

MODEL BUILDER

WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

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volume 19, number 206

The Best of Modeling



**This month: Build a Radio-controlled Pretty Bird •
A Farman 352 Peanut • Super Stofer Old Timer •
Big Birds in Florida • New Heli Column • Reviews**





Introducing the ALL NEW **HUSKY A-1** 1/4 Scale

**NEWS FLASH! Christen Industries reincarnates the Super Cub . . .
Byron Originals brings it to you in SUPERB 1/4 Scale.**

The Husky is here. Gone is the Cub's conventional flap and in its place is a 30% larger, super effective Single Slot Flap--a great improvement in slow flight stability . . . the Husky's smaller aileron features a symmetrical airfoil for greater effectiveness and roll control . . . and the Husky packs the Cub-style bungee rubber cord shocks inside the fuselage for less

aerodynamic interference.

These and other more subtle improvements put the Husky's utility role light-years ahead of the Super Cub while providing even more of those desirable Cub-style flight characteristics . . . a gentle and relaxing floater with aerobatic prowess when called for!



SPECIFICATIONS

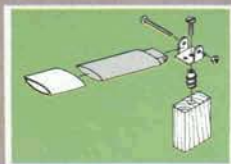
Wing Span: 105" Channels Required: 5 with flaps
Length: 67 1/2" Ready-to-fly weight (less fuel): 19-20 lbs.
Recommended Engines: Super Tigre 2500/3000, Quadra 35/40 or equivalent 2 and 4 cycles.



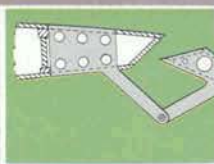
Single Slot Flaps provide superior slow flight stability and allow take off's as short as 15-20 feet! Plug-in wings provide transport and storage convenience!

Scale Appointments Even a Master Builder Would be Proud of!

Take a look at these Byron Originals scale components that are standard with every Husky kit. They're available from no one else in the industry. Who knows, maybe they'll even end up on someone else's Cub someday?



(clockwise from upper left)



- Scale Struts and Injection Molded Strut Anchors--Standard!
- Scale Injection Molded Flap Hinges--Standard!
- Scale Operating Cabin Door, Instrument Panel, Seat Backs and Cabin Floor--Standard!
- Scale Cowling Panel Lines and Vented Louvers--Standard!
- Scale Vacuum Formed Landing Lights and Wing Tip and Rudder Position Lights--Standard!



Top Performance on a Variety of Engines!

The Husky brings you Cub-style fun and performance on a variety of engines including Super Tigre 2500's, Quadra 40's and their equivalents! Optional Universal Engine Mount makes installation a snap!



Available Soon . . . Scale EDO Floats!

Injection molded foam for full scale detailing and fast building. Finishing requires glassing and painting only. A perfect float system for Cubs and similar designs.

Complete-Kit-Concept

Our long list of standard items, in addition to those illustrated here, include: fiberglass fuse with rib detailing, fiberglass wing tips, custom wire cut wing cores, all sheeting material, die-cut components, fuel system, preshaped aluminum landing gear, tailwheel assembly, all hardware, decal sheet, paint templates, glue-on wood component templates, nyrods, hinges, extensive isometric drawings and step-by-step illustrated owner's manual. Scale tires and aluminum spinner are optional, leaving you the final choice!

Order Information

Order Number	Description	Retail Price	Factory Price*
6130043	Deluxe Husky A-1 Kit . . .	\$564.29	\$395.00
4330108	Scale Tires (1 pr)	24.95	24.95
6030634	3" Turned Aluminum Scale Hartzell Profile Spinner w/ Backplate . . .	35.95	35.95
6030238	Universal Engine Mount . .	51.86	36.30
6130096	Power Package w/Super Tigre 2500	353.00	253.00

*Shipping, add \$15.00 per kit. When tires, spinner and mount ordered with kit, no shipping charge. When ordered separately, add \$3.00 per item. Power Package, add \$3.00 shipping. All shipping UPS, 48 contiguous states, HI, AK and overseas, call for shipping quote. Prices Subject to Change Without Notice. MasterCard and Visa Welcome! No COD's.

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BEECHCRAFT: STAGGERING TO STARSHIP. Ed Phillips. Staggerwing, Twin Beech, Bonanza... every production and experimental Beech airplane ever flown is documented. Complete warbird coverage of UC-43, GB-1, AT-7, AT-11, C-45, the mighty XA-38 Grizzly. Postwar years including Model 35 Bonanza, Travel Air, military and export models, T-34 Mentors, Barons, Dukes and the legendary King Airs; they're all here plus much, much more. With 245 photos, including many never published before, 343-view drawings, technical specifications. 96 pages, 8 1/2" x 11", s/bd. 2012A \$14.95

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CONTENTS

FEATURES

OVER THE COUNTER.....	6
WORKBENCH, <i>Bill Northrop</i>	10
DEAR JAKE	11
BIG BIRDS, <i>Al Alman</i>	12
CHOPPER CHATTER, <i>James Wang</i>	18
SO YOU WANT TO GO FAST, HUH? <i>James Wang</i>	20
REVIEW: BYRON'S BULLET, <i>Mark Frankel & Marty Zeller</i>	22
BIG BIRDS IN FLORIDA, <i>George P. Burdell</i>	24
MODEL DESIGN AND TECHNICAL STUFF, <i>Francis Reynolds</i>	26
ELECTRONICS CORNER, <i>Eloy Marez</i>	27
R/C SOARING, <i>Bill Forrey</i>	28
ELECTRIC POWER, <i>Mitch Poling</i>	31
PLUG SPARKS, <i>John Pond</i>	32
SMYRNA 150, <i>George P. Burdell</i>	38
RAMBLIN' THROUGH AUSTRALIA, <i>Stu Richmond</i>	40
ALL ABOUT ARFs, <i>Dr. Art Steinberg</i>	42
REVIEW: GOLDBERG'S SOPHISTICATED LADY, <i>Skip Ruff</i>	44
FREE FLIGHT SCALE, <i>Fernando Ramos</i>	46
HANNAN'S HANGAR, <i>Bill Hannan</i>	48
FREE FLIGHT, <i>Bob Stalick</i>	50
CONTROL LINE, <i>John Thompson</i>	56
INSIDERS, <i>Dave Linstrum</i>	58

CONSTRUCTION

PRETTY BIRD, <i>Alex McLeod</i>	14
SUPER STOFER O.T., <i>José Tellez</i>	37
FARMAN 352 PEANUT, <i>Walt Mooney</i>	53

COVER: This replica of a WW1 Fokker Dr.1 Triplane was seen at the 1985 Antique Aircraft Fly-In that traditionally is held on the third weekend of August, at the Evergreen Field, just outside Vancouver, Washington. The plane's owner, Patrick Henry, began with a radio-controlled version of the Red Baron's most famous fighter, and graduated to this homebuilt craft that consumed 3000 hours of Mr. Henry's time to complete. Powered by a Lycoming 150 horsepower engine, the Dr.1 was constructed of plywood, steel, and fabric in the owner's converted goat barn. Photo: Phil Bernhardt.

STAFF

EDITOR/PUBLISHER

Wm. C. Northrop, Jr.

GENERAL MANAGER

Anita Northrop

ASSISTANT GENERAL MANAGER

Dawn Johnson

MANAGING EDITOR

Richard Dowdy

PRODUCTION ARTIST

Kimber Jett-Baird

DRAWINGS BY

Al Novotnik

ACCOUNTING MANAGER

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SUBSCRIPTION MANAGER

Audrey Peterson

CONTRIBUTING EDITORS

Al Alman	Walt Mooney
Jake Doe	Mitch Poling
Bill Forrey	John Pond
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Bill Hannan	Stu Richmond
Dick Hanson	Bob Stalick
Dave Linstrum	Art Steinberg
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Eloy Marez	Bill Warner

ADVERTISING

Gordon Boudewyn

Advertising Accounts Manager

Corporate Office

(619) 744-7337

Al Novotnik

4 Beverly Pl., Norwalk, CT 06850

Bus. Phone (203) 847-7478

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This truly affordable 1/10 scale four wheel drive radio control car comes in ready to assemble kit form. It has many 'trick' features which give it a distinct advantage in competition racing.

Great strength and low center of gravity have been designed into the shielded monocoque ABS resin frame. The body and rear wing are molded from durable polycarbonate resins to withstand punishment. All radio, battery and drive train components are protected. Due to the high speeds and torques involved, the steering servo is protected by a triple-save servo saver.

The gear drive system consists of fully assembled front and rear differentials, plus a center differential with a motor protecting adjustable clutch/torque limiter. Drive power comes

from a RS-540 motor and is transferred via dual lightweight toothed belts which provide instant acceleration with minimum power loss. Belt maintenance and tension is simple due to several access hatches located along the drive train. Power is put to the ground through the durable low-profile pin spike tires. The tires are mounted on

QuikChange™ lightweight one piece chromed wheels for easy maintenance.

The suspension is superbly handled by a 4 wheel independent wishbone system. This

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M E R C U R Y
Xi-4™

TECHNICAL SPECIFICATIONS:

- Overall length: 13.78 inches (350mm.)
- Overall width: 9.61 inches (244mm.)
- Overall height: 5.19 inches (157mm.)
- Average total weight: 56.44 ounces (1600g.)
- Wheel base: 10.63 inches (270mm.)



The Mercury Xi-4 requires a 2 channel radio equipped and a 7.2VDC flat rechargeable battery pack to operate. (not included)



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3-CHANNEL
RUDDER, ELEVATOR, THROTTLE

SIG

\$72.95

SPECIFICATIONS:

Engines: .29 - .40 cu. in. 2-Stroke
.35 - .45 cu. in. 4-Stroke
Wingspan: 78 in. Length: 62 in.
Wing Area: 1150 sq. in.
Typical Flying Weight: 6 lbs.
Wing Loading: 12 oz. per sq. ft.
For 3-Channel Radio Control

KADET SENIOR

THE ORIGINAL "HANDS-OFF" TRAINER

First attempts at R/C flying should be with an inherently stable model that flies slow enough to give the student pilot time to think and react. Our **KADET SENIOR** and **KADET SENIORITA** have been widely acclaimed as the best true "hands off" trainers on the market. Both of these models are designed to fly so slowly and gently that just about anyone can handle one on their very first try! If the student pilot does get confused, merely let go of the control sticks and the **KADET** will recover itself and return back to level flight without any further input needed from the pilot — literally "hands off"!

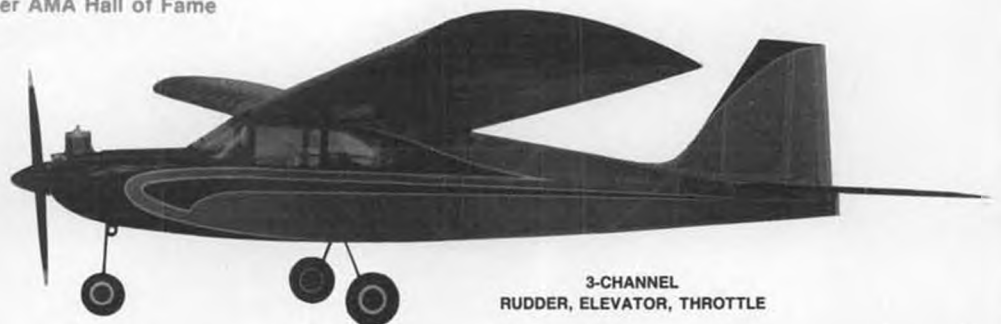
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Designed by **CLAUDE McCullough** — Member AMA Hall of Fame

SIG
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3-CHANNEL
RUDDER, ELEVATOR, THROTTLE

KIT RC-60

SPECIFICATIONS:

Engines: .15 - .25 cu. in. 2-Stroke
.21 - .35 cu. in. 4-Stroke
Wingspan: 63 in. Length: 50 in.
Wing Area: 746 sq. in.
Typical Flying Weight: 3-3/4 lbs.
Wing Loading: 12 oz. per sq. ft.
For 3-Channel Radio Control

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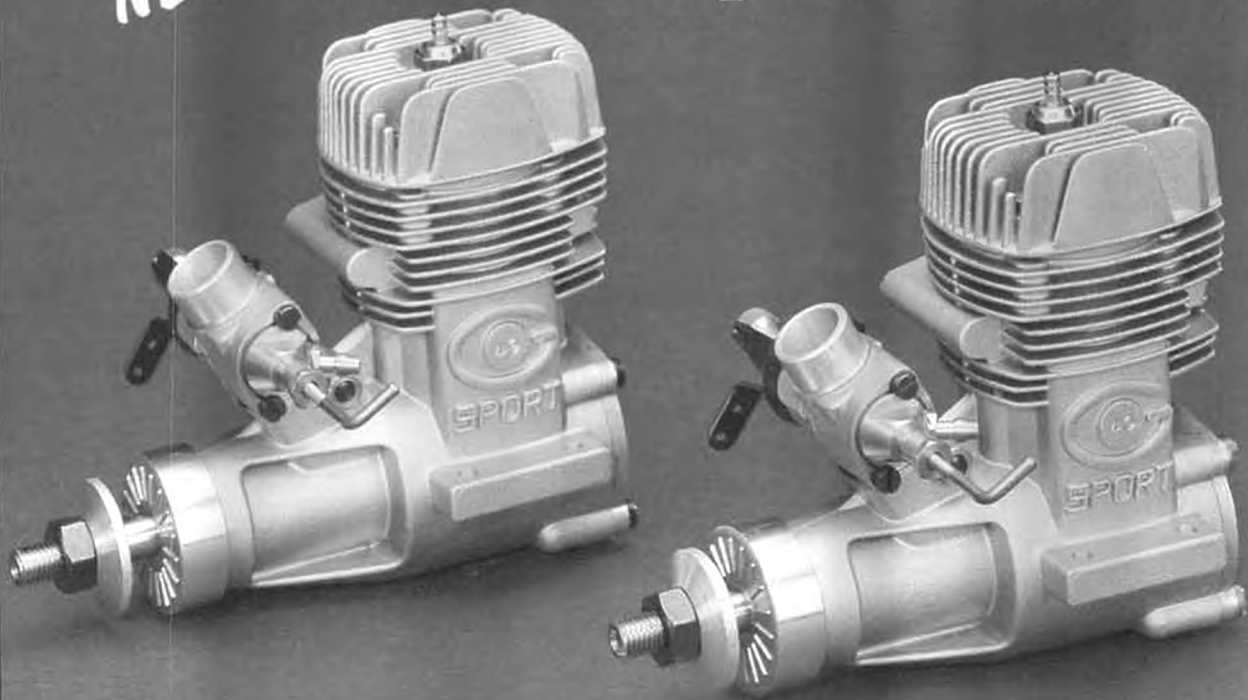
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Solidly equipped with features not normally found in sport engines, such as a chrome-plated cylinder sleeve for improved compression, bronze-bushed conrod, Schnuerle porting for extra power, rear ball bearing, and a versatile swing-style muffler, these mid-sized dynamos give you the performance that had previously been reserved for only the most demanding fliers. These quality features, along with expert Italian craftsmanship and SuperTigre's dedication to performance ensure that the G-40 and G-49 Sport engines will add a new and exciting dimension to your sport flying.

Performance and price — you can have it all.

The economical price of the G-40 and G-49 Sport engines make them an extraordinary value. These engines have been designed and manufactured to yield traditional SuperTigre high performance. And you won't have to empty your wallet to buy one. Even if you're a weekend sport flier, the new G-40 and G-49 Sport engines make it easy to become part of the growing elite of loyal SuperTigre pilots. Discover the SuperTigre G-40 and G-49 Sport engines—super performance at a super price.

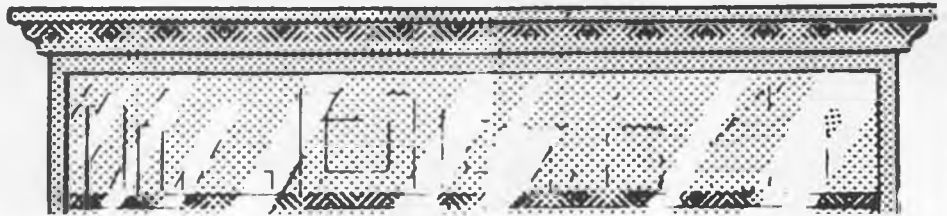
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OVER THE COUNTER

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.



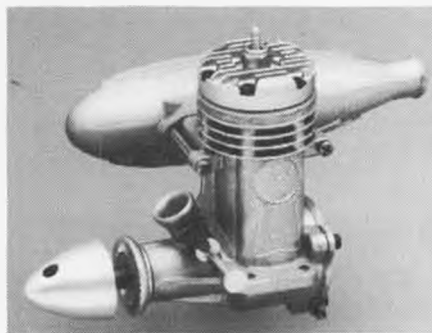
• Modelers who like to dress up their models with wheel pants will be happy to learn that Sig Mfg. Co. has two new sizes of their popular wheel pant mounts, made to fit 1/8 and 5/32-inch wire axles. These are very similar to the larger 3/16 and 1/4-inch sizes Sig put on the market early last year. Made of molded nylon with a machined brass insert, these mounts are thin enough to go on the inside of the pant, next to the wheel, and if you don't overtighten the retaining screw the pant will be able to pivot on the axle in the event of the "hard landings" we all make at times, thus possibly saving the pant from some major damage.

Sig's new wheel pant mounts come two to a package, including the mounting hardware shown in the photo, for a retail price of \$2.95. The two larger sizes sell for \$3.95 per pair. From Sig Mfg. Co., 401-7 South Front St., Montezuma, Iowa 50171.

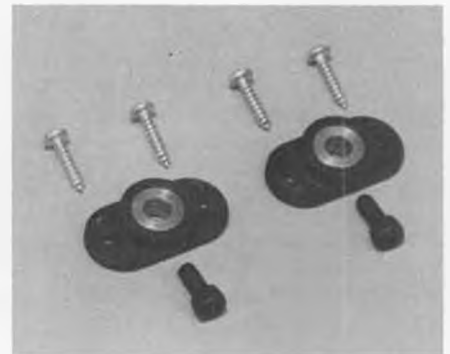
* * *

The good folks at Fox wrote to say that the venerable Fox 35 Stunt, so popular with C/L Aerobatics fliers, is entering its 40th year of continuous production. With this in mind they are now making a version of the engine called the 40th Anniversary Special, which differs from the standard Fox 35 in that it has

ornamentation molded on the bypass and is supplied with a muffler and polished spinner nut. Also, each engine is test run at the factory. Suggested list price is \$64.95. Available at your dealer or direct from Fox Mfg. Co., 5305 Towson Ave., Fort Smith, Ar-



New Fox 35, "40th Anniversary Special".



Sig's wheel pant mounts, two new sizes.

Certified Gold.



Airtronics Gold Label Super Narrow Band Dual Conversion Receivers set the R/C standard for 1991. In certified independent tests, our state of the art FM and PCM receivers meet or exceed all AMA and RCMA specifications and guidelines for R/C operation in 1991 and beyond.

These compact, lightweight, high performance Dual Conversion FM and PCM Receivers produce a clearer, more efficient signal that is less susceptible to specific types of intermodulation problems.

