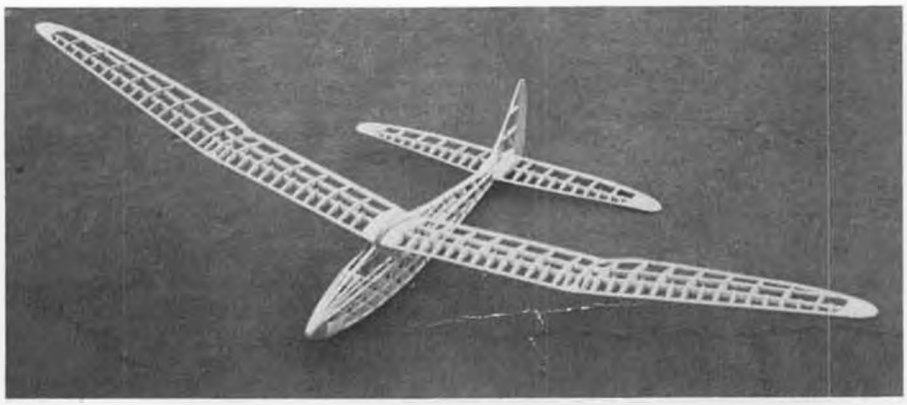
"The Viking was the last model before departing Cleveland Models and starting as a lithographer's apprentice. While at the Chicago Nationals in 1940 I witnessed some small gas models (no pylons) that were great performers. The Viking was a result of these observations.

(Columnist's note: Here all the time this columnist had been teasing John Drobshoff about the similarity of his Advanced Challenger, calling it the "poor man's Viking." Was it the other way around? Seen in Photo No. 4 is a Viking used in the now-defunct .020 L.E.R. event. This single-channel version flew very well.)

"I have all the drawings of these models except the glider in the Tribute to Brave Nations series and the two class A gliders in the indoor series. I would like to obtain these if possible. Going back to the Playboy Jr., the original was a 56-inch span, with under 300 sq. in. It was slab sided. In 1941 it was altered to 54-inch span and the chord was increased to 7 inches and additional longerons were added as in the Playboy Sr. This I believe was an improvement. It is the version that is most commonly seen.

"I spent the war years in the Air Force. A.E. school in Biloxi, Mississippi, then Navigator training and nineteen missions over Germany. I was shot down and spent sixteen months in a P.O.W. camp. While in camp I was able to build some simple rubber powered planes using elastic from suspenders. Even had a few fly over the fence and returned by the prison guards.

"After the war I was back to active modeling: 1950, 1st in Nats CO_2; 1951, Wakefield team member in Finland and team member in FAI Gas held in France; 1953, team member in FAI Gas in Cranfield, England; 1954, proxy flier for English flier Ron Moulten in Long Island, New York in FAI Gas; 1951, Wakefield design built by several modelers in the Cleveland area with good results; 1952, Ho'Boy, a 176 sq. in. 1/2A built by friends, originally powered by a Wasp and later used an Albon Dart Diesel. Presently I'm involved in R/C soaring and SAM events flying a 1/2A Texaco Playboy Sr., Playboy Sr., scaled-up Baby Playboy, Goldberg Interceptor, Korda's 1938 Diamond Zipper,



7. Dr. Harvey Pastel took this photo of his Thermic 50 forty years ago, just after finishing the structure. Model still survives, needs only partial recovering.

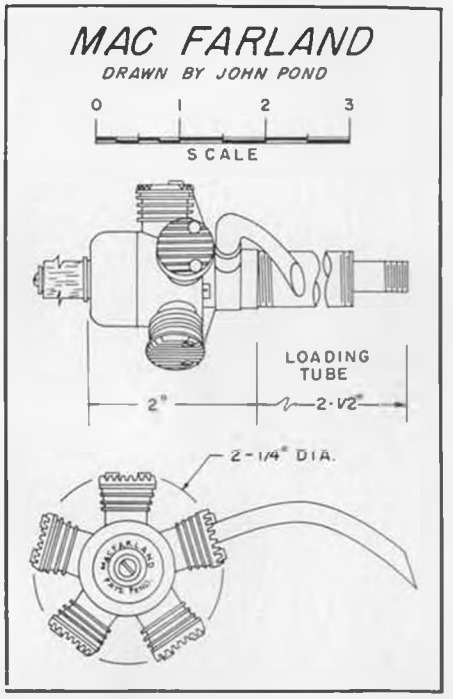
8. Not many Record Hounds being built these days. This electric-powered R/C version by Dick Gibbs of York, Pennsylvania is reported to be a very stable flier.

9. Photo from the mid-40's shows Earl Rodriguez (left) and an unidentified assistant test running a Brown Jr.

10. A good-flying English design that qualifies for the F/F Nostalgia event is the Halifax "Hermes" displayed here by John Down.

11. Bare bones Cumulus shows typical Ben Shereshaw construction. Model is being built as an R/C ship by Australian O.T. modeler Martin Simons.

12. Another Aussie modeler, Dave Hipperson, sent in this photo of his Petrides PB-2, an excellent flier and good choice for R/C Texaco. Dave's uses an O.S. .60 four-stroke.



builder chose to. The few lines to indicate the cabin version of the Playboy Sr. left a lot to the builder's imagination. It was an excellent idea, as it also became a good competitor for the O.T. Cabin events. I've never seen the Playboy scaled up, but have seen many from .020 to full-size.

(Columnist's note: A large 900 sq. in. version suitable for a Saito .65 is quite popular in Victoria, Australia. Australian rules permit up to .65 cu. in. displacement in glow models.)

"The one year I spent at Cleveland Models was a wonderful experience for me and I will never regret it. However, I was indeed very happy to leave when I did. It was time to move on. I could again enjoy the hobby.

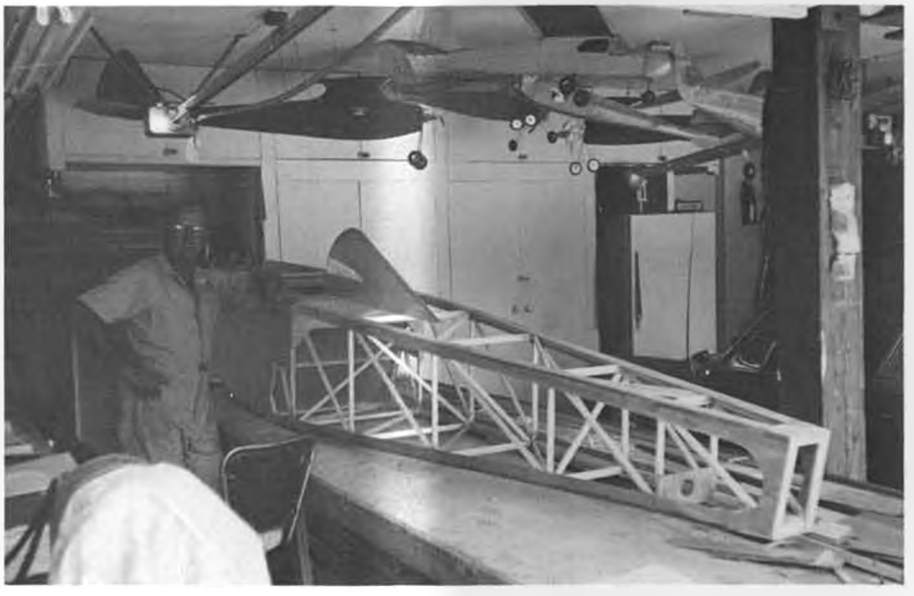
"Sincerely yours,
Joe Elgin"

Art concludes the letter with his comments: "Well, guys, there you have it. The Wakefield Gull, and Thermalier.

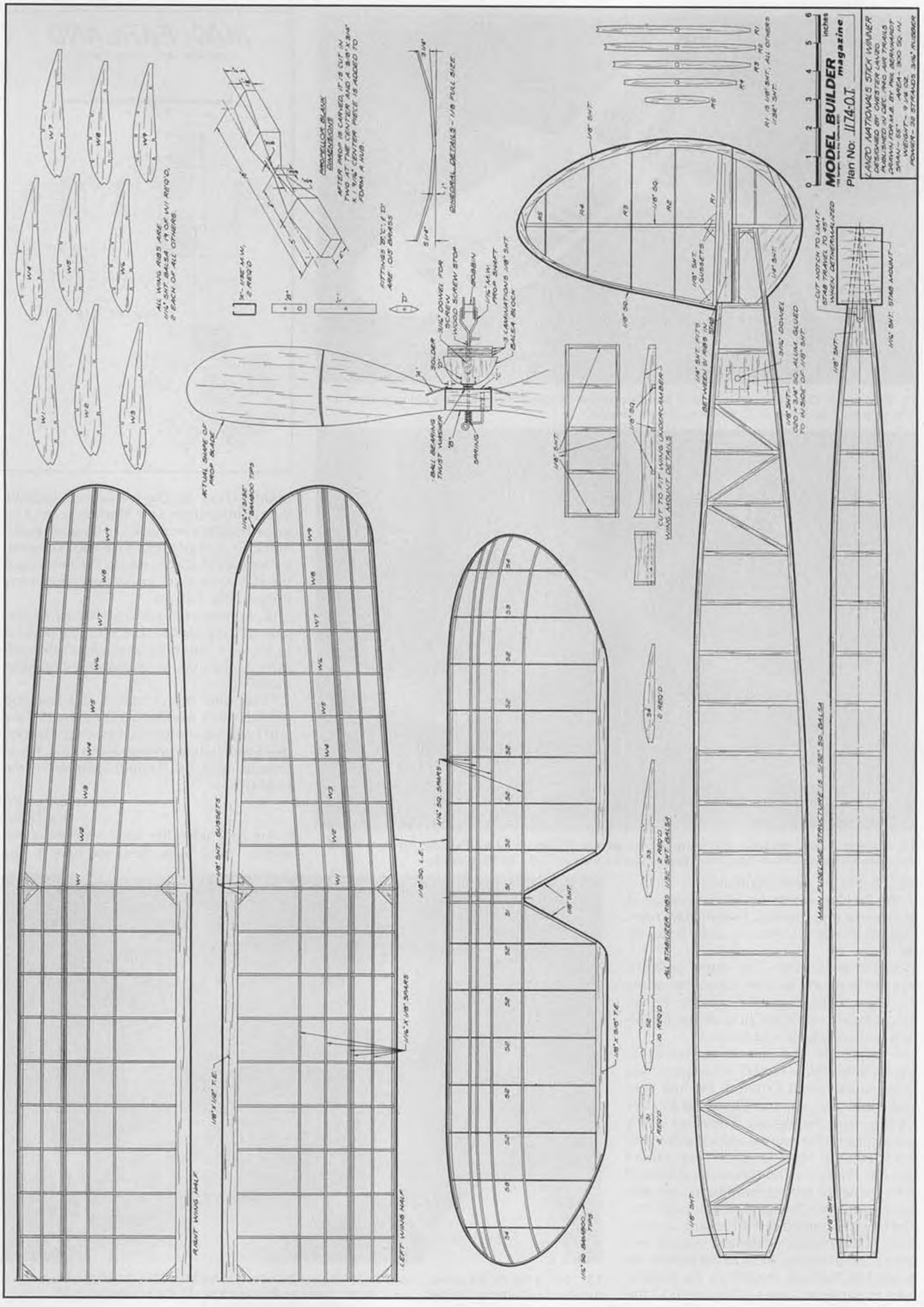
"Ed Packard would not allow anyone to put a name on a drawing. I would have been pleased if only the drawing said 'drawn by Joe Elgin.'

(Columnist's note: The same problem was encountered by Don Garafalow when he worked for Scientific. Johnny Frisoli scrupulously inspected all drawings for initials and any identifying marks.)

"I toyed with the idea of putting a J.E. somewhere. Dick Korda's Champion was being kitted when I started. He had won Wakefield that year and Cleveland Models tried to buy the design. They just didn't come up with the money and someone outbid Cleveland Models. Korda's gas model was the alternative. Korda's name appeared with the ad for several months. In later editions it became Cleveland's Champion. The Playboy was named by Ed Packard, as were most of the planes. At the last minute, just before the drawings went to the printer, he suggested that we should let the builder have a chance to make a cabin version if the



13. "Just a big model plane," says SAM 49's Pat Patterson of his Mini-Max ultralight. Pat has the structure almost finished, but a recent move to Arizona has put the project on hold.


MODEL BUILDER magazine
Plan No: 1174-01
KANZO NATIONALS STICK WINNER
DESIGNED BY CHESTER KANZO
PUBLISHED IN DEC. 1940 AIR TRAILS
DRAWN FOR M.B. BY PAUL BERNHARDT
SPAN - 42" AREA - 300 SQ. IN.
WEIGHT - 9 1/4 OZ.
POWER - 32 STRANDS 3/16" RUBBER
ALL WING RIBS ARE 1/16" SHT. BALSA (9 OF W1 REQ'D. 2 EACH OF ALL OTHERS.
PROPELLOR BLANK DIMENSIONS
AFTER PROP IS CARVED, IT IS CUT IN TWO AT THE CENTER AND A 3/16" X 3/16" X 1" HUB FROM PIECE IS ADDED TO FORM A HUB.
FITTINGS 30 G.A. BRASS ARE: 015 BRASS
GENERAL DETAILS - 1/8 FULL SIZE
3/16" DIA. BAMBOO TIPS
ACTUAL SHAPE OF PROP BLADE
BALL BEARING THRUST WASHER
SPRING
SOLDER
3/16" DOWEL FOR WOOD SCREW STOP
BOBBIN
1/16" MUSIC WIRE PROP SHAFT
3 LAMINATIONS 1/16" SHT. BALSA BLOCK
CUT TO FIT WING UNDERCAMBER
WING MOUNT DETAILS
1/16" SHT. FITS BETWEEN SI RIBS (N
3/16" DOWEL
CUT NOTCH TO LIMIT STAB TRAVEL TO 45°
STAB DETAILS - 1/2 SIZE
1/16" SHT. STAB MOUNT
MAIN FUSELAGE STRUCTURE IS 1/32" SQ. BALSA
ALL STRINGER RIBS 1/32" SHT. BALSA
RIGHT WING HALF
LEFT WING HALF
1/16" SQ. SPARS
1/16" SHT. GUSSETS
1/16" SQ. L.E.
1/16" X 1/16" T.E.
1/16" SQ. BAMBOO TIPS
1/16" X 3/16" T.E.
1/16" SHT.
1/8" SHT.
1/4" SHT.
1/16" SQ.
1/8" SQ.
2 REQ'D
10 REQ'D
4 REQ'D
inches
0 1 2 3 4 5 6

story about the man behind the all-time wonderfulest gas model airplane. I'm pretty sure the first gas model I ever saw as a kid was a Playboy Senior with an O&R .60. I've seen a lot of them since but I will always enjoy seeing one in the air as much as anything else. Thank you, Joe Elgin, for having brought so much happiness to so many over the years. Would that we could all say the same. Lots of people are more famous but the joy givers are truly the gift of God to us all."

ENGINE OF THE MONTH

For this month's engine, the MacFarland, we are again indebted to our long time friend, Danny Lutz, for the use of his engine, photos, and general information. We also must acknowledge credit to John Brown, who made a write-up in the Model Engine Collectors Journal from which we have drawn some background.

Before starting the description of the MacFarland engine, we must remind the reader this is *not* a gasoline or petrol powered motor. Instead, this unique five-cylinder radial is powered by *smokeless gunpowder.* To slow down the burning and reduce the possibility of explosion, the gunpowder was mixed with spruce sawdust, lime, and steam engine oil.

This concoction was then pressed into stick form somewhat on the order of Jetex fuel. Of course, these pellets were much longer, being fitted in an aluminum tube. After connecting to the engine, the fuel was ignited. The burning fuel developed a pressure sufficient to turn the engine at better than 2,000 rpm.

14. Master craftsman Bob Munn, of SAM 41, with three of his beautifully built and silk covered Old Timers, a New Ruler, Powerhouse, and Playboy Sr. All are competitive fliers, too.

The engine was found by Lutz in a local flea market. Best part of all, the engine was found to be in excellent shape. It appears to have been modified for shorter flights (the fuel chamber is quite small), and has an added exhaust pipe to prevent fires.

As a follow-up, Lutz discovered the machinist, Lem Pratt, who built the engine, lived near Irwin Ohlsson. In less time than it takes to tell about it, an appointment was set up and the two visited Pratt.

Upon showing Lem the engine, he was quite surprised to see one in such good shape after fifty years. As a side note, Lutz considered the engine very well made with a crankshaft that runs on ball bearings. Danny also observed the quality of die-castings was extremely good. This was quite rare as most early engines were rough sand castings.

The powerplant was called "Moto-Toy." The firm formed to produce the engine was known as the Mototoy Mfg. Co., located on Santa Monica Blvd. in Los Angeles. A chemical engineer was hired to develop the special stick fuel for commercial sales with the engine.

The company was comprised of Fred

Continued on page 85

OLD TIMER Model of the Month

Chet Lanzo's 1940 NATS Stick Winner

Design by: Chet Lanzo
Drawn by: Phil Bernhardt
Text by: Bill Northrop

• Chet Lanzo's Nationals Stick Winner was originally published in the December 1940 issue of *Air Trails.* In those days, the average rubber stick job weighed about 8 ounces on 200 square inches of wing area. Chet's 300 square inch model weighed only 9-1/4 ounces, providing a lighter wing loading and improved performance.

Typical of Cleveland area models of the time. . . and of Chet's designs. . . the wing featured multi-spar construction. Whether he had it in mind or not, the turbulator effect of the three top spars no doubt contributed considerably to the excellent glide capability. The ship is one of a select few old-timers which has bridged the gap of time. . . it is very effective in today's Unlimited Rubber event.

The Lanzo Stick model in the photo was built back in the early '70s by Phil McCary, Boulder City, Nevada. While the original model featured an auto-rudder to obtain a circling glide, Phil quite naturally installed a kick-up stab D/T. His other modification is a 20-inch diameter, 31-inch pitch propeller. The original 19-1/2 inch prop is shown on the drawing.

Phil also installed a short wire skid on the nose and lined the subfin with 1/16 wire to protect the model on D/T landings.

Ken Sykora's Old Timer Model Supply, P.O. Box 7334, Van Nuys, CA 91409 (send $2.00 for catalog) carries many old timer rubber model goodies, including 5/32 square balsa for the longerons. It's not too unlikely, however, to use 3/16 square, with 1/8 x 3/16 uprights and cross pieces. If you're worried about weight, round off the longerons. •

ALL ABOUT ARFS

By ART STEINBERG

The J'TEC "Snuf-Ler" installed on an O.S. 40 produced results that were truly impressive — see text.

• As long as I can remember I have always ignored electric powered R/C flying models. Certainly I was aware that they existed, and once in a while I even started to read a column or an article on electric flight, usually after I had finished every other article in the magazine and needed some reading material in a desperate way. But as the author began to get technical I found myself losing interest, as electronics is just not my bag. I know that there are many individuals in the R/C hobby who became initially interested because of a deep involvement with some form of electronics such as ham radio. I am not one of these individuals, as what I really know about electronic theory isn't worth talking about. So not only is the theory of electric flight a genuine mystery to me, the drawbacks have always seemed almost insurmountable. For example, I have always criticized electrics as being too heavy to fly decently. Once in a while when someone would show up at the field with such a model I would heft it in my hand and invariably make some disparaging remark such as, "Does lifting this thing ever give you a hernia?"

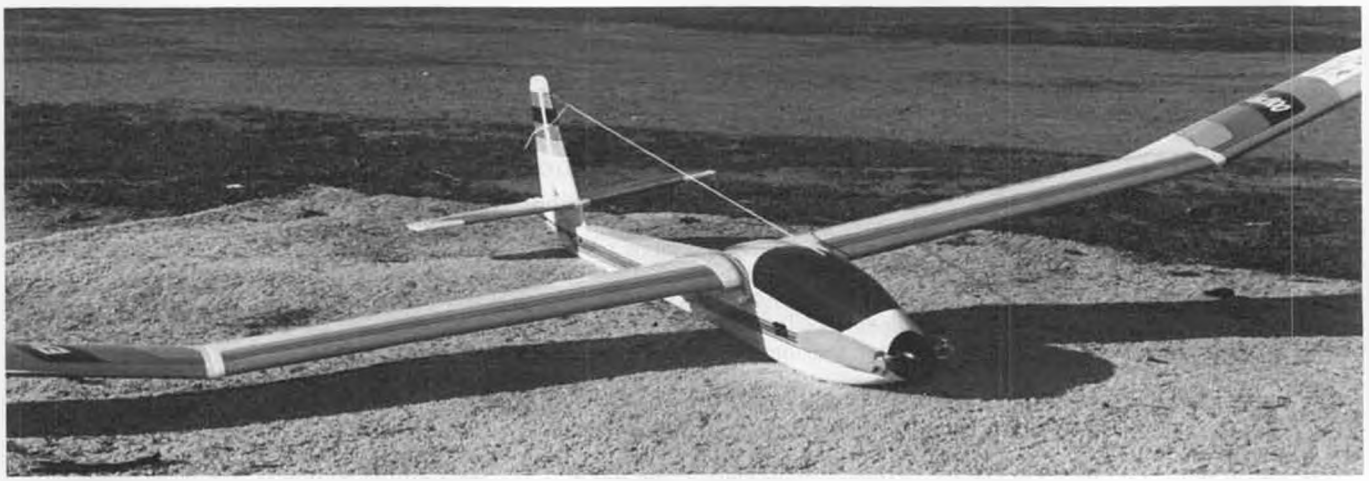
As a matter of fact, I have a confession to make. Some years ago I purchased a Playboy kit by Leisure Electronics, which is intended for electric power. I bought it because I have an interest in Old Timers, and this was the only kit I could find of this model. However, instead of an electric motor, I installed an Enya .09, and had many happy flights over a period of about two years until I got bored and traded it for some darn fool thing I didn't even need. I suppose that I committed some kind of sacrilege by using a dedicated electric model with a greasy, noise-making two-cycle engine, and many disparaging remarks were made about my little Old Timer.

A lot of air has passed under my wings since then, and I must confess that recent exposure to state-of-the-art electric models (ARFs, of course) has really broadened my outlook. Most of my newly acquired enthusiasm can be directly attributed to the model which I am presently flying at every opportunity, the EZ Elec. 1800 electric powered sailplane which is manufactured by Sports Aviation Co., Ltd., and marketed by Global Hobby Distributors.

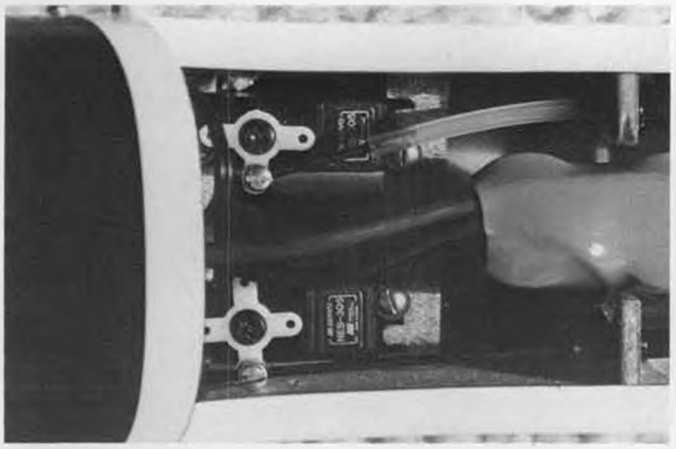
Before we explore the details and specifications of the Elec. 1800, let's talk about something which we often overlook these days: the esthetics of model airplanes. I don't think this particular project began by some hobbyist doodling a new design on the back of a grocery bag. The lines are so sleek, the curves are so attractive, that there is a certain feeling of pleasure and inner satisfaction gained by just looking at it as it reposes on the ground, and I have no doubt that the Elec. 1800 was the result of an intensive R&D effort on the part of the manufacturer. Even if it was not intended to be a flying model it would deserve to be placed on exhibition in a museum of modern design. You know, a lot of models today are built and flown with little regard to appearance, and all the emphasis is placed on flying ability. Of course, how it flies is really the bottom line, but even a trainer can be a thing of loveliness without sacrificing its flying qualities. Too many good R/C pilots today are stuck in the same old rut, flying one Ugly-Stik type model after another, engine hanging out in the wind, never realizing how much they are missing by concentrating only on flying and giving no thought to how exquisite an R/C model can be. The Elec. 1800 is an example of a model which not only flies in a superb manner, but titillates our senses of sight and touch as we behold and partake of her beauty.

Why is it called the Elec. 1800? It probably has something to do with the wingspan, which is specified on the box as 72-3/4 inches (about 1800 millimeters). Actual measurement of the wingspan came out to 73 inches, and that is about as close as you can get. As is the case with all EZ models, construction consists of a unique triple-coated and bonded material applied to a rugged balsa and plywood framework. To quote the manufacturer, "The skin is made of a special plastic foam base laminated to a synthetic paper layer with the colors printed on it, which is topped off with a layer of clear, fuel proof mylar material."

Assembling the polyhedral wing was only half an hour's work; most of the time was consumed in waiting for the epoxy to dry. As there are three wing joints, the two outer panels are first epoxied to the two inner panels, taking care to see that all leading and trailing edges are properly aligned. While these two joints are setting up, the center wing dihedral brace is fabricated by epoxying two plywood braces together to



An example of modern ARF design at its best, the Elec. 1800 really turned our columnist on to electric power. Model is imported and marketed by Global Hobby Distributors. Note high horizontal stab for good ground clearance. It's our featured ARF of the month.



Elec. 1800's battery pack and servos are accessible by removing the wing. Model has enough room to mount most of today's radios.

Electronic on/off controller from High Sky nestles on top of the receiver. Compact unit does away with a third servo and switch.

make a really strong component. Using this brace, the center joint is epoxied, and the wing is set aside to dry. Meanwhile, the tail is assembled with about another half an hour of pleasant effort, using cyanoacrylate glue. The instructions say to use additional epoxy here, but I felt it was strong enough without the epoxy. Extensive flight testing has proved that I was right, and I managed to save some all-important weight. As it turned out, the only epoxy I used was in the wing joints. The elevator was pre-hinged, but the rudder hinge was supplied unglued, as the tail surface assembly procedure required that the rudder be hinged as the last step. Of course, the necessary nylon control horns and clevises were supplied, but for some reason the manufacturer elected to supply a whole molded sheet of hardware, and anyone assembling this kit will be pleased to find that one ends up with enough additional miscellaneous parts to outfit at least four or five more airplanes!

The most appropriate word I can use to describe the parts fit is "perfect"! There was no sloppiness whatsoever, and one of the reasons for the swift assembly procedure was because no time was used in trying to get the various components to fit properly. Pushrod guide tubes were inserted in ready-made holes, and then it was time to complete the wing. Upper and lower center section covers were glued to the wing, and finally the polyhedral joints were covered with a white seam tape which blended in so well that the joints were virtually invisible. Now it was time to attend to the electric propulsion unit.

A really sturdy looking modular motor was supplied in the kit, and with it came an all-metal reduction gear unit which required just a few minutes to assemble. Though the parts for this reduction gear seemed complicated at first glance, the excellent directions enabled me to put this little jewel together with no difficulty whatsoever. Actually, it looked just like a miniature version of the gearbox that came with the Erector set I had as a child.

The reduction gear unit was bolted to the front of the motor, and a capacitor (furnished) was soldered to the rear end of the motor. The only other soldering remaining was to connect a Tamiya type plug (not furnished) to the tabs on the back of the motor. All this is very clearly diagrammed and took about five minutes. The motor was then mounted in the nose of the fuselage and held in place by a couple of rubber bands. The next job was to assemble the thirteen-inch folding prop, join it to the prop shaft and spinner, and connect the completed unit to the motor. Nothing was needed to do the job but a couple of small Allen wrenches which were thoughtfully supplied in the kit.

Selection and installation of the radio equipment was no problem at all. First I chose my Airtronics FM Gold Label super narrow band dual conversion receiver, and this slipped neatly into the cockpit area just behind the motor with plenty of room to spare. After rummaging around in my box of electronic goodies I came up with a pair of JR NES 305 mini-servos. The connectors were changed to Airtronics type, and the servos were neatly mounted on the pre-cut hardwood servo rail. (Incidentally, by adapting the JR servos to fit an Airtronics system, the servo reversing feature of the transmitter was no longer operative.) The servo rails snapped neatly into two grooves

Continued on page 68

Test flying the Elec. 1800 with Bud Lavagnino launching and Leon Friedman at the controls. Site is the North County Clouds' field in San Marcos, California.

Hirobo's ELECTRIC CHIPMUNK and Futaba's ATTACK-4 R/C System

By SKIP RUFF

• Electric power is here with a vengeance, and if you don't believe that, just scan through the pages of any model magazine and see the rapidly expanding number of battery-powered aircraft, cars, motorcycles, and boats being offered to the American consumer.

The fastest growing segment in the electric field at the moment seems to be the ARF, with most of the new stuff emigrating from across the Pacific. That includes the subject of this report, the electric-powered Chipmunk marketed by Futaba and manufactured by Hirobo, a well-known producer of R/C cars and helicopters. According to my somewhat limited knowledge, this semi-scale model is one of the first electric-powered kits of its type, designed primarily for sport/pattern aerobatics.

Futaba, the world's leading manufacturer of R/C systems, evidently sees a bright future for electric power because they have also seen fit to develop a new radio designed expressly for this type of aircraft, the Attack-4 NBL with an MCR-4A receiver, which will be discussed later on in this article.

THE KIT

The beautiful photo of the finished model on the box top certainly whetted my appetite, and I don't think anyone will be disappointed at what they find inside. All parts and components came well-protected against shipping damage. The fuselage is made of three sections of vacu-formed plastic which are joined together at the factory with all bulkheads and the motor mount (with side-thrust) installed. The pushrods to the tail surfaces are also installed, though not secured.

The wing comes in two halves, has a semi-symmetrical airfoil, and consists of a balsa and hardwood frame covered with 1/8-inch foam sheeting similar to that used in fast food containers. In turn, the foam is covered with a tough film onto which the attractive red/white/blue color scheme (similar to the late Art Scholl's Chipmunk) has been applied. The strip ailerons are factory installed. The vertical and horizontal stabilizers are solid foam, with balsa control surfaces also installed, and they are covered with the same material as the wing.

The motor is a specially wound 540/05 size with a 2.375:1 ball bearing gear-reduction unit attached to it. Although the motor has wire leads, no connectors are installed on the ends, nor are any provided in the kit, possibly so that the builder can fit his own to match whatever radio/speed control he's using.

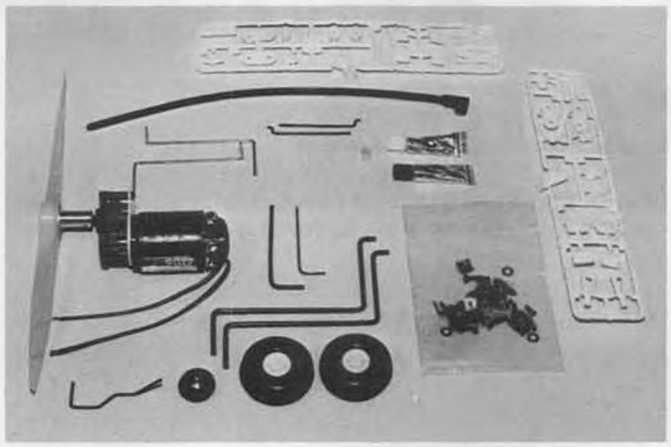
A beautiful sticky vinyl decal sheet is provided along with wheels, horns, clevises, pushrods, aileron linkages, wheel collars, allen wrenches, a small amount of 5-minute epoxy, and an illustrated 15-page instruction manual. The kit is very complete and the only additional items you will need to get it flight ready are the radio system, some cyanoacrylate, a six or seven cell battery, a charger, and if not using the Futaba radio, a speed control unit.

CONSTRUCTION

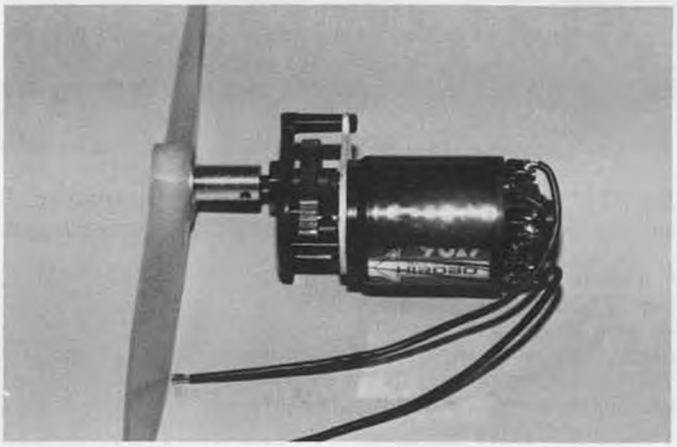
There are really only three major steps in building this kit, those being epoxying the wing halves together, installing the tail surfaces, and radio installation. Of course there is a bit more to it than that, but still, two or three evenings are all that's required to put it together. About the only problem I had involved the landing gear installation. The builder is required to cut slots into the wing skin which match slots in the underlying wood into which the gear legs fit. The dimensions of the slots themselves are given (in millimeters, as are all dimensions) in step #7 on page 6 of the manual. However, there was no indication as to exactly where these slots were to be cut, and of course, the matching slots in the wood structure were hidden by the wing skin. A close examination of the wing bottom

Individual components are supplied mostly finished, requiring only final assembly. Two or three evenings and you're ready to fly.

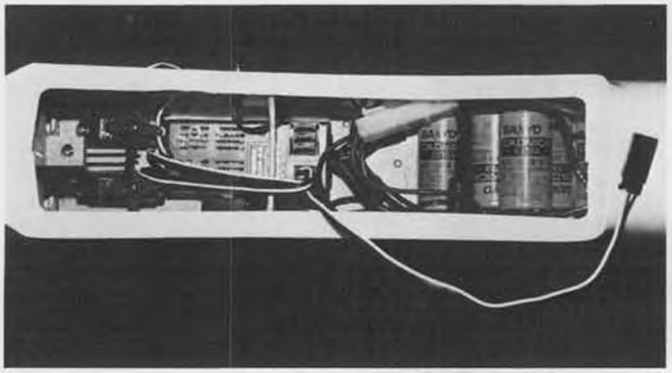
The Futaba Attack-4 radio comes with two servos; you'll need an extra for the Chipmunk. MCR-4A receiver has built-in speed control.



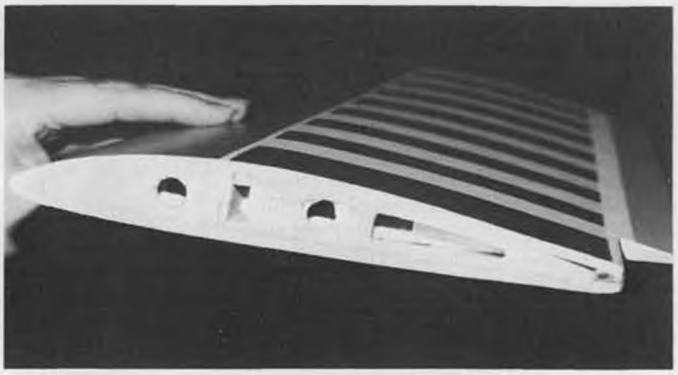
Hardware package is unusually complete. Only item not supplied is a connector for the motor leads, to match your battery and charger.