Specifications: Airtronics FM and PCM Gold Label Super Narrow Band Dual Conversion Receivers

Receiver:	92965 Vanguard PCM 4 & 6	92765 Vanguard FM 4 & 6
Transmitter:	92785 Module FM 92985 Spectral/Quantum PCM	
Length:	2.4"	2.7"
Width:	1.5"	1.36"
Height:	0.8"	0.85"
Weight:	2 oz. 2 oz. 2 oz.	2 oz.
Adjacent Channel Rejection:	Better than -69.4 dB @ + 8.5 KHz -77.3 dB @ -8.5 KHz	Better than -81.3 dB @ + 8.5 KHz -69.2 dB @ -8.5 KHz
Image Rejection:	-67.1 dB	-70.8 dB
3rd OIP:	+5.9 dBm	+3.8 dBm



Vanguard PCM Receiver.

Airtronics Gold Label Dual Conversion Receivers give you all the advantages of superior image rejection, improved sensitivity, narrow bandwidth and maximum interference rejection for outstanding aircraft performance and control.

When it comes to dual conversion receiver technology, all that glitters isn't gold. Airtronics Gold Label Receivers set the gold standard for 1991 and beyond.

Contact Airtronics for prices and availability.



Tx for Futaba's 7UHP PCM 1024 helicopter radio.
kansas 72901.

We received information from Futaba on five new R/C systems, all of which are designed to meet 1991 specs. The transmitter shown in the photo is for the 7UHP, seven channel PCM 1024 helicopter system. Also available are the 7UAP, PCM 1024 airplane system; the 7UHF, an FM helicopter radio; the 7UAF, an FM system for airplanes; and finally the 5UAP, which is a five-channel PCM 1024 airplane radio.

One look at the accompanying photo should make it obvious that these systems have far too many features to tell you about here, so we're not even gonna try. Instead,

we'll refer you to last month's "Electronics Corner" column, in which Eloy Marez talks about these new radios at length.

If you like, a complete catalog describing these new radios and other new items from Futaba is available by writing to them at 555 West Victoria St., Compton, California 90220.

* * *

The smiling fellow holding the slick R/C slope glider in one of the photos is Doug Hertzog, who just recently formed a small company called Douglas Aircraft Model Aviation. The glider, called the "Silhouette", is Doug's first product. It's designed to be a very fast, very aerobatic aileron/elevator slope soarer for mini R/C systems—the prototype uses a Futaba 4NL with S-33 servos—although it's claimed that some of the larger size servos can be shoehorned in.

The Silhouette spans a mere 43 inches and features a thinned Eppler 374 airfoil at the root, which changes to fully symmetrical at the tip. Construction is conventional balsa/spruce/plywood throughout with the exception of the foam wing core. The kit includes hardware, rolled plans, and detailed instructions. Introductory price has been set at \$53.49. An optional epoxy-glass fuselage is also available, for an extra \$26.95. (The model in the photo was built with the stock wood fuselage.)

Those who want to find out more should write to Douglas Aircraft Model Aviation, P.O. Box 92472, Long Beach, California 90809. You can also contact Doug Hertzog directly by calling (213)498-1737.



Douglas Aircraft's "Silhouette" R/C slope glider, held by designer Doug Hertzog.

* * *

Three more R/C sailplanes now available to Soaring enthusiasts are the Chuperosa, Ilo, and Callisto, all kitted by Mel Culpepper of Culpepper Models Inc. The Chuperosa is the smallest of the lot at 59 inches, which qualifies it as an AMA Class A ship. (Last year the Chuperosa set a Class A distance record of 6.6 miles—an impressive performance for a hand launch size model.) Novel features include a bolt-on foam wing

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*Return RF Module and Receiver only. An additional checkout charge will be incurred if complete transmitter is returned.	
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Vanguard FM Receiver

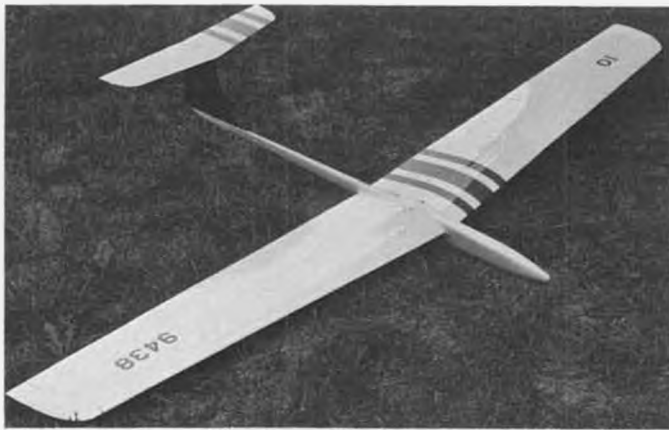
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Two of the three high-performance sailplanes from Culpepper Models are the 2-meter lo (left) and Chuperosa (above, polyhedral version shown).

with 1/32 balsa sheeting, and a fuselage with open-structure stick construction aft of the wing. There are actually two different Chuperosa kits being offered: one has a polyhedral wing for rudder/elevator controls, the other has slight V-dihedral and ailerons for more aggressive performance. The standard airfoil for both versions is the widely used Eppler E-214, but wing cores cut with the Selig 4061 airfoil are also available as an option at no extra charge. Flying weight can be as little as 16 ounces depending on the radio used.

The other two models, the lo and Callisto, were designed by well-known soaring competitor Terry Edmonds, and are so similar to each other in appearance that we've decided to let one photo pass for both. Basically they are the same model, the lo being a 2-meter derivative of the standard class Callisto. Both are aileron ships with foam core wings sheeted with 1/16-inch balsa, carbon fiber reinforced spruce spars, and fiberglass fuselages. Both are offered in various kit forms, anywhere from fuselage/wing core kits to nearly completed structures.

Pricing and kit availability information for all of these high-performance models can be had by writing to Culpepper Models, 2526 Washington, Dubuque, Iowa 52001.

* * *

R/C chopper pilots who fly off of hard-surface runways will want to check out the



New model rocketry catalog from MRC.



nifty "Skid Stops" marketed by Aerotrend Products. Skid Stops are silicone sleeves measuring 3/4-inch long by 3/4-inch diameter. When installed on your helicopter's landing skids they provide the extra "grip" necessary to keep your machine steady on the pad before takeoff and after landing, as well as helping to protect the skids from excessive wear and damage.

Skid Stops come eight to a package and are available in both black and white colors. You have a choice of getting all white, all black, or four white and four black in a single package. No word on the price, but you can get that and info on other Aerotrend products by contacting them at 31 Nichols St., Ansonia, Connecticut 06401-1106.

* * *

Anyone aspiring to get into model rocketry would do well to get the latest rocketry catalog from MRC. Far more than just a showcase for MRC products, this catalog is full of helpful and valuable information that will answer a lot of the questions that the beginning rocket enthusiast is bound to have. Topics such as model rocket terminology, how to select launch sites, painting and detailing, and principles of rocket engine operation are just a few of those covered in this full-size 24-page booklet. Basic information on the NAR (National Association of Rocketry), the governing body for model rocketeers, is also provided.

Best part of all is that even though the catalog sports a \$2.00 price on the cover, you can get one free of charge, just for the asking. Write to Model Rectifier Corporation, 200 Carter Dr., Edison, New Jersey 08817.

* * *

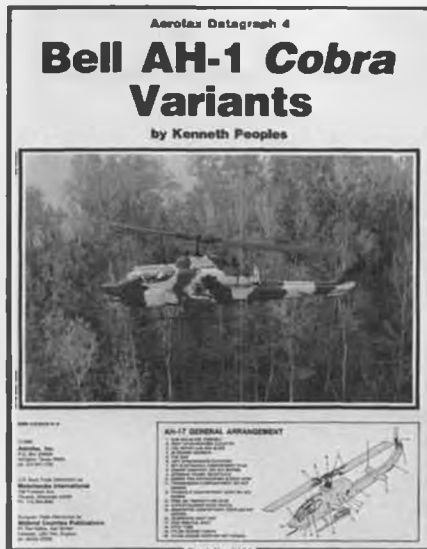
Enya owners who would like their engines to be a little quieter than the stock muffler will allow, should check out the new noise abatement accessories being offered by Altech Marketing, the importer of Enya engines. Part No. M25011 is an at-

tachment that installs into the stock mufflers supplied with the Enya 15, 19, and SS25 engines; similarly, Part No. M25111 fits mufflers for the SS25BB, SS30, and SS30BB engines. Both of these attachments are said to be easy to install, providing a noticeable decrease in noise while at the same time taking away only a minimal amount of power. You guys with the Enya 40CX, 45CX, SS40, SS40BB, and SS45 engines will have to shell out for a whole new muffler if you want to cut down on noise... and it just so happens that Altech has one available, Part No. SM402X, which is slightly longer than the original but is claimed to be significantly quieter. This particular muffler, installed on an Enya SS40, is the one shown in the accompanying photo.

Altech also has some new mufflers available for Enya four-strokes, necessary for a good noise abatement program, even though these engines are noted for being inherently quieter than their two-stroke counterparts. Part No. M604C fits the 60 and 80 four-strokes; Part No. SM904C is for the 90 and 1.20, and Part No. SMR1204C is designed for the R120 and R120GP. The lat-



Enya SS40 fitted with one of the new super-quiet mufflers from Altech.



ter two mufflers are of the flexible type, which provide more versatility in routing the exhaust away from the model.

For more information on these products write to Altech Marketing, P.O. Box 391, Edison, New Jersey 08818.

Zenith Aviation Books favored us with copies of three of their latest titles, two of which are about the Bell Cobra helicopter gunship. No. 4 in the Aerofax Datagraph series, *Bell Cobra Variants*, authored by Kenneth Peoples, offers a very interesting in-depth look at the history and development of the Cobra, from the first prototypes up to the current production version, the awesome AH-1W. The book features 240 black-and-white detail photos and illustrations, including 3-views, and four color pages showing various paint schemes. Priced at \$12.95 we think it's a very worthwhile addition to any scale modeler's library.

In contrast, *Cobra: Tank Killer Supreme*, by Mike Verier, contains only a modest amount of technical writeup, being instead a photographic record of Cobras in action, with special emphasis on the AH-1W's flown by the Marines out of Camp Pendleton in Southern California. All 120 photographs are in color. There are no line drawings and only a few detailed close-ups, but the book should still be of interest to military aviation buffs. Going price is \$14.95.

Getting away from the choppers, we also



Left and above, two new books about the Bell AH-1 Cobra, from Zenith.

received the current copy of *Warbirds Worldwide*, which is a quarterly magazine published in England. This latest one is the sixth edition to be published and features, among other things, the second of a two-part article on the filming of "The Battle of Britain"; a progress report on the restoration of a B-24 Liberator being done in Florida; warbirds at Oshkosh '88; an article on the Douglas Skyraider; a writeup and photos of a Yak-11 recently restored in France, and more. Excellent photography throughout, both black-and-white and color. This and the five previous issues of *Warbirds Worldwide*, which are still available, sell for \$9.95 each.

Orders should be sent to Zenith Aviation Books, P.O. Box 2, 729 Prospect Ave., Osceola, Wisconsin 54020, or you can order direct by calling (800)826-6600.



Redesigned, beefier speed reduction gearbox from Leisure Electronics.



"Warbirds Worldwide" mag from Zenith.

Electric fliers take note! Bent gearshafts and stripped gears are a thing of the past with the new redesigned and strengthened speed reduction gearboxes now offered by Leisure Electronics. Changes include a hardened steel 3/16-inch shaft to replace the old 1/8-inch shaft that was apt to bend in the event of a hard nose-over on takeoff or landing. Larger ball bearings have been incorporated to handle the larger shaft, and the main gear itself has been improved by molding it out of a new DuPont plastic that is tougher and therefore less prone to break teeth and split. Gear ratios offered are 2.5:1, 3:1 and 3.8:1.

The new gearbox is now standard on all Leisure gearmotors and can be purchased as an accessory for older Leisure stock and LT-50 motors. It can also be adapted to just about any other make of motor in the 05 to 075 range. Available now from your local hobby shop or direct from Leisure Electronics, 22971 Triton Way, Unit B, Laguna

Continued on page 106



New ARF .40 size R/C ship from Great Planes, the "Avistar 40".



Hobbico ESV from Great Planes.



from Bill Northrop's workbench

• Several issues ago, I quoted from, and commented on a letter in which the writer somewhat strongly questioned my understanding of free flight modeling. Although I feel justified in my reaction to his letter, I was out of line to use editorial space in the magazine to fight back... after all, the odds were 130,000 to 1 in my favor! It's called, "the power of the press," and when making comments, I think those of us in a position to use this power sometimes forget it is there.

What reminded me of this unfair advantage was the amount of mail and telephone calls I have been receiving from all parts of the U.S. and overseas in my defense, and castigating the writer for his remarks. I can only say that I am overwhelmed by the flood of support and gratitude expressed, and as most of this response came in during the holidays, I consider it to be the best Christmas present I have ever received. I don't know if it will ever be possible to answer all of your letters individually, but for now, thank you one and all for your vote of confidence.

Always thinking editorially, several inter-

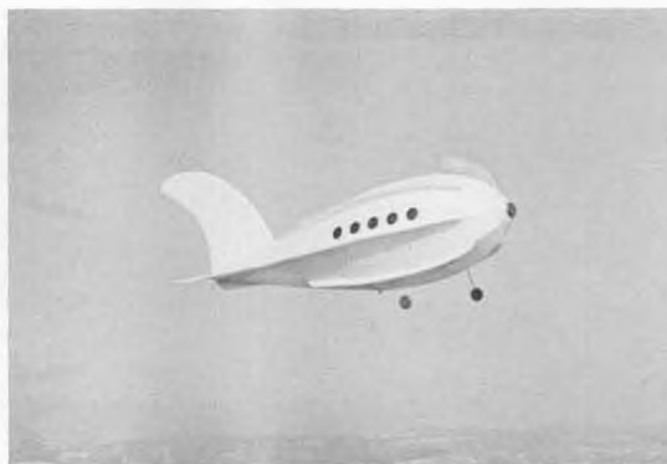


MB's editor/publisher with the original "Sproose Goose". Photo taken by Richard Spier back in early 1967, at the former Delaware R/C Club flying field on Limestone Road, between Wilmington and Newark (pronounced "New-Ark", as that used to be the name). Now there is a vocational school on the site. More info in text.

esting facts came to light from the letters and phone calls. The most important conclusion of all is that "free flight" and "dead" should never be used in the same sentence! Next, there should be no doubt in anyone's mind that free flight modelers, be they 100 percent free flight, or whether diffused as much as 99 percent by radio control or control line, represent the hard core of the model aircraft *HOB*BY. We emphasize the word "hobby" because in recent years, first with control line, and now very much in R/C, the ready-to-fly market has created a new following of model aircraft *S*PORT enthusiasts. To the hard core modeler who looks upon this development with disdain, just keep in mind that a portion of these "sport" modelers discover there is more fascination to this activity than just the flying, and soon you have a new member in the "hobby!"

One free flyer, Bob Beecroft, of Carlsbad, California, whose Class A "Satan Mk

III" we published over 15 years ago, has just come back into the hobby after a 10-year hiatus (welcome back, Bob). He wrote, first of all, to disagree with my comment that I must not understand FF, saying that I do (thanks). Secondly, he had some good advice for ALL free flight modelers... let the industry know that you're a free flyer when you buy model products, engines, props, finishing materials, etc. Tell 'em at the hobby shop when you make your purchases. Tell 'em when you order through the mail that what you buy will be used for free flight. Tell 'em at the R/C flying field when you sneak over there to see what's going on. You may be surprised how many hard core modelers you will run into. You can usually spot them by the kind of model they're flying. You know what to look for; original designs, built-up structure, open framework, neat construction, models that are allowed to fly and not just bore holes in the sky.



Skip Ruff's "Martian Spaceship" F/F glider being piggybacked to altitude by his Sig Kadet Seniorita. Photo at right shows the glider in free, stable flight. By doubling the fin area, stability has been much improved. Stay tuned...

Well, enough of this for now. We'd love to quote many of the kind letters, but back patting can get kinda too much. However, we think you'll get a kick out of this one.

I noted with interest the quotes from the letter in the "Workbench" column. I can't be sure of this, having heard of it 5th or 6th hand, but I'm wondering if this could be the same person who, in 1980, wrote a vituperative letter to the Republican National Committee complaining that an intellectual like Ronald Reagan would have limited voter appeal as a Presidential candidate, and who, in August 1988, wrote a letter to Vice President Bush, complimenting him on the selection of an economically disadvantaged war hero as a running mate.

Also, it may not have been this person, but perhaps a senior relative who, as sole arbitrageur (wow, that's a \$10.00 word!), lost a great deal of money attempting a leveraged buy-out of GHQ engines in the 1930's.

It's sometimes difficult to understand what sets people off, isn't it? Perhaps his Edsel has suddenly begun to burn unconscionable amounts of oil.

Blessings on thee, Anita and Bill Northrop, and thy supporting staff. May thy tribe(s) prosper. Month after month, you guys turn out the finest model aircraft periodical in the world. Please keep doing it.

Thanks, Jack.

VINDICATION AT LAST

Maybe it's because the name's the same, but we enjoyed a bit of smug satisfaction when the first information was released about the B-2 Stealth Bomber, followed by a partial unveiling in November 1988. It was all dressed up in a new suit, but any aeronautical enthusiast could recognize the Northrop YB-49 of 40 years ago. Even back then, albeit radar was not as advanced as it is today, the huge flying wing bomber was almost impossible to detect on a radar screen. Politics, spearheaded by the then Secretary of Defense, Stuart Symington, scuttled the YB-49 project and set flying wing development back an unbelievable number of years. It is difficult to understand how one person could apparently have the power to order and have carried out the complete and utter destruction of every single YB-49... not even one to be left for historical purposes, flyable or otherwise. Defense budgets and priorities may hold back the B-2, but the vindication is still there, right down to the exact same wingspan of 172 feet.

MARTIAN UPDATE

Two photos this month show the research progress on the R/C Martian Spaceship project by Skip Ruff, of Taft, California. The R/C model, which Skip built and test flew... once... was an exact scale-up from Roy Clough's original free flight model. The R/C version developed such violent Dutch roll tendencies on its only test flight, that Skip had all he could do to get it back on the ground in one piece.

The model shown being piggybacked to altitude with Skip's Sig Kadet "Seniorita," is a foam free flight version on which the tail fin area has been doubled. As can be seen in the glide photo, stability is greatly improved, though the glide angle is still somewhat steep. Mild power might flatten it out

a bit, but that remains to be seen when the R/C version goes up again. There will be more drop tests of the free flight model, however, before the mods are applied to the big "space traveler."

MEMORIES

The lead photo this month was sent to us by Richard Spier of Camanche, Iowa. He took this and several other photos of "Sproose Goose" (plan no. 1731, published in the January 1973 issue) just after its completion in the winter of 1966-67. Judging by the foliage, it was early spring or late winter when the photos were taken at the old Delaware R/C Club flying field, which is now the site of a vocational school. The airplane still exists in spite of many flights dur-

ing its first two years, before it was packed away for the move to the west coast. It now sits in the loft at RCMB's office. The doped silk covering (remember that stuff?) has dried out, cracked and split in many places, but the spruce framework is as rugged as ever. Some day, maybe, we'll get to refinish it, but only in silk and dope... sorry about that!

TAKE OFF THE MASK!

Bill and Bob Hunter have done it again. Satellite City has now introduced a new cyanoacrylate glue that is odorless! They're calling it UFO (User-Friendly Odorless), and it's now becoming available, in both

Continued on page 107



ADVICE FOR THE PROPWORN

—By Jake

Dear Jake:

What's the difference between a hammerhead and a stall turn?

Dennis in Denver

Dear Dennis:

One comes from the ocean and the other comes from a bad carburetor float in an old car.

Jake

...

Dear Jake:

I don't travel much, but I've got to make a cross-country trip next month. I won't have time to take a train, so I'm going to have to fly. You must travel frequently in your role as magazine correspondent, so I was hoping you could bring me up to date on the state of airline service, and maybe give me a tip or two on how to cope. Thanks for any advice you may have.

Once and Future Passenger in Connecticut
Dear Once and Future Passenger:

Your timing is superb. I've opened your letter at 38,000 feet on a flight to Los Angeles. You didn't mention when you last flew, but if it was anything over 15 years ago, the airlines have improved tremendously since then.

Let me list some of the modern advances and service improvements for you: 1. There are no more noisy propellers droning through the cabin. Hold on a second while I think of some others... 2. There are no

more noisy propellers droning through the cabin. Now that we've covered the improvements, let me mention a few things that haven't changed much since about 1951: food, seating, and carry-on luggage room.

My meal on this flight was Hawaiian Chicken. It smelled and tasted like Armenian Armpit. The guy seated next to me added to my culinary enjoyment by keeping his elbow in my salad. It wasn't his fault. He was trying his best to occupy his six inches of seating width without intruding on my space. All things considered, we worked pretty well as a team. We had the synchronized breathing down pat; he inhaled while I exhaled, and vice versa. Unfortunately, he got up and went to the lavatory. When he came back, we missed a count and both inhaled. The extra width knocked over a beverage cart in the aisle.

The side-to-side room was abundant compared to the front-to-back spacing. At one point, I was in mid-shovel with a forkful of pineapple halfway up to my mouth. The lady in front of me reclined her seat and impaled the fork into my chin. A very pleasant flight attendant relieved the awkward situation by pulling the protruding flatware out of my chin and offering me a cocktail napkin to cover up the four little holes.

I hope you appreciate the effort I've ex-

Continued on page 106

BIG BIRDS

By AL ALMAN



SOUNDMASTER MUFFLERS

Some months ago I mentioned how effective Soundmaster Mufflers were reported to be by a number of modelers using them.

Well, I finally got around to trying one, which in this case was #SM-Q2K (a Pitts-style muffler designed for 1.2 to 2.2 cid engines), and all that ballyhoo about much less noise and more power turned out to be more than just lip service.

I tested this particular model Soundmaster on my Super Tigre 2500, and although it looks a bit like the standard Super Tigre can muffler on the outside, there's a world of difference on the inside.

I didn't have a db meter on hand when I made the first few runs, but my ears told me that there was one helluva difference in sound. A few days later I ran the engine and checked these mufflers again, only this time I had a db meter positioned nine feet away, five feet high, and perpendicular to the exhaust.

It's amazing how much difference just a few db's make, and in this case the seven db's I read was perceived as being a tremendous change in the noise level (all readings are averages because throughout the afternoon a rather warm sun and heavy rain played peekaboo).

As you can see from the numbers, all mufflers are *not* created equal, and keep in

mind that there's no such animal as a cheap or inexpensive muffler. Even those token, hollow cans that reduce power so much more than they reduce noise cost a lot of bucks.

	ST Can Muffler	Soundmaster Muffler
Prop	18x10	18x10
Rpm	7,000	7,200
Db's	95	88

Yeah, a really effective muffler costs more, but you're getting a lot more for your money. You're getting the kind of quiet that will allow you to continue enjoying your hobby without having to constantly worry about who's being annoyed and how soon they're gonna close down your flying site.

It's also the kind of quiet that *you* can and will enjoy. After five years of noise control, the guys in our club have sorta taken the relative quiet at our field for granted, but the piercing and aggravating sound of poorly muffled engines (especially the smaller two-strokers) is all too noticeable and actually hurts our ears whenever we visit or fly at other clubs' fields.

Even if your present flying site is out in the boonies, you should take steps to adopt and enforce anti-noise rules and/or regulations, and if you're just getting a new field in shape, some kind of reasonable noise

abatement should automatically become part of your club or group operating procedures.

We're way behind the power curve in regards to doing something positive and constructive about our noise pollution. We can no longer afford to be loud and abrasive because flying sites are too hard to find and even harder to keep. It's high time that we *all* started to act like good, considerate neighbors.

Where do you get these Soundmaster Mufflers? From Davis Diesel Development, P. O. Box 141, Milford, Connecticut 06460, and tell them that BIG Bird sent ya.

CO₂ CONVERSION

I know that teeny, tiny CO₂ engines have been around for many years, and that even the .049 CO₂ conversion has been available for a while, and obviously an .049 isn't exactly a BIG Bird-sized engine. Then why include a discussion about CO₂ in this month's column?

Because with a jumbo (150cc) tank, the .049 can fly a surprisingly large (light) bird for at least ten minutes with a throttle control via the speed knob on the engine's head, and because Bob Davis can make the same kind of conversion for a .20-sized engine (he's already got a .10 working) that would easily power a Sig Kadet Senior-type airplane.

We're talking about lotsa torque (just like a steam engine) and L-O-W rpm similar to what full-scale engines turn. In fact, the instructions caution against running a CO₂ engine over 4,000 rpm because excessive cooling will result in a loss of power.

A converted .049 will turn an 11x8 at about 3,000 rpm and can handle props from a 10x8 to a 14x6. Of course, the ultimate prop selection will depend on the type of aircraft and the desired flight characteristics.

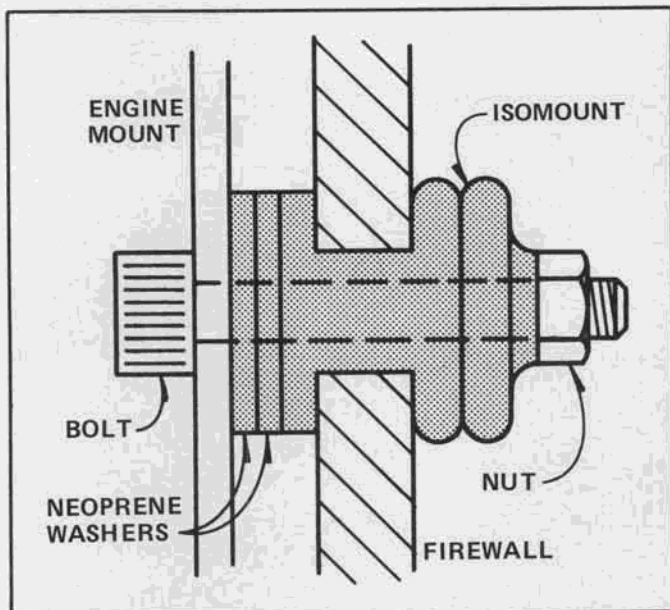
I've just started to play with an .049 installed in a Peck-Polymers Prairie Bird 50 and an Astro Flight Viking, so I'm not quite ready to bandy any rpm numbers or flight performance figures around, but so far the advantages of this power system far out-



Nifty .049 CO₂ conversion with 150cc jumbo tank, from Davis Diesel Development. Can turn up to a 14x6 at useable rpm.



Close-up of the speed adjustment knob on the .049's CO₂ conversion head. See text for more info.



Above, the Davis Diesel Iso-Mount kit includes neoprene grommets, neoprene washers and 10-32 hardened socket head bolts. Sketch at left shows installation detail.

weigh the disadvantages.

I haven't forgotten how things were back in the early days of R/C; it was very much a tinkerer's art. However, at this point in time we've come to expect everything to interface nicely and work right out of the box, except for a small percent of hardcore experimenters most of us don't want to (and shouldn't have to) put up with much tinkering.

Weather and time permitting, I'll get a handle on how viable a larger CO₂ engine would be by next month. And there'll be no smoke screen; if it doesn't look or feel right, I'll say so.

ISO-MOUNT

I haven't messed with any other kind of isolation mount since trying Lord Mounts a few years ago with a Zenoah G-38.

What I'm trying out now is the very simple Iso-Mount from Davis Diesel Development. These systems are available in two sizes; the smaller Iso-Mount kit will handle engines up to 10 to 15 cc's, and the larger one should be adequate for engines up to (at least) 40 cc's.

This kit includes four hardened 10-32 Allen head bolts, four two-inch long neoprene grommets, and 16 neoprene washers. As you can see from the sketch, the grommets are inserted into 1/4-inch holes in the firewall (flange side from the front), and the desired number of washers are installed on each bolt to act as a cushion between the back of the engine mount and the firewall-mounted flange. The bolts thread into nuts that are molded into the rear of the neoprene grommets until the grommets are snugged in tight enough to surround the firewall with a cushion of neoprene.

You can tailor the damping action of the mount by how tight you make it and how many washers you use. Also, you can offset the thrust line in any direction by using a different number of washers at the appropriate points.

There are other obvious uses for the Iso-Mount, like shock-mounting aluminum landing gears, which would allow the LG to be easily removed for transporting or

switched to another plane. And how about using them to hold all kinds of struts in place, or mounting cowls and ducted-fan housings.

The point is that a properly installed shock-mount will do two nice things for you: it'll reduce vibration, and that should greatly enhance radio and airframe longevity, and, at the same time, help to further reduce noise pollution.

PROTECTING BALL BEARINGS

Got a note from Sault Ste. Marie's intrepid Nino Campana who's protecting his four-strokers from corrosion by running them on a no-nitro fuel.

"Al, four-strokers, as great as they are, are all too prone to rusting of ferrous parts in the innards. I did all the right things (I thought) to protect my engines, but a casual examination proved that I must have missed something somewhere.

"Therefore, in the future I will use only a 15-percent castor/85-percent methanol mix for fuel. Nitromethane changes all too

quickly into nitric acid, and that stuff just loves ball bearings. The engines run quite happily on the 15/85 mix, and ball bearings are costly." This is the first time I've heard about anyone running four-strokers on an FAI blend. Nino seems to be pleased with the results, although he didn't say how the idle and top end were without nitro and what plug he was using.

At any rate, it's something worth considering. And even if the idle and top end do suffer somewhat from lack of nitro content, it's no biggie. Installing an on-board heater for the plug should make the idle reliable, and since we usually overpower our birds anyway, building light and matching the right prop to the engine/airframe should make up for any less rpm at full throttle.

Of course, eliminating nitro won't do away with all rust problems. Methanol does attract (perhaps suck up is more accurate) moisture, so after-run oil would still be

Continued on page 68



Al has some good things to say about Soundmaster Mufflers, this particular one being designed for engines up to 2.2 cubic inches.



"Pretty Bird"

By ALEX McLEOD. . . A slow, aerobatic model for .40 to .48 size four-cycle engines. Lightweight structure is its main feature. Full-size plans are available through Model Builder Plan Service.

• Beauty is only skin deep, but "ugly" goes right to the bone. The Pretty Bird is based to some degree on a .20-powered design from *Model Aviation* magazine. It is not a beautiful aircraft but a "Plain Jane Plane" that has been to the beauty parlor. A paint scheme that makes it look somewhat like a homebuilt helps to disguise the squarish lines, but, indeed, it looks a little like a Davis homebuilt.

Pretty Bird is a functional airplane, built very light to be aerobatic, yet fly slowly with low, quiet power, and be very forgiving. It makes the novice pilot look good.

There are two schools of thought regarding aircraft weight. The first one says, build them strong regardless of weight so that they won't break when they hit. The second school says, build them light enough and

they won't break even if they seem flimsy. With most of us, common sense dictates a compromise between these extremes. Unfortunately, the heavy radio gear, landing gear, and motors will help to break light structures, if not in flying, then in handling around the workshop or transporting in a car; therefore, you need a light but strong structure, and the Pretty Bird has it.

Those who want a fast-built, heavier airplane can use 1/8 sheet balsa sides, top and bottom on the fuselage right to the tail, along with 1/4-inch sheet balsa tail surfaces, but if you want an agile performer that won't break like an egg, and don't mind a little more work, then the structure shown on the plans is for you.

We have all heard of planes that flew right off the drawing board, but this one actually

did fly without trim changes. Because of its light weight, it still flies well at reduced power, but much slower. I've even tried thermaling with it. Several low-time pilots in our club who flew it wouldn't give back the transmitter, simply because it was the first low-wing aileron plane they were comfortable with. You can fly anything if you have enough power, but this low-powered airplane gives you all kinds of time to think and even change your mind.

CONSTRUCTION

The plans should be clear enough if you have built a few models already. This is certainly not a first-time model, but if you have flown a glider or a high-wing trainer, then this will be an excellent transition ship to a low-wing, aerobatic plane. If you're trying to perfect maneuvers in sport pattern models, it will allow you to do them more slowly, step by step, over the field without flying into the next county and without rekitting your hot model. Remember, in aerobatics it's accuracy first, then speed.

As was mentioned earlier, if you want a knockabout sport model that flies well, you can substitute 1/8 sheet balsa for the spruce framework of the fuselage with 1/8 square balsa where the spruce framework is shown and 1/8 sheet on top and bottom. The tail surfaces can also be cut from 1/4-inch medium sheet. Remember, this version will be heavier and needs more power to fly; therefore, it will be faster. This heavier version has been built and flies well, but it defeats the whole object of a slow aerobatic model.

For those of you who do not have an aversion to built-up stick construction, keep in mind that to ensure a strong, light model you must use gussets at every right angle



Uncowled engine keeps things simple. Model is shown here with the original fiberglass landing gear, which was a bit too flimsy and was later replaced by the wire gear shown on the plan.

joint of the spruce or balsa structure. They are almost as strong as diagonal braces. The gussets should be cut from square stock balsa at 45 degrees so that the grain of the wood runs parallel to the longest side (see the sketch on the plans). This wood should be as thick or thicker than the structural members so that it can be sanded down flush and help support the covering. When completed, a small cylindrical Dremel tool is used to cut away most of the wood, leaving a transition curve so stresses will not break the glue joints. It is more work, but well worth it. First count the number of corners, then cut the gussets using a fine-toothed saw blade. I used over 100 in the original model.

FUSELAGE

The fuselage is built by constructing the right and left sides, with doublers on the inside. The forward part is made from sheet and the back from spruce longerons and balsa uprights. The structure on the plan shows 1/8 sheet and 3/16 square strips with 1/32 birch ply doublers. I went ultra-light and used 5/32 square spruce and balsa, which I cut on my Dremel table saw. It's plenty strong enough if you take care, but you must cut your own strips.

Cut out formers #3 and #4 from 1/8 lite-ply. Make cutouts to suit your battery and tank arrangement. These then are glued perpendicular to one side as shown on the plan (use a square to check). The other side is then glued in place, ensuring that the tail post lines up properly. The plywood firewall, former #1, is added to the very front of the sides after the blind nuts are epoxied in place for the motor mount. Hardwood triangular stock is used in the corners between former #1 and the fuselage sides for strength. Add the other formers, cross pieces, tank and cockpit floor sheets. Now drill holes in formers #1, 2, and 3 for the throttle cable tube and epoxy it in place. The plywood landing gear sheet and side blocks are epoxied in place, then 1/4-inch sheet balsa is glued cross-grained on the bottom from there forward, to the point shown. Balsa sheet wing saddle triplers and



Pretty Bird's squarish lines show up well in this photo. A very functional airplane. Note how the top of the cabin is covered with clear plastic to simulate a "greenhouse" type of canopy.

cockpit interior outlines are now glued in place. Add crossgrain sheeting on top where shown. Be sure to allow for a tank access hatch on top, if you wish one; if not, install the tank and vent tubes where suitable for your engine.

I like to build a hard point in the fuselage for rear strut attachments for floats. If you want to do likewise, insert a piece of 1/8 birch plywood 1-1/2 inches wide behind former #4 on the bottom of the fuselage (right behind the wing) between the longerons. Balsa sheet inserts on the fuselage sides near the tail are needed for the control rod exits. Also, a plywood base on the bottom at the tail is needed for mounting the nylon tail wheel bracket.

LANDING GEAR

The landing gear is bent to shape from 5/32 wire. The original model had wood fairings held on with epoxy and were covered with heat-shrink tubing of the type used on helicopter blades. Earlier I tried a gear made from glass cloth and Hobby Pox #2 glue. It worked well for a while but

I didn't make it thick enough and it began to deform after a few weeks. Certainly it was much lighter and worth a try. Perhaps 20 layers of medium cloth would do it, with a layer of carbon fiber on top and bottom.