Hirobo's "Top Gun" 05 size motor is fitted with a 2.375:1 ball bearing gearbox, prop adapter, prop adaptor and 9x6 nylon prop.



Radio is driven by the motor battery, so no separate R/C pack is required. Makes for a lighter and therefore better performing model.



Wing construction consists of a foam/plastic laminate applied to a balsa frame. Ailerons are installed at the factory.

showed a small puncture in the skin on each panel in the area of the gear. The folks at Futaba informed me that this mark is where the end of the gear leg inserts into the wing and that the slot dimensions should be made from this point. Exercise care here since a mistake in cutting could result in an unsightly gap once the gear is in place. According to Futaba, word has been sent to the manufacturer to clarify this point on the instructions.

The only modification I felt was necessary during assembly was the addition of a steerable tailwheel in place of the fixed one that was supplied. That is pretty much a requirement for realistic ground handling.

If you hate to paint, you'll love this model. With the factory applied colors and careful use of the decal sheet, you can have a very attractive model with little effort. The only paint applied to the model in the photos was a bit of Testors enamel to the tips of the flying surfaces. The ingeniously designed canopy, while appearing to be a painted surface, is actually made of a very thin translucent blue plastic which is applied to the fuselage with double-sided Scotch tape. If there is a fly in the ointment anywhere here, it is probably that some of the red colors on the model are not a perfect match, and that your model will not look exactly like the one illustrated on the box since it has obviously had some paint and extra decals applied to it. Still, I think you will be quite happy with the finished product, as I was. Incidentally, I was told by Gary Hamilton, a local R/C car expert, that careful application of low heat from a heat gun while stretching the decals over compound curves will eliminate most, if not all, of the resultant wrinkles. Of course, this was after I had already completed my model. Oh well!

RADIO

As mentioned at the outset, Futaba has designed a new radio expressly for electric aircraft, and in fact, the Chipmunk was pretty much designed around it. It is the

Continued on page 64

Cooling air outlet on fuselage bottom is important — see text.

Finished model is quite attractive in its red/white/blue colors, a tribute to the full-size Chipmunk flown by the late Art Scholl.

RAMBLIN' AROUND AUSTRALIA

By STU RICHMOND. . . Concluding his journey to the land of Oz, Stu stops at a number of Melbourne area hobby shops and visits the offices of *Airborne* magazine before jumping on a plane for the long flight home.

• It seems an American modeler ramblin' around Australia is a bit of a novelty. . . we all want to know how modeling is elsewhere. I was invited to be a speaker at three different model meetings during the ramble. I felt honored—it was fun to share similarities and differences.

I like model engines and R/C pylon racing. So does Keith Harvey, who took a vacation day and joined Paul Straney (the Oz model historian) and me to visit Melbourne area hobby shops, have lunch and stay overnight at Keith's. . . and to be the guest speaker at the Doncaster Aeromodeller Club meeting. Keith had raced in the Australian 2nd F3D World Pylon Championships and placed very well. He was greeted warmly with congratulations by his clubmates and I enjoyed talking with them and answering their questions. Model building is durned expensive down under—many questions centered on model economics and on management of model club activities. Doncaster's president is Cliff McIver who owns a hobby shop and is a serious competition pattern flier. We had visited Cliff's shop earlier where I saw a perfectly beautiful scale Supermarine S6B scale model. I was gonna photograph it—but I was told it was arranged I'd get a more professional photo a bit later on another visit. Kraft Systems is still in business in Australia and I bought a couple of sets of Kraft servo gears at Cliff's store that sold for $9.95 a set—and were discounted down to only $7.80 per set! I was happy to get them!

All you pattern fliers should pay careful attention to the following exact quote from Cliff: "If you want to fly aerobatics at the FAI F3A level and want a top-line PCM radio set, to put a model together with a .61 long-stroke engine along with a pipe and retracts you will have an investment of $2,500 to $3,000 in Australia." Cliff has a composite Blue Angels airshow model (a Ken Willard creation) that is four models linked together and flown in apparent formation with one engine and one radio. Cliff says when they put three "dummy" R/C pilots with turned-off transmitters next to the actual controlling pilot, the illusion is totally spectacular. Cliff's store was jam-packed. The storeroom upstairs looked like a hangar with an SBD Dauntless, a Mosquito Bomber, a Fairey Firefly, Grumman F6F Hellcat, P-47, P-40 in spinach desert colors, an FAI pylon racer, a Sal Taibi Powerhouse and an airshow Flying Witch. Whatta neat place to visit!

These are a few of the engines Stu brought back from down under. The Sesqui (lower right corner) will appear in an upcoming "Engines of the World" article.

Next I was taken to the Hobby Hangar which operates retail hobby shops and is the Futaba importer for Australia. Additionally they bring in Webra, Fox, Midwest, Robbe and many other product lines for general distribution. Long-time modeler Tony Cincotta, at Hobby Hangar, took me back to the warehouse office where we had a delightful visit. Tony has had lots of model designs published through the years—we had a lot in common in model building. Tony gave me what is probably the only Futaba R/C cap in the U.S.A. today. Then we walked a short distance to the Hobby Hangar retail store where I really had my brains bent by the Hobby Hangar's retail manager, Monty Tyrrell, who's an MAAA Hall of Famer and can out-drink MB's own John Pond when it comes to Australian glow fuel (beer), and allegedly taught the Wright Brothers basic aeronautics and taught Mar-

Australia's Keith Harvey, like Stu, is an engine collector and R/C pylon racer. These two Hornet look-alikes were made in Australia.

Keith won the Aussie Quarter Midget Nats in 1987 with this Nelson-powered racer. Uses Mac pipe, Kraft wheels and a 7x4 Taipan prop.

Cliff McIver (right) runs a Melbourne hobby shop. Stu is holding a very popular and respected Multiplex R/C system from Germany.

Tony Cincotta (center) and Monty Tyrrell (right) are the driving forces behind the Melbourne Hobby Hangar model business.

coni how to make R/C work!! The interview went like this:

MB: Monty, when a customer comes into the Hobby Hangar and says he wants to build a Lancaster with four engines, or a Spitfire, what do you tell him?

Monty: I tell 'em they're a nut! They're always a beginner!

MB: What would you *like* to sell the beginner?

Monty: A minimum of a .19 or a 3.5cc and a plane to suit it.

MB: Understood. Monty, where's Australia's model activity going to be in ten years?

Monty: We're gonna be a lot of geriatrics, in my opinion, 'cuz there's not enough young blood coming into the bloody hobby—they have so many counter-attractions.

MB: Are we going to get the youngsters stepping up to airplanes from R/C cars and buggies?

Monty: A nucleus will come to fly R/C gliders on two channels 'cuz they'll get frustrated with cars. But as far as power planes, the R/C situation is the same anywhere in the world. They need wheels (cars) to get to the R/C flying field—and kids don't have wheels! They can't be licensed until they're eighteen . . . then they buy a car and don't have enough left for a plane until just before they get married. Then they have mortgages and babies and bills until about forty!

MB: Well then, is U-Control the intermediate solution? There's less profit for you retailers but it would create and hold interests.

Monty: No, Stu, we have too many mayors and town authorities who ban U-Control flying in Australia's parks . . . we have "NO MODEL FLYING" signs in our parks. But the U-Control fliers brought that on themselves by not using effective mufflers.

MB: But Monty, can't they now go the city councils with mufflers and say, "Look, we have new modern technology that muffles and quiets our engines; please let us back into the parks"?

Monty: Stu, the problem today is the young people don't have wheels to get to the flying paddocks (fields).

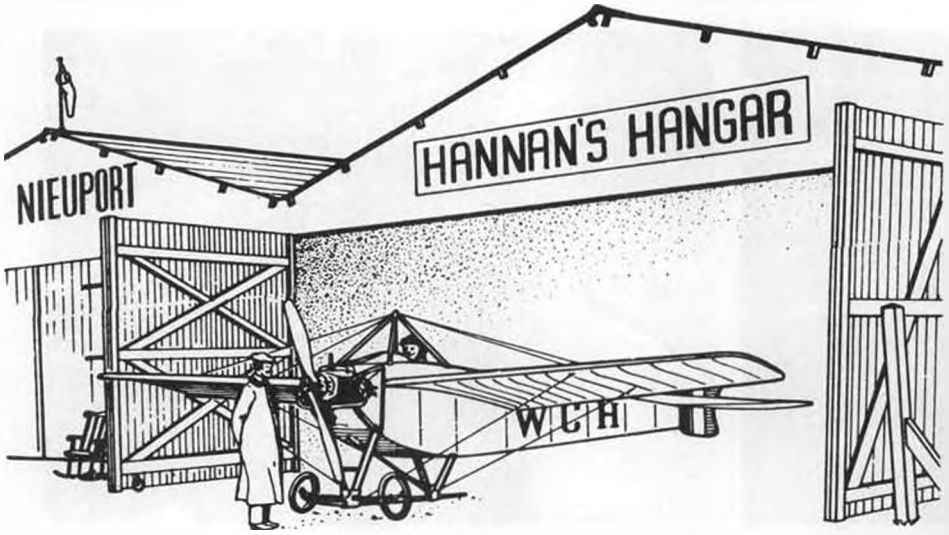
The discussion rambled on and stalled, spun, crashed and burned to conclusion. Since I was now on my way to the Melbourne International Airport for my flight back to the U.S.A., and I still had some money, I spent it there on two of those lovely made-in-Australia Price-Rite Engineering kits of American old-timers—I bought a Trenton Terror and a Red Zephyr and slung them over my shoulder. All prior purchases had been shipped home. The guys rushed me to the car and towards the

Continued on page 64

John Rogers is *Airborne's* publisher. First issue was March '71. Format similar to MB.

Stu leaves Australia with two Aussie-made Old Timer kits over his shoulder.

There's no place like home!



"A man is old when his kids give him advice. . . and wise when he listens to it."

• Our lead-in line this month is by model builder/psychologist Maurice Whitta, of Australia. Of course modelers never *really* age, do we? Or perhaps we just never quite grow up? Young-in-spirit Ray Malmstrom, of England, put it this way: "I don't get around to so many model meetings as I used to—but the bonus is that I enjoy those I do get along to even more!"

TOY AIRPLANES?

Some model builders are so sensitive to the "toy" image, that they recoil at the mere mention of the word. But what's wrong with playing anyhow? Certainly golfers and baseballers *play*, with what amounts to sophisticated sticks and balls, without embarrassment. And we are sharing *our* avocation with some mighty distinguished companions.

Frank Scott favored us with an article from *Design News*, entitled "Engineers at Play," by Associate Editor Barbara Darrow, from which we have extracted the following: "Racing bikes, radio-controlled boats and airplanes, ham radios—these are just some of the high-tech toys engineers turn to when their work day is over. . . .Engineers are wild about model airplanes, whether they're radio-control (R/C), control-line, or sail types—planes that are launched by gas power, tow line, or even rubber bands, but are then on their own." And later in the article: "The radio control module itself can be a marvel of technology. While the simpler units feature basic joysticks, the more glamourous affairs begin to rival a 747 console in complexity." And this: "Compared to the frantic hubbub of the R/C and control-line events, indoor racing (sic) is downright serene. These 'peanut scale' planes weigh less than an ounce—some just 1/1000 of that amount—and are powered by a twisted rubber band. . . .Other than their unconventional power train, they are accurate replicas of real planes, right down to instrument consoles and rigging."

Ms. Darrow goes on to describe other leisure-time activities pursued by engineers and a physicist, concluding: "The hobbies engineers choose are as eclectic as the technologies they dedicate themselves to professionally."

"Don't tell me how to adjust my model!" Walt Mooney (left) offers some friendly (?) advice to Don Munn during a San Diego Scale Staffel contest. Benno Sabel photo.

So relax, model builders, and enjoy yourselves!

SO NOW YOU KNOW

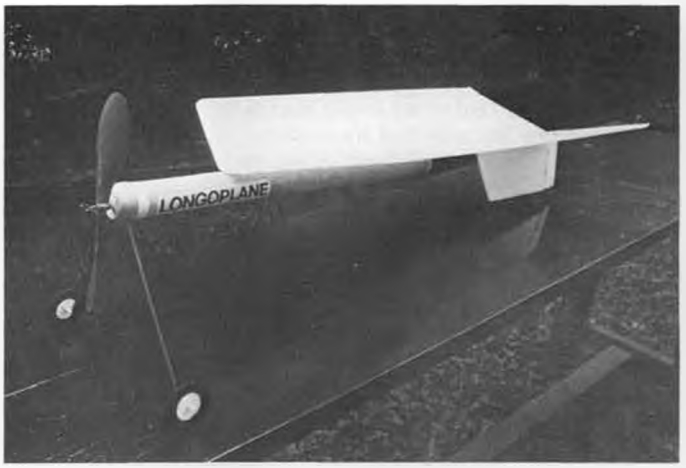
"There are really three departments in science: experiment, theory and experience. Experience is the part that doesn't get into the scientific journals." John Lilly.

FRUGAL FLYERS

Henry David Thoreau once wrote: "That man is richest whose pleasures are the cheapest." In these inflationary times it is reassuring to know that there *are* alternatives to expensive models.

Even if the eventual objective is a com-

The English have always been outstanding scale modelers and this superb Blackburn Dart as built by Doug Sheppard is certainly no exception. The electric-powered model spans 34 inches and weighs in at 17 oz. A bit difficult to trim, sez Doug, but he's gradually taming it.



Above: The "Longoplane" is a good example of what our columnist refers to as a "frugal Flyer"; in this case, an experiment in ultra-low aspect ratio wing design. Built by Georges Chaulet, of France. Left: George Kandylakis, of Greece, won the Belgian International Peanut Scale event with this fine 1912 AVRO F. Benno Sabel pic.

plex "serious" model, it often pays rich dividends to create a simple test version first. Colonel Bob Thacker, well known for his R/C scale models, is an avid proponent of this approach, and some of his most fascinating designs were first tried out in the form of catapult-launched sheet-balsa gliders.

Distinguished NASA scientist Hewitt Phillips, a lifelong builder of models, also experiments with basic models, and is presently testing a novel rubber-powered ducted fan.

Georges Chaulet, of France, likely one of the world's most enthusiastic builders of unique models, often works simultaneously on diverse designs. Witness his "Longoplane," which was constructed and tested within a very short time at minimal cost.

The author's "Frugal Flyer," a Stipa-Caproni, features a sheet balsa fuselage formed around a fire extinguisher, a Dick Baxter-designed impeller, and a cupola carved from discarded foam packing. If such a model falls short of expectations, who cares? The investment is small and the experience rewarding.

Pete Coleman, of Houston, Texas, evolved an extremely low-cost electric motor system with which he has successfully flown small free flight and control line models. He tested various combinations of components with the aid of a centrifuge, and arrived at a system weighing less than 2-1/2 ounces which will fly a free flight model for over one minute. Total propulsion unit cost? $7.30! And all of the parts are easily available. If readers express enough interest, perhaps we can persuade Pete to do a detailed article.

FROSTY FLYERS

Turning to another form of power, CO_2, we find there is still a great deal to be learned. Typically, our experience has been that CO_2 powered models were severely handicapped by low temperatures. Frost spitting out of the exhaust ports, loss of power, or complete refusal to run were usual symptoms.

Evidently there are solutions to such problems, because, according to a letter from Fritz Mueller, Hungarian modelers have held a contest under temperatures of minus 4 degrees centigrade! Some 14 scale models participated and all flew. The winner was renowned airfoil designer George Benedek, while the junior category was won by a young girl whose model attained five two-minute flights. Remarkable!

THE PASSING PARADE

Three more notables associated with aviation are no longer among us.

Earl Dodge Osborne, whose initials formed his EDO company name, died during late 1988 at age 95. Although best known for his firm's aircraft floats, he had also edited and published *Aviation* magazine from 1924 to 1929, and helped establish the Institute of the Aeronautical Sciences.

Herbert Morrison, the radio announcer who gained fame for his graphic and emotional broadcast description of the airship Hindenburg disaster during 1937, passed away at age 83. He had served in the Army Air Corps during World War II, and later became the news director for a Pennsylvania television station.

Continued on page 66

An excellent and unusual 1/20 scale rubber-powered Japanese A6M5n "Rufe" being launched by its builder, Ivan Simonik, in Czechoslovakia. Photo by Pavel Jelinek.

The original Mauboussin Hemiptere, as photographed by Pierre Mauboussin himself in 1936. Rare photo from the French Musee de l'Air, via Alain Parmentier.

Keep Your CO_2 COOL!

By FRITZ MUELLER. . . Only by understanding the properties of CO_2 can you get the most out of a CO_2 power system. Valuable info here!

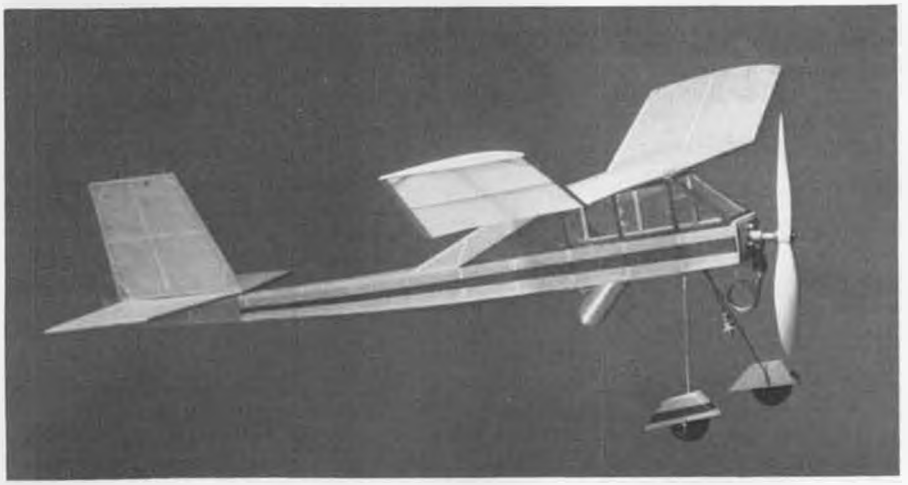
• To fly models powered by those marvelous CO_2 motors is not always pure fun and excitement. Expect frequent disappointments and grief if your knowledge about them is limited to what you read in the instructions. You will read, for instance, that: "CO_2 motors work best in warm weather." This already misleads you, because little do you know that the Britons are categorizing their weather by a different yardstick. If they would use a thermometer instead, it would become obvious that weather considered warm in Georgia would be called hot in England and hot weather is unfavorable for the operation of CO_2 motors. Hence the above statement should be corrected by saying: "CO_2 motors work best at air temperatures between 60° and 77°F." This range has been determined by experienced modelers to be ideal. Why the performance of CO_2 systems declines starting from 80°F and up, can be only understood after a look at the physical properties of carbon dioxide (CO_2). Such study will help you to predict and improve motor performance at variable weather conditions.

For an overview of useful data about CO_2 you may consult the constant density isogram. Pressures are given in 200 psi increments from the bottom up, temperatures in increments of 10°F from the left to right. A slightly curved thick line is running through the temperature and pressure combinations at which CO_2 turns from its liquid state to gas and vice versa. It is liquid above, a gas below the line. At about 87°F and 1000 psi the line ends. That is the critical point, beyond which CO_2 doesn't exist in liquid form under any circumstances. Face the fact: Liquid charges above 85°F are impossible, less energy is stored in the tank and performance goes down.

When looking further, you will see that the pressure in a liquid container at 50° is about 630 psi. The liquid will boil (evaporate) and thus draw heat out of the system if you release some gas. Continue until you see a slight frost forming at the container walls. Water freezes at 32°F. The corresponding pressure at this point is about 500 psi. The pressure will go up to 900 psi if you heat the container to 80°F. You can lower the pressure close to 500 psi without releasing any gas by holding a piece of ice against the container walls. Thus, once you know the temperature of the liquid in a CO_2 system, you will also find the pressure.

Czech flier Kucera displays the fuselage for his high-tech CO_2 ship. Tank is mounted on pylon for easy access and cooling.

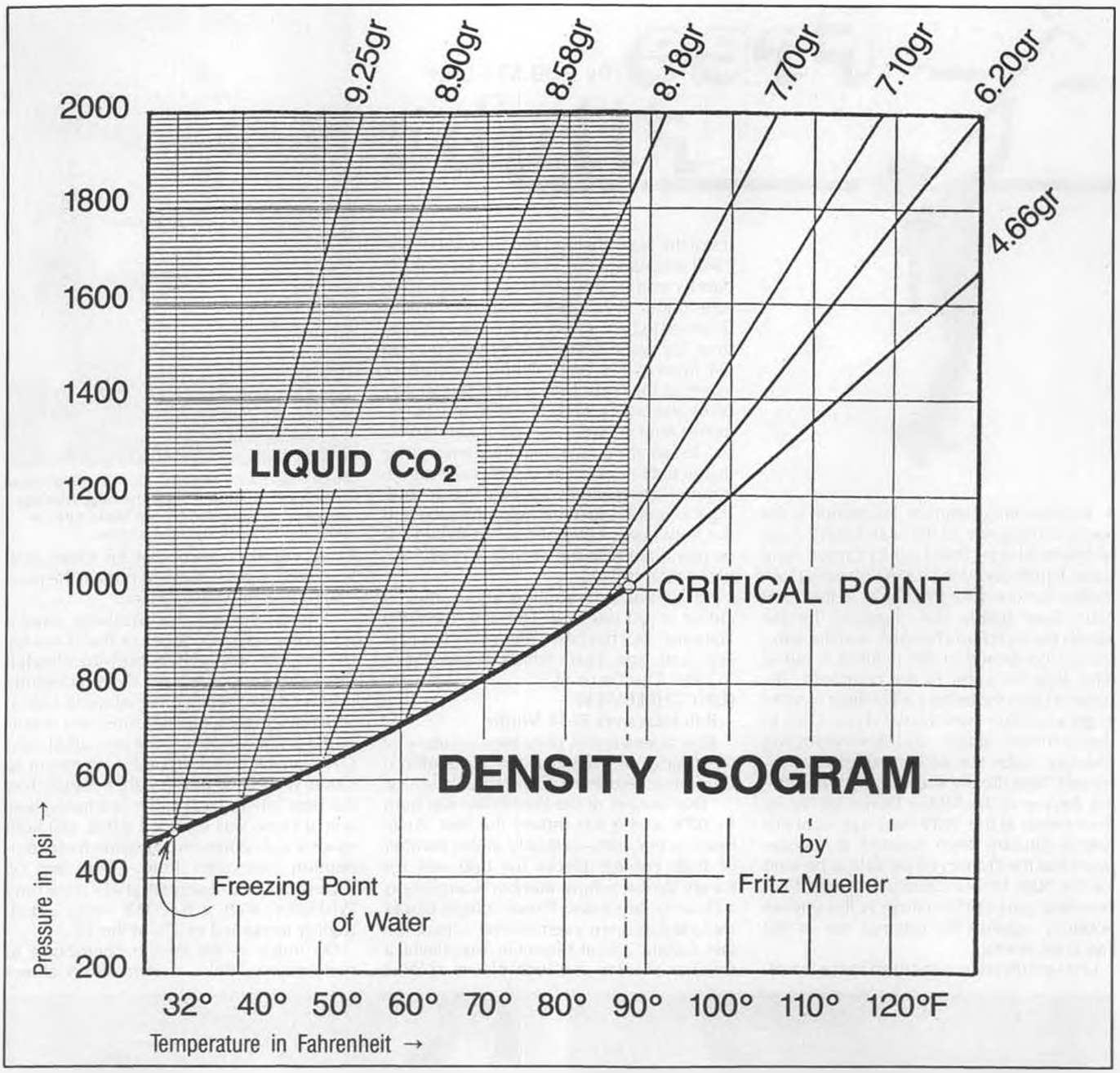
Nicely built Pitts Special by Stefan Gasparins placed second in scale at a recent CO_2 meet held in Budapest, Hungary. Note the very small filler nozzle between the landing gear struts.



Snub-nose Prairie Bird from a Peck-Polymers kit makes a great CO_2 flier. Tank protrudes from bottom of fuselage for easy cooling.

The slanted marks are lines of constant density. For our application a standard 10cc tank has been chosen as the unit volume and you can read the respective weights in grams of a full tank at the upper end of each line. For comparison, 10cc of water weighs 10 grams. CO_2 is heavier when cold, lighter when approaching the critical point. This is the second reason why the performance of CO_2 systems declines from 80°F on up: the liquid is lighter at higher temperatures, so that again less potential energy is stored in the tank. Notice, that at the frost line the liquid weighs 9.25 grams, while at the critical temperature it weighs only 4.66 grams.

It follows that liquid CO_2 expands as the temperature rises, and since liquids are for all practical purposes considered noncompressible, you may encounter some awful pressures if you completely fill up a container. This is why the constant density lines are so steep. Take a look: A container filled up at 32°F will already reach 2000 psi at 54°F. Hence larger commercial containers capable of holding, let's say, 10 pounds of CO_2 will be specified as 7 pound cylinders



(rules may vary), and not more than 7 pounds will be put into them by weight, to avoid excessive pressures. You may translate that to our chart and read that 7.10 grams of CO_2 in a 10cc tank would reach 2000 psi at about 118°F.

Now you are about ready for a practical application. Suppose the ambiance and all the equipment have the same temperature, about 75°F. By pointing the charger down, you are carrying out a liquid charge. One would assume that liquid at 825 psi (see chart) would eagerly rush into the empty tank. Not so! Liquid CO_2 released into a low pressure area instantly evaporates, filling all the spaces with gas until both pressures equalize and the action stops. Just a few drops of liquid accumulate in the tank, where the initial vaporization left a cool spot. A piece of ice held against the tank from the outside while charging would

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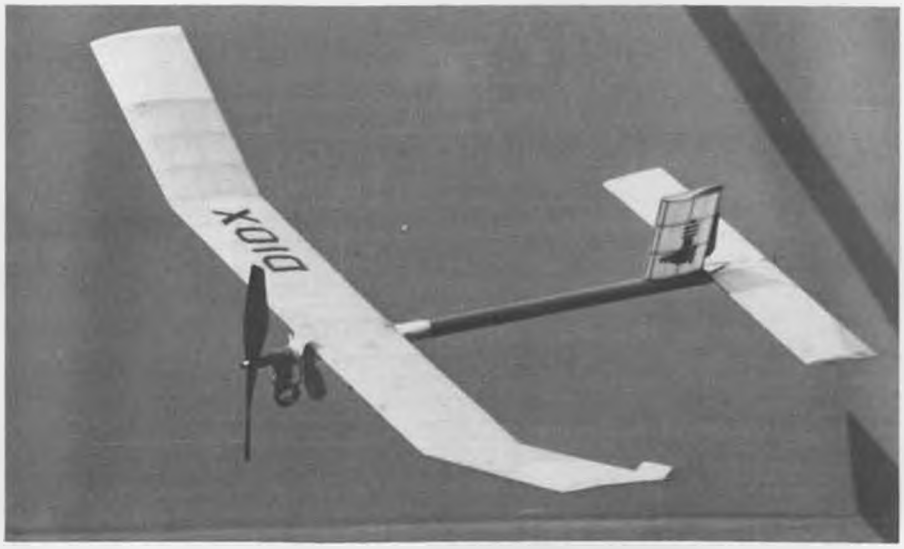


Author's DIOX made three maxes at Budapest, not bad for a beginner. The motor weighs 31 grams, the rest of the plane only 19 grams. Make no mistake, these models really perform.

Free Flight

By BOB STALICK

Andy Faykun's "Victory" Old Time Wakefield dates back to 1940 — note the huge fuselage cross-section required by the Wake rules in those days. Photo by Sal Fruciano.

• A curse on columnists. Frustration is the name of the game. In the March/April issue of *Model Builder* Free Flight, I carried on at some length about the AMA "planning" activities surrounding free flight at the 1989 Nats. Even before the magazine hit the stands the facts had changed, and the information contained in the column is out of date. It is the curse of the columnist. Because it takes the better part of three months to get a column from the word processor to the printed page, quick-developing changes make the earlier information incorrect. Specifically, the rantings surrounding the use of the Kibbie Dome for the indoor events at the 1989 Nats has, as of this date in January, been negated. It now appears that the Dome will be able to be used for the Nats Indoor Duration events. I believe that part of the reason is the intense publicity against the original site at the Pasco Ice Arena.

Lest I get myself too involved in the specifics of the Nats changes affecting free flight, I will encourage the readers to keep up-to-date by reading the latest in this saga via the free flight newsletters. Just one rumor deserves to be shelved: Somewhere, sometime, someone wrote that motorbikes and D.T. fuses will be prohibited in the outdoor events at the Nats. Late word is that motorbikes and fuses *will* be allowed, and that effective snuffer tubes are *absolutely essential*. In fact, the contest management will be instructed to inspect all snuffer tubes to determine whether they are effective, including too much space between the tube and the hold-down band. If not, no flying will be permitted with the offending model until the tube is fixed.

All of the caterwauling about sites is aimed at just one end: The best free flight Nationals that has been offered to fliers in at least a decade. That's what's in store for us in 1989. Don't miss it!

JUNE THREE-VIEW

—Bob Isaacson's RI-14 Nordic

This three-view is presented courtesy of the *Scatter* newsletter from the Southern California Aero Team, Craig Cusick, editor.

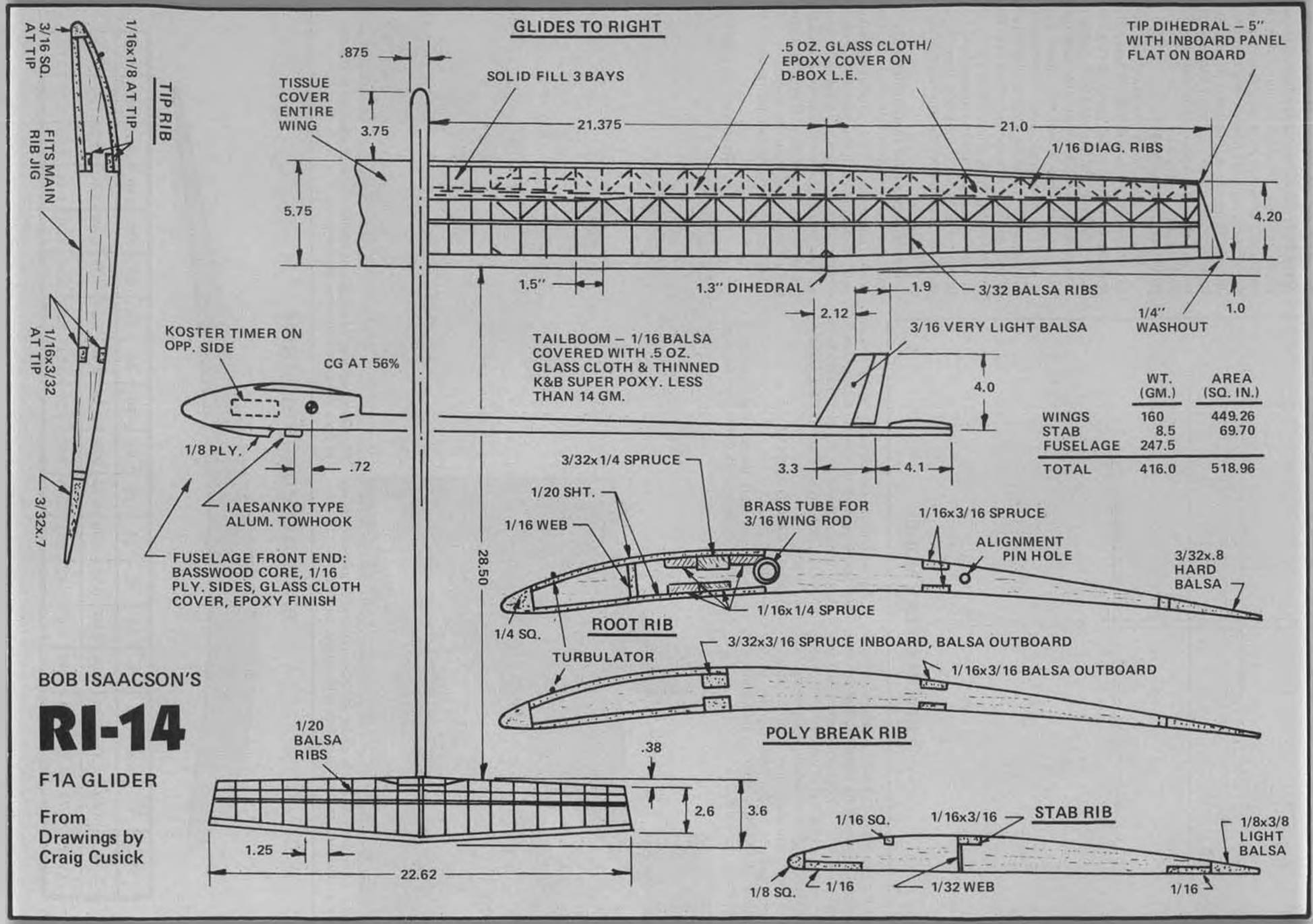
"This version of the Wishbone was built in 1979, and it has proved the best Wishbone in the fleet—certainly in the number of high contest places for Bob and for Randy Weiler, whose number 4 airplane is a close scale model. These contest places include two open international wins at the Iaet Kurtalic and at Mostra in Yugoslavia, a number of wins and high places at West Coast events, a team spot for Killer (Bob Isaacson), and second and third at the prestigious Puddle Valley Classic.

"A long time ago, the Wishbone owed a lot to the Happy Hooker (a Paul Crowley design), but now perhaps only the dihedral break proportions remain. Ike has carefully improved the airplane, developing layout, structure, shapes, mechanisms, and details to the point where it is the best all-around F1A anywhere. 'All around' isn't meant to damn with faint praise either. Randy had the best still-air total at the last finals, Ike's win at Livno was in strong wind, and both models out-center and out-glide their competition time after time. There are no secrets, but I do observe that #14 is the only Wishbone with a B-6336B wing airfoil, slightly thickened to .7% at the T.E.

"As much as the design contributes to performance, Bob's craftsmanship allows

San Diego Orbiteer, Don McHugh, with original design Coupe d'Hiver at Otay Mesa, a popular SoCal F/F site. Jose Tellez photo.

Husband and wife fliers, Don and Carol Bartick, winding her P-30 kit "Square Eagle" at Otay Mesa. Photo by Jose Tellez.