WINGS

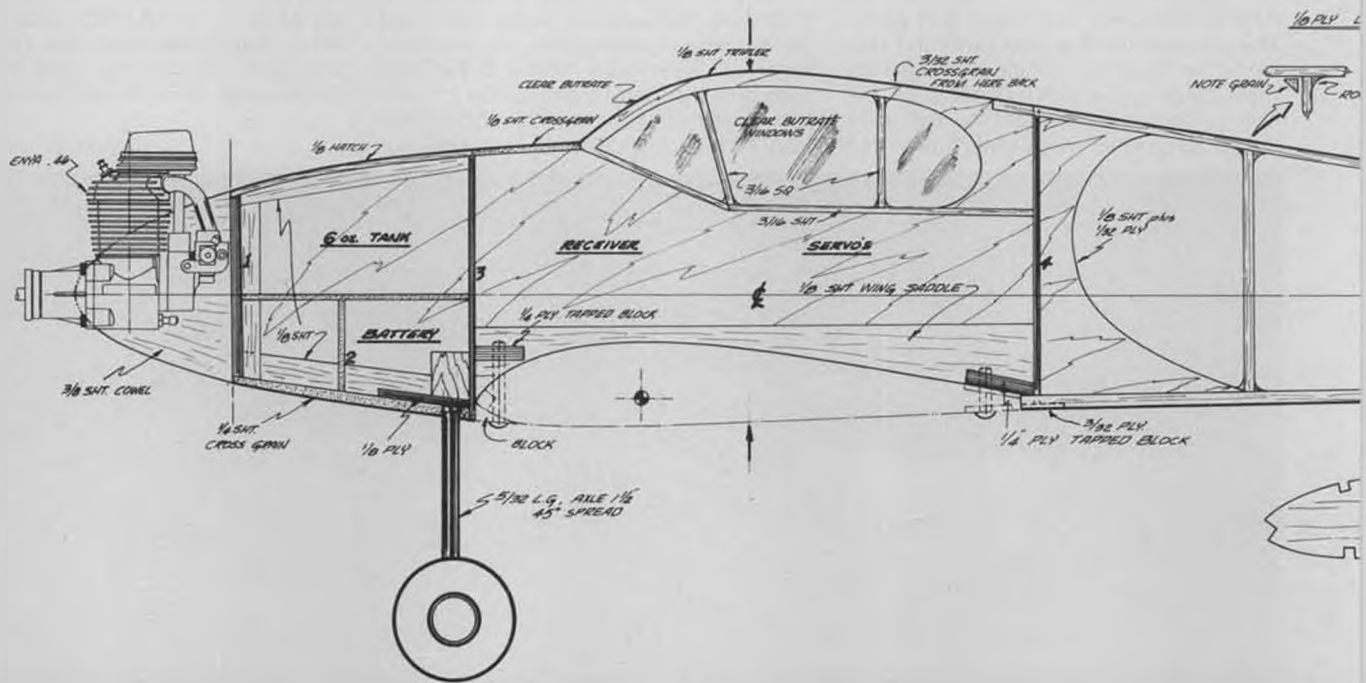
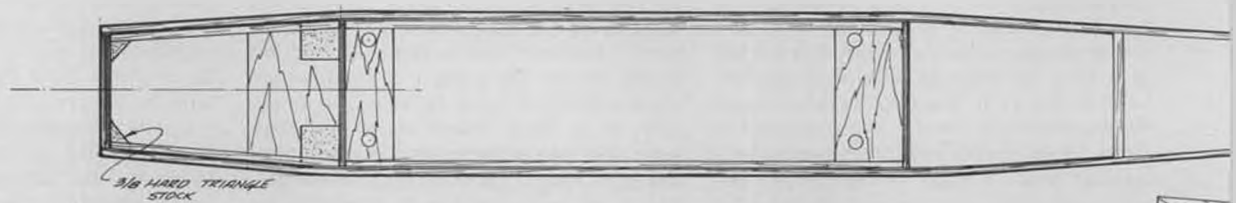
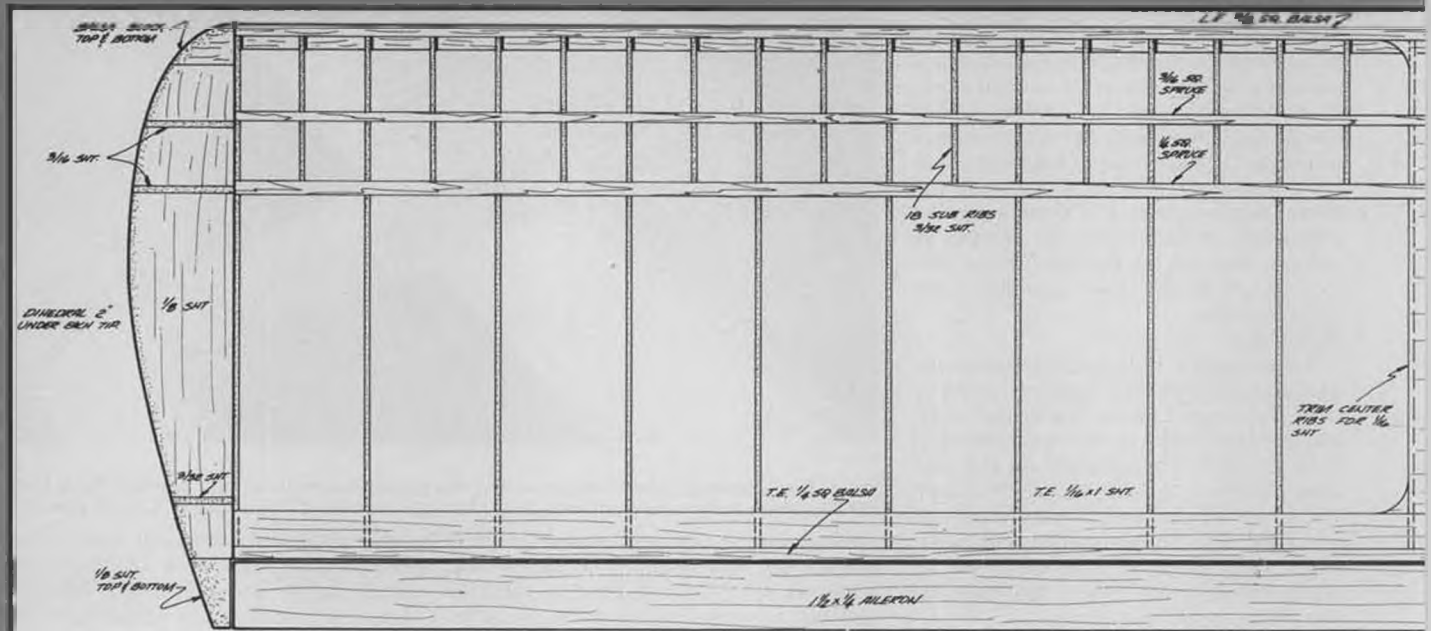
The wings are built in two separate panels, joined by two 3/16 music wire rods 9 inches long. This makes it easier to travel with them in a small car. If you don't want to do this, just build them in the usual way with the 1/8 ply dihedral brace shown.

Cut 24 ribs and 18 sub-ribs from medium hard balsa. The six center ribs are undercut to accept the 1/16 balsa covering on the center. Assemble the panels over the plan, pinning down the trailing edge sheet, then the square balsa trailing edge itself and finally the spruce lower main spar. The ribs are glued in place with cyano, the hard balsa leading edge next, then the sub-ribs, and finally the two top spars. The upper trailing edge sheet is glued in place after

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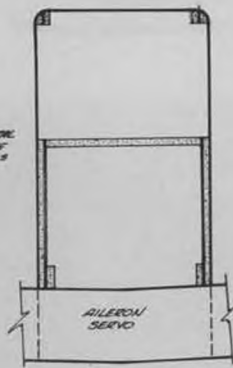
Fun-fly time! Author flies the Pretty Bird under the limbo ribbon at a recent meet held in Canada. Model is ideally suited to this kind of flying.



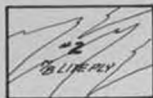


1/8 PLY DOWELTYPE BRIDGE IF ONE FORCE WING IS USED.

1/16 SHT



TYPICAL SECTION at A-A

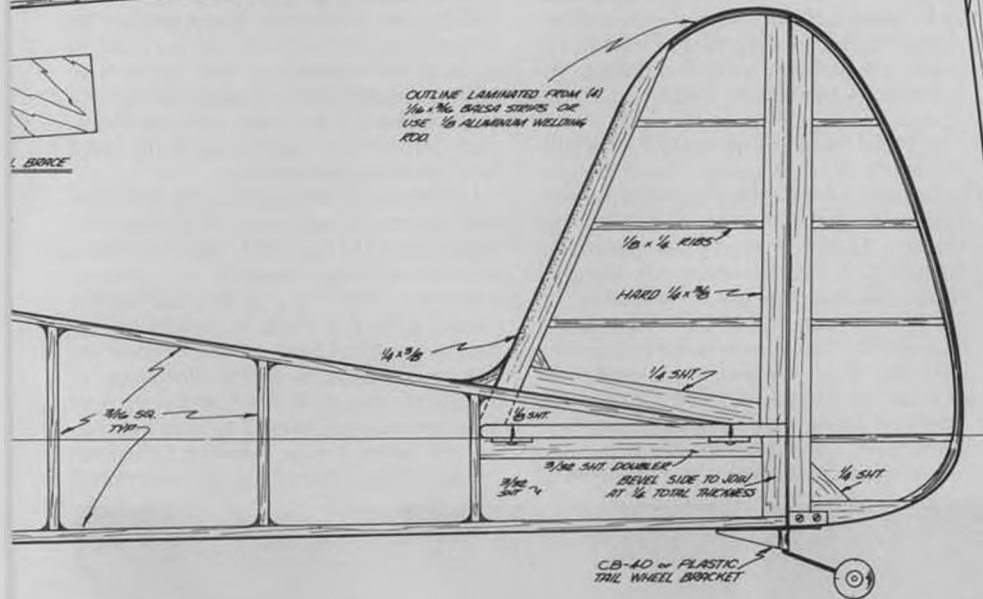


1/16 SQ



SERVO

OUTLINE LAMINATED FROM (4) 1/16 x 1/8 Balsa STRIPS OR USE 1/8 ALUMINUM WELDING ROD



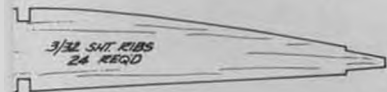
1/8 x 1/4 RIBS

HARD 1/4 x 3/8

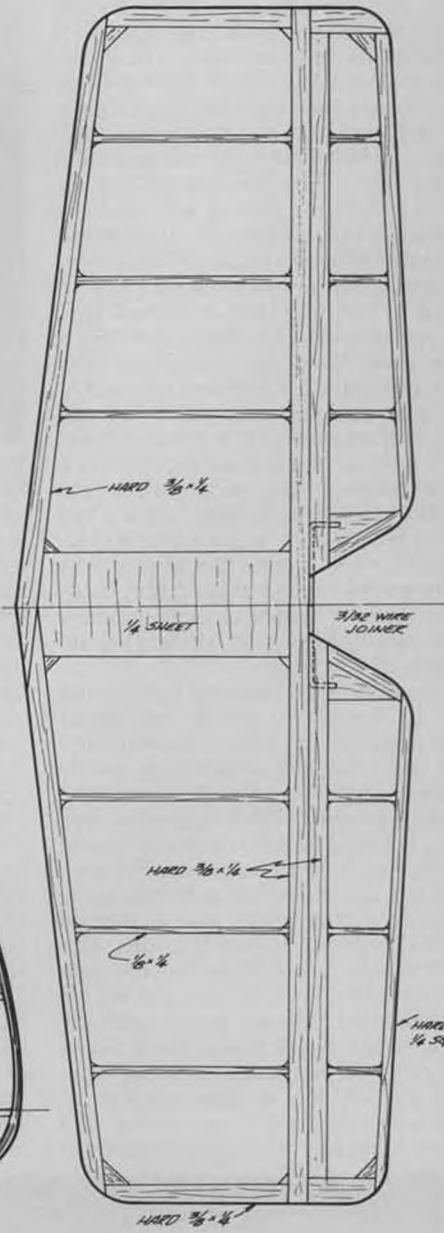
1/4 SHT

3/16 SHT DOUBLER BEVEL SIDE TO JOIN AT 1/4 TOTAL THICKNESS

CB-40 or PLASTIC TRAIL WHEEL BRACKET



3/16 SHT RIBS 24 REQ'D



HARD 3/8 x 1/4

1/4 SHEET

3/16 WIRE JOINER

HARD 3/8 x 1/4

1/8 x 1/4

HARD 1/4 SQ

HARD 3/8 x 1/4

PRETTY BIRD

58" SPAN 40-46 FOUR CYCLE
Designed by A.M. LEOD



MODEL BUILDER magazine

Plan No: 2071

CHOPPER CHATTER

By JAMES WANG



• Yesterday I was very surprised to receive a call from the editor of *Model Builder* magazine, Bill Northrop. He asked if I wanted to be their helicopter columnist. My reaction was that I was thrilled. He said that I only need to write a few pages in each issue, and each time give the readers a new insight into helicopters. He would like the column to be a show-how and explain-why type of column, so people will keep the magazine for future reference. I thought this was a wonderful idea because I would hate to write about how last weekend I went to contest A, saw John Doe, did three loops, and crashed under Mary Jane's new Ford.

The reason that I have accepted the offer is that I already have tons and tons of R/C helicopter ideas packed in my mind, to the point my head is about to explode. I think I would have no problem writing five different helicopter articles each week for the next ten years. My problem is that I just need to find the time to put all these ideas on paper. Well, I guess being your new helicopter columnist is a good start. Now, let me give the readers a short summary about myself and explain why am I qualified to accept this job.

I remember while I was still in the fourth grade in elementary school, my father's friend asked me once what I wanted for a gift. I said, "A model airplane that can fly freely in the wild blue sky, and I can control it from the ground." I didn't even know there was such a thing as radio-controlled model airplanes! Back then I just thought that such a toy must, and should, exist. At least inside the mind of a fourth grader, nothing seemed to be impossible and unrealistic. After all, if I could believe Airwolf, Blue Thunder, Battlears Galactica, Time Tunnel, and Voyage to the Bottom of the Sea, then I could believe anything. A few weeks later I did receive a control line model airplane as a gift. It was not until few months later that my father bought me a 1972 Sig catalog, and then my mind was officially opened to the



Even though the canopy says it's a Legend, that's really a GMP Stork being flown by our new Chopper Chatter columnist. Extremely stable, makes a fine beginner's machine.

wonderful world of radio-control modeling. That Sig catalog became my Bible. I read it religiously every day after school. I can recall every page from memory.

My true break into R/C aircraft came in 1974 when I saw a 50-year-old gentleman flying an R/C aircraft at Long Island, New York. Since that day, the old man and the young boy became the best of friends. He taught me not only model airplanes, but also morals and ethics. Thank you, Philip Yovino.

In 1976 I had to move to California with my family. At Los Angeles, I was fortuitous to run into John Gorham at the Sepulveda Basin. At that time he hadn't started Gorham Model Products; he was flying Schluter Heli-Babies and Kavan Jet Rangers. Again, the little boy got carried away; he just had to have one of those new toys! I managed to convince my father to buy me a Heli-Baby first. However, it was a lot more difficult to convince my mom. Of course, a straight A report card eventually did help. Since then I sank deeper and deeper into the mesmerizing world of radio-control

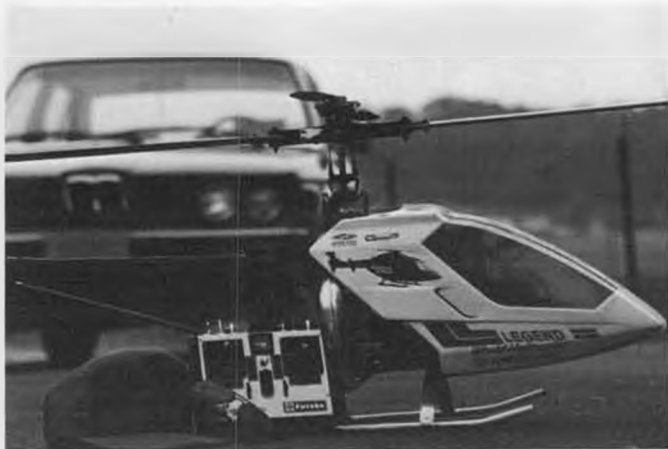
modeling. Because of this hobby I decided to pursue a career in aeronautics and astronautics. My goal is to design state-of-the-art flying vehicles. To the young readers, if you want a successful career in aeronautics, then you must get a good education. Modern aircraft have become so complicated; gone are the days that a person can design an aircraft while sitting on a toilet. In order to be competitive, and also survive hostile environments, modern aircraft are broken down into many sub-categories; each component is meticulously designed by engineering specialists.

I received my Aeronautics and Astronautics degree and an Electrical Engineering degree from M.I.T. in 1985. After that I did a year of helicopter research at Princeton University. Now I am on the final stretch toward getting a Ph.D. in helicopter dynamics at the Center of Excellence for Rotorcraft Research at the University of Maryland. I eat, drink, drive, and sleep with helicopters on my mind. I think of helicopters 25 hours a day. Full-size helicopter research is my career; model helicopters



Webra powered Schluter Champion, one of the many test bed used by our author in his world helicopter speed record attempt project. Photo at right shows the Airtronics Spectra PCM7 radio used.





Another GMP Stork in a Legend disguise, this is a Special Edition model powered by an O.S. 61RF ABC with pump and a Magna pipe. Futaba 7Hi radio. Has done 70 mph with special blades.



All that's left of the Schluter Champion on the preceding page. Some things are as inevitable as death and taxes. . .

are my hobby.

I am familiar with most of the helicopters on the market. During the past 12 years I have built at least 20 different R/C helicopters: Schluter Heli-Baby, Heli-Boy, Mini-Boy, and Champion; GMP Cricket, Competitor, Cobra, Shuttle, Stork, and Legend; American Revolution 40, Ishimasa EH-1, Kalt Baron 28, Kavan Lockheed 286, Heim 222, Kyosho Concept 30, and a few of my own designs. And there are other helicopters that I have not built, but I have flown them regularly. Periodically, I will show you pictures of the helicopters and rotor heads that I have designed. Furthermore, since I am not in the model helicopter business, I believe that I can use my full-size helicopter engineering skill to give you an unbiased assessment of various manufacturers' products.

To people who have read my articles in the *International Helicopter* magazine, published in England, you are probably already familiar with my writing style. My motto is to explain complex helicopter aerodynamics, dynamics, and stability and control in simple terms with physical insights so the layman can understand the principles. Thus, he will enjoy the hobby more, be able explain it to other people, or be able to apply the understanding to improve or modify the helicopter scientifically. In my articles, the ideas are always illustrated with perspective engineering drawings. Of course, in order to keep you up to date in the world of R/C helicopters, I

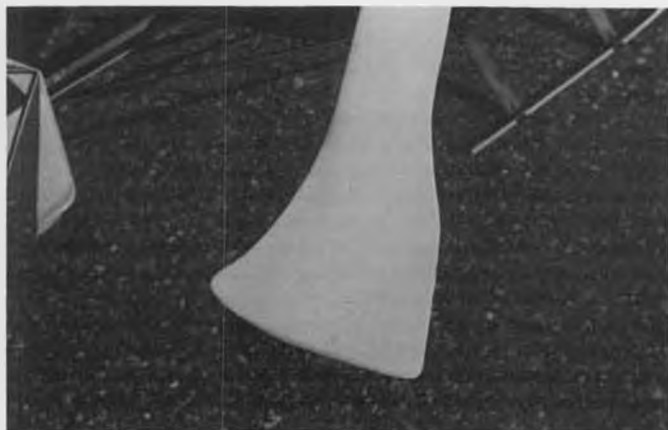
need your help and the manufacturers' help to keep me updated on what's new, what problems you would like me to answer, and what's happening in your neighborhood.

The itinerary for future columns is as follows: California IMS Show report, Kyosho Concept 30 review, bearingless tail rotor design, a windproof transmitter tray design, GMP Legend review, stability and control of flybarless versus flybar helicopters, a review of the Futaba 1024 in an Avant Garde, special MACS tune pipes for helicopters, four-bladed tail rotor review, Airtronics 735 servos, my original design electronic autopilot for model helicopters, swept tips on rotor blades, horizontal tail designs for improved stability, attaining higher speed through drag reduction, helicopter air and ground resonance problems, the '89 Paris Air Show, Third World F3C Championship with a comprehensive technical survey of the equipment each contestant used, design requirements for highly maneuverable helicopters, helicopter engines review, how main rotor rpm affects stability and control, optimal blade weight, my rigid rotor design, my bearingless main rotor design, wide chord versus narrow chord blade aerodynamics, how tall the main rotor shaft should be, why helicopters tilt to the right in hover, how rotor noise is generated, why it's better to have the tail rotor on the right and canted slightly, state-of-the-art individual blade control technique, retreating blade stall suppression through delta tips and in-

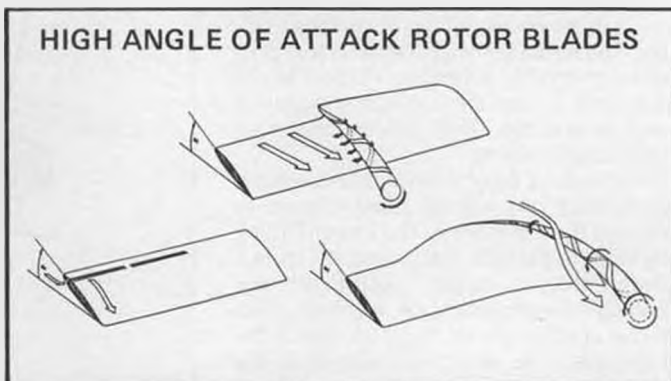
dividual blade control, Hirobo tandem helicopter review, aerodynamics of tandem helicopters, composite blades, higher harmonics blade control, vibration suppression concepts, and more.

Just to whet your appetite a little, I will give you an update on a project that I have been working on for a year. A couple friends and I are presently studying how to increase the top speed on a model helicopter. The goal is to set a new speed record of over 100 mph. The current speed record is 87 mph set by a British team in 1986. The arsenal behind our project helicopter is a new state-of-the-art rotor blade that I have designed at the University of Maryland. Normal rectangular tip rotor blades stall at about 10 to 11 degrees. My special blade stalls at 25 degrees. When a blade stalls, its lift-generating ability diminishes rapidly, and drag rises sharply. You are most likely to encounter retreating blade stall in high-G maneuvers or very high speed forward flight. My new blade design can continually generate lift up to 25 degrees. Even though it does not stall at a high angle of attack, drag does increase sharply, which makes it inefficient to operate at a high angle of attack. My new blades might be inefficient (low lift-to-drag ratio), but it is still a great improvement over the stock rectangular blades. My new blade design will continue to provide lift as long as your engine can supply the torque to overcome the

Continued on page 64



Just one of the many bizarre rotor blade planforms being researched by our author.



Special rotor blade tip planforms designed to improve high angle of attack "retreating blade" performance. Controlled vortex development is utilized to increase the stall angle, and to reduce spanwise flow development.

So You Want To Fly FAST, Huh?

By JAMES WANG. . . If you've ever wanted to know the facts behind getting the most speed out of your model helicopter, listen up, because our new Chopper Chatter columnist is going to tell you how to do it.

• How does one make an R/C helicopter fly fast? Reducing the weight will increase the acceleration, but to increase the top speed one must reduce the model's drag and add weight.

Before I started flying R/C helicopters in 1976, I flew R/C airplanes. Even now I still enjoy flying a fast pattern plane with good penetration. In the back of my mind I always wanted to design a helicopter that cruised just as fast as a pattern plane, yet had a rocket-like vertical climb rate. I imagined myself doing a rock-solid hover five feet off the deck at a local model flying field when suddenly a 60-sized pattern plane with tuned pipe and retracts does a high speed fly-by over the runway. Then I would punch the collective; in less than two seconds my model helicopter would reach 100 feet of altitude. I would then dump in full forward cyclic, with the helicopter rotating its nose downward, accelerating to 100 mph, and zipping right past the pattern plane. Next it would go on to perform the full FAI pattern, except maybe for knife-edge flight.

Well, let's study the principles for designing a fast helicopter. In order to accelerate vertically or horizontally rapidly, the helicopter should be as light as possible. This is due to Newton's Second Law, $F=ma$, which says that if the applied force is constant, then the body with less mass will accelerate quicker. I think most people can appreciate this concept without the help of Newton's Second Law.

If we want a blazing top speed, then we must reduce the drag by streamlining the model. At high speed forward flight, about 50 percent of the drag is from the main rotor mast and hub region. Therefore, the main rotor hub should be an aerodynamically clean design. The swashplate and main rotor shaft region should be shielded by a fairing. The fuselage should be as slick as possible, preferably a teardrop shape. Do not remove or reduce the size of the horizontal and vertical tail. They are necessary for high-speed stability.

Helicopters can fly forward because the main rotor disk can be tilted forward to redirect the rotor thrust. The forward tilting thrust pulls the helicopter forward. Figure 1 shows that in steady level flight, the horizontal component of the main rotor thrust exactly cancels the total drag of the helicopter. The vertical component of the rotor thrust exactly cancels the weight of the helicopter. At higher forward flight speeds, the main rotor needs to be tilted forward more to cancel the increase in drag.

On real helicopters, normally 3 to 5 degrees of forward shaft tilt is built into the helicopter design. Thus, in cruise the helicopter will not fly in an excessive nose-down attitude. Flying in a nose-down manner can be uncomfortable for the passengers, and increases the fuselage drag.

Surprisingly, to increase the top speed of a model helicopter, you actually need to add weight, rather than reduce weight.

Adding weight will increase the top speed, but it reduces the acceleration, thus the model takes longer to reach cruising speed. This characteristic is illustrated in Figure 2. A heavier helicopter requires more rotor thrust to stay aloft. At a given forward shaft tilt attitude, increasing the rotor thrust will proportionally increase the horizontal thrust component to help pull the helicopter forward.

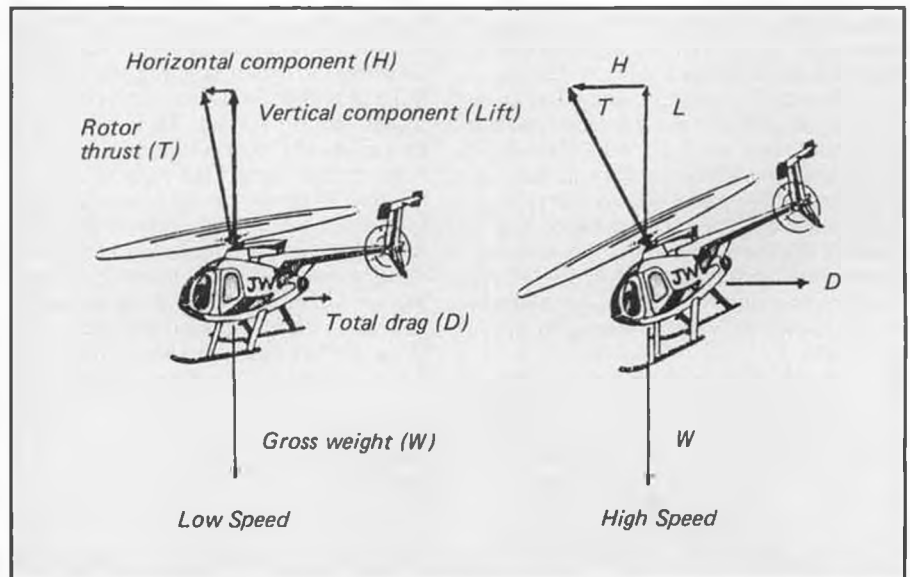


FIGURE 1 — Helicopter in steady level flight

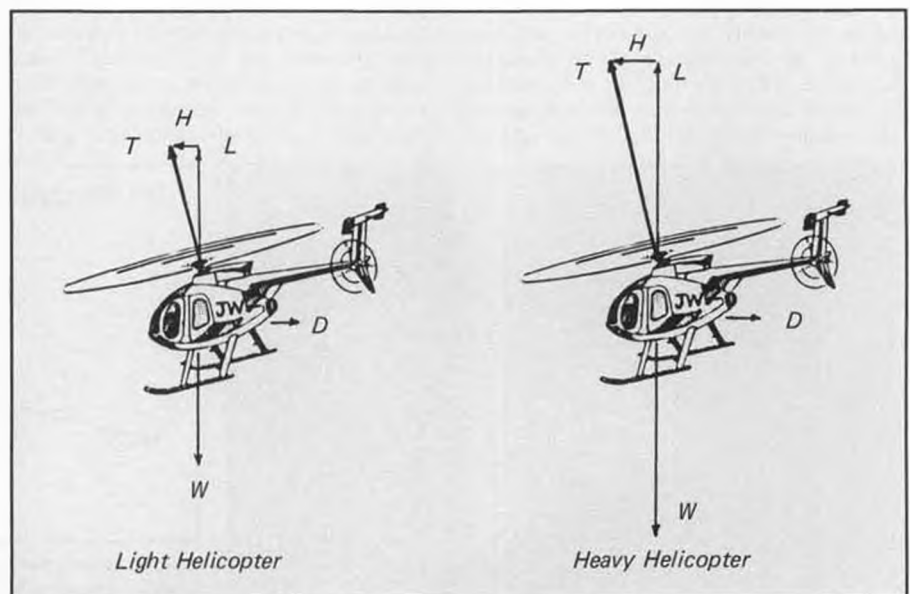


FIGURE 2 — Adding weight gives a larger forward thrust component

However, you must remember that to generate more rotor thrust, you need to crank in more collective pitch at the top end. You will notice that if the pitch is set higher than 10 degrees, the engine starts to sag and the rpm drops. This is because model helicopter rotor blades operate at low Reynolds numbers. Beyond 10 to 12 degrees, the blade stalls, which means the airfoil's lift-generating capability diminishes rapidly while the airfoil drag rises sharply. Therefore, retreating blade stall is what limits the top speed of a model helicopter. However, on real helicopters, besides the retreating blade stall limitation, there is also the air compressibility limitation on the advancing side.

I am researching, at the University of Maryland, a cutting edge blade design that raises the blade tip stall angle to as high as 25 degrees. I will explain the 1990 technology of high-speed helicopter blade design in a future "Chopper Chatter" column. Photo 1 shows some of the blades that I have built and tested in the wind tunnel. Photo 2 shows the special wind tunnel rig used for testing the blades.

How about adding a wing to help support some of the helicopter weight? Figure 3 shows how adding a wing "unloads" the main rotor. Which means the main rotor needs to produce less thrust because the wing is generating lift. The consequence is that the horizontal thrust component is reduced, thus there is less forward pulling force. Adding a wing also introduces extra drag. So do not add a wing, unless you need it to hang some Sidewinder missiles!

Modern aircraft and helicopter designers rarely use the trial-and-error method. It's too costly to build an aircraft and discover that the aircraft does not meet the performance requirements. Full-sized helicopter designers use computer codes to predict the performance. These codes can be longer than ten thousand lines. They usually can predict a helicopter's performance, structural behavior, handling qualities, blade noise, etc., to within 10 percent of the real answer. However, they can be a nightmare to use. Some of my helicopter codes can take several hours of supercom-

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Below left: Some of the different rotor blade designs being tested by the author. Below right: The very expensive rig used for testing rotor blade performance in a wind tunnel.

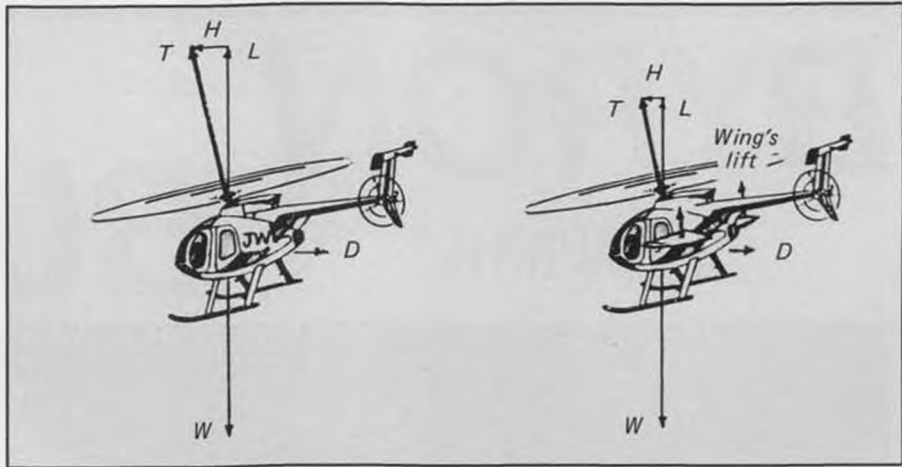


FIGURE 3 — Adding a wing reduces the forward thrust component

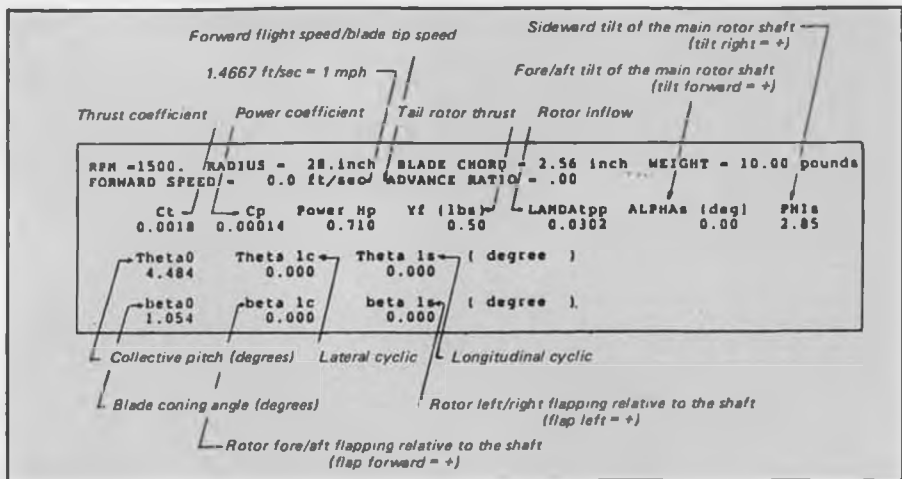
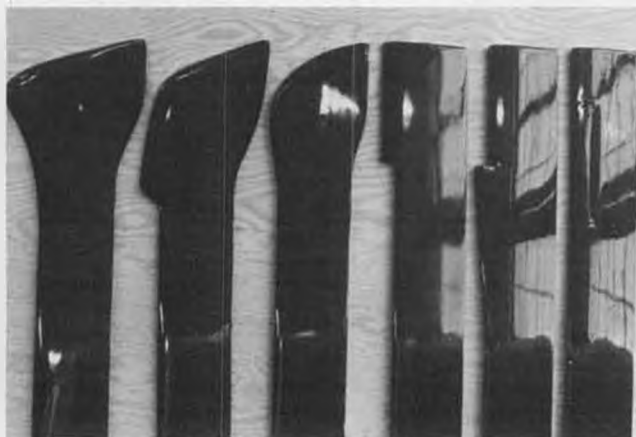


FIGURE 4

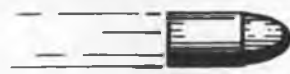
TABLE 1

SPEED feet/sec	WEIGHT pound	NUMBER OF BLADES	RPM	R inch	CHORD inch	HP	BLADE PITCH degrees	ROTOR FORWARD SHAFT TILT degrees
0	10	2	1500	28	2	.63	5.01	0
0	10	2	1500	28	2.56	.71	4.48	0
80	10	2	1500	28	2	1.05	9.47	20.60
80	10	2	1500	28	2.56	1.14	9.03	21.21
80	10	2	1500	24	2	.92	12.49	20.62
80	10	2	1500	24	2.56	.96	11.66	20.81
80	10	2	1600	28	2	1.11	8.70	20.61
80	10	4	1500	28	2	1.38	8.62	22.70
80	10	4	1500	28	2.56	1.56	8.58	23.44
80	12	2	1500	28	2	1.11	9.26	17.58

80 ft/sec = 54.5 mph



BYRON



BULLET

By MARK FRANKEL
and MARTY ZELLER



• The Byron Bullet is a non-scale, high-performance jet that was designed around the successful Byro-Fan system. The Bullet is intended to offer a quickly built alternative to the more complex scale jet kits that began the ducted fan movement. The Byron factory reasoned that a simple aircraft was needed to allow modelers to accumulate jet stick time without risking a scale model, and that such a model could be designed to make optimum use of the considerable thrust available from the Byro-Fan. The result is an attractive aerobatic model, small by Byron standards, that can be flown from any radio control field.

Marty Zeller, a professional modeler who works as a consultant for several full-sized aerospace companies, built the kit that is the subject of this review. Dave Malchione, a well-recognized jet modeler from the Northeast, helped with the Bullet's test flights. Marty prepared the following notes concerning the construction of the Bullet:

"The Bullet is intended to be a competitive sport jet model that can be built and flown by a modeler without extensive jet experience. My assessment is that this kit certainly meets these requirements.

"The kit is shipped in two large packages; the molded Byron-Foam parts in one and the fuselage and hardware in the other. Like all Byron kits, the Bullet includes the specialized hardware and accessories re-

quired to complete the model. Screws, washers, pushrods, fuel tanks, and even tires are packed in this kit.

"A major feature of this kit is an extensive owner's manual and detailed drawings. The manual contains a comprehensive discussion of the construction sequence and numerous photographs to illustrate the text. It is obvious that the folks at Ida Grove spent a lot of time in preparation of the assembly instructions. I recommend that you read the manual once while referring to the drawings, and you will be able to complete the model within the estimated building time of 40 hours.

"The lightweight fuselage shell is typical Byron glass work; it's top quality. The only cutting necessary is for the air inlets. Small holes must be drilled for the wing spars, airlines, stabilator, and vertical fin attachments.

"All flying surfaces are molded from Byro-Foam requiring very little construction. These surfaces are designed to be easily removable from the fuselage allowing for ease of transportation. The model incorporates an all-flying tail or stabilator for pitch control. Each stabilator has a 1/4-inch spar that clamps to a circular yoke which fits around the tailpipe. This arrangement provides a very stiff mounting for the tail surfaces with no obstruction to the jet exhaust. One socket head screw clamps each

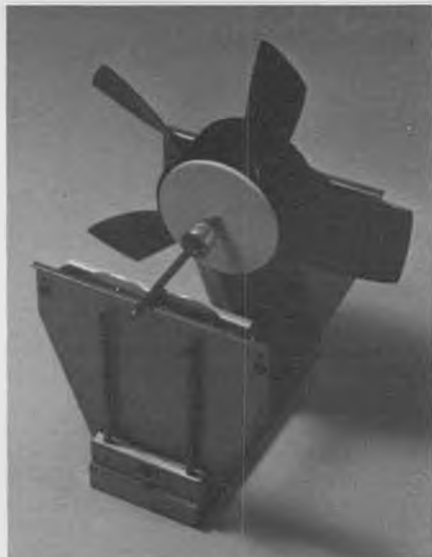
stabilator into position. A single-socket headbolt holds the fin in place and each wing spar is held in place by a socket head bolt and alignment screws.

"The recommended finish for the molded foam parts is Econokote or Solar Film to produce the lightest finish. Since we were using the new Rossi .90 for power, I elected to finish the foam surfaces with the optional fiberglass kit. I was curious to measure how much weight was added to the foam by the glass cloth, epoxy resin, primer, filler, and colored paint. I carefully weighed each assembled foam component prior to glass covering and after all finishing work was completed. I utilized K & B primer and epoxy color. The total system added 11 ounces—I would guess that is only slightly more than a plastic film finish, yet it adds tremendous strength to the surfaces.

"With the airframe painted, I turned my attention toward installing the radio and ducted fan system. The Rossi was bench-mounted and ran in for 1.5 hours with a 12x6 wood prop. The engine was then mated to the fan unit and mounted to a thrust measuring stand.

"The test stand was developed several years ago to measure propeller thrust in combination with various engines. It consists of a bench with a drawer slide mounted to the top and a spring scale at the opposite end.

PRODUCTS IN USE



The Byro-Jet impeller being balanced on a High Point precision balancer.

"Prior to each test, the spring scale was calibrated against a known weight of approximately the thrust I expected to see. In the case of the fan unit, I placed a small container on a baby scale and ballasted it to exactly 13 pounds. I then adjusted the spring scale on the thrust stand to read 13 pounds when deflected by this container.