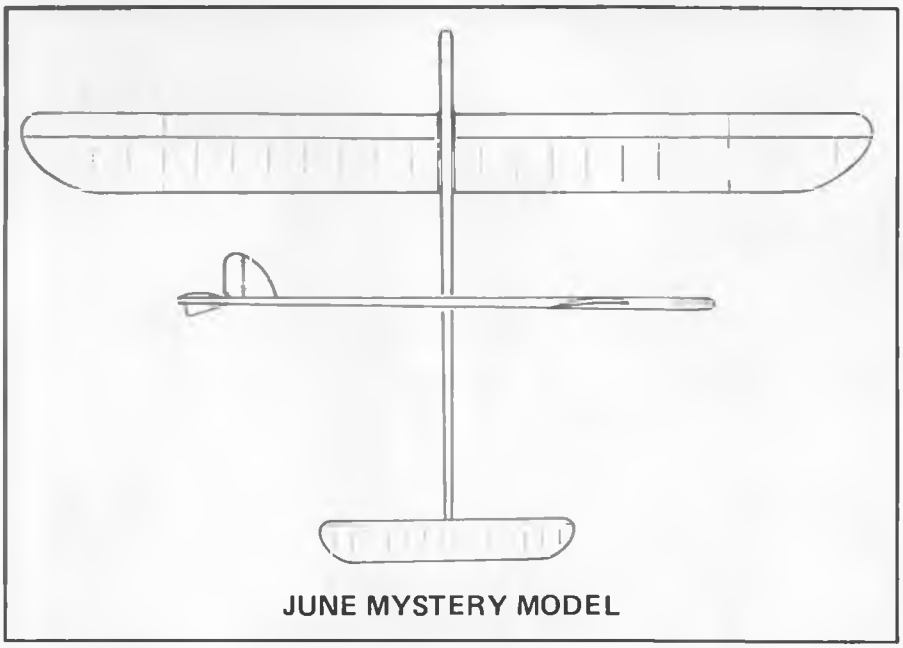
	WT. (GM.)	AREA (SQ. IN.)
WINGS	160	449.26
STAB	8.5	69.70
FUSELAGE	247.5	
TOTAL	416.0	518.96

BOB ISAACSON'S

RI-14

F1A GLIDER

From Drawings by Craig Cusick



JUNE MYSTERY MODEL

all the potential to bloom. When I started doing FAI, modelers reported that the best craftsmen were European. Names like Siebenmann and Schaller were offered as role models for those who would aspire to build the finest airplanes. Now, in glider at least, Bob Isaacson is the best builder in the world. The RI-14 is so far his best effort and worthy of our study."

For your further information about things FAI, you may wish to contact Craig Cusick about subscriptions to *Scatter*. His address is 20134 Gresham St., Canoga Park, California 91306.

DARNED GOOD AIRFOIL —RI-14

As you just read, the RI-14 glider uses a modified Benedek 6336B wing section. This Benedek airfoil is used by the majority of F1A fliers around the world. Bob Isaacson started with the Benedek section and thickened it at the trailing edge for this version of the Wishbone glider. The modification has apparently made a difference. If you are looking to improve your own F1A design, using Isaacson's airfoil might just do the trick for you. Give it a try.

JUNE MYSTERY MODEL

I have always been intrigued by this month's mystery model design. When it first appeared in the model press during the mid-1960s I was first attracted by its name. It is one of those models that must have had the name chosen before the model was drawn. The name is a classic. The model is a bit unusual in that the wing is sheeted on the top and contains no spars other than the leading and trailing edges. In addition, although it has a circular cross-section tail boom, it is made completely from balsa sheet. A brass nose cone finishes the front of the ship.

The designer of the mystery model was a prolific model press contributor during the 1960s and early 1970s, producing ships and magazine articles seemingly each month. These designs covered the cross-section of outdoor free flight events including all of the gas classes. Then, he apparently disappeared from the scene.

So, dear reader, the task facing you is to

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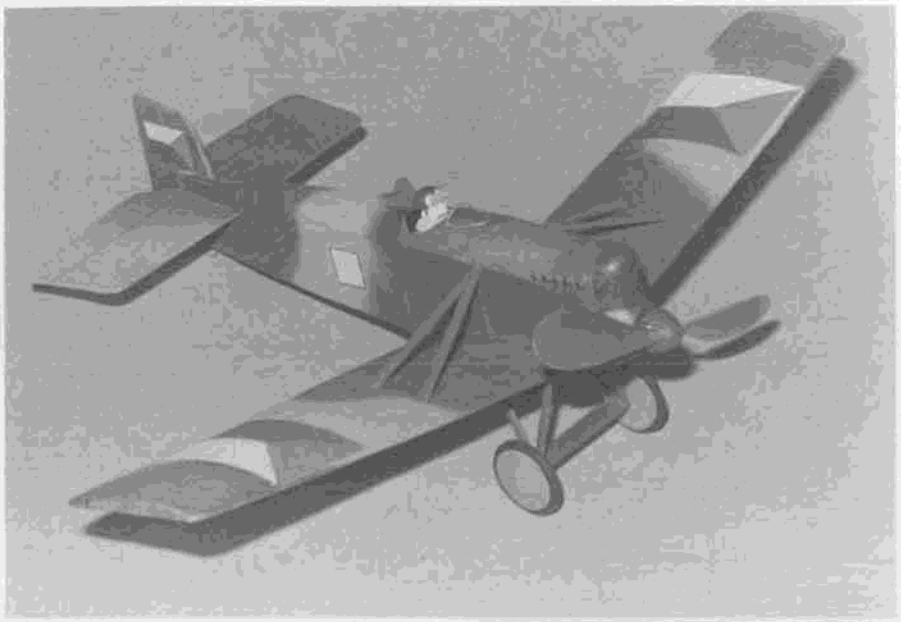
Don Spehn with his Mel Schmidt SHOCer, rated as an excellent choice for a newcomer to AMA Gas. Site is Winnipeg, Canada.

Photographer Jose Tellez caught Phil Moore with a couple of Dakotas at Otay Mesa. Note expanse of flying site.

DARNED GOOD AIRFOIL — RI-14

STA.	0	1.25	2.5	5	7.5	10	15	20	25	30	40	50	60	70	80	90	95	100
UPR.	0.70	2.18	3.14	4.55	5.65	6.53	7.78	8.55	9.00	9.15	8.96	8.31	7.26	5.99	4.40	2.63	1.84	0.70
LWR.	0.70	0.03	0.15	0.42	0.78	1.12	1.85	2.45	2.92	3.25	3.57	3.65	3.50	3.00	2.22	1.19	0.75	0.00

AVIA BH-3



A 1921 CZECH FIGHTER IN PEANUT SCALE

By JOHN BERRYMAN

• I'm ashamed to admit that the Avia is an aircraft that I know practically nothing about. I saw an R/C version of the ship on the cover of a magazine, and was immediately attracted by the colorful Czech markings and the three-color "between the wars" camouflage. Besides, there weren't too many compound curves, and apart from a rudder the size of a postage stamp, the areas and moments looked reasonably good. When I found a three-view in the magazine, I decided to build the airplane.

In the version presented here, the rudder is enlarged about 250% (it really was the size of a postage stamp!), the horizontal stabilizer by about thirty percent, and the dihedral was essentially doubled. On the real ship, the thickness of the wing also tapered from the point where the struts attach to the root of the wing.

Construction is straightforward for anyone who has ever built a Peanut. It is a low-wing, and although the Avia flies fine, it's not an airplane I'd recommend for a rank beginner.

The wing and tailfeathers are assembled in the usual manner. I chose to pay a weight penalty, and used fairly hard stock for the leading edge of the wing. I tend to hit things with my airplanes. The wing ribs are sliced, in the best Perfesser Mooney tradition. I find that wings built this way are strong, smooth (no external spar), and that tapered wings can be built easily. Keep the tail light—I used some 5 lb./cu. ft. 1/20 stock.

The fuselage longerons are stiffish 8 lb. stock (a weight penalty again), while the crosspieces and uprights are lighter 6 lb. stock. The sides are built on top of each other, to ensure that they really are identical. I like to assemble the fuselage using a couple of temporary bulkheads tack-glued in place to preserve alignment as the crosspieces are installed.

The landing gear is made from hard 1/8 x 1/16. The only wire is located in the crosspiece, and is sandwiched between two pieces of 1/32 sheet balsa. The wheels are made from two laminations of 1/20 stock, bushed with a small piece of 1/16-inch birch dowel. The flat inner hub and conical outer hub are both made from bond paper to which tissue is glued with a glue stick before the parts are cut out. The radiator is made from soft 1/32 scrap balsa. I used shims of more 1/32 scrap to maintain equal spacing for the slats in the radiator.

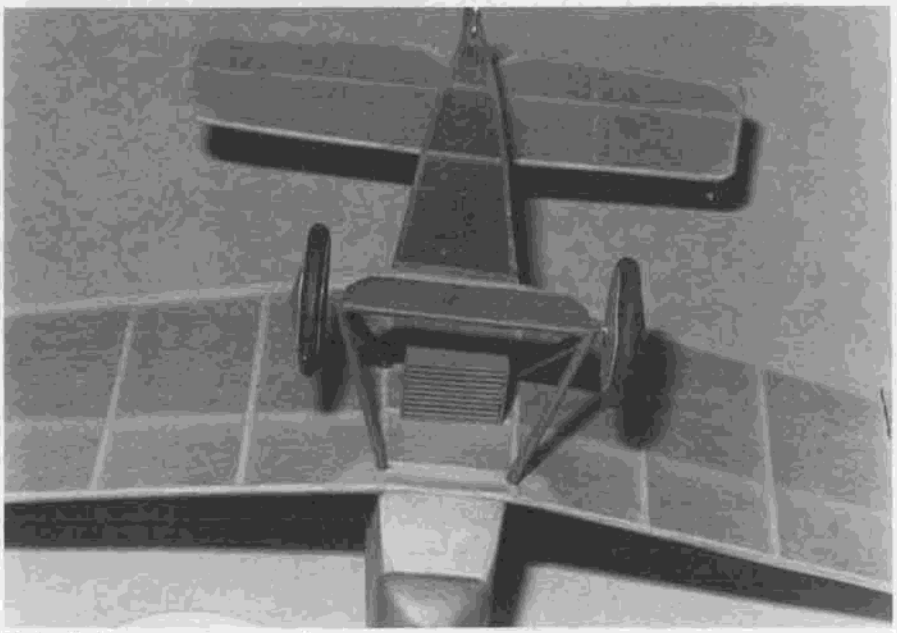
Since there isn't much nose on this airplane, I elected to use a Peck-Polymers 4-3/4 inch prop, sanded well and polished with Brasso. This also accounts for the location of the rear motor peg, which may be a bit more forward than you're used to. Yes, the motor run is shorter, but you're not carrying around a big lump of ballast in the nose, either.

All the other goodies (spinner, headrest, pilot) were carved from soft balsa. By all means, take the time to hack out a pilot. Open-cockpit airplanes look really forlorn without one.

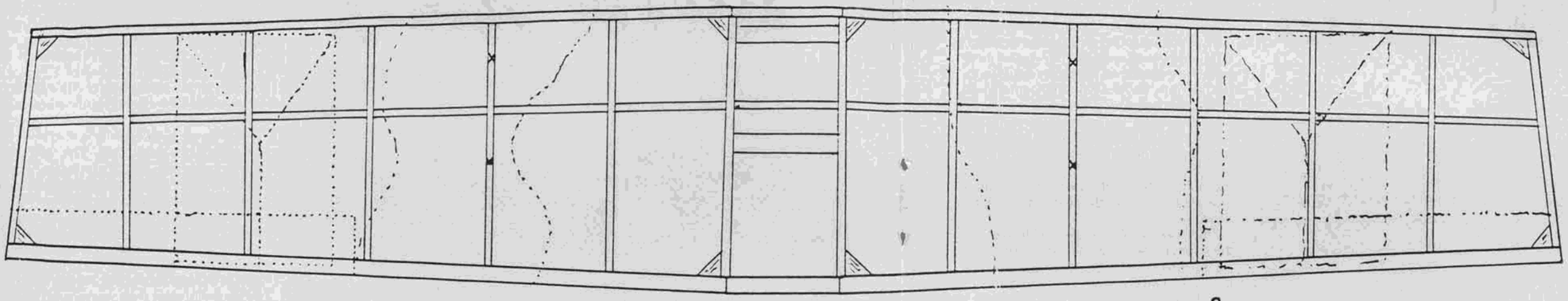
The prototype was olive drab on top with dark earth and sand camouflage, and silver on the bottom. I used Peck-Polymers' green tissue (super-light grade) for the covering on the upper surfaces, and airbrushed *thin* Floquil "earth" and "mud" on the aircraft for the camouflage. National insignia were also airbrushed, again with thin Floquil. The cost of Floquil thinner will make you weep, but I've been able to use the lacquer thinner that's sold at my local discount house with success.

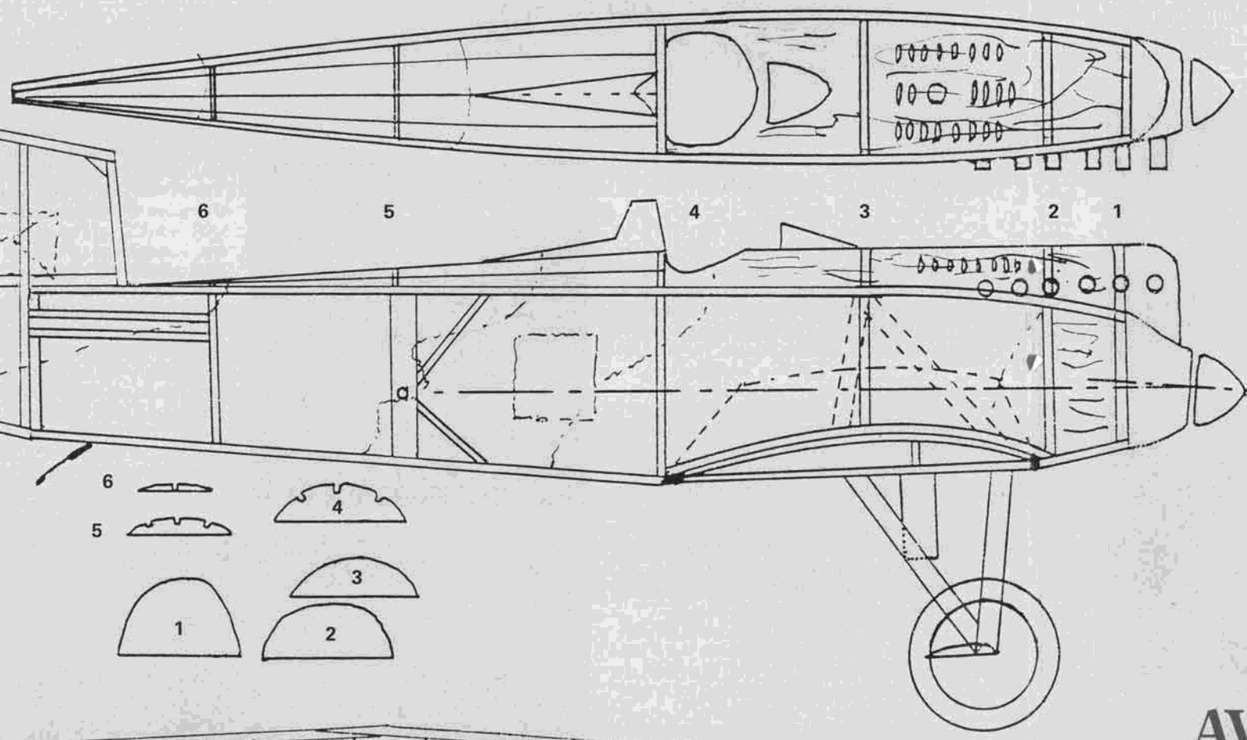
The belly of the ship presented a problem. I've found silver paint of any kind to be heavy, so I tried something new (to me, at least). I picked up some of Dr. Phineas T. Martin's Synchromatic Transparent Water Color (yes that really is the name). The good

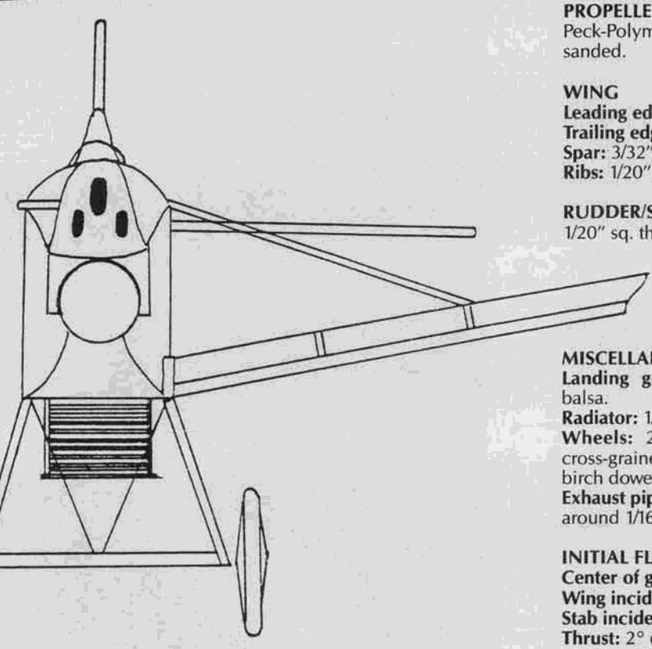
Continued on page 64

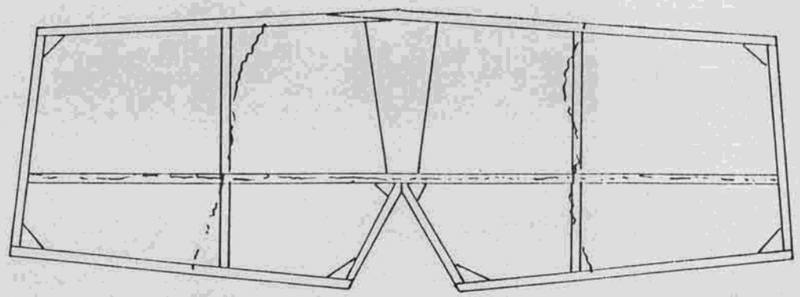


Underside features a dummy radiator made from scrap balsa — makes a nice touch of detail. Wheels are laminated balsa with bond paper on both sides.









AVIA BH-3: A 1921 CZECHOSLOVAKIAN MILITARY AIRCRAFT

Designed and Drawn By John Berryman

FUSELAGE
Longerons, uprights, cross pieces: 1/20" sq.
Fwd. bulkheads (1-4): 1/20" balsa.
Rear bulkheads (5 & 6): 1/32" balsa.
Stringers: 1/32"x1/20".
Cowl: 1/64" balsa.
Headrest and nose block: soft balsa block.

PROPELLER
Peck-Polymers 4-3/4" dia., well sanded.

WING
Leading edge: 1/16" sq.
Trailing edge: 1/8"x1/20".
Spar: 3/32"x1/20", trim as req'd.
Ribs: 1/20" balsa stock.

RUDDER/STAB
1/20" sq. throughout.

MISCELLANEOUS
Landing gear: 1/8"x1/16" hard balsa.
Radiator: 1/32" balsa.
Wheels: 2 laminations 1/20" cross-grained, bushed with 1/16" birch dowel.
Exhaust pipes: Paper tubes rolled around 1/16" mandrel.

INITIAL FLIGHT SETTINGS
Center of gravity: 12%.
Wing incidence: +3°.
Stab incidence: −2°.
Thrust: 2° down.
Rudder: 2°left.
Wash-in: Left panel, 1/16"-3/32".
Wash-out: Right panel, 3/32"-1/8".
Dihedral: 1" each panel.

COLOR SCHEME
Olive drab, earth brown, sand on upper surfaces; silver overall on lower surfaces except radiator and landing gear legs (olive drab). National insignia is red, white and blue. Squadron markings are a white square with black border.

REFERENCES
Radio Control Modeler, January 1988; *Monographie* 3-view, *RCM* cover photo for color details.

Control Line

BY JOHN THOMPSON

ALIVE AND WELL

Our (control) lines of communication bring us news of yet another strong and growing control line club.

Paul Rundell, of Topeka, Kansas, sent along copies of *Topclass News*, the newsletter of the Topeka Control Line Association, which are packed full of club news, hints and tips. I was especially interested in the "Shop Talk" column which, in the March, 1988 issue featured information on the merits of kit vs. scratch building—certainly a possible topic for a future column.

Paul also sent along samples of the business card that Top Class members hand out to prospective new members. The card contains the club name and emblem, the location of the flying site, the club's regular meeting time and has a line for the member to write his name and phone number. It's a good way to make sure that prospective new fliers can find you again after that first meeting.

Paul Rundell is a 57-year-old flier who started with a Walker Fireball and a borrowed Torpedo .29 on spark ignition in 1947, and progressed through sport and competition flying until 1970. After a hiatus, he returned in 1986. As with anyone who has left the hobby for a while, he was surprised at some of the developments, most

TOPEKA CONTROL LINE ASSOCIATION

TOPCLASS

For more information about Control Line Model Airplanes

Contact _____

Flying Site — Gage Park

Meetings every second Tuesday

The card handed out to prospective C/L fliers by Top Class members — see text.

notably some technological advances and some decline in participation. He also observes, as others have, that the trend seems to be toward a new interest in C/L flying.

He also laments the loss of control line products from the old traditional manufacturers such as Veco, Guillow and Henry Engineering (we could add others to the list). Fortunately, as most competition fliers have discovered through membership in the various specialty organizations, many new products, from kits to handles, tanks, and other accessories, have become available from an extensive list of smaller manufacturers who advertise in specialty newsletters. The products we need can be found but, for better or worse, it seems that "detective" work is one of the skills required of a C/L modeler nowadays.

However, my mail also tells me that Paul and others can rest assured that C/L fliers have not been forgotten by all the major manufacturers, even if some of them have had to cut back their C/L lines for business reasons.

"There have been many long articles, filled with flashy mathematical equations, written about propeller performance. However... the only true way to determine the best prop is trial and error."

This message comes from Scott Christensen of Top Flite Models, who wrote to say that his company continues to be interested in C/L modelers and to produce C/L products. Top Flite is, in fact, tooling up to reintroduce the Gieseke Nobler kit, which is coming back by popular demand. Other C/L products are "under development," Scott says.

Sig's Magnum kit, along with others still available in its catalog, is further evidence of industry support for C/L. Needless to say, all of these companies will judge the viability of their product lines by the support they feel from C/L fliers.

YOUTH MOVEMENT

There's no denying that control line flying has become largely an adult activity in the present era, due to the many cheap and easy activities and entertainment opportunities for young people. No matter how hard the established modelers work to attract juniors, success will only come when the prospective young flier has three important elements: willingness to dedicate some time and effort to learning and pursuing a hobby; interest in aviation; and (unfortunately) the money and space to work on the hobby. We established modelers provide the fourth essential element: a helping hand.

Therefore, it's no accident that many of the younger fliers are relatives or friends of established modelers. The parent-child team is common in both sport and competition flying.

That's a roundabout introduction to a burgeoning talent among the junior ranks in Southern California, featured in one of this month's photos. An admittedly proud father, Mike Keville, can carry on the introduction:

Long-time member of the Eugene Prop Spinners, Mel Marcum, caught with his Super Magnum by photographer Gerald Schamp at a recent EPS flying session.

"Her name is Michelle Keville. She's 13 years old and is from Lakewood, Calif. She:

"1) Flies both the aircraft in the photo, the McCoy .19 powered Streak Trainer and the Cessna 152, N48254. (Made her first takeoff and landing in May, 1988, gets dual instruction about once a month.)

"2) Is an AMA member.

"3) Has flown in a contest (balloon bust).

"4) Is planning on applying for the Air Force Academy.

"5) Lands C/L models better than Dad.

"6) Has a Mom who's a contest director.

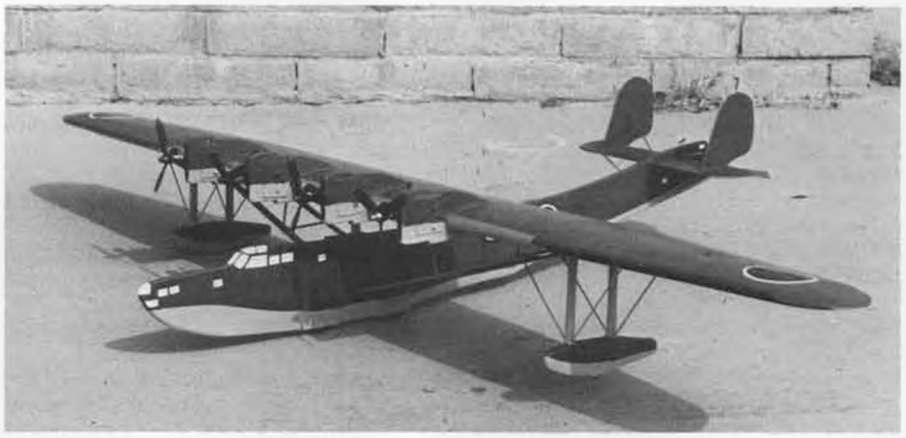
"7) Is building a .19 powered P-40 profile and is learning to do maneuvers."

It's a list of accomplishments that would make any C/L modeler proud to have

Michelle in the hobby.

Mike has pointed out a couple of elements that are key to continued involvement of juniors in the hobby, once they get started—the well-rounded activity of flying (including quickly learning maneuvers), a little competition to ignite the sporting interest, and, perhaps most importantly, *building*. As the old saying goes, "Easy come, easy go." A youngster who does all of his or her flying on planes built by someone else and handed to him or her will not have as much of an investment in the hobby—or as much knowledge about it—as one who is involved in the construction and operation of the aircraft. To be successful, any junior training program, whether formal or informal, should involve building as well as flying.

Half-A multi-engine profile scale is becoming increasingly popular, especially in California. This is Merle Mohring's 1/33-scale Tupolev TU-4 "Bull," Russia's answer to the B-29.



Very unusual and attractive C/L subject is this Japanese H6K-4 "Mavis" flying boat, another of Merle Mohring's profiles. Small half-exposed wheels are almost unnoticeable.

PROP ETIQUETTE

You see the kit or the plan, you like its looks and you read the glowing praise about how this plane flies like a dream. Maybe you've seen one on the field and want one just like it.

You build it just like the plans said; it's nice and light and straight. You take it to the field, and . . . well, it just doesn't seem to fly quite like the one in the magazine or in the other flier's hands. Did you get stung with a bad design?

Prop-ably not. Don't give up on it until you've tried some different propellers.

The issue of propellers is raised for us by Chris and John Mason of Houston, Texas, who asked:

"What would varying prop sizes and pitches do for a plane's performance? Does a smaller pitch give the plane a faster climb or does a larger prop, more pitch, give it more power in terms of wingovers, etc. I know it's a give-and-take tradeoff but I was wondering if you could give me the basics. By this I mean, if we varied the pitch, what benefits would we see, and what are the drawbacks as well?"

There have been many long articles, filled with flashy mathematical equations, written about propeller performance. However, I believe that the only true way of determining the best prop for your airplane is the time-honored scientific method known as trial and error. No mathematical equation in a magazine can ever quite anticipate the particular demands of your airplane, your particular type of flying, and your personal preferences.

As Chris suggests, there are some general guidelines, but there is no substitute for experimentation when it comes to props. This means you are going to have to acquire a variety of different props and try them out to see which ones do the job best. Varying the prop's length, blade shape and pitch will all affect the plane's speed, climb and turning ability. You will be able to pick a starting place for your particular kind of plane and flying, and then try variations on that "starting" prop. For example, with a .35-powered stunter, you'd start with a propeller that has a 10-inch blade and a 6-inch pitch (10x6).

(By the way, the first number of a prop designation always refers to the blade length, tip to tip, and the second to pitch, the theoretical distance that the prop would move forward for each revolution.)

An oft-repeated Northwest joke is a reference to the search for "the" prop, e.g.:

"There is no such thing as 'the' prop for any event. Every plane is different."

"Yes, right. But, this here is 'the' prop

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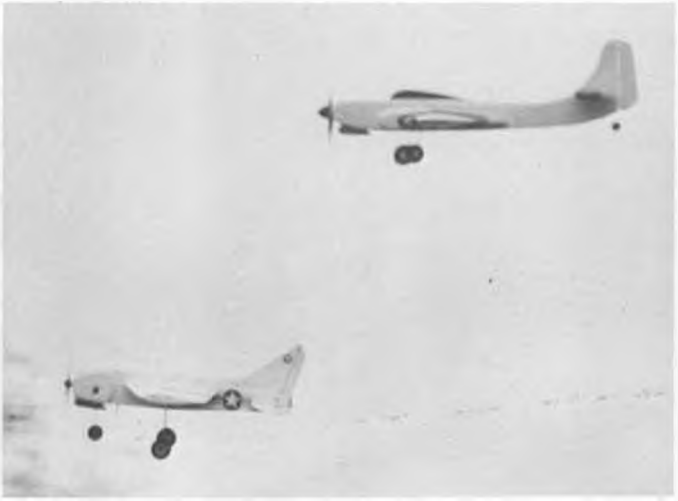
Michelle Keville, of Lakewood, California, has a record of accomplishments that any 13-year-old would be proud to claim. Michelle flies both the Streak Trainer and Cessna 152 — wonder which one she likes best?



Nice example of close precision formation flying by Jim Cameron (who also took this photo) and Gerald Allen. Both ships have throttles. Jim is show team director of the Seattle Skyraiders.

Free Flight Scale

By FERNANDO RAMOS

CONTEST ANNOUNCEMENT

As the flyer on the following page indicates, the Flightmasters club is going to be holding their first Flying Aces style contest on August 12 and 13 of this year. Judging and a great catered picnic will take place at my home on Saturday afternoon and the flying will last all day on Sunday. There will be four regular rubber and power scale events featured, plus three rubber mass-launch events.

The entry fee is $13.00 ($15.00 after July 30) plus $10.00 per person for the catered picnic. All contestants will receive a contest information packet providing all of the rules, maps and addresses once they have turned in their entry fee, along with a list of local motels.

Send your entry fee to Byron Calomiris, 3406 Fela Avenue, Long Beach, California 90808. We want to make this biannual event something very special for the F/F Scale fraternity!

NEW ITEMS

Flying T Model Company, 134 N. Edgemont #204, Los Angeles, California 90029, has quite a few items for the scale modeler. For starters, they have 29 plans and kits of rare and vintage aircraft of the pre-WWI, and some lesser known WWI aircraft.

Also, and this is something I consider rather unique, is that they have photo-etched fittings. These beauties are etched from brass, and include pitot and step sets, prop bosses (these fit on the front of a scale prop hub, giving the model additional realism), and more. There is a packet that includes instrument bezels for the antique aircraft. Last, but not least, is a packet of strut fittings. These attach to the base of interplane struts and provide an anchor point for the rigging. These are especially intriguing to me. Most of the DeHavilland aircraft used this type of fitting.

Flying T also carries scratch building supplies, such as a couple of thicknesses of aluminum paper, hard litho plate, and soft aluminum sheets. How about copper paper which can be used for making radiators? Yep, they carry it! Something that I have been looking quite some time for is decal paper; they also carry that.

Send them a buck for their 12-page catalog. You won't regret it!

A couple of months ago I mentioned the most clever Edjer for sharpening X-Acto and other brands of #11 blades. At that time I didn't have the exact cost of these devices. Well, I do now. The cost is $7.50 plus $1.75 for shipping. These are available from The Edjer, P.O. Box 0, Moorpark, California 93020.

The incomparable Bill Hannan has just come out with Volume IV of *Peanuts & Pistachios*. The latest in the series for builders of small flying scale models, this concise booklet presents a truly international selection of photos, plans and 3-view drawings to inspire, encourage, and stimulate you to greater achievements in your model building.

Intended as permanent references, these publications are printed on top quality stock, and contain no paid advertising. Bill does not sell subscriptions because new volumes are offered only when they are ready, without deadlines or time constraints.

This latest volume has the same 8-1/2x11 format with 16 pages plus hard cover. There are some nifty plans, sketches, cartoons and 44 photos. The cost is only $5.50 plus $1.50 for postage and packing. Order yours from Hannan's Runway, P.O. Box A, Escondido, California 92025.

* * *

Every once in a while I think it is a good idea to mention areas of model plans that can lead to major headaches during construction. Since I learn about these the hard way, I can only hope that the rest of you can learn from my mistakes!

Recently, I got the inspiration to build another British biplane, this time the DeHavilland Fox Moth. I wanted more than anything else to build this as an exercise to try a few ideas and gimmicks that I had in the back of my mind. I knew from the beginning that this was really going to be a sport model rather than a pure scale model.

In typical tradition, I framed the fuselage and got it sheeted. The stab and rudder were built next. Also, as usual I left the wings until last. I just can't get excited about building wings! Both lower wing panels were built first, directly over the plans. I then placed them back to back. Guess what? They didn't match! I had two dissimilar wing panels! Whoever did the drawings didn't pay much attention to details.

I feel that it was my own fault, because I have been there before. When I built the upper wing panels, I used the same left and right plans as for the lower wings. I figured I might as well keep the error constant. Had I had my wits, I would have used only one wing panel drawing for the construction of all the panels.

With a biplane, having this problem is particularly aggravating, because the interplane struts have to be in perfect alignment. That is, if you are looking from either the front or the side of the model, they should be vertical and parallel. I did not locate the strut attach points until I was ready to assemble the model in my jig, at which time I

Continued on page 101

Jumbo scale at its best! Beautiful rubber-powered BFW Messerschmitt M23b by Bill Noonan spans 39 inches and was featured as a construction article back in the October '76 issue of MB (Plan No. 10763, $5.50). Colors are red and white with black striping and lettering.

FLYING ACES

AUGUST
12 & 13
1989

FLIGHTMASTERS CONTEST !

F.A.C. EVENTS INCLUDE:
1. RUBBER SCALE
2. PEANUT SCALE
3. JUMBO SCALE
4. POWER SCALE
(GAS, ELECTRIC, CO_2)

RUBBER MASS-LAUNCH EVENTS: A. WWI
B. WWII
C. GOLDEN AGE (1929-1941)

JUDGING:
SATURDAY,
AUGUST 12,
1 p.m. to 5 p.m.

SITE: HOME OF
FERNANDO RAMOS
19361 MESA DRIVE,
VILLA PARK, CA 92667
Phone: (714) 637-6312

FLYING: SUNDAY, AUGUST 13

SITE: MILE SQUARE PARK, FOUNTAIN VALLEY, CA

Flying begins at 8:00 a.m. for Rubber; 9:00 a.m. for Power.

ENTRY FEE: $13 ($15 late fee, after July 30)

CATERED PICNIC at the judging sites: $10 per person.

Send check or money order payable to FLIGHTMASTERS
Byron Calomiris
3406 Fela Avenue
Long Beach, CA 90808

Contestants will be sent entry forms, maps, F.A.C. Rules, etc.

the INSIDERS

INDOOR FLYING REPORT

By DAVE "VTO" LINSTRUM

U.S. INDOOR CHAMPS
JULY 21, 22, 23

Mark your calendar for the first week of June to attend the U.S. Indoor Champs at East Tennessee State University, Johnson City, Tennessee. Held in the 116-foot ceiling Mini-Dome, it promises to be the best indoor meet in the world, bar none. More details from NFFS and MIAMA sponsors next month. Plan now to attend. It will blow your mind!