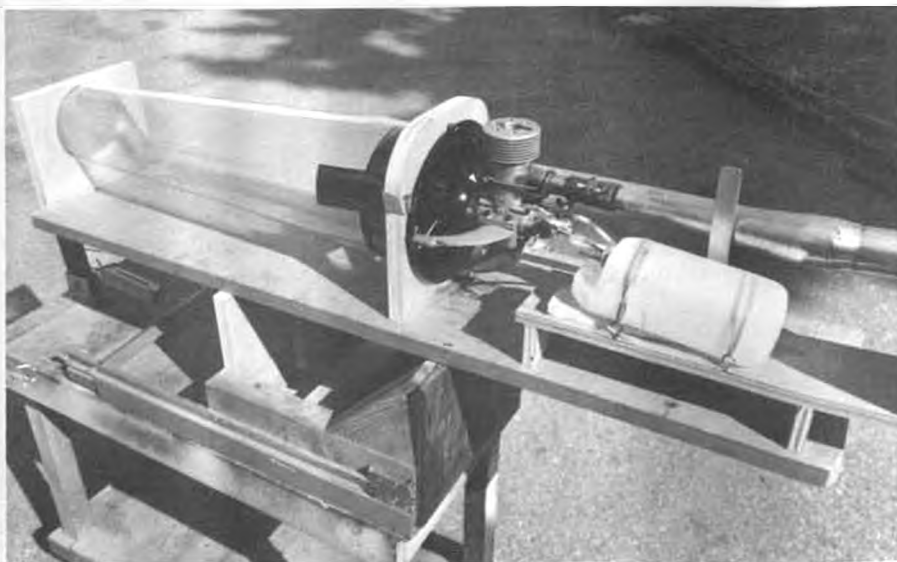
"A lever at the rear of the slide allows the scale to be locked out. This prevents the slide from moving during engine startup and adjustment.

"I had some initial difficulty obtaining reliable readings on my digital tach. I went from a single wide white stripe on one blade to a wide stripe on two blades. This was later changed to a narrow stripe on one blade. Finally, I changed to a Royal analog tach and readings were easily obtained.

"I also had the opportunity to test the new Byrojet fuel. Originally I used a 10-percent nitro content with a high flash point synthetic and modified castor oil lubricant. Byron's intent is to provide a cleaner-burning fuel with a broad band of needle valve settings. I was able to obtain consistent bench runs of 19,500 to 20,000 rpm, which yielded thrust readings of 12 to 13 pounds. The Byrojet fuel permitted the Rossi .90 to deliver its maximum power at a leaner needle valve setting (by approximately 1/3 turn) than other fuels of similar nitro content. Furthermore, the exhaust residue in the tailpipe was substantially cleaner with the Byrojet fuel. The efficiency of this fuel is evident in the needle valve setting and the clean exhaust.

"At this point we turned the Bullet over to Dave Malchione for the initial flight test. The first flight revealed the first hint of a problem with the project. The takeoff was made from a grass field on a very warm afternoon (well over 90 degrees). As the model climbed out, we heard the exhaust note change. Before Dave could complete one circuit of the field, he noticed that he was losing several control functions. The throttle was inoperative, pitch and roll were

Continued on page 105



The engine test stand designed and built by Marty Zeller to test the output of the Rossi 90 / Byro-Jet combination using various fuels.



Bottom view of one of the Bullet's wing panels reveals cutouts for the landing gear and aileron servo. Molded foam parts were fiberglassed and finished with K&B epoxy paints.



Stabilizers are controlled by a metal ring that fits around the exhaust tailpipe. Provides a very rigid mount for the tail surfaces and does not interfere with the jet exhaust.

BIG BIRDS IN FLORIDA

By GEORGE P. BURDELL. . . A photographic look at the first annual giant model aircraft fly-in sponsored last June by IMAA Chapter 228, the RCACF Miniature Aircraft Association, in Apopka, Florida.

• *Model Builder* columnist BIG Al Alman who lives in the Pacific Northwest oughta be proud of the guys who live diagonally across the USA in Florida. Florida has finally formed a chapter of the International Miniature Aircraft Association (IMAA) that operates worldwide. The Florida gang held their first giant model fly-in in late June, and it was an immense success with 27 models coming in to land and perform for a crowd conservatively estimated to exceed 300 R/Cers and friends. The landing fee (entry) was \$5, and that paid in advance for 30 shiny plaques to be made that said, "I Flew in the First Annual IMAA Chapter 228 Giant Scale Fly-In June 26, 1988." Each of the 27 pilots received one of the plaques as a reminder of a nice day of R/Cing with their big bird. The hosting club lost a bit on the mementos but profited a small fortune by their weenie wagon selling hot dogs, BBQ sandwiches, popcorn, and gallons of cold drinks on a warm (hot-as-hell) Florida summer Sunday.

The Second Annual Giant Model Aircraft Fly-In is now on the 1989 calendar for the Orlando area. For details please write to Larry Dungan, CD, Remote Control Association of Central Florida, P.O. Box 8213, Maitland, Florida 32751.

This is the same club that runs the world famous Tangerine International R/C Championships. Writing to the same address will get you on the Tangerine mailing list if requested. •



A partial view of the busy pits. Spectators loved seeing these big models perform. . . and the fence just out of sight to the left was close enough for picture taking.



Norm Holland's Laser 200 idles in for a touch-and-go at the Apopka, Florida Tangerine Model Airport just northwest of Orlando. Model weighs in at 17 pounds, uses a Saito 270 with C&H ignition conversion to put on some pretty impressive aerobic demos.



Engine installation details in Bob Godfrey's latest, the Ultimate 10 Dash 300S. Zenoah G-62 mounts on the front end of a piece of 4-inch-diameter PVC white plastic pipe, which in turn is held into the model by a series of rubber rings. In-flight smoke tank is inside the pipe just behind the engine; fuel tank is also in the pipe but farther aft, right at the model's balance point. Cleverly engineered mount reduces vibration transmitted to the airframe and radio.



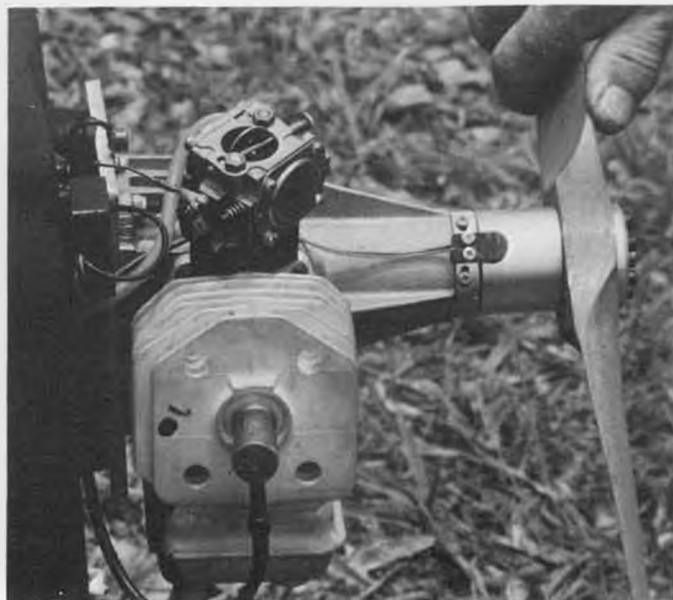
Photo at left shows Miami's Frank Reyes and his gorgeous black and white Beechcraft Staggerwing, built from the Byron kit. Frank installed a complete cabin interior, then found that the seats he'd put in were keeping the wheels from coming all the way up. His solution was to hinge the seats so that they are actually pushed up and out of the way by the retracting gear. Above: Every model gathering has to have at least one Cub. This clipped-wing version by an unidentified builder/pilot was probably built from the 1/4-scale Sig kit.



Norm Holland gets right down to business when working on his Laser 200. Note Norm's wife's name, Dottie, on left side of fuselage.



Above: Guy Greco, who retired to Orlando from New York City, displays the bones of his attractive scratch-built "sorta-Stinson" sport model. Will use a Saito 120. Left: Eric Dern, originally from West Germany, likes big and original models like his 11-foot-span "Donald Duck Flyer", which weighs in at 27 pounds. Donald Duck dummy adds five more pounds. Below: Power for the Donald Duck Flyer is this 3W-60 engine from Germany. Available in sizes ranging from the 3W-35, a 2.1 cu. in. single cylinder, to the 3W-240 B4, a four-cylinder, 13.7 cu. in., 18 hp monster. All made especially for model aircraft by three fellows whose last names all start with W.



MODEL DESIGN & TECHNICAL STUFF

By FRANCIS REYNOLDS

- This is the third and last installment on composite structures, for now anyway. Next month we will do something completely different.

FOAM CORE SECTION JOINING

Where we make a complex foam core, such as a fuselage, of several foam sections, we must somehow stick those sections together. This doesn't turn out to be a major problem, but there are some considerations that we need to note. First, it doesn't have to be a strong joint, since the foam itself has very little strength, but it needs to hold the parts rigidly aligned while we sand the joint flush and get some epoxy/glass on the foam to turn it into a structure. We cannot use a number of glues or cements we modelers are used to, however, because they would dissolve the foam. Cyano glue, Ambroid or other "model cements," and polyester resin are all taboo for that reason. (Last minute insert: Satellite City's new "UFO" cyano doesn't dissolve foam. It may be just the thing. I haven't tried it yet.) Glues and cements that do not dissolve foam include epoxy, "white glue," aliphatic resin glue, R/C-56 glue, and wing-skinning contact cements. There is a problem with all these non-foam-gobbling glues, except epoxy: they require air to dry. Unlike wood, the plastic foams we use are closed-cell and airtight. Except for very small joint areas, most of these glues would take ages to harden in foam joints. So we are left with epoxy, but this is no good on foam either. The problem, in case you haven't experienced it personally, is that the glue line is so much harder than the foam that when we sand

across the joint the foam sands down but leaves a ridge of glue sticking up, which is most resistant to the formation of a smooth surface.

To minimize this problem with epoxy, I try to use a minimum of glue and keep it back from the edge of the part. I also mix as many micro balloons into the epoxy as it will hold, since the micro balloons make the epoxy sand easier and also make it stiffer so it doesn't run out to the edge as badly. By the way, Goldberg's Epoxy Plus seems to be a medium-fast epoxy plus a modest amount of micro balloons. If you use this product for your foam joints, mix in more micro balloons first. (I also add more micro balloons to Epoxy Plus when I use it for fillets. Then it *really* becomes non-sagging as well as easier to sand.)

If you do end up with glue at the surface of a foam-to-foam joint, don't try to sand it flush. Dig out the surface glue, leaving a trench, then fill the trench with NHP's Micro-Fill or Goldberg's Model Magic. These similar-acting super products sand just like the foam does, but they have little strength, so don't use them in structural applications. Also, they will still dissolve in water after hardening, so make sure the surface is well sealed.

FOAM STRUCTURAL JOINTS

There is an exception to my comment that foam-to-foam joints in composite structures don't need to be strong because the fiberglass will carry the load. In some cases the fiberglass *can't* carry the load. Picture a foam and fiberglass stabilizer mounted on a foam/fiberglass fuselage. We may have a

very strong epoxy bond between the glass on the underside of the stab and the glass on the sides or top of the fuse, but think about this: we still have weak joints. The catch is that the bond between the fiberglass and the foam is poor because the tensile strength of the foam itself is poor. Therefore, a load on the stab will simply pull the glass loose on the bottom center of the stab, and the stab will be dangling.

Fortunately there is a very simple, fast, neat, low cost, and nearly weightless solution to this and similar angular foam-joint problems. I wish there were answers this good for all of our design problems. Toothpicks are what we use. Tapered round wood toothpicks. Align the stab and stick dry toothpicks through the stabilizer glass and foam and an inch into the fuselage foam. After you have about a dozen in, pull one out, coat it lightly with epoxy, and poke it back into the same hole. When all these "tension ties" are epoxied in and cured, clip them off close to the surface, sand them flush, and prime. Either the fuselage or the stabilizer will fail before that joint lets go.

Your friendly local toothpick has another useful application in foam/fiberglass construction. If we tried to mount control horns on all-foam-and-glass control surfaces, the foam inside would soon crush and the horn would be loose. We could inlay a hard-

Continued on page 92



Our columnist uses plastic wallet cards — in this case an old driver's license — to squeegee epoxy into fiberglass cloth.



Fiberglass cloth draped over foam nacelle, ready for the epoxy bonding coat. Clamps act as weights to keep cloth in place.



If you thought the old Cox .010 was tiny, have a look at this! Handmade diesel from Germany has about 1/8 the displacement of the .010. More details in text.

Electronics Corner

By ELOY MAREZ

• First a clarification: our spark ignition expert, Mr. Floyd Carter, can be found at 11232 Crist Dr., Los Altos, California 94022. The telephone number is (415)968-4246, and if you are going to call, I recommend early evening California time. If you are calling from Connecticut, don't forget it is three hours earlier out here! I'm serious, I have lost count of how many telephone conversations I have had with persons who don't know or forget that the entire world does not operate on the same time as they happen to live in. Anyway, Floyd is your source for do-it-yourself spark ignition circuitry, plus some hard-to-get items such as Hall Effect sensors and magnets. On a related subject:

JOE HAS MOVED!

Joe Klause, probably better known to most of you as Kustom Kraftsmanship, has moved his cart a little further down the road to: P.O. Box 3010, Fallbrook, California 92028, with telephone number (619)728-4365. You do have an excellent chance of catching Joe there during the daytime, but the time difference still applies. KK is also a good source for spark ignition parts, such as the Modelectric coil, and other hard-to-find related items like spark plugs and condensers. It is also a dependable supplier of custom Cox engines and parts, Rev-Up propellers and many Old Timer supplies, even silk! A detailed brochure, well worth the price, is yours for only \$1.

IT'S DROOL TIME FOR WEE R/C'ERS

Can you believe that little engine in the photo? Telling you about it is probably not the nicest thing I have ever done, since it is not a commercially available product, but it is a little work of art, and I just have to share it with you.

First of all, it is a diesel, and it does run. Everything is functional, including the R/C-style carburetor, and the little muffler fol-

lows accepted design and construction. Specifications? It has a bore of 3mm and a stroke of 2.8mm. This gives an actual displacement of .0198cc. To save you scrambling for your calculator and conversion tables, let me give you that in inches. The bore is .1181 inch, stroke is .1102 inch, for a displacement of .0012 cubic inch. For comparison purposes, the Cox TD .010, which many of you are familiar with, has a bore of .237 inch and a stroke of .226 inch. This little diesel is wee indeed!

That is about all I know; nothing about performance figures or if it has a name. Probably not, on the latter. I do know that this and other similar engines are made by some unidentified person in West Germany, obviously someone with not only excellent eyesight, but with a lot of skill and patience. That is all the information I have. Again, this or these engines are not for sale.

The information and the photo came to me through the courtesy of Franz Kavan, well known for his carburetors, Jet Ranger helicopter model kit, and for his FK-50 twin-cylinder, four-cycle engine, which he can supply you with. Its displacement? Why, 50cc!

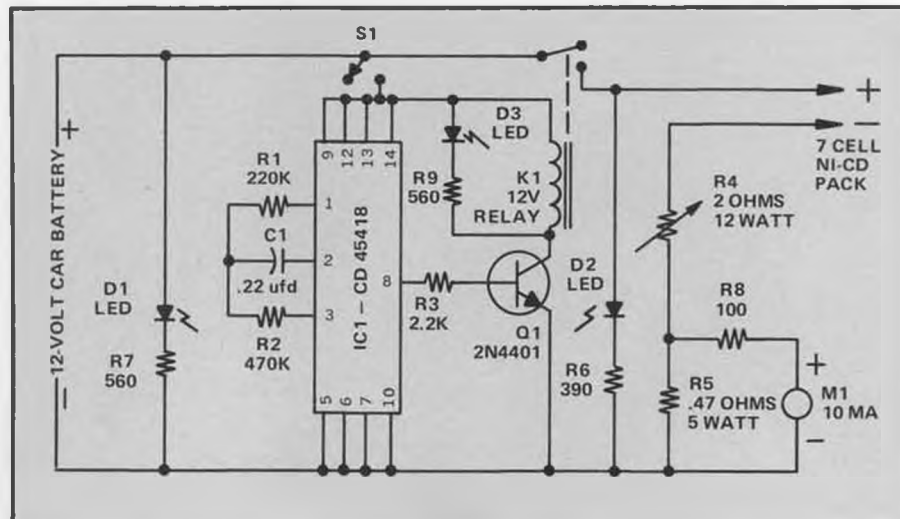
FLOYD "SPARK IGNITION" CARTER

He's back with us this month, only this go-around, he is sharing a charger with us. I'll let him tell it in Carterese.

"Learn by doing" is the motto of my undergraduate alma mater. That slogan has served me well over the years. But age also brings on carelessness. Now I often 'learn by failing.' One painful lesson recently convinced me that I needed a field charger that was idiot-proof. I had been charging my seven-cell Ni-Cd pack (for a Leisure 05 motor) with a piece of lamp cord and a power resistor spliced in somewhere, using the familiar car battery as a source. This worked pretty well until one day I forgot all about my pack being on fast charge. (You know how easy it is to get jawing with the gang on the field.) When I finally realized my pack was still on charge, I had ruined a good seven-cell pack and darn near started a fire (with my car providing much of the fuel).

"The result is a field charger that is truly

Continued on page 76



Schematic for Floyd Carter's foolproof one-hour Ni-Cd field charger. Fully described in text.

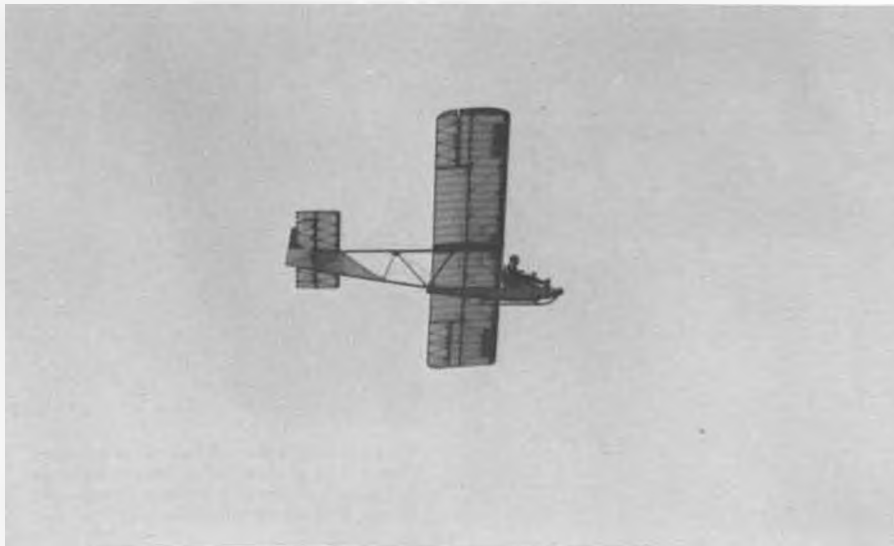


Photo taken at the first annual International Scale R/R Soaring Fun-Fly (see text) shows Eric Eiche's 102-inch SG-38 Schulgleiter in full flight. Hobby Lobby has a kit for it.

R/C SOARING

By BILL FORREY

• Multi-club soaring events always draw the most interesting sailplane designs. One such group of events in Southern California is the "SC-squared" contest circuit. In this circuit, each of the participating Southern California Soaring Clubs takes its turn hosting all the other clubs with a thermal contest. Recently I attended the Inland Soaring Society's "SC-squared" contest and came away with several photos of some fascinating sailplane designs.

Joe Wurts of the Thousand Oaks Soaring Society is no stranger to these pages. His designs and his soaring skills have earned him a lot of well-deserved recognition. At the ISS SCSC, Joe won, flying his latest ther-

mal contest ship which he named Ariel.

The Ariel is a composite structure design using blue foam wing and stab cores, carbon fiber spars, fiberglass wing and stab skins, and a molded epoxy fiberglass fuselage. It has a wingspan of around 110 inches and uses Joe's favorite airfoil, the Eppler 374. The Ariel's control functions are simply ailerons, coupled or uncoupled rudder, flaps, and elevator. The wing features a mild version of the popular Schuemann multi-swept wing panels with straight trailing edge. The outer tip panels are removable for transport. All hinges are mylar tape and the removable wing tip panels are held in place by tape as well.



The man to beat, Joe Wurts, shows off his latest creation, called "Ariel", at a recent SC² meet at Riverside, California. Structure is almost 100% composites, very little wood used.

Joe is a keep-it-simple designer. He designs models under the "if it looks right, it is right" philosophy. As a humorous example, when asked how much dihedral was used under each wing, Joe replied, "About that much." He didn't know, it just looked right to him.

Because the Ariel's wing bolts on and is unlikely to move, Joe was able to lay in the drag-cutting fiberglass wing fillets on the wings rather than the more common method of putting them on the fuselage. The result is a very clean fillet with hardly any noticeable seam. Joe says that it's better to leave the fillet seam against the fuselage rather than the wing. This is because the boundary layer of air flowing down the fuse is already separated, therefore the seam can't add any drag.

Joe prefers JR Propo servos for the Ariel. These are the only mini servos he knows of that have metal gears. Presumably, these gears would yield greater strength and longevity than the more common nylon gears. There are four of these servos buried in the wing of the Ariel.

One photo shows how the servos are mounted. Joe simply cuts the profile view of each servo into the wing skin, removes the foam, inserts the servo with the control arm sticking out, and tapes the servo in place. Both the tightness of the cutout plus the stiffness of the tape keep the servo from moving. Servo removal is quick and easy; remove the tape and extract the servo. The method is simple, quick to execute, aerodynamically clean, and very effective.

Lately, glider guiders have been coming up with many different kinds of landing skids designed to minimize roll-out after touchdown. They've tried Goldberg wing-tip skids mounted on the fuselage, specially molded "sharks teeth" skids, offroad R/C car tire tread, offroad bicycle tread, and cut-up floor mats. Joe's solution to the problem was to use a nut-and-bolt approach, literally. The steel bolt is pushed through a hole in the fiberglass fuselage from the inside, then a washer and a nut are tightened against the outer side. To protect fingers against abrasion caused by the exposed threads, silicone rubber tubing is slipped over the bolt. This bolt skid causes the model to slow down very quickly as it digs into the grass and/or dirt. It also helps the groundskeeper detach the old grass!

I personally don't recommend this landing bolt approach because of the possibility of injury in the event of an accident. A glancing blow across the top of the head would certainly give a nasty wound. However, as long as there have been towhooks, I've never heard of one of these protruding metal hooks causing this kind of injury. Still, it seems an unnecessary risk.

Glenn Clifton of Pomona, California, is a member of the Silent Wings Soaring Association. He brought a pair of unique designs to the ISS SCSC. The first one I'd like to go over is his scaled-down Gemini MTS.

Both Glenn Clifton and Harvey Jenkins flew these Mini-Geminis in the contest. Glenn has built three of them and Harvey has built one. To quote Glenn, "These models are exceptionally good fliers. They are perfect in every aspect, and have a great



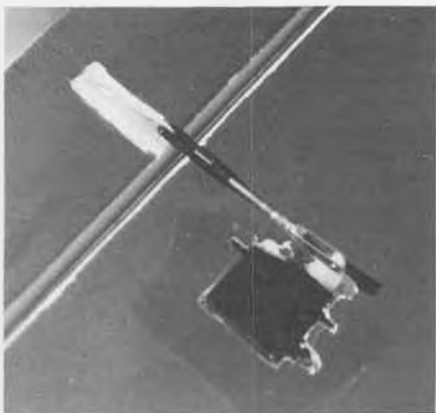
Two Mini-Gemini, 2-meter versions of the Gemini MTS, as flown at the Inland Soaring Society's SC² contest by designer Glenn Clifton (left) and Harvey Jenkins.

speed range. The wings are so strong you can really 'stand on it' when winch towing." The reason they are such strong wings is that after the size reduction, they retained the 1/8 x 3/8 spruce spars and 15-percent thick airfoil of the full-size Gemini MTS.

Glenn arrived at the two-meter span Mini-Gemini by taking the Gemini MTS plans and photocopying them 17 percent smaller. He spliced all the Xerox copies to-



Joe Wurts getting his Ariel off to another good launch. All eyes are on it.



Servo mounting in the Ariel's wing. Servo fits into a close-fitting hole, then is taped over. What could be easier?



Mike Smith shows off his Kiebitz, a ten-year-old German F3B ship. Thermals like a champ!

gether and made himself plans to work from. As it turns out, the No. 7 tip rib of the full-size Gemini becomes the root rib of the Mini-Gemini.

The other interesting design Glenn came out with is what he calls the Illegitimate Lady. This model is a 25-percent Xerox reduction of the Goldberg Sophisticated Lady. This reduction takes it from a 2-meter span ship down to a 1.5-meter, or 60-inch, AMA Class A ship. Glenn has built two of them. They each weigh 13 ounces ready to fly. They have 7-inch root ribs, 6-inch tip ribs, and a projected wingspan of 57.25 inches.

As you would expect, these Illegitimate Ladies fly very well. Their thin flat-bottom airfoils, sharp fuselages, and clean T-tails cut drag and increase performance. I'd bet that if Goldberg Models kitted this little gem, they'd sell a million of 'em.

Mike Smith of Oceanside, California, is a member of the North County Clouds club. In the ISS SCSC he flew a beautiful sailplane called a Kiebitz (meaning a type of German swamp bird). Mike says this is a ten-year-old F3B design from West Germany designed by Franz Perseke. In Mike's words, "This is my favorite airplane to date. I wish there were more available. It's the only plane I can consistently catch when I fly at Torrey Pines." I watched this model fly around the

sky, catch thermals, and spot land. It was a beautiful, graceful sight.

The Kiebitz uses spoilerons for glide path control. This means that both ailerons deflect upwards 30 to 35 degrees to act as spoilerons. Mike says that when using these spoilerons you can achieve a very effective final glide by holding the nose of the glider up, thus stalling the inboard wing. The reflexed ailerons keep the outer panels from stalling, thus maintaining roll control. The result is a slower approach that allows greater accuracy in spot landing. Mike says that when using spoilerons, the aileron control is diminished, so full aileron command is required to get roll response.

The specs for the Kiebitz are: 111-inch wingspan, 9-inch root chord, 5-5/8-inch tip chord, what looks like a modified Eppler 374 airfoil, 4-1/2-pound flying weight, 13 oz./sq. ft. wing loading, and a horizontal stab span of 27 inches with a 4-inch chord.

There were other interesting sailplane designs and one winch mod which were worthy of note at the ISS event, but these will have to wait. My "in" basket is still overflowing with mail and I have to get back to it!

INTERNATIONAL SCALE R/C SOARING FUN-FLY

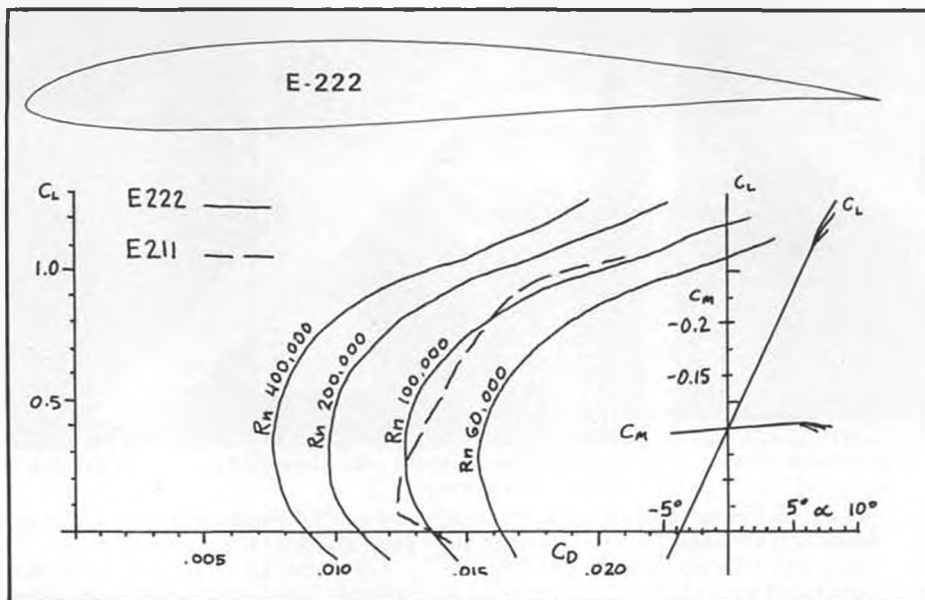
The TRICS club of the Tri-Cities area of Washington state (Richland, Pasco, Kennewick) are at it again. Their first annual scale fun-fly in 1988 was an unqualified success. This event was marked by outstanding enthusiasm and tremendous support from the soaring community. The success of the first event has prompted an encore for 1989. The Memorial Day weekend of May 27, 28, and 29 has been set aside for the second annual event. If you wish to attend, I strongly urge you to contact the event host, Wil Byers, TRICS VP, 632 Meadows Dr. E., Richland, Washington 99352; (509)627-5224.

This is a fun-fly and soaring social event. You will not need to bring scale documentation. If you wish, power scale gliders (e.g., F-16 Falcon, U2 spy plane, etc.) are allowed. No judging will occur, no rules apply (other than safety), and no hassles will be tolerated! This is simply a scale fun-fly on one of the world's best multi-slope soaring sites.

The entry fee is \$30, including one raffle ticket and one banquet dinner. If you have more than one sailplane, the entry fee goes up \$5 per ship and includes one extra raffle ticket per ship. The dinner will include en-



Ariel's landing "skid" is actually the end of a bolt, which digs into the grass and/or dirt and brings the model to a screeching halt. Simple and effective, but is it safe? Our columnist doesn't think so.



Glenn Clifton again, this time with two of his "Illegitimate Ladies", a 25% reduction of the popular Goldberg Models design, made for the Class A RCHLG event. Excellent flyers.

tree, salad, choice of potato, choice of vegetable, roll with butter, and beverage. There will also be a no-host bar, a guest speaker, a slide presentation, and the raffle. Extra banquet tickets are available at \$18 each.

Headquarters for the event will be at the Clover Island Motor Inn, 435 Clover Island, Kennewick, Washington 99336; (800)833-1800. Be sure to mention that you are with the soaring group when making reservations.

1989 AMA NATS

The same folks who are putting on the fun-fly above are also hosting the AMA Nationals. Tri-Cities has been chosen as the site for the '89 Nats. The dates will be July 15 through 23. This year, for the first time ever, sailplane fliers will be treated with one day of AMA-sanctioned slope racing! Contact Wil Byers at the address above for further info.

R/C HAND-LAUNCH CONTESTS

I've been notified of two major RCHLG contests for 1989. The first is located in

Southern California, and the second down in Texas.

The grand-daddy of all RCHLG contests is the ISS RCHLG contest hosted by the Inland Soaring Society of Riverside, California. The sixth annual ISS event will be held, as usual, on the first Sunday of June. Only AMA Class A gliders are allowed, but with no restrictions on R/C functions. There will be three rounds flown, with tie-breakers as needed. The flying field will be the University Middle School athletic field, corner of Spruce and Rustin, one block east of Iowa Avenue in the Canyon Crest Heights area of the city of Riverside. (Thomas Guide, page RIV 8, A-5.) There is no pre-registration required, just be there between 8:00 and 8:30 a.m. for sign-ups.

The second RCHLG event is hosted by the Southwest Soaring League, Richard "Bud" Black, contest organizer. He sent me the following letter which I will take the liberty of shortening.

"...Our second annual was patterned after the Inland Soaring Society of Riverside's

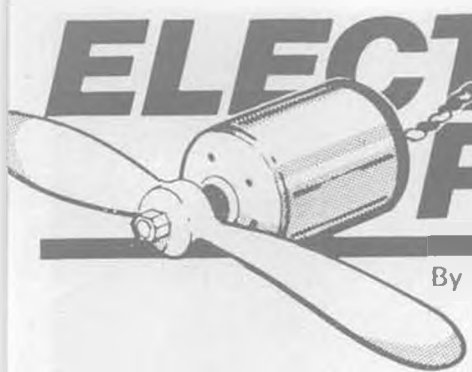
EPPLER E-222

N	X	Y
0	100.000	0.000
1	99.669	.071
2	98.722	.291
3	97.241	.645
4	95.270	1.078
5	92.812	1.560
6	89.889	2.092
7	86.547	2.666
8	82.830	3.269
9	78.784	3.883
10	74.458	4.492
11	69.901	5.079
12	65.162	5.630
13	60.292	6.127
14	55.342	6.558
15	50.361	6.908
16	45.399	7.167
17	40.503	7.326
18	35.719	7.378
19	31.091	7.319
20	26.662	7.147
21	22.471	6.864
22	18.555	6.473
23	14.947	5.981
24	11.678	5.395
25	8.774	4.728
26	6.258	3.994
27	4.149	3.210
28	2.461	2.396
29	1.203	1.578
30	.382	.792
31	.007	.100
32	.199	-.470
33	.990	-.993
34	2.291	-1.499
35	4.083	-1.953
36	6.351	-2.340
37	9.078	-2.648
38	12.243	-2.872
39	15.821	-3.010
40	19.779	-3.064
41	24.083	-3.035
42	28.690	-2.932
43	33.557	-2.760
44	38.634	-2.531
45	43.867	-2.254
46	49.201	-1.942
47	54.578	-1.608
48	59.935	-1.266
49	65.212	-.928
50	70.344	-.609
51	75.268	-.320
52	79.920	-.075
53	84.238	.118
54	88.157	.249
55	91.618	.313
56	94.560	.306
57	96.916	.234
58	98.625	.128
59	99.656	.036
60	100.000	-.000

contest, and the events have been very popular. Most of our monthly contests are Dual Elimination. As we have several pilots flying Class A aircraft who have physical problems, we have come up with an optional modified Dynafite 2M Up-Start (10 feet of 1/8 rubber and 30 feet of monofilament). It does not give the launch that a true

Continued on page 71

ELECTRIC POWER



By MITCH POLING

• I haven't discussed motor break-in before in this column. However, it is a very important part of competition car racing, and it does apply to aircraft too, so here goes! Initial break-in means running the motor with no load at about half the usual voltage for as long as it takes the brushes to wear to conform completely to the commutator. This depends very much on what motor you have. There are two common types of ferrite 100-watt (05) motors. The Mabuchi type has non-replaceable brushes in a crimped-on motor backplate. The brushes in this type of motor are very hard, since they have to last the life of the motor. They break in very slowly. An example is the DSC 075 motor. The best procedure with these is to run them an hour or so on half voltage and let it go at that. They will not be broken in completely, but I have found that the performance will be quite satisfactory.

The Yokomo type of motors have replace-

able brushes and respond to break-in very dramatically, with power increases of 10 to 20 percent. The brushes are held in brush slots by a spiral spring, so they are easy to pull out and inspect. Examples are the Leisure 05 motors and most offroad car motors. I usually break these in with a six-cell pack tapped at the center. The motor is run on three cells at a time. I do not permanently tap the pack; I use jumper wires. A couple of two-foot long lengths of #16 wire with alligator clips is ideal for this. I use red wire for plus and black for minus so that I do not forget and break the motor in backwards!

Most battery packs have a shrink-wrap covering and end caps which cover the straps connecting the cells. If you have a six-cell pack made of twin sticks of three, removing the end caps will expose the straps you need. Cut the shrink wrap carefully with a #11 knife and keep the caps to put



"Shocer Treatment" by Don Hughes won 1st in Class A Electric at '88 U.S. F/F Champs. Uses a Kyosho AP-29 motor, six cells.

back on later. Connect the positive end of your jumper wire to the positive end of the battery and the negative jumper to the negative end of the battery. Connect the positive and negative wires to the positive and negative lugs of the motor, respectively, and let it run with no load until it stops. This is usually about twenty minutes. Now disconnect the jumpers from the battery and reconnect the negative jumper to the negative end of the battery, and the positive jumper to the center strap. Run the battery down as before. Now both sides of the battery are discharged, and you can charge it as usual on your six-cell charger. Most break-ins will take two to three charges (four to six runs) to finish.

When you are done with the break-in, put the end caps back on the pack and tape them on. Some six-cell packs are made with the cells side by side, like marbles in a row. For those, you have to remove the heat-shrink around the center strap, which is



A nice building job on this Warlord 40 by Mike Kometz, powered by an Astro 40 cobalt. Electric conversion of the Bridi kit required no major mods.

Continued on page 78



Above: If it's aerobatics you want, the Great Planes Electrostreak is hard to beat. John Mountjoy flies his with an Astro 05 cobalt. Right: Russell Culp's USFFC winning "Summerwind" F/F ship.





1. Photo from the first SAM 100 Annual shows Paul Ahnet getting his O.S. 75 4/c powered Quaker off to a good start.



2. Seldom seen Mickey DeAngelis design, the Miss Fortune X. This Super Cyke powered R/C version belongs to John DeLaGrange.



PLUG SPARKS

By JOHN POND

• Seems like just last issue since I heard from Morton Ross of Morristown, Pennsylvania, but he is such a good contributor we can't help but run a few of his pictures.

We are fortunate to get photos of SAM 100's first O.T. R/C Annual, as this new club is going to need all the help it can get, publicity-wise. Mort reports Contest Director Paul Ahnet did a fine job. Although the meet was well run, he forgot to put in his request for good weather: cold and windy with gusts up to 25 mph. Ow!

Photo No. 1 shows the great bearded one, Paul Ahnet, taking off a Quaker powered with an open rocker arm O.S. 75 four-stroke. Besides running the meet, Paul found time to place second in the Fuel Allotment event.

Because of windy conditions, entries were down. (Mort sez even he didn't fly.)

Mort states he was amazed to see the experts handle the 1/2A Texaco models staying directly overhead under power. Despite the wind, with only one exception all models landed on the field!

The meet, held on Sunday, November 6, at the Lebanon Valley R/C Club Field at Myerstown, Pennsylvania, aroused considerable interest despite the weather. This was the last 1988 contest in the Northeast area. As Mort remarks, "Now we can get back to building." Photo No. 2 shows a fairly rare model, "Miss Fortune X," as designed by Mickey DeAngelis. No matter how he designs them, they all fly well as can be attested to by John DeLaGrange. John did some lovely construction work followed by Micafilm covering. With a Super Cyclone for power, the model turned out to be an excellent flier.

In the January issue we ran a photo of Mort Ross's Schumacher "Candid." He has again submitted a picture of this colorfully decorated model. Photo No. 3 shows what can be done with striping and a good color scheme. Best part of all, the model is 1/2A Texaco size!

The last photo we are using of the SAM 100 Annual is Photo No. 4 of Doug Koch with his 1/2A Texaco entry, a reduced size "Miss America." The small ones fly as well as the big ones. This has contributed heavily in the shift in entries from Texaco to 1/2A Texaco. Size, money expended, and ease of handling contribute to the wave of interest in 1/2A.