PEEK AT INSIDERS WORKSHOPS

Our "Insiders Workshop" this month is the one used by famous Insider Bud Romak, of Oakland, California to build his fabulous microfilm F1D birds. When the photo was taken, he was in the middle of building some Old Timer gas and rubber models for flying outdoors at Taft. The workshop is in a spare bedroom in a wing of his hillside home in Moraga. It looks out on the pool deck and gets plenty of northern light. Romak is a past World Champion and a member of several past USA Indoor Teams.

If you would like your workshop featured in Insiders, send us a contrasty color or B/W photo and a brief description. Don't bother cleaning it up, even if your wife insists. Workshops are meant to be messy—some superb models come from the most untidy shops.

OBSCURE AIRCRAFT

From the David Diels line of plans and kits (mentioned last month) comes a real beauty from WWI: the 1917 Morane-Saulnier A-1 French parasol wing fighter. It has really nice proportions (see the profile drawing). With those great roundels and a nice paint job, it should get you lots of scale points. It makes up into a nice AMA scale model in 1 inch=1 foot size (27-inch span) and you could reduce it by a photocopy machine to Peanut or Pistachio size (13-inch and 8-inch span, respectively). If you have access to a large size copier, you could even make it into a Coconut Scale (36-inch span). The plan is 24x36 inches and sells for $3.50 plus $.75 postage in the U.S. Add six percent Ohio sales tax if you live in Ohio, Michigan, Indiana, Illinois, Kentucky, Pennsylvania, West Virginia, Wisconsin, or Minnesota (sounds like a tax cartel to us!). Order your fine flying French Morane-Saulnier A-1 from David Diels, Diels Engineering, Box 101, Woodville, Ohio 43469. If you don't have one, send $1 and a SASE for Catalog 12B which lists many more Obscure Aircraft in the Diels hangar.

VERY FAMOUS AIRCRAFT

Our VFA this month are also from Diels (see address above) and are shown in close-up photos. The Curtiss SBC-4 Helldiver (kit $13/$1.50 pp) and the Chennault Flying Tiger P-40 Tigershark (Peanut kit $10.50/$1.50 pp) are probably the most famous, but the Grumman F8F-2 Bearcat also saw a lot of wartime action. The latter is an evolution of the more famous Wildcat and Hellcat of WWII. All of these are good fliers, so order your kits today for flying fun. Kits come complete with light balsa, tissue, molded canopies, and fully detailed plans/instructions. Be sure to tell Diels that *Model Builder*/Insiders sent you. Support cottage industries.

The latest kits from Diels are the WWII Japanese Shinden canard fighter and famous Grumman F4F Wildcat. The latter is taken from the *Model Builder Flying Scale Planbook*, so you know it is a goodie! For full details on these two new kits, send a SASE to Diels Newsletter (see address above). If you live overseas, send International Reply Coupons instead of the SASE.

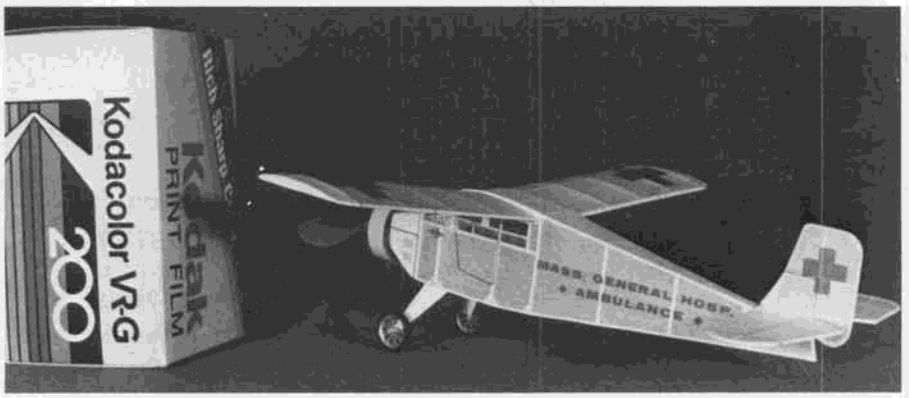
HOW THE INDOOR BUG BIT ME

"Dear Dave,

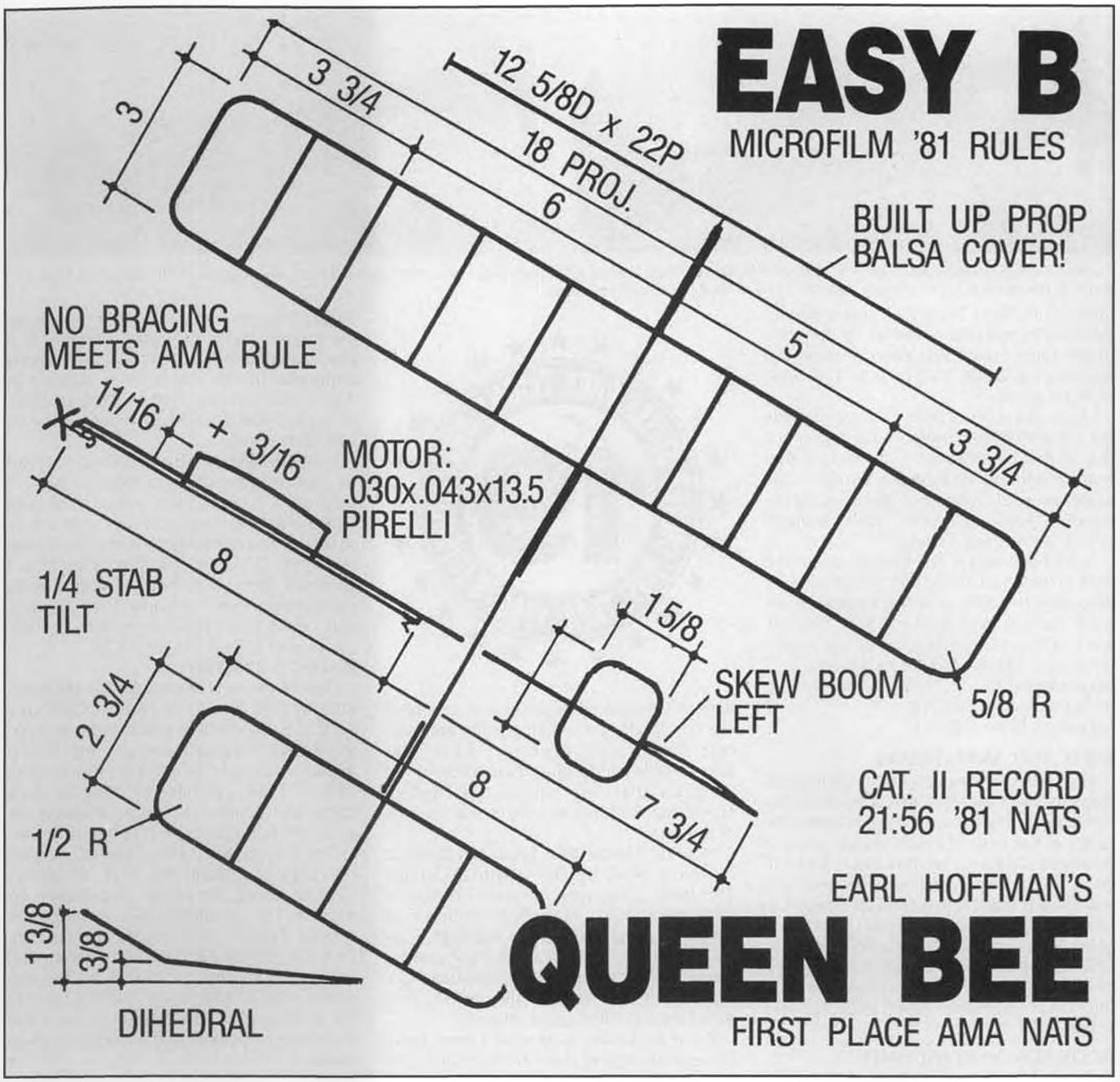
I read your 'Insiders' column today and instantly understood your message. Let me tell you why I enjoyed it so much, since I suspect others in the silent majority might only respond via mental telepathy and not immortal prose.

"When I started out in modeling (1950's) I built every plastic kit conceivable and developed a bias toward scale models. While the rich kids in town flew their Ringmasters, I plugged along with stick rubber models befitting my low monetary status. With the

This is where world-class Insider Bud Romak turns out his incredible F1D ships. Looks like he's in the process of building some Old Timer free flights, too.



Colorado's Perry Peterson built this nifty Peanut version of a Mass. General Hospital ambulance plane. Film box is a camera store display prop.



advent of more money in the 60's, I was captivated by the Guillow Zero. It looked great and flew like a truck. I loved them all, truck-like or not. My best was a Monogram Hellcat that had a balsa wing precarved for the upper surface. It flew so well across my front lawn that I can still visualize the scene. I was the neighborhood hero for a day.

"Then came the 70's and more disposable cash allowed me to get into R/C sailplanes. My love of scale lingered and I built R/C sailplanes of ever-increasing scale. Along the way, uniquely qualified observers like my wife and son made comments like, 'Boy, it takes a long time to finish a scale model!' and 'Dad, you're always building those things. When do we get to fly them?'

"I began to take notice of the Peanut plans and those guys pictured in Hannan's and Ramos' columns. They all seemed to be having fun and they built aircraft that they were turned on to, not just types that were

Not the best photo, but it ought to at least give you some idea of the vast interior of the Kibbie Dome, site of the 1989 AMA Nats indoor events. Facility was obtained by Insider Andy Tagliafico. Prospective entrants should contact Vince Mankowski at AMA headquarters for more info.

Two of the many fine rubber scale kits offered by David Diels are the 1/24-scale Grumman F8F Bearcat (left) and Curtiss P-40 Tigershark Peanut. Both of the models pictured here were built by Jake Zarson, of Florida.

outstanding fliers. What really irked me was their ability to build airframes by the gross in the same time I was documenting and building my single TG-2 or 1-26. The nerve of those guys!!!

"Now along you come, Dave, and really get me with both barrels. You're telling me that all that time I've been spending winter hours scheming to select the 'perfect' scale sailplane, could have been spent having fun building less-than-perfect scale subjects with less time and money?

"OK! I surrender. The checks are in the mail to Peck and all the rest. I even casually discussed the idea of flying indoors at the grade school gym with my son, Steve Jr. Now, keep writing that column and inspire more guys like me to take a chance!

Steve Moskal
30 South Kensington Ave.
LaGrange, Illinois 60525"

USFFC TAFT ANNIVERSARY

The United States Free Flight Championships in Taft, California this Memorial Day weekend will be celebrating almost two decades of thermals. If you can plan to be in Southern California for this meet, you will enjoy the best competition of the year. CD will be Bill Booth Jr. of the San Diego Orbiteers, who trained for the job last year. Bill plans to make a few improvements in the USFFC, which should make it run even more smoothly. We hope to see your smiling, sunburned face there. FREE FLIGHT FOREVER!!!

BOOK REVIEW BY PAT DAILY

Air Aces of the Austro-Hungarian Empire 1914-1918, by Dr. Martin O'Conner. Published by Champlin Fighter Museum Press and available for $40, from Historic Aviation, 3050 Coronation Rd., Eagan, Minnesota 55122, USA.

Over seventy years ago (Dec. 3, 1916) Tenente Mazzoni and his crew of Tenente Borra, Tenente Guzzanti, and Caprole Castoldi were flying in their Italian Caproni Ca-1 bomber high above the Isonzo front. As they crawled through the cold dim winter sunshine with the Caproni's engines roaring, they were suddenly attacked by three aircraft of the Austro-Hungarian Army Air Service. Leading the attack was Oberleutnant Godwin Brumowski, piloting his Hansa-Brandenburg D.1 "KD" fighter. He was joined by two other Austro-Hungarian aircraft, piloted by Gottfried Banfield and Karl Cislaghi. The Caproni's gunner, Caprole Castoldi, was unable to hold the Austro-Hungarians at bay, and the Caproni was forced down over enemy territory. The

Italians were taken prisoner and may have even had a glass of schnapps with their victors later that evening. This was Brumowski's fourth of thirty-five confirmed victories that left him as the Austro-Hungarian Empire's leading ace at the end of the war.

How do I know this? From this fantastic historical work by Dr. Martin O'Conner. This book, 336 pages, contains a history of forty-nine aces, statistics, numbering schemes, victory tallies, loads of high quality photos of aircraft, and 48 color profiles along with 16 multi-views of significant aircraft. Artist and historian Ray Rimell provided the excellent color artwork.

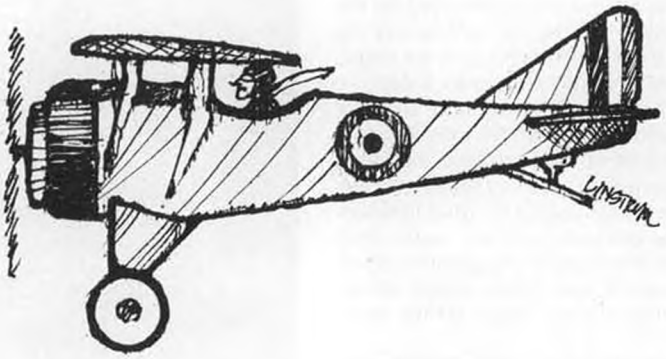
What a Christmas present! I have spent hours studying this excellent book and constantly find new details. What intrigues me the most is the author. Dr. O'Conner is a physician (radiologist) from Vermont who is a modeler like us. He became involved in Austro-Hungarian aircraft and history while trying to detail a model. This book is the result. It is superb.

I just finished my Albatross D-III that I did in Austro-Hungarian markings. After I received this book, I was forced to recover wings, redo markings, and alter several construction details to make it authentic. Curse you Marty O'Conner. It's all your fault that I spent all these extra hours on an already completed model. But now it is authentic, and I even know that Friedrich Hefty flew this beauty (Alb D-III OEF 53.21).

WALDO'S RUNWAY

One of the new book items at Hannan's Runway (P.O. Box A, Escondido, California 92025) is *Waldo Waterman, Pioneer Aviator* ($18.95 + $2 postage/handling). This is the autobiography of a flying pioneer from 1910 to 1944, compiled by historian Jack Carpenter. Waldo was also an inventor, engineer, test pilot, aircraft designer, airline pilot, and bit player in Hollywood movies. His designs include the 1921 Waterman Gosling Racer, Arrowbile, and Tucker Arrowbile. He counted Charles Lindbergh, Amelia Earhart, Will Rogers, and Cecil B. DeMille among has pals! For a great read, buy this book. For more info on Runway items, send a SASE for the latest catalog to the address above. Joan Hannan has a real cornucopia of model and full-scale aviation goodies. •

OBSCURE AIRCRAFT



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Ramblin'. . . . . *Continued from page 45*

airport, but there was one last visit that had been arranged in advance. There was sufficient time to visit the publication offices of a model magazine. Australia has two model magazines: *Australian R/C Modeller* and *Airborne*. I met the editors and publishers of both magazines and received invitations to visit, but due to geography and time, I only made it to *Airborne*. Its format is more like *Model Builder* than any other American magazine. John Rogers is the publisher and Merv Buckmaster is the editor. Murray Scott, of the other magazine, was on my R/C glider team and much fun. His magazine is 100% R/C oriented.

If you'd like a one-time-sample issue of *Airborne*, send $5.00 in U.S. cash (no checks or money orders due to expensive bank clearing charges) for surface postage and handling to: John Rogers, sample of *Airborne*, ROPOMOD Productions, Unit 11, 67 Garden Dve.; Tullamarine, Victoria 3043, Australia. Expect a three, four or five month postal transit time. You'll see such things as the new Futaba 1024 PCM, mail-order priced at only $1995, and the fabulous new supercharged YS-120 four cycle at only $699!

The ramble around Australia was fulfillment of a model builder's dream. It was made possible by Australian modelers who gave more than they could ever hope to receive. People like David Axon, Chris Greenwood, Bob Carpenter, John Chadd, Ivor F, Gayle Wyer, Ford and Pete Lloyd, Gordon Burford, James McFall, Merv Buckmaster, Murray Scott, John Rogers, Leo and Mike O'Reilly, David Meson, Ron and Bruce deChastels, Rex Brown, Ian White, Les Bollenhagen, Andy Kerr, Steve Rothwell, Ross Woodcock, Andrew Kennedy, Paul Straney, Bob Main, Bill Cooksey, Reg Pocock, Max Starrick, Ranjit Phelan, Tony Cincotta, Monty Tyrrell, Wayne Hadkins, Eric Bielby, Mike Frizell, John Channon, Tony and Mike Farnan, Keith Harvey, Steve and Val Vickers, Bernie McKay, Rex Kilsby, the Red Baron, Brian Winch and others. . . along with their wives and kids who fed me, did laundry, gave up beds and accepted an American model builder.

Special thanks go to Bill Northrop, publisher of *Model Builder*, who has allowed this story to be shared with you.

To you all I say. . . G'DAY MATES! •

Peanut. . . . . . *Continued from page 53*

doctor produces a series of liquid water colors that are sold in graphic arts stores. I bought some "stone gray," threw about half of the small bottle in my large airbrush bottle, thinned it about 200% with isopropyl alcohol, and added a few drops of ammonia to help it penetrate the tissue. Then I mounted some Peck's white tissue on a frame, and airbrushed on about three coats of the Dr. Martin's. The result is emphatically not metallic, but it does give a good representation of the gray of weathered aluminum, and is not "toy-ish," as silver paint often appears to be on small models.

My initial flight settings are indicated on the plans. As is the case with any low-wing Peanut, be prepared to tweak as required. The completed ship weighs a fraction under 8 grams (with its plastic prop, and less rubber). I believe that a hand more deft than mine with an airbrush could have shaved the weight to about 7.5 grams. A home-brew prop would help even more, but might result in balance problems. I fly my ship on one loop of .100-inch FAI about 1.5 times the distance from the front motor hook to the rear peg. The Avia will never beat a Fike, but it is a seldom-modeled subject that is cute as the dickens in the air. Have fun! •

Chipmunk. . . . *Continued from page 43*

Attack-4 NBL with an MCR-4A receiver. This new radio is 1991 legal and features, among other things, servo reversal and two of the incredibly small S133 servos (a third servo will have to be purchased for the Chipmunk). The biggest change between this and other Futaba radios is, of course, the receiver with built-in MOSFET proportional speed control. This eliminates the need for a fourth servo or a separate speed control, and since the receiver utilizes the motor battery for radio power, a flight pack battery is neither needed nor provided. To prevent loss of control due to a discharged battery, an "autocut" circuit shuts off the motor once the voltage drops low enough, allowing plenty of remaining current to power the radio for the subsequent glide and landing. Two more excellent safety features are a built-in heat protector which shuts off current to the speed control in case of an overload, and a push-button safety switch that prevents accidental motor start and possible damage or injury due to turning on the radio with the throttle opened.

The receiver/speed control operates on a six or seven cell pack, and according to the spec sheet, can handle 100 amps continuous with a 450 amp surge. Total airborne weight (with three servos) is under four ounces. All in all, this is a superbly designed system that I'm sure will become immensely popular with the electric crowd. For those choosing not to use this radio, Hirobo recommends a radio system of not more than three ounces airborne weight, excluding battery.

Due to the tremendous amount of car equipment available, Futaba has elected not to import the motor battery depicted in the instructions, leaving the buyer to pick his own. Being somewhat greedy, I decided to go for the "biggest fuel tank" I could find and selected Sanyo's 1700 SCE cells. These are the same size and weight as the 1200's, but of course, have much more capacity. They are available as a performance matched set from Revtech Industries, a leading supplier of high performance R/C car motors and equipment.

FLYING

I ran a few tests before flying to compare battery packs and the following is what I came up with. Be advised that this was an unscientific test. The seven Sanyo 1700 cells yielded a peak propeller rpm of 8300

and a duration of 3:45 (at full throttle) before auto-cutoff. A seven-cell pack of Sanyo 1200 SCR's delivered the same rpm with a duration of 2:35. A six-cell Kyosho pack (1200's) gave the longest run at 4:30, but at a much reduced power output of 7300 peak rpm. Actual flight times are of course much longer as the motor unloads somewhat and the throttle is used. The average flight lasts about four to five minutes, but on one flight, performed at a slow cruise, I managed a run of six and a half minutes followed by a 30 second glide.

All up weight came to 2 pounds, 13 ounces, which is remarkably light considering 13 ounces of that is battery. At 47 inches of span and 360 square inches of wing area, the loading is 18 ounces per square foot. Not bad at all! My model balanced close to the forward limit of the C.G. range. I set up the control throws on the ailerons and rudder as shown in the directions. However, on the advice of the people at Futaba, I reduced the elevator throw by approximately a third, giving a total of 3/4 of an inch measured at the center. This reduces the possibility of an unwanted snap at low speed/altitude.

The first flights yielded a couple of problems which, fortunately, are easily remedied. On my model, the motor would shut off after only one to two minutes of flight, then come back on for a few seconds, shut off again, and so on. What was happening was that the heat/overload protector was activating due to the receiver getting warm, which was understandable since no provision is provided for airflow through the fuselage to cool it or the battery pack. As a cure, I cut an opening of approximately 1 x 1.5 inches on the bottom behind the wing saddle, enlarged the hole in the firewall through which the motor fits, and blocked off the air outlet at the bottom of the cowl so that all air entering it must pass through the fuselage, thus removing the built-up heat. Since then I've had no further problems in the sixty degree weather we've had lately.

The other problem has to do with the landing gear. On the second landing, the model stubbed its toes on a small clump of grass during the rollout which caused both gearlegs to fold back about 30 degrees. The wire did not bend, but instead, the rather soft wood that the very ends of the gear stick into, split. This was after I had already fit larger wheels for the dirt field I fly off of. For a simple fix, I drilled out the holes in the wing (being careful not to go out of the top skin) and epoxied in some brass tubing for the wire ends to fit into. So far, this has held up even to my rather "abrupt" arrivals. If one flies off the pavement and makes halfway decent landings, this problem will probably never arise.

I wanted to get the negative stuff (minor as it is) out of the way first and save the best for last, that being, of course, how well this thing flies! The R&D guys at Hirobo earned their yen(s) on this job because the model is a delight in the air. Loops, rolls, and inverted flight are no problem. With the reduced elevator throw, the model is very reluctant to stall or spin, but it is still capable of excellent slow flight with plenty of flare for the landing. With the low stance and wide track gear, the model has docile ground handling qualities.

The only thing that is a bit disquieting (pun intended) is the almost total lack of noise as the model performs all these maneuvers. Though the gears and prop whine a bit, I can barely hear them in the air, although admittedly, years of listening to the tunes of loud motorcycles and unmuffled two-strokes has certainly affected this writer's hearing somewhat.

As far as performance is concerned, I would compare it to a model of similar weight and loading powered by an engine somewhere between a hot .10 and sport .15, which means the maneuvers are a bit more crisp when preceded by a shallow dive to gather speed. But shucks! That's the way the

big boys do it!

For those who like what they see here but are a bit short on flying experience, you might want to consider the new high wing, three-channel electric "Professor," also made by Hirobo. Whatever your decision is, I'm positive you'll be most pleased with these latest offerings from Futaba.

Manufacturers mentioned in this article are listed below.

1. Futaba Corporation of America, 555 West Victoria Street, Compton, California 90220, (213)537-9610.

2. Revtech Industries, 7401 White Lane, Bakersfield, California 93309, (805)836-9099. •

Sea Fly. . . . . . *Continued from page 20*

foam and fiberglass. Pre-drill the washers before installing them. The struts are epoxied in place after the wing and the wing floats are all painted. I could see through the fiberglass where to cut the holes in the skin to match the holes in the washers. With a balsa covered wing you will have to accurately measure and record the locations of the washers prior to sheeting.

NACELLE

The pattern for the nacelle on the prototype model was turned on the lathe from blue foam. Several layers of epoxy/glass were laid up and cured on the foam pattern, then the foam was dissolved out, leaving a hollow fiberglass nacelle. If you are going to turn a foam pattern, put a half-inch dowel through the foam and glue it in first. The foam is too flexible to turn without it. The plans also show how a circular foam pattern can be wire-cut in pieces, assembled and shaped without a lathe.

Let the epoxy/glass on the nacelle cure for a week or more before removing the foam, especially if you thinned the epoxy while laying up the glass. Thinned epoxy takes much longer to cure completely. Lacquer thinner or acetone would dissolve the foam out very rapidly, but these active solvents also soften the epoxy temporarily and invite damage to the part. It is better to use mineral spirits (paint thinner) to dissolve the foam. It is slower, but causes no epoxy softening. Also, I found that the lacquer thinner type of solvent makes a sticky mess and leaves gummy strings of partially-dissolved polystyrene on the inside of the nacelle. The paint thinner makes a mush of the foam without getting sticky. Use a spoon to scrape out the mush as you add more thinner.

RADIO INSTALLATION

On seaplanes especially, the bubble-covered plastic sheeting used for packing makes a much better material than sponge rubber for wrapping the receiver and the battery. Sponge rubber is open cell and absorbs water. Put a block of white foam or an inverted foam drinking cup under the receiver to hold it up out of any water that gets into the hull. We don't intend to have any water in the plane, but in the real world we usually have some sooner or later.

I use Futaba S29 sealed servos where I can. Seal any unsealed servos, as well as the joints and wire opening in the battery case and the receiver case, with silicone or Wilhold R/C-56 glue. R/C-56 is not truly waterproof, so don't use it for seaplane structural joints, but it resists water long enough to be fine for radio sealing. Also, put the receiver in a small plastic bag and tie the open end around the servo leads. Water in the servo connectors can short out the signal enough to cause trouble. I have at least one good crash to prove it. Water in the battery connectors and switch will not short the power out, but if it is not dried out after the flying session the presence of the voltage will cause electrolytic corrosion which will soon ruin the connectors and switch. If there is any chance of water in the plane, disconnect the battery from the switch, shake any water out of the battery connector and dry it. Once the voltage is removed from the rest of the system, it will dry safely without corrosion.

Again, seaplane flying is an increasingly popular form of R/C, but don't choose this special model as your first seaplane unless you are interested in composite construction. •

Hannan. . . . . . *Continued from page 47*

Sir Thomas Sopwith died in his sleep, age 101, during January, 1989. He had been active as a racing car driver, balloonist, self-taught aviator, aircraft designer and yachtsman during his long life. Among his companies' products were aircraft such as the Sopwith Tabloid, Pup, Camel, Snipe and WWII Hawker Hurricane.

Knighted during 1953, Sopwith went on to become Chairman of the Board of Hawker Siddely, who developed the VTO Harrier fighter, which he regarded as his all-time favorite aircraft.

Our gratitude to Ed Whitten, Mark Fineman and Curtiss Mooney for supplying information regarding these gentlemen.

NEW PUBLICATIONS

Rubber has been employed to propel models longer than anything else except gravity. Yet, for all its apparent simplicity, the successful flying of "rubber jobs" remains a specialized art, not as easy as it may appear. Thus we were pleased to see the new Don Ross book, *Rubber Powered Model Airplanes*, appear. Illustrated by Jim Kaman, who did the drawings for Bill Warner's beginner's series in *Model Builder*, the publication delves into such topics as wood selection, construction, covering, propellers, rubber itself, flight trimming, and original designing. As Ross wrote: "It has all the information I could gather from 40 years of personal building and flying, books and magazines, to give anyone a complete foundation in modeling."

Added features are brief discussions of electric and CO_2 models, reduced-size plans, and a list of more than fifty sources for publications, plans, kits and materials as well as modelers' organizations. *Rubber Powered Model Airplanes* is available from MB advertisers.

BRITISH BOOKS

Argus Books, of England, under the editorial direction of Ron Moulton, has recently published the first few in a series of R/C handbooks focusing upon basic tech-

niques. The first, entitled *Building From Plans*, written by David Boddington, would actually prove useful to builders of any sort of model aircraft, not just the radio controlled variety.

Examined are the reasons for building from plans ("Were there no satisfaction from the building as part of the hobby, we should all be flying 'ready-to-fly' models."); choosing a model subject (". . .try not to get completely out of your depth."); understanding construction plans (". . . individual drafting styles may not keep strictly to convention and some interpretation may be necessary."). Also discussed are adhesives (speaking of need for interpretation, we can only assume that "Cow Gum" is something like rubber cement. . .wch), construction, matching powerplants and R/C equipment to models, and much more. Although intended for newcomers to the hobby, we found this book an enjoyable way to brush up on techniques.

Another in this series by Argus is *Installing Radio Control Equipment*, authored by Peter Smoothy. The logical follow-up to the previous volume, this one explains the correct installation and check-out of vital R/C guidance systems, powerplant controls (gas and electric are both discussed), control mixers and retractable landing gear (undercarriages!).

We also appreciated Mr. Smoothy's written dedication to his wife, who "usually smiled" during 21 years of marriage to an avid model builder!

Third in the Argus series is *Setting Up Radio Control Helicopters*, by Dave Day, which carefully delves into the "black art" of R/C 'copter preparation and flying. Included is extensive detail regarding control linkages, adjustments, stabilizing gyros, programmable transmitters, aerobatics, inverted flying and much more, well beyond my qualifications to evaluate. All of these Argus publications are beautifully illustrated with *Aeromodeller* magazine style line drawings of sparkling clarity, as well as numerous photographs, and they are available from *Model Builder* advertisers or directly from Argus Books, Wolsey House, Wolsey Road, Hemel Hempstead, Hertfordshire HP2 4SS, England.

PLANS

Speaking of plans, as we were earlier, Al Lidberg's drafting board must seldom cool down, and his latest production is a Jumbo scale Cessna Airmaster construction drawing. This clean (no wing struts) classic spans 40 inches, and may be flown with a 12-inch diameter plastic prop or the traditional carved variety. The plans are beautifully drawn and are accompanied by complete building instructions, color information and a proof-of-scale 3-view. The price is $6 from A. Lidberg, 614 E. Fordham Dr., Tempe, Arizona 85283.

MORE PLANS

Dick Gleason has a new catalog of model plans and 3-view drawings. Featured are construction plans from *Air Trails*, Hobby Helpers, *American Aircraft Modeler*, *Popular Aviation*, and many other sources. Also offered are airfoil patterns and a unique plans finding service. Dick has painstakingly tabulated over 2,000 model plans,

and can quickly locate any of them for copying at a reasonable fee. The comprehensive catalog is $2 from: Gleason Enterprises, 1106 10th Drive S.E., Austin, Minnesota 55912.

AND KITS

Tireless David Diels has released two more rubber-powered flying scale model kits, the Curtiss SBC-4 Helldiver, and the Douglas TBD-1 Devastator. Both of these Navy aircraft are interpreted in traditional stick-and-tissue style, and are to a standard 1/24th scale. Produced in quite limited quantities, these offerings show tender loving care in wood selection, and are unusually complete, having printed sheet wood, stripwood, lightweight tissue, molded clear plastic canopies, plastic propellers, thrust bearings, quality decals, and instructions complete with documentation.

The Curtiss is priced at $14, while the Douglas costs $15.50, with an extra $2 postal charge for either kit, directly from Diels Engineering, Inc., Box 101, Woodville, Ohio 43469.

When writing to any of the manufacturers or publishers mentioned, please tell them *Model Builder* sent you!

FLYING ACES WEST COAST

For years the famed Flying Aces Club, promoters of the world's largest flying scale model contests, have conducted their semi-annual Nationals in the eastern United States.

On August 12 and 13, 1989, the California Flightmasters Club has scheduled a Flying Aces contest, according to Fernando Ramos. Included are events for rubber-powered scale, Peanut scale (with Walt Mooney rules), Jumbo scale, Power scale (gas, electric and CO_2), plus WWI, WWII, and Golden Age mass-launch events. A bonus is a catered picnic to be conducted at the judging site, in Villa Park, California.

Entry fee is $13 prior to July 30 ($15 late fee), and the picnic is $10 per person. Contestants will be sent entry forms, maps, F.A.C. rules, etc. Checks or money orders should be made payable to Flightmasters, c/o Byron Calomiris, 3406 Fela Avenue, Long Beach, California 90808.

Here's your chance to fly with many of the *Model Builder* magazine contributors, enjoy low-pressure competition, and maybe even visit nearby Disneyland to help celebrate the 60th birthday of Mickey Mouse!

SIGN-OFF TIME

We conclude this column as it began, with the philosophical thoughts of Maurice Whitta, from "Down Under": "Modeling is my fun, and my fun is to dabble. When I'm at leisure I can do without the compulsion to finish things, and if I feel like designing a wing or making a prop for some model which may never be finished, so what?

"My blood pressure's down, and the hobby costs me less than some people I know spend on grog. In fact, less than a lot of people spend on running to the doctor."•

ARFs..... *Continued from page 41*

inside the fuselage and were glued into place. Servo and receiver power was provided by a 250 mAh battery which has proved entirely adequate, providing I don't exceed an hour of air time. The motor provided with the Elec. 1800 was designed to be powered by a seven-cell battery pack, and the directions go so far as to specifically recommend the Astro Flight 8.4 volt #7407 battery pack. This left only one more choice to make, that of a speed controller or an on/off controller. The decision was completely taken out of my hands when I ran into a most interesting fellow by the name of Rainar Wiebalck, owner of High Sky R/C Accessories, 3929 Kansas St. #9, San Diego, California 92104, telephone (619)297-5792. Among other products, Rainar manufactures an ingenious little electronic on/off controller which comes with a connector to fit your receiver, whatever make it may be, and the device weighs only 1.2 ounces. He felt it would be ideal for the Elec. 1800 and suggested that I give it a try. The switch incorporates an optional brake, but I decided not to use it. Rainar advised me to take the extra five minutes to hook up the brake, but I figured that since I had a folding prop it would automatically fold back when I switched the power off. Wrong! Without a brake the prop continues to windmill furiously even though it is of the folding type. My advice is to definitely use a brake if you have one available.

The balance point location is clearly imprinted on the side of the fuselage, so the element of guesswork is completely eliminated; fortunately, the model was perfectly balanced with no need to relocate any of the equipment. All assembly now completed, the ever important question of flying weight and wing loading had to be computed. Specifications indicated that the total weight should be in the 49 to 53 ounce range, and I was most gratified to find that the Elec. 1800 weighed exactly 49 ounces, a very good sign. Using the wing area figure of 530 square inches, the wing loading figures out at 13.3 ounces per square foot, a highly acceptable value.

Now that I was the proud possessor of a handsome but untested sailplane, the moment of truth had arrived. What better place to conduct initial flight testing than at the home of the North County Clouds field at San Marcos, California, just a few short minutes from my ARF Aeronautical Labora-

tory? Bright and early on a sunny Saturday morning I stood on the apron of the model gliderport, my trusty assistant Leon Friedman at my side, and with all batteries fully charged. Here at this site dedicated to silent flight the only sound to be heard was the quiet whish as one graceful sailplane after another was winched into the calm blue sky. As I completed rubber banding the wing to the fuselage, one of the club members came up and informed me that it was my turn on the winch. I declined his kind offer and pointed out that I had no need for winches or high-starts. I determined that my frequency was clear, and as Leon assumed launch position I pushed the throttle stick up, whereupon the powerful motor came to life, spinning the prop with the characteristic whine of electric propulsion. Leon heaved the Elec. 1800 forward with a smooth, practiced motion, and she climbed straight out in almost perfect trim. Not wishing to overtax my batteries, I allowed the motor to run for about thirty seconds, at which time about three hundred feet of altitude was achieved. It was one of those practically windless days, and thermal activity had not yet begun, so I contented myself with flying in wide circles, marvelling at the flatness of the glide and the reluctance of the model to surrender even the slightest altitude. Response to both rudder and elevator input was extremely gentle, and I realized that anyone but an absolute beginner would have no difficulty in controlling this model. Stability was outstanding, as was to be expected in a well-designed polyhedral wing, and of course, the flat glide and quickness to respond to the slightest lift was a direct result of the Eppler 207 airfoil.

When the model had finally descended to about twenty-five feet above the field I restarted the motor and up she climbed, just as powerfully as the first time, and once again the motor was stopped after thirty seconds. I continued my hunt for a thermal, but all the other sailplanes were also in dead air, and even the hawks were furiously flapping their wings, so I had to settle for another slow descent. I had enough power left for one more try, but thermals were just too elusive that morning. The landing was one of those extra-smooth touchdowns, so gentle you couldn't tell exactly when the belly kissed the ground.

Since then I've put in a couple of dozen flights on this thoroughly enjoyable electric powered sailplane, and I finally found a thermal which afforded me a twenty-minute-plus flight. I expect to have a lot of relaxed flying fun with my Elec. 1800, and I heartily recommend and endorse this model with absolutely no reservations. Your favorite dealer probably has the Elec. 1800 in stock, but if not, check with Global Hobby Distributors, 10725 Ellis Avenue, Fountain Valley, CA 92728-8610. In Canada, contact Richmond R/C Supply, 8071 Alanmore Pl., Richmond, B.C. V7C 2B6, Canada.

J'TEC "SNUF-LER" MUFFLER

While it is not the main purview of this column to report on engine developments, from time to time it becomes necessary to depart somewhat from the topic of ARFs and explore other fields. Along that vein I would like to report the following experience.

Not long ago I was flying one of my favorite sport models which was powered by an O.S. .40 FSR ABC two-stroke engine with factory muffler. I was using a 10x5 fiberglass prop and my usual fuel mix which contained 5% nitro. The needle valve was turned to its customary rich setting, which produced 10,800 rpm at full throttle. The model was a trainer type and I was doing something I really enjoy, teaching someone to fly. The transmitter was in the hands of the student, and he was executing a high racetrack pattern. I mentally noted to myself how quiet the engine sounded, purring away at half throttle, not missing a beat. Presently I decided to land the model as we were nearing the end of our fuel supply, and just as I was about to shut her down for refueling, one of the other fliers came along with a decibel meter in his hand. He was doing an informal survey of engine noise, and he asked me to run up the engine at full throttle while he made his measurements from a distance of nine feet. I was genuinely surprised when he rated my engine at a solid 90 db on his meter, exceeding by far what I thought the sound level would actually measure.

Soon after this occurrence I happened to be talking with John Tatone of J'TEC about a problem I was having with a faulty muffler on my Rossi .40, a powerful but notoriously loud engine. John advised me to remove the rear end of the Rossi muffler and attach one of his Snuf-Lers to the front part of the muffler assembly. He shipped a Snuf-Ler right out to me and I had it in a couple of days. On its arrival I examined it carefully; it was a black tubular affair about as long as

the average muffler, but a bit thicker. I decided to install the Snuf-Ler on the O.S. .40 first, and if it showed promise I would then try it on the Rossi.

According to the very clear instructions from JTEC, I would first have to remove the rear half of the O.S. muffler. There are probably ways of unscrewing the back from the front part, but a half-hearted attempt produced no success. I then switched on the bandsaw and in three seconds the muffler was bisected. A quick dressing on a belt sander smoothed the edges perfectly and all I had to do then was drill one hole in the front of the muffler and bolt on the Snuf-Ler.

The next morning at the field the O.S. was fired up using the same prop, the same fuel, and exactly the same needle valve setting. The decibel meter was placed at the same distance as at the previous test, and instead of a reading of 90, it was now indicating 87, a substantial reduction in sound, right in line with the claims of the manufacturer. Furthermore, rpm's were now tached at 12,000, an increase of 1,200 rpm! I am more than impressed by this product, and I intend to use it wherever possible. In a subsequent talk with Dave Abby, co-inventor of the Snuf-Ler, I learned that even though there is an outward resemblance to certain lawn mower mufflers, the JTEC product has two expansion chambers, and when this is combined with the half muffler attached to the engine, the exhaust is then tamed by three chambers. The exhaust then passes through a special venturi designed to provide a free flow. Dave also told me that the smooth black coating on the Snuf-Ler is not just enamel, but a space age electro-deposited high temperature epoxy resin which is securely bonded to the outside and the inside of the Snuf-Ler, and this provides a more even dispersal of the oily exhaust residue, while completely preventing any baked-on deposits from forming on any of the metal surfaces.

I don't yet know what the results will be when used with engines other than the O.S. .40, but I can only assume that most .40 size engines should benefit equally. Don't be surprised if one of our major engine manufacturers soon furnishes the Snuf-Ler as standard equipment; I understand that it is a strong possibility. I think it's an excellent product, and I feel it will be widely used by modelers who are facing noise problems almost everywhere.

Well, it looks like we've greased this column in for another landing, and as always, it's been a pleasure having you along. Until next month you can always contact your old flying buddy at 2267 Alta Vista Drive, Vista, California 92084, or telephone (619)726-6636. •

Big Birds. . . . *Continued from page 13*

and Kingfisher, mourned over his trashed Turbulent for three full years (he had an exceptional love affair with that bird).

After finally getting back to the wreckage, Doug found that she needed a new fuselage, right wing and vertical stab. And this time around he made sure that the colors are true to the original N417M, which flew in 1958 and was on the cover of EAA's *Sport Aviation*. MacBrien reports that the "new" Turb flies even better than the old one did.

The point is that sometimes we need a really long hiatus before getting back to "the body" and working our magic to bring the plane back to life.

By the way, word has been passed around that four bucks to Doug will get you a lifetime supply of rivets. Not so! He doesn't have those cement-coated brass nails for sale but does recommend that you check with Aircraft Spruce & Specialty Company—they used to have them a few years ago.

BIG BIRD SOCIAL CALENDAR

June 9-11: Come to Big Sky Country and the first IMAA Regional Fly-In hosted by the Billings Flying Mustangs. They've got a great, big, flat, unrestricted piece of plain they call a flying site (the runway is paved), so you can make your final approach as long as you want to.

It's gonna be three days of flying, fun, socializing, lotsa raffles and drawings and good eats. . . and should be easy to get to for most guys up here in the Northwest. And without a huge crowd (about 100 pilots), we're talkin' about maximum flying time and maximum safety. Also, there's no landing fee, you don't need a reservation, and it's IMAA and AMA Sanctioned. Contact Event Director Donald Herington, P.O. Box 22406, Billings, Montana 59104, (406) 656-3558.

June 14-18: This is the *big one*, IMAA's 9th Annual Rally Of Giants, in Odessa, Texas.

The West Texas Magnum Squadron (IMAA Chapter 172) is working hard to insure that this Fly-In Festival's gonna be the best one yet.

They've got a terrific flying field with three paved runways (the main runway is 400 x 70 feet) and 32 feet of covered pit area. Of course, this Gathering of Eagles is dedicated to the safe, noncompetitive, relaxed flying of Big Birds and is IMAA and AMA Sanctioned. Besides the manufacturers/suppliers' displays, storing/charging tent, concessions and IMAA HQ tent, there's gonna be the traditional Friday evening picnic and Saturday night banquet. An Odessa Chamber of Commerce van will be on hand.

Pre-registration (deadline is June 1st) will save you five bucks, so if you're planning to attend send for the brochure/flyer (it has all the info and a registration form) to Robbie Carson, 6576 Amber Drive, Odessa, Texas 79762, (916)368-5874.

July 29 & 30: The Puget Sound Rocs (IMAA Chapter 108) will be holding their 7th Annual Big Bird Bash & Tea Social at the Rocs' Roost. C'mon and enjoy two full days of flying fun with us and renew old friendships while starting some new ones. The field is right next to Yelm, Washington, and is easy to find so navigation shouldn't be a problem.

Flyers are available from me or from Bruce Gale, 811 9th Avenue S.W., Puyallup, Washington 98371, (206)845-0705.

DIDJA KNOW THAT. . .

The advice your son rejected is now being given to your grandson.

The flying season is in full swing now, so don't get into any bad safety habits. An accident can ruin more than just your day. Al Alman, 16501 4th Avenue Court East, Spanaway, Washington 98387, (206)535-1549. •

Electric. . . . . *Continued from page 25*

charger alone, it cannot hold a constant voltage and may damage the charger or make it malfunction. The lawnmower battery I use holds 12 volts, but it is old and cannot hold up under the draw without the car charger on it. If I do use it alone, the voltage starts dropping, and the Navcom charger cannot hold a constant current. The current will drop and may result in an undercharge, but I have not tried to find out.

The battery pack under charge should be in good condition. The cells should be matched to about 10% or better. An uneven pack will either stop the charge too soon, or a cell may overheat and vent. Finally, the official position as far as super fast charging is concerned is that "you are on your own." The charger manufacturers and the battery manufacturers do not admit that it is possible. This is just like buying a Porsche and being told not to drive it over 55 mph or damage may result. Understood, OK? I super fast charge, the other fellows at the track are super fast charging, *but it may not be for you.* In any case, I do recommend that you use either the Navcom or the Tekin chargers, I know those work. If you free lance, you may damage some packs. I have not tried packs other than 1.2 or 1.4 Ah. I am not sure how smaller size packs will handle super fast charging. This is all on the leading edge of the technology.

I make sure my packs are matched by discharging them completely. I use a taillight bulb or a headlight bulb and let it run until it goes out, which takes about one hour. I do not leave it on discharge overnight. Conventional advice is to discharge until you see 1 volt per cell. The complete discharge runs the pack down to nearly zero. In fact, many racers leave their packs on discharge all night long. I see no problem in this. My packs are well balanced by this procedure, and they are in excellent condition. My one-year-old SCR pack, which has been through about 200 races, has better capacity and voltage than my brand new SCR pack, which has not had a chance to be broken in yet (only 6 runs on it). I maintain that year-old pack as said, with complete discharge. Quite frankly, the origin of the "discharge to 1 volt" rule is a complete mystery to me. Why is it chanted over and over by most writers? Have you ever damaged a pack by completely discharging it? In eighteen years of electric flying, I have completely discharged packs many times, left them that way, and never had damage. What am I doing wrong? The only damage I have ever had was from overcharging to the point that a cell vented. Anyhow, if discharging the whole pack to zero makes you worry, discharge each cell individually to zero instead, or to 1 volt if that makes you feel better. Now the pack should be matched well enough for super fast charging.

I recommend after you have matched the pack that you do the first charge at a conventional rate to be sure that it is in good shape. Run it or discharge it, then charge at the 7C rate (8 amps for the 1.2 Ah cells). The pack should charge in 12 minutes or less for a 1.2 Ah pack, and be warm but not hot. If the pack charges smoothly at this rate, you can charge it at an 8C rate the next time (10 amps for a 1.2 Ah pack). You will find that the pack will produce more rpm and longer duration after several super fast charges; it seems that the pack is "conditioned" by the process. My theory is that the plate material is being powdered by the super fast charging, this in turn makes more surface area accessible for charge storage and delivery. The accompanying chart shows how effective super fast charging is.

As you can see, the power delivery of the SCR and SC cells has increased from 1.1 and 1.2 Ah to 1.32 and 1.39 Ah respectively! This is a significant increase in duration and the rpm figures are excellent, as good or better than the "normal" 4C charge. I confirmed this with separate runs on the SCR pack, charged at 4A and 10A, and the 10A charge delivered 100 rpm more down to discharge. By this time the SCR pack had been charged consecutively at the 10A rate six times and the 4A charge rate delivered 76.5 Am/1.275 Ah, which is higher than I have ever gotten from 4C charges before on this pack (it normally delivers 1.15 Ah). Note, though, that the Gates 1.4 Ah pack did not show such a dramatic change. It is a brand new pack with only five cycles on it. My conclusions are that a pack must be

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thoroughly broken-in before the pack shows the full benefit of super fast charging, and that once the super fast charging has conditioned the pack, normal charging will also show an improvement. However, the effect is good for only a few hours. I did this testing over three days, and each day I had to recondition the pack once with a super fast charge before I started seeing the increased run and power. Interesting! Anyhow, this new technology seems to be just what pattern fliers, pylon racers, F3E fliers, and "hot shot" fliers want and need. Go for it! I highly recommend the Navcom Racing Plus 10 charger, contact them at 350 North Main St., Huron, Ohio 44839, (419)433-7626.

I am very impressed by the performance of the one-year-old battery packs as well; they perform every bit as well as new packs. Both are veterans of many races, about 200 for the SCR pack, about 100 for the SC pack. They have been peak charged only, no timer type charging. This speaks well for peak charging. By the way, the prices have been coming down on SCR packs. I see Andes Hobbies, P.O. Box 3077, Laguna Hills, California 92654, (800)444-2007 sells a six-cell SCR pack for $25 plus $3 shipping. CS Flight Systems, 31 Perry St., Middleboro, Massachusetts sells the Astro SCR packs at a 15% discount plus $2.50 shipping. Astro has the 900 mAh SCR packs as well as the 1200 packs. I think the SCR cells are absolutely the best, and with this new super fast charge method, they have more duration than any 1200 pack charged conventionally. Winners all around!

On to what readers are doing! John Foley sent a photo of his wild looking Diabolo, built from Hobby Horn plans (P.O. Box 2212, Westminster, California 92684). It flies on an Astro cobalt 15, twelve 800 mAh cells, and a 7x4 pusher prop. The span is 60 inches and the flying weight is 52 ounces. The takeoff is short and climb very good with 800 mAh cells; with 1200 mAh cells the takeoff is long, but flight characteristics are good. Landings have to be done carefully, as the canard and nose gear are easily damaged. The original plane flew on a Mabuchi 550 and 8 cells, but many fliers have found that this is an underpowered configuration, with difficult takeoffs. I recommend the 15 for the Diabolo. John is also flying the Electrostreak, which is available as plans from *Model Aviation* or as a kit from Great Planes. I have gotten several letters from happy Electrostreak owners, they all like the way it flies. John says his is very aerobatic with a Race Prep stock car motor and a 6x4 prop. This turns nearly 15,000 rpm on seven cells. Way to go!

Colin McKinley sent photos of his full-size Goldberg Valkyrie. It was originally built for a four-stroke .90, but was never flown that way. Colin put an Astro cobalt 60 in it with twenty-four 800 mAh cells, a 16x8 prop, and on/off motor control. The span is 10 feet, 13 sq. ft. area, 9.5 lbs. all up. It takes off in about two fuselage lengths, flies at a fast trot, and lands at walking speed. It gets to about 800 feet on one charge. Colin says the only problem is getting it to the flying field, it needs a van!

Other announcements. Astro will have its annual old timer and glider contest at Estancia High School, in Costa Mesa, California, on June 17 and 18. Both seven cell and open classes will be flown. This is where you see some really top flying!

A.C.E., the Aviation and Computer Enthusiasts, sent a sample of their newsletter. They feature reviews of programs, books, aircraft design, aircraft game and flight programs, and programs for aircraft modelers. They have disks for Apple, MAC, MSDOS and Commodore 64. Their newsletter comes out every two months and costs $10 per year; write to 2009 Camelot Drive, Las Cruces, New Mexico 88005, (505)526-5645. Have fun, and get a bigger charge out of electrics! •

CO_2 . . . . . *Continued from page 49*

hold the temperature there near 40°F and you could cram about 4 grams of CO_2 in a 5cc tank, since the charger is at a higher temperature level, but you would have to run the motor right away to avoid uncomfortable pressure buildup in the tank when you remove the ice. Even then you would not experience a good run, because there is not enough room to allow the liquid to swell when it starts boiling. It will spill into the gas tubing and stall the motor.

You can avoid overfilling and still get ex-

tended flights by going through the following steps: Apply the usual liquid charge, remove the charger, cool the tank with ice, remove the ice and charge again. Thus you are limiting the amount of cooling to whatever (negative) sensible heat the tank is capable of storing. A tank frosted from a previous run can also store enough negative heat (coolness?) to further a proper charge.

The motor will typically start at a higher rpm, then slow down, then the rpm will rise again toward the end of the run, just when the tank starts frosting up. That doesn't make any sense, because the temperature in the tank keeps on falling as the liquid vaporizes, and we know that the pressure goes down as well. The rpm should exactly track the pressure, because pressure is the force which moves the motor. Ancient railroaders could explain what's happening here with two words: "Wet steam!" Water vapors at a pressure temperature combination near the boiling point is called "wet" because it contains liquid mist and it condenses readily in cooler spots or even at flow restrictions. Wet steam could destroy a cylinder, bend a pushrod or break a shaft in a larger steam engine; here wet vapor merely slows our CO_2 engine down, but often over a sizable portion of the run.

Let's review what happens. Frost on the tank is telling us that the pressure in the system is below 500 psi so the motor should slow down toward the end of the run. The feeder tubes and motor are then probably at 50°F, which constitutes "superheat" if related to the boiling temperature of the remaining liquid CO_2. Vapors will therefore get superheated in the tubes and the motor will run on perfectly dry gas, which most likely causes the power upswing. The loss of power by wet vapor evidently outweighs the power loss caused by pressure decreases. Hence you can hold a piece of ice against the tank before each flight, to decrease the pressure in the system so that the gas reaching the motor will be dryer. This can increase the available power and extend duration. Tell that to an old pro and he will have a fit.

The above-mentioned considerations apply mostly to high performance F/F models built for the specialized CO_2 contests in Kladno (CSSR) and Budapest (Hungary). Their tanks are exposed to be readily accessible for cooling. Some contestants are using aerosol cooling sprays, few are using ice. Running times of the Modela motor have been nearly doubled in the last five years by application of these new "scientific" findings. It has been tried in the past to warm the charger, which puts more CO_2 into the system by the thus yielded higher pressure. This method proved wrong, because gas will condense in all the spots cooler than the charger and liquid will accumulate in the tubes and motor. To remedy this, cool the tank, so that all the liquid will be drawn into it and all the puddles will dry up.

When the tanks are not accessible, namely in scale models, one must resort to autocooling. The liquid CO_2 supply has to be cool for this procedure. Temperatures above 80°F are not favorable. The first liquid charge will put about 1.5cc of liquid into a 5cc container. After that the liquid is evaporated by releasing CO_2 gas through the filler valve to frost up the tank. A second charge will put up to 3.5cc of liquid into the tank. Never release the gas by running the motor, because this would cool it and the tubing, so that liquid could condense there.

What has been said here about CO_2 should enable you to intelligently judge given operational situations and foretell the consequences. You will have more fun when worrying less as performance goes down at temperatures short of "ideal." To get "maximal" charges for "best" results is only of importance if you want to beat somebody in a contest, otherwise relax and enjoy the sport!

If you have any questions, send an SASE to Fritz Mueller, 4117 Searcy St., Columbus, Georgia 31907. •

Tech. Stuff. . . *Continued from page 24*

other time.

Why a flying boat instead of a floatplane? Because flying boats are better (May '89). But beware, I'm an independent cuss. Traditions in design don't carry much weight with me. If my designs look like airplanes when I get through, it is only because I have concluded that conventional is a better way to go than anything different that I can dream up at the moment. I have a habit of challenging almost all design practices. Most of the times that I think I see a better way of doing something, I learn the hard way that my new way was not better, but that is the cross that we innovators must bear. Don't get me wrong, inventing is fascinating, and occasionally pays off.

Preliminary Design

Our example design is the latest, but not the last, of a series of experimental seaplanes I have been designing, building, and testing. It's name comes up "Sea Fli XI," pronounced "sea fly ex eye," but meaning the eleventh plane in the series. Its immediate predecessor, Sea Fli X, shown along with XI in the photo, is another flying boat

with the same wing size, wing planform and airfoil, and the same powerplant, to permit direct comparison between the two designs. Number ten is a low-wing pusher, has a lot of balsa in it, and the foam-core wing is skinned with 1/64 plywood. It flies okay, but it took a long time to build, is heavier than I would like it to be, required a pound of nose weight to balance it, and I goofed on the hull design and had to make a modification before it would get off the water. Thank God it wasn't perfect. If it had been, I wouldn't have learned anything, and would have had no incentive to design more model seaplanes.

There are two somewhat separate aspects of the preliminary design job: we must establish the configuration, and we must decide on the materials, processes, and type or types of structure. Since what we are going to build will influence how we should build it and out of what, let's tackle configuration first.

Wing Configuration

The reasons for the wing configuration, which were established on Sea Fli X, were and are as follows: It has a symmetrical airfoil (NACA 0015 or equivalent), because this is to be a fully aerobatic model, and it is fifteen percent thick, because that is thick enough to provide a good strength-to-weight ratio in the structure and thick enough to provide good maximum lift and a somewhat gentle stall, yet thin enough for moderately low drag.

It was given an area of just under 800 square inches for moderate top speed and therefore reasonable safety. My reflexes and eyesight aren't what they once were, and I fly on a lake where I sometimes have to watch out for boaters, skiers, and swimmers. We are going to design and build a light airplane. The large area will then result in a low cube loading (Sept. & Dec. '88) which will enable it to land slowly. The drag of the big wing, with only four-stroke .60 thrust, will prevent me from flying excessively and dangerously fast.

I chose a span of 66 inches and a mean chord of 12 inches, partly because they are simple round numbers, and because the resultant aspect ratio of 5.5 is high enough for moderate induced drag, yet the aspect ratio is low enough for easy construction and a light structure. My hat is off to the sailplane modelers who build wings with 20:1 aspect ratios. Structural design is a whole new ball game in that region.

I decided to taper the wing, because a tapered wing is aerodynamically and structurally more efficient. A tapered wing with a foam core is easier to make (by the pivot point foam cutting method, Feb. '89) than a rectangular wing. Tapered wings have a better roll rate for a given aileron size. Also, I think tapered wings look better. The taper is moderate because too much taper contributes to tip stalls and inadvertent snap rolls. The airfoil will remain fifteen percent thick throughout the span, because that works well and it must be constant to permit pivot-point core cutting. I will use no washout because I want the aircraft to fly the same way inverted as it does upright.

The leading edge of the ailerons will be at least as thick as the trailing edge of the wing just in front of the ailerons. Ken Runestrand, in his column in the December 1988 *RCM*, points out that a thick wing trailing edge and a thin aileron behind it is bad news. Differential aileron deflection will be used, even though this means there will be more down aileron than up while flying inverted. I don't spend much of my flight time inverted and the improvement in upright control with differential is significant. Also, differential is free. With any aileron linkage I can think of, it is just as easy to set up for differential as it is to adjust for equal up and down.

The wing tip design will be something easy to build, like slashed tips, because wingtips have very little effect on performance unless we get really exotic. Tip vortices and the induced drag they cause are going to be there, come hell or high wing tips.

Another question is whether it will be a one-piece wing or consist of plug-in panels. Maybe this belongs in the structural part of the design effort, but it is so dependent on configuration that I'm going to discuss it here. Sea Fli X was a mid-wing design and therefore had to have plug-in panels. That was one of the things I wanted to avoid on XI. This design will be shoulder wing, but the engine is above the wing. We have the choice of building the engine nacelle as part of the hull and using plug-in wings, or using a one-piece wing and mounting the engine on the wing. The latter will be easier and result in a lighter airplane.

An additional reason for building a removable one-piece shoulder wing is that it will provide an opening which is well up from the water for access to the radio. Sealing low hatch openings is difficult and they usually leak despite all. Even with a high opening under the wing, we have to do a good job with wing seating (spell that "sealing") tape.

Stabilizer

Some coming month we will get into flying wings and also canards and their strengths and weaknesses, but right now we are designing a conventional configuration

with a conventional sized stab, set a conventional distance behind the wing as determined by the conventional formula for tail volume coefficient (July '88).

On landplanes we decide to put the stab high or low according to our feelings on whether we want the stab in the wing downwash and/or in the prop slipstream. On seaplanes there is an additional concern: keeping the stab out of the water. I can report from personal experience that having waves breaking over the stabilizer is not good. In fact, it is bad.

Vertical Stabilizer

When we get the hull, fuselage, wing floats, and power nacelle all designed we will cut out a paper doll (July '88) and decide how much fin and rudder we need for proper directional or yaw stability. The area of the vertical fin will normally be somewhat larger in a seaplane, in order to compensate for the lateral area of the floats or hull. Our paper doll exercise takes care of that automatically. We hear, "You have to use a sub rudder on floatplanes." The designer of the original landplane designed it for wheels, not floats. A sub rudder is simply a fix to correct the center of lateral area after the addition of the floats messed it up. Incidentally, I don't know why it is called a sub "rudder" when it is usually a sub *fin*.

Hey, we are out of space, and it seems like we have only started. This must indicate that there are an awful lot of things to consider in designing an airplane. I will devote the next two months to finishing up this sample design. So far, the only materials we have needed are pencil and paper, plus a calculator and maybe a book or two on design. Next month we will continue with the preliminary design but then we will be ready to drag out the drafting board or spare table, or clean off the workbench, and make full-scale layouts of our design.

By the way, if you want a preview of what the drawings will look like that we are going to make, they are in the "Sea Fli XI" construction article in this issue. Even though you may have no interest in building this particular model, if you are interested in the design process, I recommend that you read the construction article anyway, because it contains a lot of material related to the design effort.

It has been said that "Wisdom consists of the anticipation of consequences." The wise designer has experienced many crashes to enable him to anticipate the consequences of poor design. •

Electronics. . . . *Continued from page 21*

thumb is that the larger the VR is physically, the greater the current it can control. VR's in the TO-92 package handle milliamps, the ones in DIP packages are generally good for an amp or so, and to go higher, one has to go to the TO-220 or TO-3 sizes. Now bear in mind that a VR rated at a certain current, for example, a 5 volt, 1.5 amp device, will not necessarily *force* 1.5 amps of current through anything it is connected to. The ampere rating is the *maximum* which the VR can supply, the actual drain being determined by the demands of whatever is connected to it.

The VR IC works equally well from a battery powered or transformer/rectifier voltage source.

Picking the right VR for a specific job is simple; it is determined by your voltage and current requirements. There is a fixed voltage VR for all the commonly called-for values. Identifying the VR can be another thing completely. The large demand for these devices has attracted a lot of semiconductor manufacturers, each of which has apparently considered it important to invent their own identification system. You can find VR's with 2N, PN, and MPS numbers, which one would naturally assume to be transistors, but are in fact real voltage regulator IC's. Some makers number their VR's with the prefix 78 for positive regulators, 79 for negative. The rest of the number is a clue to the voltage, i.e., 7805 is a 5 volt positive device; 7912, 12 volts negative, etc. Other common VR's are assigned LM prefixes, the most common being the LM-340-XX line, the XX being a digit or digits that identify the voltage. For example, an LM340T-5 is a five volt unit. The complete specs, including current ratings, must be obtained from the maker's data sheets and

are also listed in most of the larger electronic catalogs.

Again, the above units are designed to provide a fixed voltage. There is another family of adjustable voltage regulators which perform the same job, but whose output can be set at any value within their operating range with the proper external components. Such a VR is the LM723, a 14-pin DIP type VR with an output voltage of between 2 and 37 volts, at a maximum current of 150 milliamps. *Important*: remember that the input has to be higher than the output. It is not possible to take this or any other similar device and make it produce an output voltage higher than the input. Other somewhat similar devices are the LM150/LM250/LM350 family, which come in a three terminal TO-3 package. They differ only in their temperature ratings, the 150 being good down to -55 degrees C. That's about -130 degrees F, at which point I can't believe I'd be too concerned about how stable my voltages were.

But regardless of my concerns, or lack of them, the LM150, etc., are capable of handling up to three amps in the 1.2 to 33 volt range. In their most basic application, they require only two external resistors to set the output voltage. Generally though, small value capacitors are added to both the input and the output. These variable VR's are extremely useful in powering circuits or devices requiring voltages in ranges for which fixed output devices are not available, and are far better to use than the more often considered dropping resistor.

But the versatility of the VR IC does not end with its primary job of providing a fixed voltage. With the addition of usually uncomplicated external circuitry, they can be put to work in various other ways. For example, the addition of heavy bypass transistors results in much greater current capacities, and other circuits will turn them into constant current instead of constant voltage sources. I have included a few of the more common circuits, but there is simply not enough room available to cover all of the possibilities. If you have further interest in the subject, a quick note to Texas Instruments, National Semiconductor, Motorola, etc. will bring you data and application information. Or try your nearest electronics store or neighborhood library—look for VR's under the *Linear IC* section of the texts.

FEEDBACK

In January EC, we included a reader's circuit for a decoder that could be added to a two-channel receiver to make it "play" on additional channels. Well, Murphy got to it. It shows two capacitors labeled C2. Reading the circuit from left to right, the first one is correct. The second one, in parallel across R2, should be label C1; a .1 uF unit as listed in the parts list. Hey, it happens to the best of us!

That circuit brought another decoder from John Tavares, of Colorado Springs, Colorado, which John has engineered primarily for the older Ace R/C Digital Commander receiver, and for which he claims operation clear down into the noise level. Those of you interested is such, please drop me a SASE for a copy of the schematic and John's crystal clear description of how the circuit works.

ENGINES AGAIN

A couple of months ago I introduced you to a German made microscopic size diesel which unfortunately is not available. Well, this month I want to tell you about much larger ones, five and seven cylinder four-stroke radials actually, with the good news that they *are* available.

I have known of this engine for some time, having met the designer and manufacturer, Wolfgang Seidel, and having seen early versions of his engines. The workmanship is impressive, to say the least, and though I have not had an opportunity to operate one of these engines, I know they have received excellent reports in the German model press. Three of the smaller engines are being flown in a Junkers JU-52, which would be worth a trip across the ocean just to see fly.

Accessories available include a three-point firewall mount and a set of glow plug cables. Only 300 of each version have been manufactured, and each one is numbered and delivered with a certificate of authenticity. Prices? Well, what with the bouncing around of the U.S. dollar and the German mark, all I dare tell you is "about" $1800 for the 540; $2200 for the 770. There is a descriptive booklet available, but unless your German is better than mine, you won't learn much else from it other than what I have already told you. However, your letters will be answered in English. For accurate price and delivery, contact: Wolfgang Seidel, Triffelstrase 22B, 0-6729 Hagenbach, West Germany, telephone (07273)4421.

RADIO KILLERS?

Well, let's see! After the normal failures to be expected from "the cheaper the better" electronics that we insist on, and after the daily misuse and abuse that our R/C systems are subjected to, I would say that next in line as the worst enemy of airborne equipment is vibration. Engine-caused vibration, to be exact. Reducing that bad old vibration can be done by installing an engine "Flex Mount," a dampening device recently introduced by Planes & Things.

As you will see from the accompanying sketch, the Flex Mount system consists of four hard rubber vibration isolators equipped with a threaded stud on one end and an insert on the other. The stud is installed into firewall mounted blind nuts; the engine is attached on the other end with a one-piece aluminum plate solidly mounted to its backplate. The resulting isolation keeps all the engine induced vibration from being transmitted back into the airframe and subsequently, into the R/C equipment.

I have mentioned here before that the better classes of R/C equipment have been greatly improved in recent years. One of the problems that have been addressed is better vibration resistance. Such construction techniques as plated through hole PC boards and surface mount technique components have greatly increased the equip-

ment's susceptibility to vibration. Taking it one step further and eliminating as much of this vibration as possible will add even more to the lifespan of those months of work flying around up in the wild blue! The Flex Mount idea will help you in that direction.

The aluminum plate furnished will fit O.S., Rossi, Webra, and YS engines, and as a bonus, the backplate can be used as a template with which to accurately mark and drill your firewall. Prices and availability information are available from: Planes & Things, 1226 E. Ave. J-12., Lancaster, California 93535. Evening phone is (805)948-5869; ask for Jerry Budd.

THE SOPWITH CAMEL AND THE HARRIER

Just about as far apart as they can be, wouldn't you say? I recently read in the local paper that Sir Thomas Sopwith, probably best known as the designer of that famous biplane, recently passed away. "Tommy" Sopwith died at the ripe old age of 101, having in his time been a race car driver, yachtsman, balloonist, and self-taught pilot. He also designed the lesser known Pup, and the Snipe, but became known more for the Camel which accounted for 1294 enemy aircraft in WWII, including the infamous Red Baron. His Sopwith Aviation Company, through a number of the mergers common in the aviation industry, and under another name but under his control, ultimately produced the Harrier. His 100th birthday was celebrated in part with a fly-by which included both a Camel and a Harrier.

Isn't that fantastic, to have been an active part of aviation from the spit and wire days, through two world wars, to the moon landings? Quite possibly, in the high pressure business world, Sir Tommy will soon become only a picture on some factory wall, but not so at the model fields of the world. I can't remember a time without models of the Sopwith Camel, I can't imagine a time without them. And somehow, I find it hard to believe that someone who left so much that will bring so much pleasure to so many is completely dead, don't you? •

Free Flight. . . *Continued from page 52*

determine the name of this month's mystery model, write it on a card or letter, along with your name and address and send it off to *Model Builder*, attention: Bill Northrop. If you are the first one to get there with the correct answer, you win yourself a free one-year subscription. Ready? Set? Go!

THE GOLLYWOCK SAGA, PART 3

In January, I presented as the monthly three-view, the venerable rubber model by Wally Simmers, The Gollywock. Shortly after it appeared, I received a letter from Pete Sotich, who conveyed some added information from Wally about the Gollywock. Well, it happened again. I requested some further information from Pete Sotich about Wally's contention that the model flew better with a 13.5-inch propeller rather than the 12-inch prop shown in the plans. Herewith is his response: "The reason for the 12-inch diameter prop on the Gollywock is that the saw used to cut prop blanks could not handle anything larger than a 12-inch length. Maybe you could include this item for your readers."

Well, is that how classic designs come about? I guess so. In any case, it is a great old model with either the 12 or the 13.5-inch propeller.

D.T. TIMER FAIL-SAFE FIX

A neat suggestion passed this way via the *Satellite* newsletter. It comes from Lyman Armstrong. Lyman sez, "To keep the line of either the D.T. or engine shut-off from getting caught under the wire hook of the timer and face plate, cut a piece of 1/4-inch rubber about 1/4 inch long and pierce a hole in the center. Now slip this little gem over the wire hook of the line you don't want to get caught. Presto! You have a built-in line stopper."

GETTING STARTED AND BECOMING COMPETITIVE

By Terry Thorkildsen

This little gem of information comes straight from the pages of the *Satellite* newsletter edited by Ralph Prey of the San Valeers F/F Club. Terry Thorkildsen is the treasurer, and a very successful free flight competitor. Terry writes:

"Have you ever wondered why some modelers become quite proficient at building, trimming and flying competitively whereas others have a hard time acquiring these skills? Some people have a natural

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duke's mixture

When your motor quits at the wrong time, and there is still fuel in the tank, blood pressure goes up, and sometimes airplanes get bent. Unfortunately, there is no simple answer, like replace transistor XX, and all will be happy. However, with some systematic exploration, problems can usually be sorted out and corrected.

First, it is important to understand that when a model airplane motor quits unexpectedly, 99 times out of 100 either it isn't getting fuel, or else the glow plug has cooled to a point where it won't fire, (flameout). A flameout usually occurs when the motor has been idled back and then quits upon giving it the throttle. An interrupted fuel flow is usually the cause when the motor quits at full power, or nearly full power.

Now, first let's consider possible causes of fuel interruption. If a motor seems to run well on the ground and the first two or three minutes of the flight, then quits when you put the airplane in a climb, you can almost always assume that the tank tube has cut a hole in the flopper tube where it slips over the sharp tank tube end. When the fuel level is burned down a little bit and the airplane is nosed up, this hole is uncovered and the motor sucks air and dies from fuel starvation.

A second possible problem is that sometimes the flopper tube will fall forward and get stuck. The third cause of fuel flow interruption is caused by too long a tank flopper tube. In a fast pass situation the fuel wants to fall forward on the approach, but there is not enough downward pitch to bring the flopper forward. The solution that seems to work well for me is to shorten the flopper tube so that the flopper tube weight is about 2/3 of the way back in the tank. This way your tank has be to almost empty before this effect becomes evident. If none of these seem to explain the problem, then it is reasonable to assume that you have dirt or some obstruction somewhere in the fuel line.

Flameout problems are harder to put your finger on. First thing to do is to try a new glow plug. Very often a glow plug will be come coated with impurities of some type and will become ineffective. If a new glow plug doesn't correct the flameout problem, then go over the low speed mixture adjustment procedure. In Fox motors, we have the best result when there is enough fuel in the carburetor and crankcase for the motor to run on from 6 to 8 seconds after it is shut off. You check this by running the motor at idle with the glow plug heater on, and pinch the fuel line just back of the nipple. If the motor runs on more than 8 seconds, then you want to lean the low speed needle in. If it stops immediately, then you want to back it out a little until this run-on time is achieved. This should be done with the high speed needle set on the rich side. After the low speed is set, then set the high speed in accordance with your airplane's needs.

A restriction in the exhaust pressure supply will tend to flood the motor in a throttle back situation, particularly with a large, spongy plastic tank. The solution is to clear the line and enlarge the pressure fitting hole.

It is not unusual for a light, high powered model to have a carburetor properly set, but when you give it the throttle for take-off, then the motor staggers. This is caused by cavitation of the fuel line. A good 40 size motor will produce 6 or 7 pounds of thrust at take-off, and if you have a 4 pound airplane, there is no way that the fuel is going to continue to feed the carburetor. You can sometimes trick this situation by routing the fuel line around the front of the carburetor, and then looping it into the carburetor so that there is a little fuel in the line past the cavitation point.

One of the most often made mistakes is in idling a motor too rich. A motor will continue to idle and do very well with a surprising amount of fuel accumulated in the crankcase. However, when you advance the throttle, and the motor speeds up, this is sprayed into the upper cylinder and it is pretty hard to keep a glow plug lit with a fuel stream spraying it. The solution, of course, is to adjust the low speed needle leaner (in).

Some lesser likely causes of a motor quitting that I have run across are as follows: Once I found a piece of fuel tubing in which a sliver on the inside had become peeled off and it acted like a foot valve. It would pass fuel slowly, but when the fuel demand became great, then the piece tended to flop over and close the passage. Another time a customer brought me a motor that just positively would not idle, or even run at partial throttle. Upon disassembling the motor, we found that the owner had "hopped the motor up" by smoothing out the ports and radiusing the upper lip of the piston. In this particular case, the small radius completely changed the scavaging flow and the by-pass was spraying the glow plug. Now, another cause of a motor quitting at idle or low throttle is moisture in the fuel. It only takes 8 or 10 drops of water in a gallon of fuel to completely destroy its idling ability. On a day that might have 95% humidity, if you leave the lid off for 1/2 hour, what is going to happen is that the fuel will evaporate, and as it evaporates it cools, and as it becomes cooler than the surrounding air, it reaches the dew point. Water then condenses on the wall of the container, both inside and outside. The water on the outside, of course, doesn't do anything, but the water on the inside becomes mixed with the fuel, and, presto, you have a half a jug of fuel that won't idle worth a XXXX. The only solution is to toss it and get another can. Probably the best insurance you can buy against a flameout is to use a Fox Miracle Plug. If you haven't tried one, you should.

Happy Flying,

Duke Fox

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competitive drive which certainly helps at the contest end, but there are other things that can develop a modeler's skill even if he just wants to stay at the sport level.

"When I grew up as a kid, my father wasn't into modeling, so the skills I picked up came from trial and error plus observing and asking questions of the master modelers and fliers. This is an important point since most modelers are happy to share their knowledge with you and will answer any questions that you might have. Ask your local hot-shot flier the questions you have, to avoid wasting time doing things the hard way and to learn things that they already know.

"It is important to pick a good easy-to-trim model to start with. There is a lot to say for flying hand launch gliders and small rubber models prior to starting out with a gas model. P-30 and Pee Wee 30 are two great events to get your feet wet. For the life of me, I don't understand why some experts don't leave these events just to the beginners and novice fliers instead of making them one more competitive event that they also fly. Two good models for these events are the Square Eagle for rubber and the Busy Bee design by Bill Booth, which appeared in *Model Aviation*. Both of these models are available in kit form. (The Square Eagle is kitted by Blue Ridge Models and the Busy Bee by Campbell's Custom Kits.)

"The Nostalgia event is a great way to get your feet wet and is a lot more relaxed type of flying than modern AMA gas. Two excellent models that are easy to build and trim are the Ramrod and the Top Banana. There are other good ones, but there are some that you should avoid.

"The Spacer and the Playboy Jr. are both models that don't have much stability. When I was a kid, I built an AB Spacer, and my friends had warned me that it could be trimmed perfectly but that if it stalled off, it might spiral all the way to the ground. After this happened to me once, I chucked the fuselage and made a longer one, increased the stab area, and flew it with no problems after that. I even used a variety of engines on this ship. (Note: The original Spacer could use a slightly thinner airfoil on the stab, only 1 to 2% less would do it, to decrease its sensitivity. This modification is highly recommended to any Spacer.) Before you dismiss this as my experience as a kid, I have since seen class fliers like Dick Lyons and Ralph Prey try unsuccessfully to fly these. This lack of stability is published in a chart on page 89 of the 1959 Zaic Yearbook. This chart also shows that the Zeek and the Civy Boy are trouble.

"If you can scratch build and like Old Timers, then two excellent models are the Alert and the Kerswap.

"After you have become proficient at Nostalgia, and if you want to fly modern AMA gas, then the models that I would recommend are the Shocer, Max Hog, Maverick, Orbiteer, Pilfered Pearl, or Astrostar. There are kits available for the first four. The Pilfered Pearl and Astrostar must be scratch built, but both are NFFS Models of the Year. Plans are available from NFFS Plans Service. The Astrostar was featured last December in *Model Aviation*. Full-sized plans are available from them.

"Of the above models, only one has elliptical tips (the Maverick) and there is a good reason for this. Elliptical tips are harder to build flat and straight since you have to be more careful with the grain of your wood or you will get free warps in the form of washout or wash-in that you don't want. I would also stay away from high thrustline models if I had just started. This design type doesn't recover from a stall well.

"I wouldn't start out with a fire breathing Schnuerle hot rod in gas but instead work into it slowly with a good 1/2A or old style baffle type engine such as a Max .15. Keep it simple and avoid any VIT or fancy timers until you get your skill level mastered. Don't try to go too fast too soon! Baffle type engines start easier, and you don't need 40 to 60% nitro when you are getting the basics.

"After you have selected and built your model, then let one of the local experts look it over for you. You want to make sure all of the flying surfaces are flat with just a kiss of wash-in on the right main panel. You should not see any rudder offset when viewed from the front. The best article ever written on trimming a modern gas model was written by Ralph Prey in the 1979 July and August issues of *Model Aviation*. The Florida Modelers Association has a manual available on free flight trimming. This manual contains Ralph's articles on trimming along with many other good articles and is well worth the $8 plus $2 postage. Order

from Terry Rimert, 367 Orange Ave., Baldwin, Florida 32234.

"After you have looked the model over well and checked out the glide, then ask for help on trimming the first couple of flights until you get the model flying safely.

"It is important to get a mentor or flying buddy who can help you through the first few flight stages until you get your skills to where you don't need any help. Maybe you don't like to bother someone and ask for help while they are flying at a contest, but it doesn't take that long to look a model over. Trimming can be done during the off-periods of the contest or at a test flying session. Most modelers would be happy to help get a new modeler going in the right direction, rather than lose him if he becomes discouraged from too many crashes.

"To sum it up: Look and learn from the experts. Choose a good, easy-to-trim model with a mild engine. Build the model without warps, and get help for trimming or anything else that poses a question for you."

THE GEODETIC GALAXY REALLY DOES RETURN

Some months ago, I reported that John Anderson was reproducing the Geodetic Galaxy kits that were produced in the late '60s and early '70s. Here's the latest. It can be purchased directly from John Anderson at Galaxy Model Co., P.O. Box 4842, Covina, California 91723. The cost is $24.95 plus $1.62 for postage. The ship is a fully geodetic 1/2A pylon style free flight. The fin is mounted on the stabilizer and the surfaces are rectangular. As I recall, the wing area is about 320 sq. in.

John also notes that the Galaxy 585 and Vic Cunnyngham's Maxi 1/2A will be available before the summer flying season.

If John's kits are anything like the earlier version, they will be extremely well produced with fully cut parts from high quality balsa. The Galaxy is a model that Terry Thorkildson could have included above in his list of kits that would be worthy of consideration for a first free flight.

I'll try to get a picture of a Galaxy for a future issue so you can see for yourself.

BILL BAKER HANGS IT UP

I just got a copy of one of my favorite newsletters, the *Okie Flyer*, edited by Bill Baker. This was issue 34, and according to the text it is the next to the last that Bill will be publishing. He notes that, "It isn't fun any more."

Bill does promise that issue number 35, his last, will be a humdinger. I look forward to getting my hum dinged.

It's always sad to see one of the good ones take a hike. Maybe the *Okie Flyer* will reemerge some day with the same mix of humor, acid commentary, and tips. I hope so.

A FREE FLIGHT GLOSSARY OF NOTABLE SOUNDS

From the pages of the *Minneapolis Modeler* newsletter comes this enjoyable collection of well-known, but now defined, sounds from the free flight field:

SPLUNK: sound made when model, under full power, hits soft ground. Has hollow sound.

SPLAT: sound made when model, under full power, hits hard ground. Sharper sound than above.

SPRACK: sound made when model, under full power, hits very hard ground, such as concrete. Very sharp sound like a rifle shot.

SPROING: sound made when model, under full power, hits metal object such as an automobile. Has definite ring to it, easy to distinguish.

SPLOOSH: sound made when model, under full power, hits body of water. Also easy to recognize.

SPLACK-ECK-ECK: sound made when model, under full power, hits woods or branches. Similar to Sprack but has what sounds like an echo.

Submitted by Don Spehn, president of the Minneapolis Model Aero Club.

THAT'S IT DEPARTMENT

That looks like the end for another month. I am getting excited about the upcoming outdoor contest season, and I hope to share pictures of my newest B ship with you in a month or two. I'm ready to fly. I hope the weather cooperates. If you are flying already, catch a thermal for me. •

Choppers. . . . . *Continued from page 31*

an articulated rotor with zero flap hinge offset. But not quite, because each of the two blades cannot flap up and down individu-

ally, thus it does not meet the definition of an articulated rotor as we defined earlier. The two-bladed teetering rotor was invented by Bell Helicopters in 1940. It is a very simple and effective design so it has endured. Hence, it has been chosen for R/C helicopter use. Have you ever heard a real two-bladed Bell Huey fly overhead? It is a noisy son of a gun. It has that distinctive two-per-rev whopping noise. That pounding bass sends vibrations down your spine. It makes a heavy bass noise because it only has two blades, thus each blade has to work harder than a 4 or 5-bladed rotor. We don't hear a low bass drum-like noise on our model helicopters because our model rotors spin at 1500 rpm, unlike Huey rotors which spin at 300 rpm.

How is the control response on a two-bladed teetering rotor? Full-size helicopters like the Bell 47, Jet Ranger, and Huey have *free* teetering main rotors. They are like model helicopter rotors with the rubber damper removed. Bell designers chose to have the blades teeter freely to minimize the vibration transmitted through the shaft to the cabin. Consequently, the control response is very poor. That's why you never see a real Bell 47, Jet Ranger, or Huey do a loop or roll. Since model helicopters do not have to carry passengers, model helicopter designers decided to add a spring restraint at the hub of the two-bladed rotor to improve the control response by allowing the flap moment to transfer from the main rotor to the fuselage. During the past 10 years, we learned to call this rubber piece a "rubber damper." Technically, this is completely wrong, because this rubber piece is providing spring action like the spring steel plate in the Baron 28 hingeless rotor example. It acts like the coil spring on our car suspension system. We describe it with the words "stiff" or "soft." The shock absorber on a car's suspension provides damping. We describe damping as "strong" or "weak." Please remember that the rubber damper is there to provide *spring stiffness*, not damping. So please don't say, "The softly damped rotor is what makes the Concept so docile and forgiving."

The flap spring stiffness on GMP model helicopters is controlled by compressing the rubber damper inside the main rotor yoke. The flap stiffness on Schluter, Heim, and X-Cell main rotors is controlled by using thicker washers, or by adding extra washers to compress the two O-rings inside the main rotor hub. By adjusting the rubber damper stiffness, we can give our model helicopters an equivalent flap hinge offset of anything from about 3% to at least 12%. The full-size aerobatic BO-105 that can perform loops and rolls has an equivalent flap hinge offset of about 12 to 15%. Increasing the main rotor flap stiffness increases the control power, increases the angle of attack instability, increases the speed stability, and increases the rotor damping. These results consequently affect the helicopter's static and dynamic stability and control sensitivity. Thus, flap stiffness is the most important design parameter on any helicopter.

You are probably wondering about the lag hinge; does it affect the stability and control of helicopters? The answer is no. Blade lead-lag motion can affect the aeroelastic stability of each blade, and might cause the helicopter to shake, but lead-lag has no effect on helicopter handling qualities. For R/C helicopters, the main and tail rotor blade attachment bolt also functions as the lead-lag hinge. Should we tighten the blade mounting bolt so there can be no lead-lag action, or should we make it loose and add a coil spring, or make it loose and add a lead-lag damper? The answer is to make it loose and add a lead-lag damper. We want to allow each blade to have the freedom to swing fore/aft because as the blade flaps up and down, due to a phenomenon called Coriolis force, it will make the blade swing forward (lead) as the blade flaps upward, and make the blade swing back (lag) as the blade flaps downward. If the blade is not allowed to lead-lag, then stress can build up at the blade root which can cyclically fatigue the blade and lead to premature failure. However, we don't want the blades to lead-lag totally free either because the blades can swing fore/aft too easily and may oscillate at a frequency that is very close to the helicopter fuselage's natural frequency. When this happens on the ground it's called ground resonance; if it happens in the air it's called air resonance. When resonance occurs on a full-size helicopter, it can destroy the helicopter in less than five seconds. The phenomenon is similar to a female vocalist singing at the natural frequency of a wine glass and causing it to shatter. You may have observed this ground resonance phenomenon on an R/C helicopter when the blade bolt is too loose, so you see the helicopter rocking laterally on its skids as the rotor rpm is revved up. Thus, for R/C helicopters we always want to tighten the main blades snugly so they can still swing fore/aft, but so that there is sufficient friction to prevent the blades from oscillating. People will ask you, "Is the blade allowed to pivot so it can swing back when it hits the ground?" The true answer is no, it is done in order to reduce the chordwise stress at the blade root. On full-size helicopters, rather than tightening the blade bolts, a shock absorber-like damper is used to impede the blade from lead-lagging very freely. This unit is called a lead-lag damper. Frequently, Delta-3 and Delta-4 hinge offsets are used to reduce excessive blade flapping angle. The X-Cell uses Delta-3 on the tail rotor. The GMP Legend uses Delta-3 on the main rotor. I have explained Delta-3 in Issue 3 of *International Helicopter* magazine, but next month I will touch on it again. Figure 6 shows the lead-lag damper on a Bell Huey. (Note that the real Bell Huey and all the full-size helicopters manufactured in the U.S. have counter-clockwise rotation main rotors when viewed from the top. Only the French and Russians have clockwise rotation main rotors.)

Have you wondered where model designers get their rotor head designs from? Figure 7 is a picture of the real Bell UH-1

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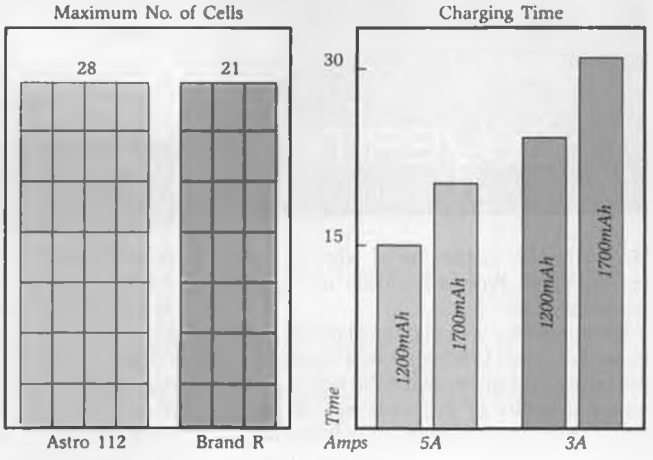
DC/DC CHARGER COMPARISON



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Huey main rotor hub; doesn't the Hirobo/GMP Prohead shown in Figure 8 resemble this?

Next month I will start explaining stability and control. Later on, I will explain how the stabilizer bar improves the static and dynamic stability of R/C helicopters. Meanwhile, play around with your flap stiffness to discover the right control sensitivity for you.

* * *

Besides discussing helicopter theory, I want the readers of "Chopper Chatter" to be the first to hear of any new R/C helicopter related products from around the world. What's new? The four major helicopter lines in the U.S. have each introduced a new helicopter. Kalt introduced its Cyclone II in Japan. I have seen the pictures. It has a molded rotor head, built-in autorotation clutch, and a new canopy design. Hobby Dynamics will probably bring it to the U.S. this summer. Miniature Aircraft Supply will introduce an X-Cell 30 later this summer. As I was told by Mr. Walt Schoonard, the X-Cell 30 will be in kit form, with a retail price around $399. They also have some new fiberglass blades and a tachometer under development. I have not seen any of these yet, but I will tell you more as soon as I receive more details from these two manufacturers.

GMP introduced a very inexpensive .40 size helicopter specially designed for beginners, called the Rebel. The Rebel has a hi-tech composite rotor head. I have seen it and I am very impressed by its simplicity and stability. The Rebel has lots of inherent static stability, and minimal aerobatic capability. For beginners, I think that's ideal. How stable is it? GMP demonstrated its stability by putting it in a hover, then putting the transmitter on the ground for a few seconds. You can't beat that for a beginner machine. The Rebel is a fixed-pitch helicopter with minimal parts count, but all the parts are of the usual GMP high quality. It's interesting that a manufacturer has designed a helicopter just for beginners, rather than like most of the beginner helicopters on the market now, which are designed as all-purpose beginner to advanced flier machines. I was skeptical of the idea of fixed-pitch helicopter for the '80s, but the Rebel's stability is impressive. A super-stable .40 size machine that can be purchased at the hobby shop for less than $200 will make the Rebel popular. GMP says the advantage of a .40 size machine versus the smaller ones is that it is big enough to be seen, less affected by wind, and most important of all, beginners can use one of those very inexpensive .40/.45 size engines on the market. The Rebel will the first R/C helicopter in the world to be accompanied by a $15 videotape that takes the beginner from building to setting up, trimming, and flying. Not a bad idea! The Rebel is scheduled to be out at the end of June.

Schluter has released a new .60 size aerobatic machine called the Magic. It will retail for around $799 and should be available in stores this summer. The Magic has many common components from the successful Scout, such as the main rotor head, three rocking servos control system, 45 degrees offset swashplate, cooling system, and molded landing struts. The new features are a molded servo tray, thrust bearing in the tail rotor blade holders, new tail rotor gearbox, and new power train layout. It also has a revolutionary spring loaded starting system. The engine starting shaft engages the engine only when the electric starter is pressed down on the starting cone. The starting shaft disengages when the starter pressure is let off. This system reduces the engine vibration transmitted to the frames. I have seen the engineering drawings, and the Magic looks pretty good. There will also be an optional driven tail rotor conversion kit, and a gel-coated Jet Ranger body for the Magic. There is a Magic Ranger kit which includes the mechanics and the fiberglass body. Want to know more? Hold your breath for a thorough review in an upcoming issue of *Model Builder*.

What's new in helicopter radios? Airtronics has just introduced a new Vanguard line of high-quality, but inexpensively priced FM and PCM systems. They are in the two to three hundred dollar range.

I want to thank all the readers who called or wrote. In the future, if any reader has questions regarding helicopter aerodynamics, dynamics, or stability and control, feel free to write me. If you include a self-addressed and stamped envelope, I will try to respond within three days of receipt of your letter. How about telling me what's happening in your neighborhood? Do send pictures of you, your helicopters, or at least tell me what helicopters, radios and en-

gines you fly, so I know what examples to use in my articles. Fair enough? My address is P.O. Box 692, College Park, Maryland 20740, (301)589-0855 or (301)454-8601. •

Plug Sparks. . . *Continued from page 39*

MacFarland, a German die-maker, machinist Lem Pratt, the chemical engineer, and the designer of the engine, C. H. Stevens. MacFarland was the P.R. man and as such, negotiated a contract with the Hearst newspapers via Mr. Giles of the L.A. Herald Examiner.

The contract called for production of the motors, fuel, and later on, airplane kits based on the model, designed and flown by a young modeler named Irwin Ohlsson. Hearst was hoping to distribute these as prizes to the Examiner newsboys obtaining a prescribed number of subscriptions. One can also detect the early stirrings of the Junior Birdmen, a Hearst national organization that made its appearance in 1934.

One of the problems of this motor was the amount of heat generated, making it necessary to use mica as a replacement for celluloid for the cabin windows. The dirty deposits which formed every time the engine was fired up required frequent cleanings. This shortcoming can be appreciated when one has to completely disassemble the engine and clean it out.

The model that Irwin Ohlsson had built to replace the impractical all-metal Lockheed Vega was an excellent performer, although care had to be taken on dry grassy fields which were prone to catch fire.

In 1934, Ohlsson decided to go into the model business himself, marketing the Cruiser kit, wheels, and other miscellaneous items (all before the Ohlsson Miniature). Irwin recommended a high school boy by the name of Ira Hassad take over as chief model builder and test pilot for the Moto-Toy/Examiner project.

Came the day the Herald Examiner decided to make a formal demonstration of their project. Anybody who was somebody was invited to watch the flying. With reporters and photographers on hand, Ira Hassad closed the pressure relief valve to gain a little more power. Whether this had to do with the debacle that followed is moot. The model flew beautifully. Just about the time everyone was thoroughly impressed, the model exploded in midair.

Following a conference, the engine project was abandoned on the premise the engine was too dangerous for young modelers to handle. The program actually died aborning!

As an afterthought, Irwin recalled the engine could blow up anytime—and they did, infrequently!

Specifications, as given by John Brown, are as follows:
Output: 1/25 hp at 2,500 rpm
Bore: 3/8 in.
Stroke: 1/4 in.
Weight: 8 oz.
Weight without tank: 3 oz.

Of interest is that the shaft and piston were made of steel, with the latter employing brass rings. Conrods were made of aluminum. A most unusual engine!

20 YEARS AGO, I WAS. . .

Stew Wieneke of 110 E. Main St., Libitz, Pennsylvania 17543, writes to say that after reading the Plug Sparks column in *Model Builder*, he felt like he had just crawled out from under a rock! He had not built a model in fifteen years! He writes:

"Things have changed a bit; R/C helicopters, 7-channel R/C units, digital pulse control, electric propulsion. . . what a revolution!

"However, my interest in model airplanes was rekindled by my sons (ages 5 and 2) who seem to be developing an interest in airplanes. One day, as I was telling my oldest son about the planes I used to build and fly (consisting of free flights and control line) I thought I would try to promote his interest by buying a kit and showing him how it was done.

"Back in the sixties and seventies, virtually every store with a toy department had a few balsa kits on hand. Not any more! I searched for over a week and found an Arts & Crafts store that sold balsawood for doll house furniture. I bought some wood thinking I might be able to scratch build something with the handful of leftover parts that had survived the years.

"After a few days, I actually produced a rubber powered biplane that somewhat resembled a Curtiss Jenny. In making it simple and durable, I made the parts of solid balsa using two pennies to balance it. Necessity is the mother of invention. I had never carved a propeller before, but I persevered and it did look good hanging up in the son's bedroom.

"Deciding to see if it would fly, I took it out and wound the rubber thread as tight as I dared (15-year-old rubber!). Set it on the sidewalk and let go. Surprise! The model lifted off and flew a short distance. Although the performance was nothing to brag about, I was delighted with the flight.

"That's when I realized this is what this hobby is all about. I don't want my kids to grow up thinking that this hobby consists of buying an airplane in a store, starting it up, and then tossing it in the air.

"I feel there is only one way to get satisfaction of having 'done something.' Not simply flying the model, but building them as well. Don't misunderstand, flying model airplanes is fun, but flying is a concept. The idea you scrawl on a napkin during your coffee break is the real challenge! That sense of accomplishment is something that has been missing from my life for years. I had been too busy to realize it!

"I started drawing up my own plans, but not being very experienced at it, I have sent for your rubber powered model catalog to find something I would like. There is a scarcity of parts around here. I finally found a decent hobby shop just as it was in a "Going out of Business" sale. From now on, looks like I will have to depend on mail order and the information in *Model Builder* magazine.

"After reading Bill Northrop's 'Workbench' column (March 1987), I feel James Bocckinfuso was right. High-tech R/C models are fine but anyone who thinks there are no interesting challenges or rewards in building and designing O.T. type free flights is thinking *wrong*.

"Thanks to your column and *Model Builder* for giving us a fine magazine devoted to fun and a rewarding hobby."

SAM 4

Talking to Karl Spielmaker, SAM 4 spark plug, is always a fun experience. "Bearing Von Spielmaker," as he has titled himself, is a versatile fellow who builds and flies O.T. models of all sorts, writes and publishes a newsletter, manufactures engines on the side, and in his spare time, manages and runs the MAM Mini-Champs. Wotta glutton for work!

In a recent phone conversation with Karl, we got on the subject of Jimmy Allen models. The ill-fated International SAM Champs proposed for Reno, Nevada was to have the Jimmy Allen Races as of old. This writer mentioned he has a J. A. Silver Streak ready to fly.

This prompted Karl to immediately send out Photo No. 5 of his Monsoon Clipper as originally produced by Country Club Aero Supply of Kansas City, Missouri. Pop Schreiber (now deceased) was responsible for the Jimmy Allen plans, so it is no great surprise to regard the balance of the plans put out by Country Club as Johnny Allen inspired.

Karl also reports a tremendous upsurge of interest in model airplanes. Even the boob tube doesn't stop them. A surprised Karl reports this is where the interest started: on TV!

SAM 7

We have been receiving results of the three annual contests held by SAM 7, the Spring, Summer, and Fall meets. While results are fine, photos are so much more effective.

To that end, George Armstead sent in a photo of his Nelder Moffett in response to the article I ran in this column several months ago.

George says he built the Nelder model back in 1979 and Photo No. 6 shows it does fly! The photo may be a bit dated (1982) but it was only recently that the *Model Builder* office cleaned out their files and this writer received many letters, photos, and goodies that have been overlooked all these years.

On the model's flight characteristics, George says it flies better using the two-bladed propeller shown on the plan. The propeller instructions state both blades can be hinged, making it an eligible SAM feature.

For those who don't read plans too thoroughly, the plan gives more explicit trimming instructions than what appears in the 1941 magazine article. At age 14, George made a successful flying Nelder back in 1941. How about that?

READERS WRITE

Received a most interesting photo from Harvey Pastel of 1 Heritage Place, Suite 105, Manchester, Connecticut 06040, wherein he states that the Thermic 50 seen in Photo No. 7 was built back in 1949.

The model has languished in his basement but is still in good shape, needing partial recovering. This writer would like to mention that Harvey might consider converting the model to R/C. The O.T. R/C Glider event is gradually gaining acceptance on the West Coast and its affiliated ten SAM Chapters.

Using the same high-start for launches, this pretty well puts flying down to skill and, of course, some luck. Leaving it as a free flight does restrict activity as only one club, SAM 7, offers this event.

MORE READERS WRITE

Also received a nice in-flight photo of a Henry Struck Record Hound, from Dick Gibbs, 2570 Edgewood Lane, York, Pennsylvania 17403. As seen in Photo No. 8, no problem at all.

Gibbs, who writes the Electric column for *Flying Models*, says when he was asked for trimming tips on the Record Hound, his recommendations resulted in a 40% loss of performance and now asks "Howcum?"

On the West Coast, Howard Osegueda has had phenomenal luck with his Super Cyclone powered Record Hound. The writer did note he employs a rather shallow climb angle, but the model moves out very well and does end up at a very respectable altitude. The glide is all that is claimed: superb!

ANOTHER OLDIE

Back in 1974, Earl Rodriguez, Box 175, Lacombe, Louisianna 70445, wrote to *Model Builder*, sending in Photo No. 9 showing Earl on the left. The two are test running a Brown Jr. engine.

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RC is suppose to be fun—not terror filled anxious moments.

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Although he is not certain, the photos were taken in the middle forties. The other photo of the Bantam speed model has been lost so we have no identification for Earl's assistant.

Earl is (or was) a member of the SAPS of Picayune, Louisiana and indicates that at that time, this energetic young club was quite active in putting on displays at the shopping center malls. Hope they have been able to continue to spread the "gospel of SAM."

ENGLAND

In an exchange of plans and photos with Keith Harris of England, I was struck by the good looks of a Nostalgia design, the "Hermes" as kitted by Halifax Products and seen in Photo No. 10.

This 1946-7 design (available from John Pond Plan Service) built by John Down, is a dandy flier utilizing a 1.5cc diesel or smaller. This particular model has won numerous contests and is well worth looking into for a possible competitive model in the Nostalgia event.

FREE PLUG DEPARTMENT

While sitting at my booth at the I.M.S. Trade Show in Pasadena, I was approached by old time friend, Dick McCoy. As many modelers now know, McCoy is back in the business of selling parts to the various size McCoy engines.

Dick has now ventured into the glow plug business and left three for me to look over. He is, at present, marketing three types of plugs: MC 59 (hot plug), MC 104-8 (cold plug), and the MC 104-9 for ducted fan type engines. Not sure if I got the dope right, so the best idea is to write: Dick McCoy Model Engines, 5674 San Bernardino St., Montclair, California 91763.

AUSTRALIA

Ever so often we get good pictures from Australia, as can be seen in Photo No. 11. Of the three photos submitted, we selected the "bare bones" photo of the Cumulus as built by Martin Simons.

The main reason for showing the structure is to illustrate the typical Ben Shereshaw construction techniques. All the Shereshaw designs, the Cavalier, Nimbus, Cloud Cruiser, Champion, etc. show the same construction; i.e., sheeted wings, box spar arrangement, and the same basic outline of the tails. Many other models of that period reflect the influence of Shereshaw, as the same sheeting and construction techniques are utilized.

NEW SAM CHAPTER

A letter came in from Dick Brace, 6121 North Hampton Place, Wayne, Indiana 46815, announcing the formation of SAM Chapter 28. "Meetings are being held at the cafeteria area of North American Van Lines. We call ourselves the Flying Circuits (F/C) Old Fort Flyers. C'mon down to the Breakfast Club at the Speedway Club at 8:30 a.m. and get acquainted. Call 485-8673 for directions."

AUSTRALIA AGAIN

Just about the time we were going to press, Photo No. 12 showed up from Dave Hipperson, P.O. Box 297, Victoria Park, West Australia 6100. This is really a good shot of a Petrides PB-2, one of the lesser known Texaco type models. This is not to say this design won't win, as it has many times in the past.

Problem with today's competition is that too many of one design is being built. A case of "monkey see, monkey do." There is an implied guarantee of success when one picks out the most popular model for competition. All too true, one does have a better chance, but is that what we really want? One design model contests?

Closing off, David did send pics of his other models including an English Cloud Airmaster and a scaled Bay Ridge Diamond Demon. Little bit of variety there!

CONTEST ANNOUNCEMENT

SAM 58 is again putting on their 3rd Annual R/C Assist O.T. Contest in Central New York. This meet is scheduled for June 10-11 at Grenadier Field, Caughdenoy, New York, 10 miles north of Syracuse. A total of twelve events will be held over this weekend. For information write C.D. Dick Sargent, 105 Chestnut Hts. Dr., Liverpool, New York 13088.

SAM CHAMPS

By now, everyone knows the proposed International SAM Champs at Reno during the month of June has been shelved. In its place, the SAM Champs are now scheduled to be held later in the year on October 8-13 at Jean, Nevada.

Jean is located 22 miles southwest of Las Vegas on I-15. The SAM Headquarters will be at the Gold Strike Hotel/Casino. Flying will be at a large dry lake north of Jean. For info, write to Contest Manager Larry Jenno, 4341 Flanders St., Las Vegas, Nevada 89121, telephone (702)731-4029.

WAZ YOU DERE, CHARLIE?

Finally heard from "Doc" Chuck Patterson, former prexy of SAM 49. After going up to the Northwest for awhile, imagine this writer's surprise when he received a letter from Patterson at 448 North Hwy. 89, Suite F, P.O. Box 1143, Chino Valley, Arizona 86323. Chuck also sent in some photos of his model activity. We have picked out Photo No. 13 showing his partly constructed "Mini-Max" ultralight with a flock of Old Timers overhead. "Doc" sez the Mini-Max is just like building a king-size model.

THE WRAP-UP

What better way to wrap-up this column but with an excellent photo of that prolific builder, Bob Munn, of San Diego. Bob can be seen in Photo No. 14 holding all the models he has built since coming back from Australia after a 4-6 month stay.

Bob belongs to SAM 41, the San Diego Aeroneers, a very active SAM club. As can be seen in the photo, the models are a Sal Taibi Powerhouse, a New Ruler as designed by Henry Struck, and a Joe Elgin Playboy Senior. The only things missing would be representative models from Berkeley and Comet, say the Super Buccaneer and the Zipper/Sailplane series respectively.

In closing, Bob believes Old Timers should be silk covered, doped, and trimmed to match the original color scheme. As can be seen, he is pretty successful at that! •

Concept 30. . . *Continued from page 33*

trim the helicopter. I believe this unique feature is not found on any other helicopter kit on the market. This factor will definitely facilitate the beginners, especially if the beginner cannot find help locally.

The total time it took me to go from opening the DX box to flying was only six hours. If you are short on time, or if you are a total beginner and you don't think that you can accurately assemble a helicopter kit by yourself, then the DX kit with engine is definitely the only way to go. You have no excuse not to succeed now!

No matter how good a helicopter flies, it must have aesthetic appeal. Unlike flying a real helicopter, we constantly look at the

The Mirage 550.™

The only thing that's ordinary about *this* electric sport-trainer is its price tag.

MIRAGE 550

WINGSPAN:	54 INCHES
WING AREA:	464 SQUARE INCHES
LENGTH:	39 INCHES
WEIGHT, READY-TO-FLY:	40-46 OUNCES
RADIO:	ACFT., 2-3 CH. RQD.

Kit includes motor with switch harness, prop, spinner, wheels, formed cowling and wheel fairings.

Among 550-class electrics, nothing tops the Mirage's combination of sparkling performance, deluxe features and easy-to-build simplicity.

When our boss suggested that we should develop a sport-trainer for our Turbo 550™ motor, we hadn't told him we were already testing a little gem that out-flew anything we'd seen.

Boy, was he delighted.

And we've got a feeling you're going to like the Mirage 550 even more than the boss did.

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Besides delivering the kind of superb stability and long, slow glide that make it an outstanding trainer, the Mirage's advanced aerodynamics and state-of-the-art Selig airfoil come through with the kind of performance that even an expert can appreciate.

You'll take off from hard surfaces in about sixty feet, climb to a thousand feet on a charge, loop and roll from near-level entry and make touch-and-go landings that are a thing of beauty.

And speaking of beauty, you've probably noticed that the Mirage's dramatic cowling, Posi-Lok wheel pants and rakish lines lend it a touch of class that's sure to score big at the club show-and-tell.

A standard 6 or 7 cell pack powers the shock-mounted Turbo 550 motor.

The Mirage may be basic, but it certainly isn't boring.

THE DETAILS THAT MAKE THE DIFFERENCE.

Special featherweight wheels, ultralight formed components and precision-cut parts from carefully selected balsa bring you better performance and they also help make building the Mirage a breeze—even if you've never built before.

You'll work from clearly illustrated step-by-step plans and instructions that leave no detail to chance. Options like on-off "throttle" and speed controllers are explained, covering technique is described and there's even a section on trimming and flying your model.

THE VALUE'S HARD TO TOP, TOO.

The kit includes the Turbo 550 motor and switch harness, a high-efficiency propeller, a C.G. spinner and all the hardware you'll need. Except for covering material and glue, there's hardly anything extra to shop for.

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model helicopter from the outside when we fly, so the lines should be pleasant to the eyes. The round canopy on the Concept is very cute. The one-piece canopy design is also very strong. It comes with a tinted brown canopy. The red and white decals decorate the model very well. Unfortunately, I think everyone who buys the Concept will use the same decal set so that most likely every flying Concept will look the same. At least all the other Concept 30's I have seen look just like mine! The low overall height of the model, with the thin, tall, raked forward skids and swept back fins give the model a fluid look. The tall plastic strut landing gear is excellent in absorbing the shocks of hard beginner landings and autorotation practices. It allows sufficient ground clearances for landing in grass fields. If you fly off concrete, slipping some plastic urethane tubing over the skids will extend the life of the plastic struts a little.

In terms of convenience, the tail boom is attached to the fuselage frame in a very unique manner to allow quick removal for travel. I have built many of the helicopter kits sold on the market, and the tail boom attachment method on the Concept is the best and most convenient that I have ever seen. By loosening four bolts, the tail rotor drive shaft comes apart easily due to its slotted coupler (similar to Heim and Schluter helicopters). The tail rotor control pushrod can be snapped off readily because it has a ball joint connector to allow the pushrod to separate. Very well thought out! This part of the design deserves an A+.

The engine location is interesting. It is inverted to allow easy access to the glow plug. The kit includes a glow plug wrench, too. The inverted engine allows conventional O.S. mufflers to be used. The rear start cone feature on this helicopter design is definitely more convenient than the belt start method. The engine crankshaft is canted 7 degrees downward to allow easy reach with a regular aircraft electric starter. The engine cooling system is very effective. I have flown my Concept at ambient temperatures over 100 degrees F without overheating the O.S. .28 F-H. The aircraft style muffler that comes with the engine also works quite well. Even though my neighbors haven't complained yet, I don't think they would appreciate it if I started flying it in my yard everyday.

The main rotor head is not a teetering rotor design. The main rotor head is similar to Hirobo/GMP's DDF rotor head as used on the earlier Shuttle and the new Stork. It is a two-bladed articulated rotor with 5% flap hinge offset. Why not just choose a teetering rotor design? The reason is that an articulated rotor with a soft spring or no spring at the joint which allow individual blades to flap easily, gives a smoother ride. By using hinge offset, we can achieve improved control while maintaining the smooth ride characteristics. Since the hinge offset distance on the Concept is small, only about 5% of the blade radius, the moment transfer ability will actually be slightly less than a tightly compressed rubber damper or rubber O-ring equipped teetering rotor. The end result is that the small hinge offset rotor will have very gentle and smooth flight characteristics. See the "Chopper Chatter" column in this issue for an explanation of two-bladed main rotor design theory.

The servo tray is molded from plastic, and it has five holes for five servos: roll cyclic, pitch cyclic, tail rotor, throttle, and collective pitch. I used a Futaba radio on my Concept. The Futaba S-130 servos pop in the holes perfectly. I have also tested JR and Airtronics servos and they all pop in there perfectly. The molded servo tray also has a chamber reserved for a yaw rate gyro. I

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PROFESSOR SPECIFICATIONS	
Length	35.04" (890mm)
Wingspan	48.82" (1240mm)
Area	446.5 sq. in
Weight (w/rec system)	39 oz.
Motor	RS540SH w/3:1 reduction gearbox
Recommended system	Futaba 4NBL/MCR
REQUIRES: 7.2v/1200mAH NiCd battery pack and charger, 2-4 Channel radio control system (electronic speed control optional).	

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highly recommend you get a yaw rate gyro. You have spent the bucks for the whole deal already, so why save on that extra $70 for a gyro that will make a world of difference on this helicopter?

I do have a suggestion for you when you attach the tail rotor control and roll control servos. The small plastic pieces that are supposed to fit above the tail rotor servo and the roll control servo mounting lug can be difficult to install. Because it is very difficult to install the screws from underneath the servo, I find it much easier to put these four plastic pieces on the bottom side of the servo mounting frame, then the servo screws can be installed from the top side. On top of the plastic servo tray, you can attach two plastic clips that come with the kit. The plastic clips keep the electrical wires tidy. This is another innovative idea that I have not seen on other helicopters. The left side plastic landing strut has a small loop molded on it to hold a 6-inch long nylon tube into which you can slip the receiver antenna. I recommend that you cut the receiver antenna to only four inches, and attach a base loaded receiver antenna designed specifically for R/C helicopters. GMP makes one that is about $8. The advantage is that the base antenna is only seven inches long so it can be hidden inside the canopy. It looks a lot better this way, and you don't risk stepping on the long wire antenna. You will not have radio range problems either. I use base loaded antennas on all my helicopters, and there is never a range problem.

How well a helicopter flies is highly dependent on its control linkage setup. The short distance between the servos and all the control bellcranks allows all the pushrods to be straight. This gives a very good and tight control setup. At first, the Kyosho ball joints seem to be quite tight, but after a few flights these ball joints become very smooth. The DX kit has plastic bushings for all the control bellcranks; the SE version uses ball bearings. I think beginners will not be able to tell the difference between the two. For the advanced flier, I do recommend paying the extra bucks and getting the SE with the bearings. You have made it to forward flight and aerobatics, so you deserve it.

With the gyro and a 1000 mAh battery pack, my Concept 30's CG comes out slightly nose heavy. This is okay, as it makes the machine slightly more stable in forward flight. A 500 mAh battery pack would have made the CG come out perfect, but the standard 500 mAh pack that comes with the radio system would only allow three safe flights when running the rate gyro off the receiver battery pack too.

How does my Concept 30 DX fly? Beautifully. On the first flight, the trims were so good I did not have to adjust any control linkages. Just a touch on the trims, and I was able take both hands off the transmitter and have it hover there by itself for few seconds. Before the first flight was over, I handed the transmitter over to a friend, a beginner, and he was able to hover it rock steady. I had so much faith in its stability, I wasn't worried that he would crash it. Of course, he knew how to hover already, but it is still remarkable that he was not fighting to hold the hover steadily. My friend describes it as having the ability to install confidence in you.

After one flight I was ready for rock and roll. Next on the agenda were simple 180-degree stall turns, high speed passes, low speed circuits, quick stops, high-g pullouts, loops, rolls, 540-degree stall turns and autos. It grooves just like big helicopters. There are no bad habits at all, although the controls are not as fast as some of my other helicopters. The one word that describes this copter the best is "enjoyable."

I have my controls maxed out. The swashplate deflects 30 degrees to either side. The tail rotor control is maxed out, too. The rolls on the DX were not too fast because of the heavy aluminum paddles. I believe the SE with the larger area and light plastic paddles will be more aerobatic. I used a Futaba gyro on the DX. With the gyro setting at fifty percent, the heading hold ability is almost too good. The Concept has problems doing a fast pirouette or completing a 540-degree stall turn. This setting is ideal for beginners, but I prefer a fifteen percent gyro setting to give fast tail rotor response. A fifteen percent gyro setting provides just the bare minimum for a nice assisted heading hold and lots of tail control response for fast 540-

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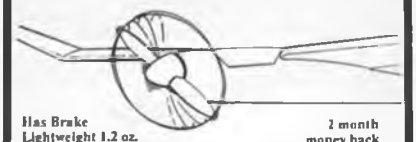

degree stall turns.

One thing that may surprise many experts is how easily this tiny helicopter can do a beautiful autorotation. It is even easier to do an auto on this model than on some of my big ones. The Concept only needs half collective stick to flare the helicopter at the bottom of the auto. The explanation for this is the very light disk loading. For example, the GMP Cobra has a 48-inch main rotor diameter and it weighs 8.5 pounds. The Concept 30's main rotor diameter is only about 2.5 inches smaller, but it weighs three pounds less. I also like the vertical tail fin. It is long enough to protect the tail rotor blades from touching the ground when flaring the helicopter at the end of an auto. At full down collective, I have my Concept 30 set at minus three degrees for autorotation. For beginners I suggest you do as the instructions say; set the low end at zero degrees. The hover and full collective setting are both set up using the paper pitch gauge enclosed in the kit. The gauge dictates six degrees for hover and ten degrees at the top end. I find the paper pitch gauge extremely useful. You can't go wrong if you use it.

A new helicopter usually needs at least 10 to 20 flights before everything sort of sets into place to make the helicopter groove properly. The Concept is the model that I have had the easiest time with. Everything is in harmony right from the first flight; even the tracking was perfect (the enclosed paper pitch gauge must have helped). I either set it up well, or it's engineered well, or all the parts just have perfect tolerance. One thing for sure is that all the molded plastic parts fit perfectly: not too tight and not too loose. I think this is attributed to Kyosho's experience in molding delicate parts for their vast product line of electric R/C cars, motorcycles, boats, and airplanes.

The SE version is more responsive and snappier than the DX because it has a set of larger and lighter Hiller paddles. The purpose of the flybar is to stabilize the model helicopter. The principle behind it is that the flybar provides a mechanical lagged-rate feedback that helps stabilize the helicopter pitch and roll motion just like the electronic rate gyro that helps stabilize the yawing motion of the tail. The heavier the paddle (or the smaller and thicker the paddle size), the more stable the model will be. The lighter, larger, and thinner the paddles, the more responsive the model will be. For advanced fliers, I think you would enjoy the response of the SE version. Beginners can always upgrade their DX to SE by adding ball bearings and buying a set of lighter and larger SE paddles. I find the O.S. .28 F-H to be sufficiently powerful for hover and fast climb so that my DX was doing at least 45 mph on the straightaway.
straightaway.

There are three factors that explain the excellent stability of the Concept 30. First is the soft, articulated main rotor. Second is the torsionally soft, forward chordwise CG blades, and third is the extremely high Bell-Hiller mixing ratio. Conventional wood blades on the market generally have a chordwise CG at thirty to forty percent. Kyosho claims the Concept main rotor blades have a chordwise CG balance at twenty-seven percent from the leading edge. A forward chordwise CG is desirable for two reasons. One, it prevents stall-flutter of the rotor blades (this is the reason most people have in mind). The second reason, which is not widely known, is that a forward chordwise CG provides a mechanical lagged-rate feedback to stabilize the helicopter in the pitch and roll directions. The effect is quite similar to the flybar on our models. Using a forward chordwise CG blade is like adding an extra flybar to further stabilize the model. The detailed principle will be explained in a future column.

The third factor that contributes strongly to the Concept's superb stability is it has the highest Bell-Hiller mixing ratio of any collective pitch R/C helicopter on the market. The GMP Prohead only has about fifty percent, the Kalt Blackhead has about seventy percent, and the Hirobo DDF heads on the Stork and Shuttle have eighty percent. Fixed-pitch helicopters like the GMP Cricket and MFA Sport 500 have exactly one-hundred percent. The Concept has nearly ninety-five percent. The higher the Bell-Hiller mixing ratio, the more effectively the flybar can help stabilize a model helicopter. Mr. Taya achieved such a high Bell-Hiller ratio by ingeniously incorporating the Bell-Hiller mixing arm on the sliding washin-washout scissor unit, rather than on the flybar seesaw or blade pitch arm as conventionally done. So far I think it is a first in the model industry. He has certainly impressed me.

(I have explained the Bell-Hiller mixing ratio in Issue 4 (Fall '88) of *International Helicopter* magazine. I will go over it here briefly. Ninety-five percent mixing ratio means if the rotor disk is tilted ten degrees relative to the flybar by a sudden gust, the flybar will automatically cause the main rotor blade pitch angle to change by 9.5 degrees to help restore the main rotor to the original equilibrium. A large ratio is desirable because it helps restore rotor equilibrium quicker.)

So far, the only problem that I have had

with the Concept is the engine bolts coming loose by themselves after the first few flights. One of the four bolts actually got lost in flight. Make sure you apply some CA glue before you tighten the bolts. Loctite will not work on plastic.

I think the Concept is a very well engineered model helicopter. It is an evolutionary design because Mr. Taya has incorporated many original ideas, unlike most designers who scrounge other successful helicopter designs and simply refine them. There is absolutely nothing wrong with borrowing and improving other people's successful design. But there is a limit that you asymptotically approach that simply says it cannot be improved further significantly. That's the principle of "rate of diminishing return." Hence, you just have to venture a bit and deviate from the norm to obtain a noticeable improvement.

For people who are familiar with the successful Hirobo/GMP Shuttle, you might find that the Concept has a similar feel because both are in the same weight class, have the same rotor diameter, same engine displacement, and both employ an articulated flap hinge to offset the main rotor. The new white colored canopy Shuttle XX does not have the offset articulated main rotor design; it has a stiffer floating axle design similar to the Champion and X-Cell to quicken control response and prevent boom strikes. The individual flapping blades on the Concept are restrained at the hinge so I haven't had the blade come down low enough to cause a boom strike (yet).

In conclusion, I found it most enjoyable to fly the Concept 30. It is not "intense" to fly so I feel relaxed. It's a good break from flying those fast, high powered, big choppers. A small helicopter like this fits nicely in the car trunk. I leave mine in there frequently, so I can pop it out during lunch break, or do a demo anywhere. I think the Concept 30 can actually be a competitive machine for the AMA novice class because it is one of the most stable helicopters in hover. But if you want all-out hot-dogging aerobatics at sub-light speed in a 20 mph gale, then you still need a large and mean machine. Rumor is that Kyosho is working on one of these for next year. If Mr. Taya can apply his secret recipe of making the Concept stable and still quite agile at the same time, then I think he will have a winning .60 size machine. Even though I am an engineer, I still believe theory can only provide a guideline. Once you know which direction to go, then you have to use intuition, creativity, and luck to play around with the magnitude and deviate from the main path slightly to find the optimal design. •

Control Line. . *Continued from page 57*

for. . ."

Abandoning any attempt to be mathematical or scientific, let's discuss some general bits of knowledge collected in a good many years of flying, experimenting and observing others working with props.

First of all, it's necessary to understand that different types of engines require different kinds of propellers because of their design. It's necessary at the outset to determine what kind of engine is going to power your aircraft.

For example, an old-fashioned single-bypass engine such as a Fox .35 stunt is going to produce most of its power at lower rpm than a Schnuerle-ported belch-fire like a Fox Combat Special. That lower-rpm engine is going to want much more prop for the same displacement in most applications.

The Fox. 35 stunt is going to be happy on a 10x6 for sport or stunt flying and perhaps a 9x6 or 9x7 for racing or FoxDoo combat. The Combat Special, at virtually the same displacement, is going to insist upon something more like an 8x6-1/2. This is because the latter engine will develop its horsepower at nearly twice the rpm of the stunt engine—with a 10-inch prop it would be lugged down (imagine a car trying to go up a steep hill from a standing start in third gear).

Experimentation becomes important when you realize that very small differences in the prop blade can make very large differences in the performance of the airplane. This is particularly true of the higher-rpm engines.

An example from personal experience: My particular fast combat planes are happiest using an 8-1/2x6-1/2 Top Flite pylon racing prop cut down to 8 inches. The obvious question is, what difference does it make to cut such a teeny bit, only a half-inch, off that

prop? You're talking about a quarter-inch off each skinny little tip! In level flight, not much difference is noted. However, in maneuvers, a definite change in engine sound—indicative of lugging and slowing of the airplane—is discernible. Why not try any old 8-inch prop? While props may look substantially the same, there are major differences in their performance. The same above-described combat plane, equipped with an 8x8 Y&O paddle-blade prop, loses about 5 mph in level flight but turns tighter. This example does not mention the perhaps 20 other props that have been tried over time. (An 8x6-1/2 Zinger, much thinner than the Top Flite, is too slow in both level flight and turns, though the engine sounds great—here the rpm is too high and the blades inefficient . . . and so it goes.)

So, here are some general ideas for starting points in your prop experimentation, which must be combined with the understanding that you can go too far in any of the suggested directions:

For engines designed to run at low rpm such as a Fox .35 stunt:

- For stunt maneuvers, a long, wide-bladed prop of medium pitch (i.e. 10x6 for a .35).
- For level speed, a shorter prop of higher pitch and a narrower blade (i.e. 9x7, 9x7-1/2, 8x8).

For high-rpm engines such as a Fox Combat Special:

- For maneuvers, a short, narrow-bladed prop of moderate pitch (8x6, 8x7, 8x8).
- For level speed, a medium, thin blade with more pitch (8x7, 8x8, 8x9, 9x7, etc.)

These are the most general of guidelines, especially when you consider both the extremes and the compromises that are possible.

On one extreme end, you see the diesel engines, capable of swinging huge blades (I've flown a very heavy diesel .19 powered balloon-bust plane swinging a 10x6 prop that would do any kind of maneuver or vertical climb running at extremely low rpm). On the other end are the speed props with the tiny, short, thin blades and pitches up to 10 or 12 inches.

Compromise also is a big part of prop selection. Navy Carrier fliers have to deal with the need to go as fast as possible and as slow as possible in a single flight. Combat fliers search for the prop that provides the highest possible top speed combined with speed through turns. Stunt fliers search for a prop that will pull their plane through the difficult maneuver pattern at a slow and graceful speed without stalling or slowing, and while matching the engine (does the engine break from 4-cycle to 2-cycle in maneuvers or does it like to run a steady rpm?)

At the bottom line, how do you select the prop for your airplane? Here's one method of determining the prop that suits your application best:

Find out the "recommended" prop for your plane. This will be in the kit instructions, the magazine article, or in the advice from your local expert. Chances are that this prop is near to what you want to use.

Acquire the "recommended" prop, along with as many variations on that same theme as possible. You may not have to actually clean off the hobby shop shelves if you are resourceful. Contests often have props as prizes. Most experts have collected large quantities of oddball props that may not suit their own needs; they'd probably gladly give you various ones to try. Remember, you want variations not only in length and pitch, but in brand name and prop style. Every company's prop blades are different from those of other manufacturers; two 9x6 props may have entirely different characteristics.

So, for your sport racer, you may have acquired a dozen or more props, including the following: 8x7, 8x8, 9x6, 9x7, 9x7-1/2, 9x8, in brand/style such as Top Flite, Top Flite pylon racing, Rev-Up, Rev-Up pylon racing, Zinger, Zinger wide, Tornado, Master Airscrew, Taipan, or your local epoxy-glass prop maker.

Get out to the field and start trying different props, one at a time, and recording their performance. Start by getting a good, solid, consistent engine run on the "recommended" prop, as a "control" measure. Then begin switching props (you may have to retune the engine for different props). If it's speed you want, a stopwatch will be all you need. For other applications, you'll need to compare both speed and performance in maneuvers.

As one or two props begin to emerge as the best of the lot, begin to consider that

you may not want to use the props in their stock configuration. You may find it desirable to shorten the blades, for example, and try again. This may require more props and flying sessions.

Eventually, one prop should emerge as "the" prop for your particular plane and flying task. Bear in mind that if you build a new plane, even of the same design, you should go through much of the process again, because the new plane will be different.

We've talked mostly about the .35-size engine, but the same principles apply to selecting the correct prop for whatever size engine—you just start from a different baseline.

Also, no matter what size prop you're working with, you *must* take care to assure that the props you're using are balanced. Mass-produced propellers do not come from the factory balanced, no matter how much care is taken in the manufacturing process. It's always necessary to check and adjust the balance of your propeller before putting it on the plane. If you don't, you risk poor performance or damage to your airplane by vibration, or at worst, throwing of a blade.

Buy one of the several good prop balancers available in hobby shops, learn how to use it and balance all your props. Sand material off the back and front of the heavy blade until the prop balances perfectly.

Does this sound like a lot of work? Yes, it is. If you're a regular reader of this column, you know that achieving performance in either sport or competition flying requires lots of practice and shop time. The rewards are in satisfying flights and contest victories.

HELP WANTED

Occasionally I receive letters asking technical questions that are beyond my personal knowledge, but I would like to cover as many C/L topics in the column as possible. For that reason, it's necessary occasionally to do it like Dear Abby does, and ask for help from the readers.

Merle Mohring of Rialto, California is a longtime C/L flier who recently has become a scale competitor. Here is his dilemma:

"I discovered 1/2A multi-engine profile scale events and since most of what I build falls into that area, I got into competition and I'm hooked.

"I have on hand a converted R/C kit of an Me-109 that I would like to compete with in the larger class of sport scale events.

"The question I have is this: Is there any information available for the conversion of R/C systems to control line use? My 109 has throttle and flaps and I really do not wish to add a fourth line. Can you help?

"Could you also include some how-tos in scale options (flaps, retracts, bombs, etc.)?"

The 1/2A multi-engine scale event that Merle mentions, popular in California, produces some very interesting airplanes which I've had the enjoyment of seeing at the Northwest Regionals on occasion.

A photo of Merle's beautiful Tupolev TU-4 "Bull" accompanies the column. It is the Russian "copy" of the B-29. Merle's is powered by four Cox Black Widow .049 engines, has a span of 51.5 inches and a length of 35.75 inches. Needless to say, it was very successful in California contests in 1988.

Merle also included a photo of his H6K-4 Mavis flying boat, with four Babe Bee .049 engines and a 65-inch span and 42-inch length.

My own scale building projects have been confined to simple sport scale planes with no special bells and whistles, so I'll ask for help from readers in contributing some scale hints and tips, which I'll gladly pass along.

In regard to the Me-109, a couple of ideas come to mind, which our readers certainly can expand upon.

First of all, if you do not desire to use the flaps, you can simply make them stationary. If you do want to use the flaps, it may be possible to do so without the fourth line, though it may limit your options for use of the flaps.

One method would be to set the flaps up on a spring-loaded trip mechanism such as that used by carrier fliers to release their tail hook. You would set it up so that a quick application of full-down control would release the mechanism and deploy the flaps. The drawbacks, obviously, are that your flight would lose much of its scale realism during the deployment and that the flaps would be down for the rest of the flight. Another method would be to connect the flaps to the throttle, so that they would deploy on low-speed flight and return to original position on high-speed flight.

Your widest range of options would be in the use of a fourth line. This can be done without a special handle if you are willing to employ a second handle, which could have only the fourth line, or even a fifth line if you desired. I've seen this system used successfully. Finally, and readers would have to help us set this up, you could use R/C servos controlled through your lines. As Dear Abby says: Readers?

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We have another question that will require the help of the old-timers among the readership.

Alvin Schroeder of Iowa City, Iowa, has some physical disabilities that prevent him from flying C/L the usual way, but he's still interested.

He has asked for help in finding out about an old method of controlling a C/L plane from outside the circle. He passed along an old advertisement, probably from around 1950, for a product called the Monitor Pylon Control, which was described as "a brilliant new invention that makes control line flying available to anyone who has hands or feet." This was a device that stood in the center of the circle and controlled the plane, while the pilot stood outside and controlled the device by another set of lines.

Is there anyone out there who ever used or saw such a device in use? If so, how did it work, was it practical, and could it be duplicated by Alvin? Better yet, does anybody *have* one?

Let us know. You may also want to write to Alvin directly at 1010 West Benton St., Apt. 110F, Iowa City, Iowa 52246.

PEN PALS

The Muswellbrook Modellers Club Inc., of Muswellbrook, NSW, Australia, would like to make contact with U.S. model clubs. Secretary Helen Milwain says the club would like to exchange newsletters and other information.

"Although control line is still popular, we find it hard to keep up with what is happening both here in Australia and overseas," Helen writes.

"My husband, Rob, flies combat and speed. He is competing in the Australian Nationals in January in the Goodyear and FAI speed. I am the secretary of our local club, Muswellbrook Modellers Club Inc. We have a strong control line section with many juniors getting ready for their first competition next March when our club hosts the Hunter Valley Championships—a two-day event for radio and control-line fliers.

"Our club also is hosting two other major events in 1989, the Vintage & Veterans Competition in May and the control line state championships (NSW), a three-day event in June.

"The Vintage & Veterans competition is a new competition for old models and designs (must be at least 35 years old) and gives some of the older modelers a chance to get together and share some of the early days and ideas with the new modelers.

"We would be interested in any names, addresses and information on any control line groups in the U.S.A. We are keen to keep up with what is happening in the control line area and are only too happy to share what is happening here in Australia."

Write to: R&H Milwain, 24 Kamilaroi Street, Muswellbrook 2333, N.S.W., Australia.

TIPS AND RIBS

A few news tidbits from the mailbag:

• The 1989 Nats control line events will be spread out over a full eight days, according to the preliminary schedule we have received. This is an unusual schedule and I would not be surprised to see adjustments made. However, fliers will want to be aware of the new schedule. Here's what we have received:

Sunday, July 16: 1/2A speed, 1/2A profile proto speed.

Monday, July 17: Jr. slow combat, senior slow combat, open slow combat, A speed, FAI speed.

Tuesday, July 18: Open slow combat finals, B speed, Formula 40 speed.

Wednesday, July 19: FAI combat, open and advanced precision aerobatics, D speed, jet speed.

Thursday, July 20: 1/2A combat, open and advanced precision aerobatics, profile Navy carrier, scale racing.

Friday, July 21: Junior combat, senior combat, open combat, open precision aerobatics, advanced aerobatics finals, junior aerobatics, senior aerobatics, Navy Carrier I, Navy Carrier II, mouse race, FAI team race.

Saturday, July 22: Open combat finals, open aerobatics finals, rat race.

Sunday, July 23: Slow rat race.

This schedule does not yet show the unofficial events, which presumably will include Old Time Stunt. Also, a request has been made by the Northwest fliers to include Northwest Sport Race and Northwest Super Sport Race as unofficial events; no re-

sponse had been received from AMA at this writing.

• The *Skywriter*, published by the Seattle Skyraiders, is one of the fine club newsletters that carry the C/L word. The *Skywriter* goes out to subscribers as well as club members. The newsletter carries competition news, hints and tips, club news, and, since the suspension of publication of the regional newsletter *Flying Lines*, has taken over compilation and publication of Northwest competition standings. A recent issue reports that the club's 1989 members are: president, John Hall; vice-president, Roy Nakano; secretary-treasurer, Alice Gardner; safety officers, Orin Humphries and Roy Nakano; and show team director, Jim Cameron. One of Orin's jobs as safety officer is to be insurance officer, keeping track of the status of AMA liability insurance. Club dues are $15 a year ($10 for seniors and $5 for juniors). Newsletter subscriptions are $12 a year. A competition newsletter, published three times a year and including schedules and results, is $5 a year. Write Dave Mullens, 15559 Palatine Ave. N., Seattle, Washington 98133.

• The new flying site of the Eugene Prop Spinners of Eugene, Oregon, which also is the home of the annual Northwest Regional Control Line Championships, has been in use for a year now, and the 18th annual Regionals will take place May 27-28. The Prop Spinners are pleased to have recently signed a contract with the city of Eugene that gives the club use of the site at Mahlon Sweet Airport for the indefinite future, except for a few periods of peak airport use when the site is used as an overflow parking lot. The written agreement could be a model for other clubs to use in negotiating with their own local governments. I can provide copies to anyone interested in finding out about it.

• The Northwest Regionals adds five new events this year, along with the old array of control line competition. New events are nostalgia stunt, .15 Navy carrier, sport scale, FoxDoo combat and FAI Team Race. Events discontinued this year are FAI combat and profile scale. Other events on the schedule are 1/2A, A, B, D, Jet, FAI and Formula 40 speed; Northwest Sport, Northwest Super Sport, Mouse I, Mouse II, Goodyear, slow rat and rat race; 1/2A, slow and fast combat; precision scale, precision aerobatics (four PAMPA classes), old time stunt, Class I and II carrier, and balloon bust. For information or a contest flyer, write to 1520 Anthony Ave., Cottage Grove, Oregon 97424.

Newsletter editors and other correspondents, please note the *Model Builder* columnist's new address: John Thompson, 1520 Anthony Ave., Cottage Grove, Oregon 97424. •

F/F Scale. . . . . *Continued from page 58*

located these points carefully. This was not an easy task, but in the end, all came out OK. Naturally, none of this would have become necessary had I caught the error ahead of time!

This next item is so trivial, you may wonder why mention it at all. Well, I've seen plenty of drawings for all kinds of models, and I must say, that more often than not, the following is generally the case. On so many models, the stab simply sets on top of the rear longerons. This makes life quite easy. However, the angled sticks in the stab that match the angle of the fuselage longerons (looking from the top) are often omitted. How the designer figures to attach the stab with any integrity is beyond me. This certainly is no big item, but one that a beginner may overlook.

Even though I have mentioned the next item before, I feel that it merits repeating. There are some model designs that require the first fuselage bay be angled inward rather severely. Typically, this occurs with a radial engine design. When that first bay is angled inward as shown, the overall fuselage length will be shortened. Radial engine type aircraft already have a short nose, and you need not add to this problem.

The solution is an easy one. Just measure the length of the front bay longeron from the top view, and transfer this length to the side view longerons. Again, this is no big item, but just another problem you can avoid before you start cutting wood!

The next comment is really directed to the beginner. I hope that most of you use Xerox copies of the fuselage bulkheads, wing ribs, etc., instead of cutting up the original plan. For the longest time, I used "One Coat Rubber Cement" to attach the Xerox copy to the balsa. Then when I peeled off the paper, some of the glue would invariably remain on the wood. It was usually a pain taking the time to remove this residue, but it had to be done. Like so many things in life, you get used to something, and some of the pitfalls are conveniently overlooked. Well, I found something far better than the fore-mentioned product. It is simply called "Glue Stick," the one in particular that I have is "Uhu Stic." If you have kids in school, they probably have some as part of their school supplies. If not, it can be found most any place that school

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supplies can be purchased. The stuff works and holds thing in place while cutting and sanding. It also peels off clean!

Another item. Most kits and plans show bulkheads with notches for the stringers. Personally, I suggest that you do not cut any of the notches until you are ready to glue the stringers into place. This way you can notch as you go, assuring that each stringer will be straight. A variation of this is to undercut each bulkhead by the thickness of the stringers used. That way you can just place the stringer on top of each bulkhead, aligning as you go, and don't have to worry about notching. When they are glued into place, go back and place a bit of glue on either side of the stringer where it is tangent to a bulkhead. It is quick, strong, neat, and you do not have to scallop between stringers prior to covering. Keep in mind to do one stringer at a time from side to side, eliminating the possibility of the fuselage taking on the look of a banana! •

R/C Soar. . . . . *Continued from page 29*

perhaps a more important conclusion, is that there is no 'one best airfoil for everything.' Aircraft design, and for that matter, design of any type is a matter of compromise. You always have to trade off one design objective with another, be it complexity, weight, performance, etc. You cannot expect to create that killer airplane which will do five minutes from 200 feet in dead air, *and* do the F3B speed course in 18 seconds. But if you do find one, please call me!

"The airfoils we have used on the Mistrals discussed were selected based on the design goals for that particular airplane, at that time, and with the personal flying style of the pilot in mind.

"Personal flying style accounts for much in terms of the performance that will actually be extracted from any particular airplane. If the pilot is passive and likes to float around, picking up thermals that just happen to come along, an airfoil like the E374 is not appropriate. Something like the E392 would be much better. With the E374, the passive pilot loses out in minimum sink and climb rate, and typically would not take advantage of its ground covering capabilities.

"On the other hand, if the pilot is aggressive and likes to move around and look for thermals, the E392 would not be as good a choice; the E374 would be better. However, adding ballast seems to muddy the water. The stock Mistral has the best calm-air performance, and *can* compete with the E374 in the wind when ballasted. The E374 is not quite as adaptable. This is not to say one airfoil is better overall than any other; each of the five aircraft has won contests. It all depends on what you want. Of course, the wind conditions in your area have an effect on airfoil selection too.

"All of this discussion seems to reinforce the old adage, 'Pick an airfoil you like and stick with it.' As an example, Sean Bannister of England used the E193 on most (if not all) of his Algebras. I think there were 13 at last count. I personally like the E193 best on the Mistral, and Bruce Taylor likes the E211."

Thank you again, Alex. I don't think I can add much to this . . . so I won't! If anyone else has been experimenting with airfoils in this way, please share your findings with us, it makes for great "hangar talk!"

If anyone out there would like to fly a very well developed thermal machine like the Mistral, a check or money order for $125.00 (U.S.) made out to ASTECH Models, 6521 Betsworth Ave., Winnipeg, Manitoba, Canada R3R 0K2, will do the trick. If you wish to speak with Alex personally, phone (204)895-4270. Keep in mind the time difference if you live out west.

HIGH-TECH, HOW-TO VIDEOS

I received a very interesting announcement in January regarding some instructional videos on composite model construction. Julian Tamez of Channel 1 Productions has produced three VHS tapes entitled: "Cutting Foam Cores," "How to Vacuum Bag," and "Making Molds." Having seen some of his early videos on vacuum bagging, I can vouch for the professional quality and educational value of these tapes, even though as of this writing I haven't seen one.

His letter is self-explanatory, so here it is:

"Dear Bill: We are pleased to announce the release of an instructional video tape on how to vacuum bag fiberglass wings and where to buy materials. The tape gives a simplified, step-by-step way to build composite wings for model sailplanes or power planes. Most people are intimidated (by this method), but after seeing our tape they find it is as simple as one-two- three. The rewards in aircraft performance and personal satisfaction are the best part.

"Channel 1 Productions also has a tape on making fiberglass molds. It covers the ABC's of this technique as well as what equipment and materials you will need. Again, most people are intimidated until they see how easy it really is. This tape is not just intended for model aviation purposes. It allows you to manufacture most any fiberglass part you desire.

"The third release is a tape on cutting foam wing cores. It covers step-by-step the techniques of template making and the actual cutting of foam.

"Lastly, we have plans and photos that show you how to make a battery powered bubble blower. The bubble blower puts out 'millions' of soap bubbles that float in the air. Its application is to study and/or locate thermals. It is a terrific aid for hand launch glider flying!

"Each tape is $34.95 plus $3.50 shipping and handling. Texas residents must add 8% sales tax. Buy all three tapes and save $10.00 off the merchandise total."

I spoke with Julian tonight, and he told me to tell *Model Builder* readers (and obviously you qualify) that you can deduct 20% from the regular price of each tape! Let's see, eighty percent of full price is. . .tic-tic-tic. . .that works out to $27.96, or a savings of $6.99 a tape. Get all three and you save $20.97! So, be sure to mention good old *Model Builder* R/C Soaring if you wish to save some bucks!

REMEMBER THE PIERCE 970?

I received a second letter from Fred Hacke of Bethalto, Illinois, this past December. His letter was in response to some cor-

CLASSIFIED ADS

IMPORTANT INSTRUCTIONS: Non-Commercial(personal items) rate is 40 cents per word, with a minimum of $6.00. Commercial rate is 50 cents per word, with a minimum of $10.00. No ad agency discounts allowed. Phone number counts as two words, abbreviations count as whole words and will be spelled out. All ads are payable with order, and may be for any consecutive insertion period specified. Send ad payment to: MODEL BUILDER, Classified Ads, 898 W. 16th., Newport Beach, CA 92663.

VACUUM BAGGING SUPPLIES, Rohacell foam, Kevlar, fiberglass, Safe-T-Poxy and more. For free catalog, send SASE to: Composite Structures Technology, Dept. D3, 3701 Inglewood Ave., # 268, Redondo Beach, California 90278.

SCALE PLANS: Curtiss, Grumman, Vought. SASE for list. C.F. Smith, Smith Plans, 9043 Fairway Blvd., Sun Lakes, Arizona 85248. (602) 895-8745.

WANTED: Ignition model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, Oklahoma 74063; (918)245-3649.

WANTED: SPARK IGNITION MODEL AIRPLANE engines circa 1930-46. Fair, competitive prices. Tom Forsythe, 318-12th Ave., Box 141, New Glarus, Wisconsin 53574; (608)527-2066.

Tired of forming props on bottles and cans, with uncertain results? Try our computer-designed hardwood prop forms. 3 sizes. Any pitch, from Peanuts to Wakefields. To 6" dia. $8.00; 12" $10.00; 20" $15.00, plus $2.00 shipping and handling. E. Wickland, 2412 Tucson Ave., Pensacola, Florida 32506.

4"x8" vacuum former with self-contained heat source. Easily constructed from local materials. Plans $12.00. Complete unit $42.00 postpaid. GRACO MODELS, Box 18358 Kearns, Utah 84118.

Everything from AUTOGIROS to ZAIC BOOKS! Send $2 for complete catalog of publications, plans, cards and more. HANNAN'S RUNWAY, P.O. Box A, Escondido, California 92025.

"EASE-OF-FLYING RATINGS of R/C Trainers," rates 30 models. $2.00. Jim Waterman, 3818 Deerfield Dr., San Antonio, Texas 78218.

COMPUTER PROGRAM: PATTERN MASTER — Use your IBM P/C or compatible to make cutting patterns for aircraft covering. Program and user guide $24.95; demo version (includes $5 coupon for full version) $5.00. Chandero Systems, 14 Parkview, Long Valley, New Jersey 07853.

NEW! VOLUME 4, PEANUTS & PISTACHIOS! Packed with plans, photos & pointers, $5.50. Still available but going fast, Volume 3 @ $5 and Volume 2 @ $4.95. Add $1.50 postage and packing (one, two or all three books). California orders add applicable sales tax. HANNAN'S RUNWAY, P.O. BOX A, Escondido, California 92025.

SPECIALIZING IN MAJOR DECALS, also kits and supplies. For personal service and good prices, send $1.00 for catalog to: Clark's Aircrafters Supplies, 501 Raintree Condo's, Malvern, Pennsylvania 19355.

VIDEO TAPE: 1988 U.S. INDOOR CHAMPIONSHIPS, filmed at the ETSO Mini-Dome. Shows all of the events flown, interviews with modelers, and the newest innovations in modeling. Professionally edited, 72 minutes long. Great for clubs, teachers, competitors, and to show to non-modelers. VHS, $25.00 each, includes P&H. Mike Arak, 4200 Aurora St., Suite O, Coral Gables, Florida 33146.

WANTED: Revell plastic model kit of "visible radial aircraft engine." Call or write Richard Tabler Jr., 24 Thorndike Street, Arlington, Massachusetts 02174 (617) 641-1089.

HOLMES AIRPORT, Jackson Heights, NY, early '40s late '30s, anyone with information on model or full-size activity please call Lionel (312) 343-5869. Leave message I will call you.

HOBBY SHOP, Maui, Hawaii mall location, w/adjacent R/C car race track. $50,000. 1988 gross $209,000. Write: Hobby Habit, Maui Mall, Kahului, Hawaii 96732 (808) 871-6666.

CLASSIC COMBAT MODEL PLANS: Quicker, Reactor, Wow, Renegade, etc. SASE for list. Barry Baxter, 6490 Sonora Way, Cypress, California 90630.

BUILD YOUR OWN low cost adjustable foam cutter. Make solid or hollow core wings, fuselages, tail surfaces, etc. FREE foam sources, "hard shell" techniques, foam samples, latest airplane plans list, new R/C Skydiver plus much more. Send business SASE. Foam Scale Models, Box 662MB, St. Croix Falls, Wisconsin 54024.

ENGINE VIBRATION ISOLATOR MOUNTS. Four rubber mounts with 10-24 socket head bolts, $6.50. Penron Products, Box 13051, Arlington, Texas 76094-0051.

WANTED: Marine Model Company ship model kits. All letters answered. Joseph Dudzik, 301 Stonehaven Dr., Norman, Oklahoma 73072.

SELL your ship models at huge profits to discriminating buyers. Expert craftsmen only. Write: Worldwide Broker, Box 1, Littlestown, Pennsylvania 17340.

NOWLEN AERO Peanut Scale Classics: Wright Type A $6.95. Nieuport 11, Deperdussin $10.95, Bristol Scout $13.95, Aerodrome $7.95. $2.00 S & H any size order within U.S., 139 Boardwalk B, Greenbrae, California 94904.

MODEL AIRPLANE MAGAZINES from the '30s to the present. Send large SASE to Jim Robertson, 35 Stonecrest St., Joseph, Missouri 64506.

MAGAZINES FOR SALE: Entire collection 400 issues. Model Airplane News, Air Trails, Model Aviation, Model Builder, American Modeler, etc. SASE for list. Mel Levy, 4642 E. Onyx Ave., Phoenix, Arizona 85028.

Flying Scale Inc., 41 rubber scale, collectors quality plans, $6.00 each. SASE for list. Spans 17" to 34". Military, Golden Age, French, British, German, Japanese. 1905 Colony Rd., Metairie, Louisiana 70003.

IMPORTED DIESEL ENGINES — world's best selection: Current production Aurora, Cipolla, D-C, Enya, KMD, Mikro, MK-17, MVVS, PAW, Silver Swallow & USE Diesels. Also Mills and Taplin Twin replica diesels and very special imported glow engines. Catalog — $1.00. CARLSON ENGINE IMPORTS, 814 E. Marconi, Phoenix, Arizona 85022.

MODEL MAGAZINES sale — 1949+, Air Trails, American Aircraft Modeler, Model Airplane News, R/C Modeler, Flying Models, Model Aircraft. SASE to Milton Sheppard, 670 Concord Rd., Glen Mills, Pennsylvania 19342.

HEAVY DUTY HI-START PARACHUTES. Small $7.50 plus $1 S&H, large $8.50 plus $1 S&H. Airmen's Supply Co., P.O. Box 1593, Norfolk, Nebraska 68702-1593.

FREE $4.95 SURPRISE GIFT WITH ANY MERCHANDISE PURCHASE! JEWELRY, PATCHES, REPLICAS: Own the very first wings, embroidered Royal Flying Corp. 3½ inches, $4.95. Hat-In-The-Ring pin $4.95. The renowned Blue Max; blue cloisonne Maltese Cross, gold plated eagles, 2 inch medal, free chain, $12.95. Shipping $2.00. WWI to present catalog $1.00 refundable. Company Of Eagles, 875A Island Drive, Suite 322M, Alameda, California 94501-0425.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, Washington 98027.

Randolph Butyrate and Nitrate dope. Twenty-three colors. Three new all-wood control line kits, or plans only. 1950s style kits, complete. Scratch-builders supplies. Send large 45-cent SASE. ABC Hobby Supplies, P. O. Box 2391, Clarksville, Indiana 47131.

We stock the complete line of Easy Built kits from Canada, rubber gas and electric. Also Dubois, Deils, Fresno, others. Catalog $1.00. Airmen's Supply Co., P.O. Box 1593, Norfolk, Nebraska 68702-1593.

PLANS ENLARGED — Large Scale Specialists, PC Model Software. Free catalog. Concept Technology, P.O. Box 669D, Poway, California 92064. (619) 486-2464.

BARGAIN HOBBY SUPPLIES: Everything for the free flight enthusiast. Balsa, tools, kits and more! Send SASE to: Discount Hobby Supply, 629-B South Breed St., Los Angeles, California 90023.

WWI AND WWII POSTERS. In color, imported from England, 20 x 30, suitable for framing. Sample photos, send $1.00 to Biggin Hill Publ., Box 786-O, Freeport, New York 11520.

MAKE A BEERCAN BIPLANE, 9 inches long with 14-inch wingspan. Instructions, patterns, photographs. $9.95. Kit Nine, P.O. Box 72104, Marietta, Georgia 30007.

CUSTOM EMBROIDERED PATCHES. Your design, made any size, shape, colors. Five-patch minimum, guaranteed colorfast. Free brochure. Hein Specialties, Inc., Dept. 238, 4202 North Drake, Chicago, Illinois 60618-1113.

IGNITION AND GLOW ENGINES. Collectors, runners, used, new. Sell, trade, buy. SASE for large list. R. L. Eierman, 504 Las Posas, Ridgecrest, California 93555; (619)375-5537.

"GOON," "BULLDOG," "GEE BEE'S," etc. by Vern E. Clements, 308 Palo Alto Dr., Caldwell, Idaho 83605. Plans-Catalog-News (NOW 16 PAGES): $3.00, refundable.

SCALE DOCUMENTATION: Aircraft photos and photo packs, civil, military, warbirds, etc. Detailed close-ups, nose art, unit badges. Catalog $1.50. AirPhoto, Dept. MB, 3 Leelynn Circle, Londonderry, New Hampshire 03053.

INDEX TO ADVERTISERS

respondence we had earlier in the fall. This was related to an upcoming segment which was to be published on the subject of Phillips entry mods for flat-bottom airfoils, such as that found on the Pierce Aero Company Paragon. Fred had asked the question if I or anyone else had any information about this particular modification. His second letter follows.

"Dear Bill: I have received your computer copy of the February article. It was quite a surprise to see that you found the question regarding the modified Paragon airfoil of such interest. The following is some historical background related to the question.

"A friend of mine, Bob Oglesby of Alton, Illinois, began in the hobby of R/C soaring by building a 2-meter glider. The Paragon was suggested, and built, as his second kit. A magazine article on the Paragon pictured a second design also. Ed Slobod (author and designer) indicated it was an earlier design named the 970.

"Slobod had a couple of kits remaining, and these were purchased. The 970 wing is 3 meters, 970 square inches, has a 9% flat-bottom airfoil, and is a two-piece wing with rods. The 970 is a smooth design with a flying stab. It flew well, but proved to not thermal as well as the Paragon.

"This led to a discussion with Slobod regarding the use of the Paragon wing on the 970. My concern was that the stab and rudder might be too small for the increase in wing area. The 970 is 970 and the Paragon is 1080 square inches. Slobod felt it would be no problem, and he was correct.

"The modified Paragon (wing) was built per Slobod's suggestions. My preference was the two-piece wing (more like the 970). Slobod, of course, favors the three-piece wing. The 970PW, as I refer to it, flies quite well. By the third flight, the 970PW had exceeded the longest flight by the 970 in six months of flying. I know there are variables to consider regarding my last statement, but it more than impressed me."

Thank you Fred! Anyone wishing to see how Fred modified the Paragon wing may refer back to the February issue, where actual rib drawings appear.

SPORTSMAN MULTI-TASK: BOREDOM BUSTER?

Jim Gray, editor and publisher of *RC Soaring Digest*, writes in asking for support of an idea whose time has come. The idea has been kicking around the country for years in many soaring clubs, and perhaps it has enough grass roots support right now to get started. The idea is to put some fun and excitement back into soaring contests by means of multiple formats within a single event.

Jim likes to call his effort the "RCSD Challenge." And that is basically this: to motivate clubs and individuals into organizing a sportsman-level, multi-task event like the Two-Meter World Cup of the early '80s. Jim says there is "a lot of support and interest . . . even from readers who normally fly thermal duration only. They tell me they are bored with duration and precision duration, and want something else to challenge them."

Jim goes on to say, "Way back in the '70s, Ed Slobod was a champion of multi-task soaring, and he developed his Gemini MTS, as you know.

"I'd like to propose that the 'One-Design' idea be modified a bit to include anything up to and including a set of specifications. To make it even simpler, we could (as an example) allow a specific maximum wing loading of perhaps 12 oz./sq.ft., a kit availability price of $150 maximum, and an all-up weight of, say, 70 ounces.

"The idea would be to simplify *tasks and rules* and encourage individuals and clubs to become involved. Grass roots support is needed . . ."

And I believe it is there! Any clubs out there interested? How about it, Soaring Union of Los Angeles? San Fernando Valley Silent Flyers? South Bay Soaring Society? Rocky Mountain Soaring Association? Tidewater Model Soaring Society? Long Island Silent Flyers? Portland Area Soaring Society? Any takers?

Personally, I liked the old Two-Meter World Cup format. I flew in all four of these annual events, even placed second in 1982 at Las Vegas, and I consider myself no expert pilot! The format was one round of four-lap speed on a 150-meter course (this was before F3B became four-lap speed), one round of ten-minute, man-on-man duration (try that without lift), one round of unlimited distance on a 150-meter course (a real distance event), and then on day two, three rounds of 10-lap distance on a 150-meter course scored man-on-man (so-called "racing distance" ala full-size).

Sportsman Multi-Task can be anything your club or region will support (or will tolerate). You select the model specifications or restrictions to suit your area's needs. Then give me a notice of your event, and I'll let people know about it! I will even attend (within reason).

EVENTS CALENDAR

The LSF Soaring Nationals will be held on May 6-7 at Morgan Hill (South San Francisco Bay area). Contact Alan Peterson at (415)941-0623, or Michael Forster at (415)851-3834.

The Western United States R/C Soaring Championships will be held on June 10-11. Contact Ron Lenci at (209)838-3869. The

NOTICE: NEW Full-Size Plan prices are now in effect. Send a long, self-addressed envelope for your list of revised plan prices.

MODEL BUILDER

All Full-Size plans purchased from *MODEL BUILDER* Magazine include a reprint of the construction article, if building instructions were part of the article.

SEND TO: MODEL BUILDER PLANS SERVICE
898 W. 16th St., Newport Beach, CA 92663

Minimum order: $10.00

NEW ORDERING INSTRUCTIONS

U.S. orders, including APO and FPO, add 20% of total order for shipping and handling. Overseas orders (includes Canada and Mexico) add 50% of total order. Remit payment by International Money Order or U.S. funds, drawn on U.S. bank. Please, no cash or C.O.D.'s. Mastercard or Visa include card number, expiration date, and signature. Add 5% to credit card orders. California residents add 6% sales tax.

No. 6891 SEA FLI XI **$12.50**
Composite foam/fiberglass R/C seaplane for .60 to .90 power. By Francis Reynolds.

No. 1174-O.T. LANZO STICK **$7.50**
Rubber stick winner, '40 Nats. 4-1/2'. Still good in Unlimited. By Phil Bernhardt.

No. 5891 HUMONGOUS SAGE HEN **$21.50**
The ultimate R/C trainer. Big 84" span, .40-.45 power. Bruce Edwards and Al Alman.

No. 589-O.T. G.E. CABINETTE **$7.50**
Cute 36" cabin ship from 1942 M.A.N., originally powered by Atom 09. Frank Ehling.

No. 34891 PRETTY BIRD **$12.00**
Simple, lightly built 58" sport R/C ship for .40-.48 four-strokes. Alex McLeod.

No. 3489-O.T. SUPER STOFER **$6.50**
Half-A version of Harold Stofer's 1939 pylon model. 34" span. By Jose Tellez.

No. 2891 NORD 3202 **$10.00**
Scale model of French primary trainer, for .19 to .25 power, by Ted Schreyer.

No. 2892 1/3 GIPSY MOTH **$25.00**
Plans blown up from original 1/4-scale design by Bill Northrop. Ten-foot span.

No. 289-O.T. ALERT **$10.00**
Very competitive 53" B/C pylon design by Michael LaTorre, from Dec. '42 A.T.

No. 1891 DAYDREAM BIPLANE **$23.00**
A big, easy-flying sport scale designed for a .65 4-stroke. 60" span. Benjamin.

No. 1891-O.T. LI'L MISERY **$7.50**
An interesting fuselage pod-model from '42 with 50" span. By Cohen & Worth.

No. 12881 R/C GUFF **$25.00**
Pioneer R/C aircraft, won '38, '39, '40, '47 Nats, now in Smithsonian. Walt Good.

No. 11881 THE WHISP **$10.00**
Simple R/C hand launch glider for slope or park flying. 49-inch span. By J. Tank.

No. 11881-O.T. CLASS C GLIDER **$7.50**
A Joe Weathers classic glider design from Flying Aces, 1939. Wingspan is 30 inches.

No. 10881 HAWKER HURRICANE **$17.00**
A control line sport scale for .30 to .40 engines, made of cardboard! C. Felton.

No. 1088-O.T. PORTERFIELD **$7.50**
Rubber scale monoplane from 1940 Flying Aces. 28-inch span. C. McCullough.

No. 9881 BLACK STAR **$10.00**
A swept-wing, Vee-tailed R/C model for an .049. Uses foam wings. By Saponara.

No. 9882 CONSOLIDATED XBY-1 **$7.50**
A rubber-powered bomber in 1/20 scale with a 27-inch span. By Mark Fineman.

site will be Fred C. Beyer High School (previously the site of 1984 2-Meter World Cup), 1717 Sylvan Ave., Modesto, California.

The 6th Annual R/C Hand Launched Glider Contest hosted by the Inland Soaring Society (Riverside, California) will be held on June 4th. Limited to AMA Class A gliders and hand launch only. A designated "arm" may throw your glider for you. Contact Ian Douglas (714)621-2522 after 6 p.m.

Electric fliers will take note of the 15th Annual Astro Champs to be held June 17-18 at Fairview Regional Park (Estancia High School), Costa Mesa, California. Motor-gliders and old timer models only on these dates. Contact John Lupperger at (714) 646-5316 weekdays.

TH-TH-THAT'S ALL, FOLKS!

Till next time, thermals everywhere! But ya gotta search for 'em! Bill Forrey, (714) 245-1702 after 6:30 p.m. •

O' Counter. . . . *Continued from page 11*

onto the shaft. Collet-type adapters are also offered in 4mm and 1/8-inch sizes, as well as a 1/8-inch adapter that uses a set screw for attachment, rather than the collet setup.

The motor and folding prop shown in one of the photos is meant only to be representative of the vast selection of different size electric motors and folding props produced by Graupner and brought into the U.S. by Hobby Lobby. Far too many to list here, your best bet would be to get a copy of Hobby Lobby's Catalog #13, which is available free of charge. Write or call Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, Tennessee 37027, (615)373-1444.

* * *

The folks at Fourmost Products have introduced a couple of new items that will no doubt prove handy to most modelers. The first is Recoil Tubing XL, a longer version of Fourmost's original Recoil Tubing. The XL version is a full six-foot length of transparent blue urethane fuel tubing pre-formed into a six-inch coil. This allows your field box and fuel can to be placed at a comfortable distance from your model; after fueling, the tubing retracts into its space-saving coiled form. Because it's made of urethane, Recoil Tubing XL is safe to use with gasoline, diesel or glow fuels.

Also new from Fourmost is their new line of Precision Solder Washers. These are made of brass and are available in four sizes, to fit 1/16, 3/32, 1/8, and 5/32-inch wire. What makes these washers special is that they have holes that are just two thousandths of an inch oversize, for a close fit that keeps them positioned squarely on the wire instead of flopping over to one side, as is so commonly seen. The result is a strong, neat solder joint. These new washers can be used for landing gears, tail wheels, bellcranks, thrust bearings, or just about any other application that calls for a retaining washer to be soldered in place. Packaged in bags of 12, the retail price is $2.00 for each size.

From Fourmost Products, 4040 24th Ave., Forest Grove, Oregon 97116.

* * *

Windsor Propeller Co. has added two new sizes of props to both the K and Antique series of Master Airscrew propellers. The familiar black K series line now includes 12x8 and 15x10 sizes, in keeping with the current trend toward higher pitches and lower rpm's for lower operating noise levels. These props are painted white on both sides of the tips—an important safety feature, as black propellers are notorious for being virtually invisible even at idle speeds. The white tips make the propeller arc stand out very effectively.

The new sizes in the Antique series are 10x5 and 11x6. All the props in this line are molded from high-visibility yellow/orange glass-filled nylon and feature the distinctive scimitar shape used on some WWI fighters. You now have a choice of six sizes of Antique series propellers, the others being 12x8, 13x6, 14x7 and 16x7.

From Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, California 95401.

* * *

The F6F Hellcat and Focke-Wulf 190A photos this month come from Bob Holman, who advises that he has bought all of the tooling and drawings for these and a FW-190 D9 variant from Don Lien, who formerly produced them under the Aero-Craft name. All span 80 inches and are supplied as semi-kits, which consist of epoxy glass fuselage, cowl and other parts, and foam cores for the wing and tail surfaces. The quality of the glass work in Bob's kits is excellent, as we found for ourselves when examining some of them at his booth at the recent IMS Pasadena show.

Bob's line of scale kits and plans just continues to grow. A large number of kits are now available (mostly semi-kits as described above), plus he has an extensive line of plans for scale models of all sizes and types, from top U.S. and British modelers. Bob is the U.S. agent for plans sold in the U.K. by ASP (Argus Specialist Publications, publisher of *Aeromodeller* and the like), as well as those by noted English scale modelers Dennis Bryant, Brian Taylor, the Thorpe brothers, etc.

Bob Holman's "Best of Scale" catalog sells for $4.00. He also has ASP Planbook # 1, which lists all of the ASP scale plans from small rubber to large scale R/C. ASP Planbook #3 is an illustrated catalog of 3-view drawings published in the English model magazines. The two Planbooks also go for $4.00 each, but if you order all three of these catalogs together Bob will cut you a deal and let you have them for just $9.00 postpaid. How you gonna beat that?

Order from Bob Holman Plans, P.O. Box 741, San Bernardino, California 92402.

* * *

A gentleman by the name of Bill Larrabee is introducing the first of what he hopes will develop into a series of profile flying scale gliders using laminated cardstock construction. As the accompanying photo shows, Bill's first offering is a 3-in-1 kit featuring three versions of the P-51 Mustang. Included with the kit is a cutting board, a display stand and an assembly fixture (a beautifully designed piece of work in itself) to insure proper alignment of the flying surfaces. We had a chance to inspect one of these kits first-hand here at the MB office and must admit to being quite impressed with the engineering and preparation work that has gone into this project. The cardstock material, printing, and two sheets of written instructions are all first class. Going price of this particular kit is $6.00 postpaid.

From Bill Larrabee, P.O. Box 725, San Dimas, California 91773. •

Jake. . . . . *Continued from page 7*

your advice completely. I gather from other letters to you that not everyone else shares my appreciation of your wisdom. Since I am certifiably crazy (I have the doctors' and judges' signatures to prove it), and since I agree with you when others don't, I can't help but wonder if your faculties aren't suspect.

Thank you for your time. I will write again if I am fortunate enough to experience another half-hour of coherency on a Wednesday.

#6371-554365 in Orchard Park, NY

Dear #6371-554365:

For the life of me I will never know how you found this out, but yes, it is true. When I was a student at Piedmont College of Advice Journalism and there was a major crime within a hundred mile radius, it is true that my faculty were often suspects.

Jake

* * *

Dear Jake:

What is a trim tab?

Harley in Ashtabula

Dear Harley:

It's the bill you get for having your shutters, windows, and doors painted.

Jake

* * *

Dear Jake:

I'm interested in light hand-tossed R/C gliders, and the "V" tail looks like it might have less drag (and looks neat).

To save weight I was thinking of just eliminating the control mixer mechanics altogether. Then make up for this loss by holding the transmitter at an angle. What do you think? Good idea or not?

Cockeyed Roy in Columbia, MO

Dear Roy:

It might work on a single stick, but on a two-stick you'll also be mixing throttle and nose wheel steering. If that's the case, the engine response and ground handling of your hand-launched glider will go to pot.

Jake

* * *

Dear Jake:

Why would a pilot be afraid of a cat? I overheard a couple pilots talking in a bar, and they both said they hated to fly if there were any cats around. What's the big deal about flying with a cat?

Eavesdropper in Evanston, IL

Dear Eavesdropper:

C.A.T., or cat as seasoned pilots will sometimes call it, stands for clear air turbulence. It's an atmospheric phenomenon that results in bumpy or choppy air without the presence of clouds or storms that usually provide warning signs for turbulence. C.A.T. can occur at the high altitudes frequented by airliners or near the ground where lightplanes and models fly. The wind shears and gusts in C.A.T. can occasionally be strong enough to cause structural damage or even loss of an aircraft. The causes of C.A.T. are not fully known and it is the subject of a longstanding research program by the Air Force. C.A.T. is also a problem for indoor modelers. Unexplained course deviations, violent stalls, and even broken wings sometimes occur during the flight of fragile microfilm models in closed indoor facilities. These events were often blamed on air currents from heater ducts, air conditioners, door closings, etc., but such occurrences have been noted when absolutely no correlating physical event took place. The explanation? Indoor C.A.T. The cause? Unknown, but sneezes, hiccups, and Polish sausage on a Kaiser with a side of baked beans have all been postulated as contributing factors.

Jake

* * *

Dear Jake:

Is it true that Bess Myerson posed nude on the cover of Air Trails *in 1954 and lost her Miss America title because of it?*

Stanley in Steamboat Springs

Dear Stanley:

No, it was Phyllis George on the cover of *Better Homes and Gardens* in 1969.

Jake

* * *

Dear Jake:

Why are hurricanes called twisters?

Amateur Meteorologist in Altoona

Dear Amateur Meteorologist:

Hurricanes are not called twisters.

Jake

* * *

Dear Jake:

Oh. Then what is called a twister?

Amateur Meteorologist Again

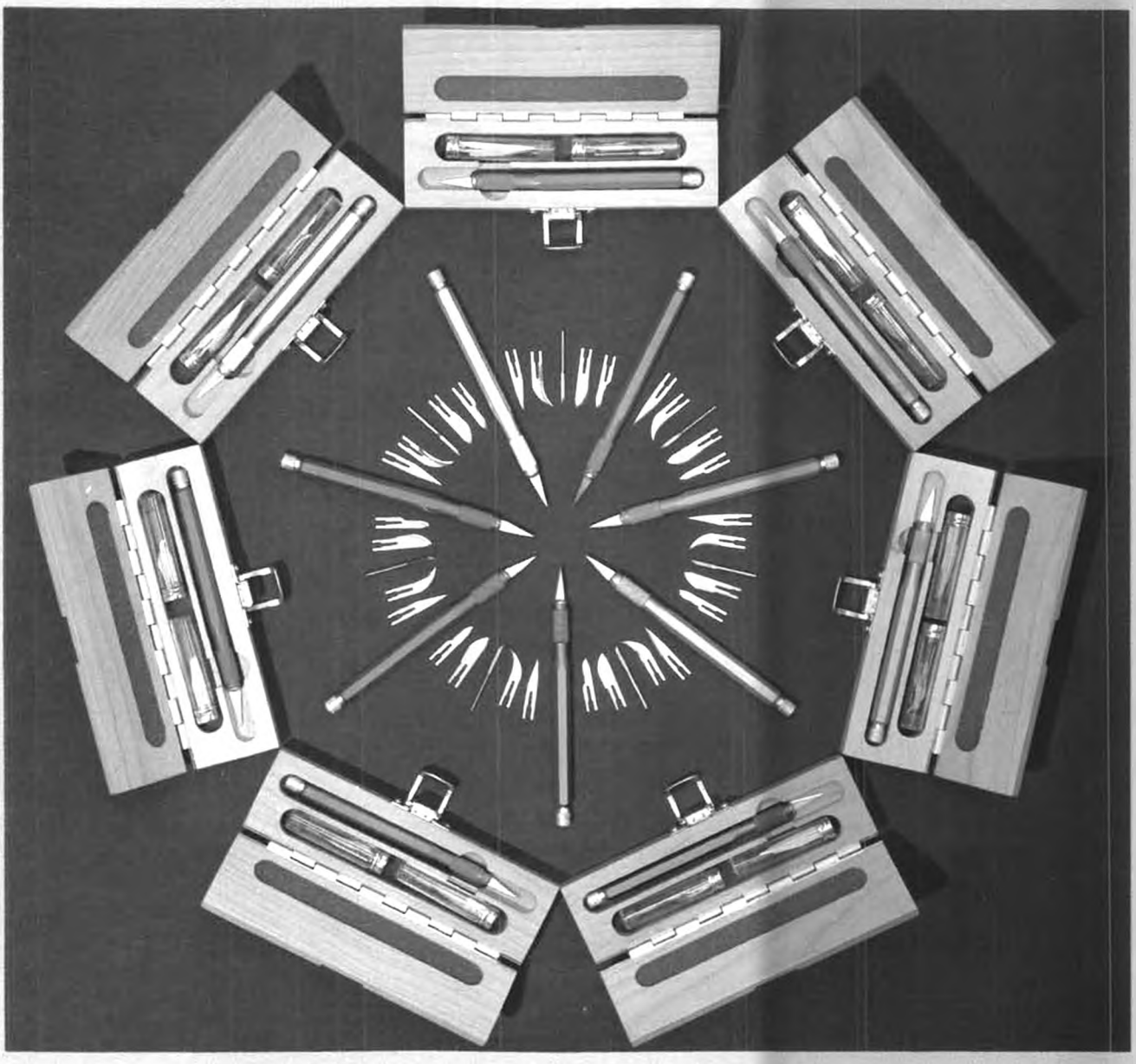
Dear Again:

Chubby Checker.

Jake

•

IN THE BEST CIRCLES, IT'S **über skiver**



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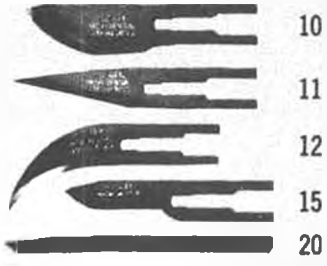

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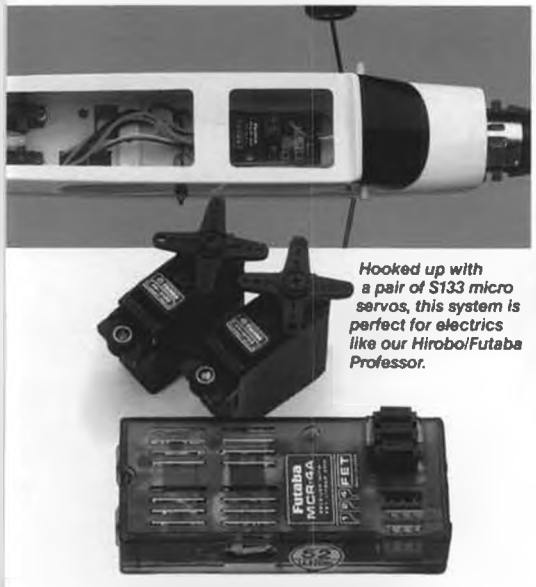
Our newest 4 channel system has something for everyone. In fact, the Attack 4NBL is such a versatile performer we've customized it for all kinds of radio control fun.

ATTACK ELECTRIC

The 4NBL/MCR system is destined to become a favorite with electric flyers. This Attack system comes complete with our new MCR-4A integrated receiver/speed control. This remarkable device incorporated a four channel receiver and a MOSFET speed control into one very compact, very light and very efficient package. It also incorporates BEC to eliminate the need for, and extra weight of, a receiver battery.



Hooked up with a pair of S133 micro servos, this system is perfect for electrics like our Hirobo/Futaba Professor.

The MCR-4A four channel receiver/MOSFET speed control weighs just 1.5 oz. and can easily handle 280 to 540 size electric motors. 1.24" x 2.92" x 0.63".

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There's a 4NBL system for sailplane flyers, too. With the Attack glider package you get a pair of S133 servos, R114H four channel receiver and a 250mAh NiCd pack. Again, when size and weight of the airborne package is critical, Attack is the answer.

Transmitter/T4NBL				
RECEIVER	SERVOS	BATTERY	FREQUENCY	TYPE
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R114H	S133(2)	NR-4K	72MHz	Sailplanes
R114H	S148(3)	Dry Case	72MHz	Aircraft
R114H	S148(3)	Dry Case	75MHz	Truck/Boat

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