Mort goes on to say that Mickey DeAngelis was expected to show but didn't, on account of threatening weather. It took a long time but Mickey is learning!

1/2A Texaco

1. Doug Koch
2. John DeLaGrange

Limited Engine Run Comb.

1. Frank Lashek
2. Phil Zack
3. Richard Reuter

Antique

1. Fred Quedenfeld

Fuel Allotment

1. John DeLaGrange
2. Paul Ahnet



3. Another rare one, a Dick Schumacher "Candid", scaled for R/C 1/2A Texaco by Mort Ross. Should be a great flyer. How about a 150%, eight-footer for Big Texaco?



4. At the SAM 100 Annual, Doug Koch gets his Miss America set for a 1/2A Texaco flight while a contestant in the background prays that Doug won't get a max. Didn't work; Doug won the event.



5. Photo from 1940 shows Tom Mountjoy and his Gull Wing Sportster, the Beauty Event winner at a local New Jersey contest.



6. Distinctively marked Jasco Flamingo, powered by an O&R 60, flown by Jim Robinson at last year's SCAMPS Annual at Taft.

O.T. Electric

1. Paul Murr

THE NAME OF THE GAME IS FUN

Many of the O.T. clubs are missing out on the fun at their meetings. Based on the experiences of SAM 21 (oldest West Coast R/C O.T. club), arguments and prolonged discussions on rules and protocol should be referred to capable committee members. When presented in complete form, then the membership can have at it; otherwise, too much effort is dissipated in endless discussions.

To this end, SAM 21 has promoted "Show and Tell" and "How-To" demonstrations, and a coffee break with appropriate goodies provided by the member selected for that meeting. Certainly makes for some interesting gas sessions.

Probably the biggest and best fun item is the "White Elephant Pirate Sale" staged by SAM 21 annually at the December meeting. In this game, everyone is required to bring a present worth no less than \$10; this gets away from bringing junk (a mean trick anyway). Some bring several, as does this author, to make up for those who forget to bring their donation.

After all the packages are put on display, everyone picks a number from the hat. Play begins with the No. 1 ticket holder making the first selection from the group.

He is then required to open the package and display the contents to the rest of the participants. No. 2 member likes what he sees in No. 1 and promptly claims what No. 1 has. Now No. 1 must go back and pick another prize (he cannot pick directly back, as there must be at least a one-pick interval).

No. 1 again opens the package and No. 3 likes what he has and claims this for himself. The No. 1 man, who liked what he picked the first time, can now reclaim his original pick from No. 2. To gain undisputed claim to any package, one must have acquired it three times.

You can laugh yourself sick. At one White Elephant Pirate Sale, three rolls of original red transparent MonoKote was put up as a prize. Now everyone has used and likes the original transparent red. Why Top Flite ever discontinued this very popular shade is a mystery to this writer. Needless to say, the MonoKote must have passed through ten hands before someone could claim it.

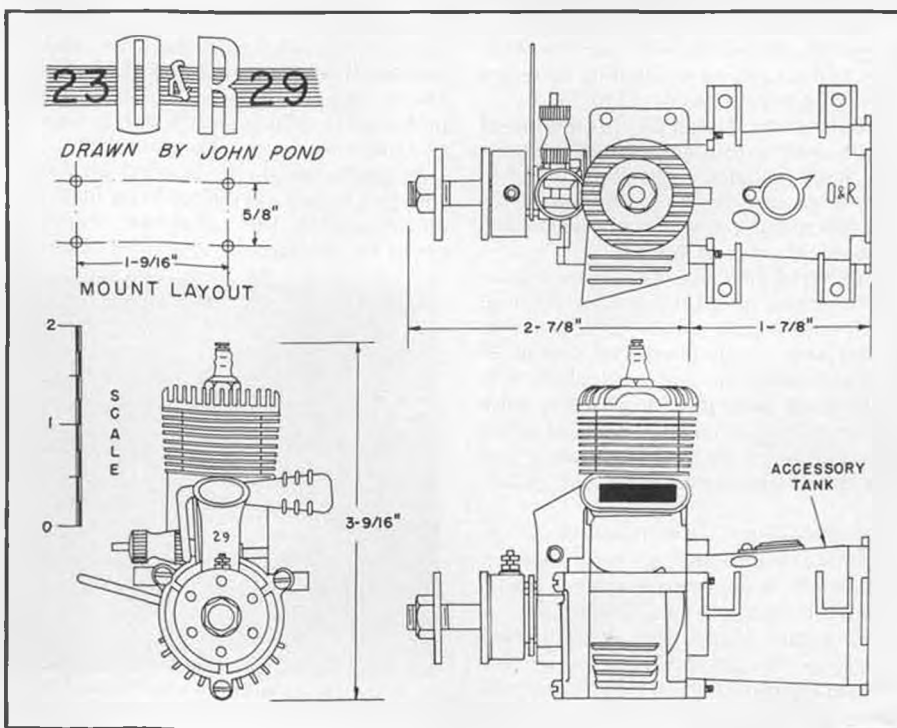


7. Andy Peterson's 1939 "Cruiser", reproduced by SAM president Jim Adams. Features a high aspect ratio wing and quite a long tail moment. Jim's flies with an O&R 23.

Competition for this item was almost like a contest!

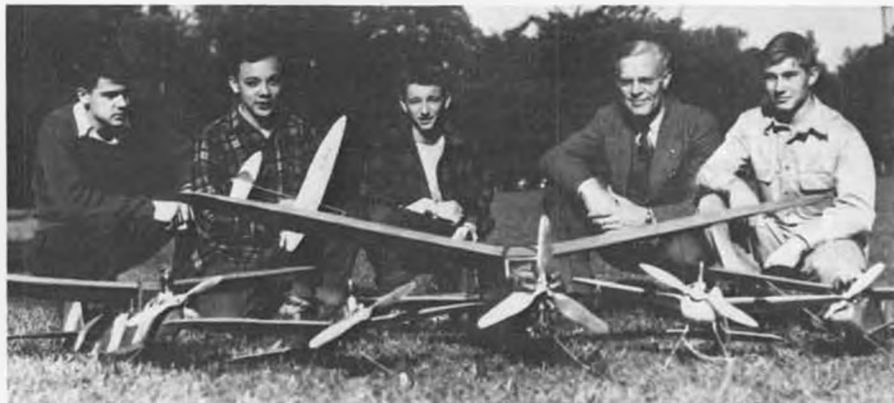
The game continues with each subsequent participant either claiming someone's prize or drawing one from the pile. The game concludes when the last package is drawn.

Timewise, this does not take over an hour and a half with 28 to 30 participants. This is one of the events anyone can get into (providing you have a present to start with). The past W.E.P.S. was about the most hilarious with comments to the effect, "Don't fall in love with that item too much," a threat that





8. SCIFS member Dick Lyons did his usual excellent job in building this scaled-down Red Zephyr for the F/F 1/2A Texaco event. Did 42 minutes at '88 SCAMPS Annual.



10. Another old photo, this one by Don Belote, shows members of the old Toledo Model Manglers club. All are control line models.

generally meant that prize was earmarked for someone else.

Afterward some impromptu swaps are made, as I picked up a VooDoo combat model complete for an Easy Built glider kit. Just a case of a rubber man ending up with the wrong prize. More darn fun!

ENGINE OF THE MONTH

Most all model airplane publications have featured articles on the development and specifications of the Ohlsson line of engines. In this case, we are limiting ourselves to the front rotor series of .23 to 29.

The sideport Ohlsson 23, first originated in 1938, was the most popular engine in its time. Ten years later, competition and rule changes forced Ohlsson to develop a front rotor system that could be easily adapted to the standard sideport model.

1948 found the Ohlsson & Rice corporation humming at full production. After all these years (including from 1939), orders to dealers were finally filled. Not one to let grass grow under his feet, particularly with all the good performing front rotary valve engines starting to claim the market, Ohlsson came out with a 23 front rotary and front rotary adaptation for the old 23 side ports.

A slightly larger size with bore of .760 in. and stroke of .660 inch, giving a displacement of .29 cu. in., was introduced. The 29 came in three forms: an "Engine Pak" at \$11.95, a glow plug engine at \$12.95, and the ignition version at \$13.95. The ignition timer and housing (called the Adjustomatic timer) was sheer genius and simple. To set

your engine's point gap adjustment, one simply loosened the small retaining screw and rotated the timer housing until the proper gap was achieved. The retaining screw was located on the outside of the timer housing for easy, accurate adjustments.

Both the "new" Ohlsson 23 and 29 featured "ebonized and rollerized" parts; i.e., the castings were highly polished and all external parts including the drive washer were finished in a contrasting black ebony. These engines, offered in 1949, were presented in deluxe form featuring expensive roller bearings on the crankshaft.

As can be seen in the drawing, an accessory tank mount was offered to facilitate engine mounting. This radial-type mounting could be obviated by attaching beam or



11. Andy Kovacs built this neat Buzzard Bombshell back in 1973. Is (or was) powered by an Enya 35, guided by a Cannon radio. Still got the airplane, Andy?



9. Sven-Olov Linden's photo of the 1939 U.S. Wakefield team at Bendix, New Jersey.

rail-type adapters. These were rather simply installed by removing the two top crankcase screws and sliding the adaptor between the tank and cylinder. Crankcase screws were then replaced and tightened. It was not necessary to remove either the standard tank or the later model tank mount.

It was things like this, the constant improvements on an already proven engine, that maintained its long popularity. With the tremendous manufacturing facilities at O&R, parts and service were in a class by themselves.

Naturally, with the new gas classes being divided at .30 cu. in., it was a natural to enlarge the .29 to .33 size and at the same time, present these models in the popular glow plug version.

According to Joe Wagner, the outstanding engine authority, this is what led to the ruination of the huge O&R company. The staked-on cylinder head used on these engines simply was not strong enough to stand the higher power and rpm generated by the nitrated glow fuels. No question about it, a complete redesign was in order, something that neither Ohlsson nor Rice relished.

Rather than produce a whole new set of castings, dies, etc., or go into some other phase of manufacturing, a parting of the ways occurred (with some bitter recriminations at that time), and the production of



12. Darold Jones, a member of SAM 1 in Denver, shows off his spotted Gollywock.

Ohlsson engines eventually ceased. Truly a shame that, in essence, the glow plug slew the "giant." For those interested in the technical end of Ohlsson engines, the main cylinder barrel was made of steel with the cooling fins machined in place. The cylinder barrel was then spot welded to the die-cast aluminum alloy case. Rounding out the other aluminum die-castings were the front crankcase cover and connecting rod.

As reported before, the machined aluminum head was swaged to the top of the steel barrel. The piston was hardened and ground steel with a hollow steel wrist pin held in place with two lock rings.

The crankshaft was hogged out of solid bar stock, then hardened and ground at the main journal and crankpin. Roller bearings (found only in O&R engines) were the engineering department's answer to ball bearings. To this day, no one can really say



13. Photo taken in 1974 shows John Pond (right) in his slimmer days, leaning on the J-3's prop while his buddy Bryan Wheeler anchors it down.

which was the best in field performance.

Strobatic tests showed that with standard glow fuel (5 to 10 percent nitro) the Ohlsson 23's performance jumped to 12,000 rpm using an 11x5 propeller. Similar type rpm figures were obtained from the Ohlsson 29. No question about the glow plug; it did improve performance tremendously!

TRIDENT 65 REVISITED

A writer has to be careful what he says these days, as Dan Lutz of 455 South Stage Coach, Fallbrook, California 92028, writes to say that Zip Grandell is still alive and well.

According to Dan, Zip retired from Lew Mahieu's machine shop in Long Beach and moved to Oregon. Grandell is now living at 129 So. H Street, P. O. Box 94, Lakeview, Oregon. Those who want to talk to Zip personally can reach him at (503)947-4013.

Irwin Ohlsson and Lutz have been in steady contact with Zip since his move north. His son, Dick Grandell, still lives in Southern California and flies models occasionally.

30 YEARS AGO, I WAS . . .

Received a very interesting letter from

Raul Lomeli, Apartano Postal 31-473, Guadalajara, Jal. 45050, Mexico, who writes to say he is selling his collection of Cox .020 and .010 engines to a local collector.

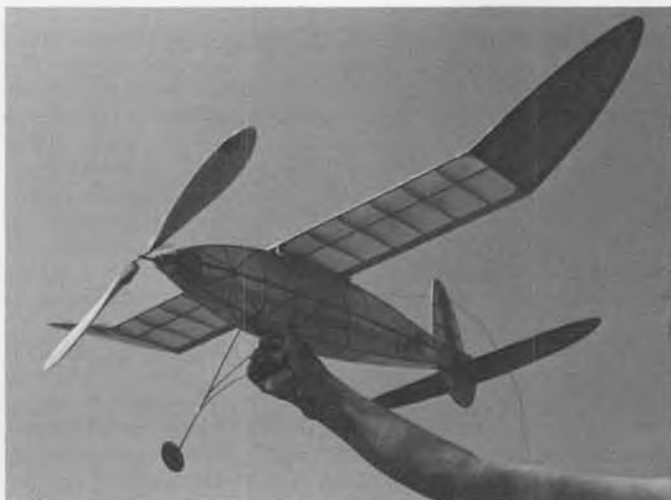
This has brought about the memories of his first USA Nationals held at Los Alamitos, California, in 1959. Raul writes as follows:

"To say the least, it was a fantastic experience. The highlight of the meet was when Mr. Leroy Cox approached the Mexican team and shook hands with each member. He extended his left hand, closed fist, and slowly opened his hand. In his palm was the prettiest and smallest engine I had ever seen, a Cox .010.

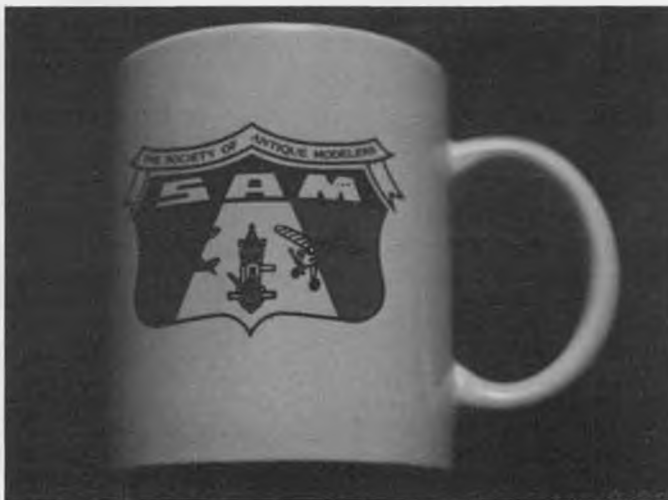
"A chorus of exclamations arose, the most predominant ones being where, when, and how much. Cox indicated at that time the engine was not for sale.

"Next day, the entire team visited the Cox plant in Anaheim where we saw machinery producing engines by the thousands. It was absolutely mind-boggling! If I thought I was in love with the Pee Wee .020, it was like

Continued on page 100



14. A new event for R/C? Valter Ricco of Italy reproduced his 1940 Wakefield design as an experiment in rubber-powered R/C.



15. The latest in SAM novelties, a SAM mug being marketed by John Targos of Argo USA.



OLD TIMER MODEL OF THE MONTH

SUPER STOFER

By JOSÉ TELLEZ. . . Here's a simple, rather obscure Zipper-like 1939 pylon design, scaled down for .020 to .049 engines. Build it robust for sport flying or super light for high performance. Either way, it's a winner!

- The original Super Stofer was a 1939 design by Harold Stofer from Indianapolis, Indiana. It was powered by a Brown Junior and the plans were published in the *Journal of International Aeromodeling* of July 1939. (I believe that this was one of the only two issues ever published!) Plans of the original version are currently available through John Pond's Old Time Plan Service—see his ad elsewhere in this issue.

I first became aware of the model through a photo in *MB* of a full-size Stofer built by

Mal McLean of Long Island, New York. The model looked like a primitive Zipper which might be fun to try out as an O.T. replica. I scaled this version to yield an approximate 34-inch wingspan and placed the firewall to accept a Cox TD .020 with a small metal fuel tank in the fuselage and a 30-second KSB timer for fuel cutoff. A reed valve Pee Wee .020 and an eyedropper tank would provide ample power and simpler installation if you want to forego the sophistication and extra zip; however, the model is going

to need weight up front since it has such a short nose, so take your choice.

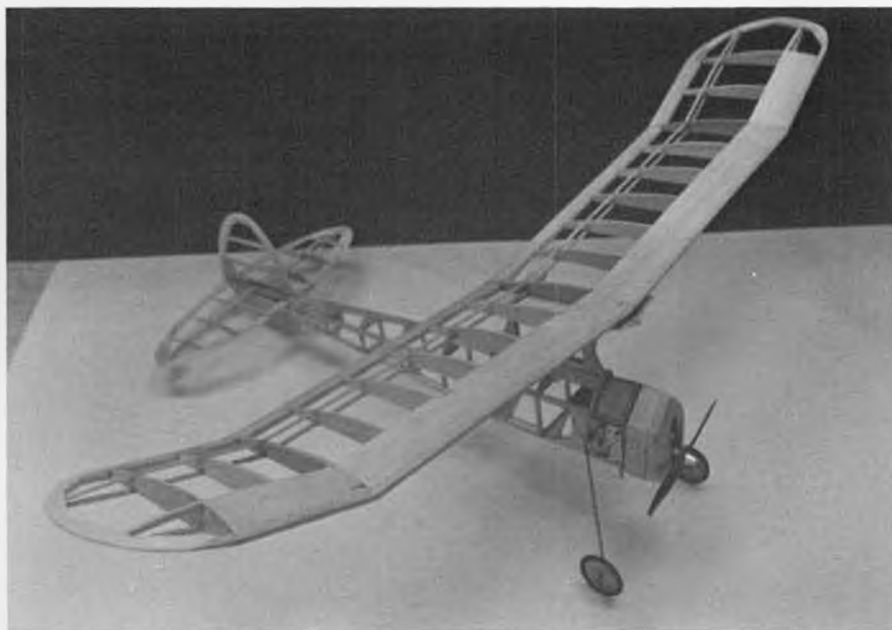
Although I marked the plans .020 to .049, after having flown the model with the TD .020, I would suggest staying with the smaller engines unless you feel you are an expert at trimming overpowered rockets.

To achieve that great old-time look and to keep the overall weight down, the two models I built were covered with Japanese tissue, and I used Aerogloss clear to glue on the tissue and dope the covering. The structure is light, so you might want to add some castor oil or other plasticizer to prevent excessive shrinkage and a warped flying surface.

You want to build as light as possible, so make sure you select your wood properly. Except for the fuselage longerons, which need to be hard, I used light six-pound balsa throughout. It is especially critical to achieve a very light empennage since the nose is so short; otherwise you will be struggling to get weight up front or end up with an unflyable tail-heavy model.

In spite of the drive for a lighter rear end, you should not omit a dethermalizer. The model performs very nicely and does not need much of a thermal to get it going. I used the simple fuse type with a snuffer tube, which is light, simple, and reliable.

The fuselage is a standard box structure. Start by building two identical side frames; box these in with the crosspieces to form the box and then add the top and bottom formers. The pylon has two outer formers and a core. In short, each one of the vertical

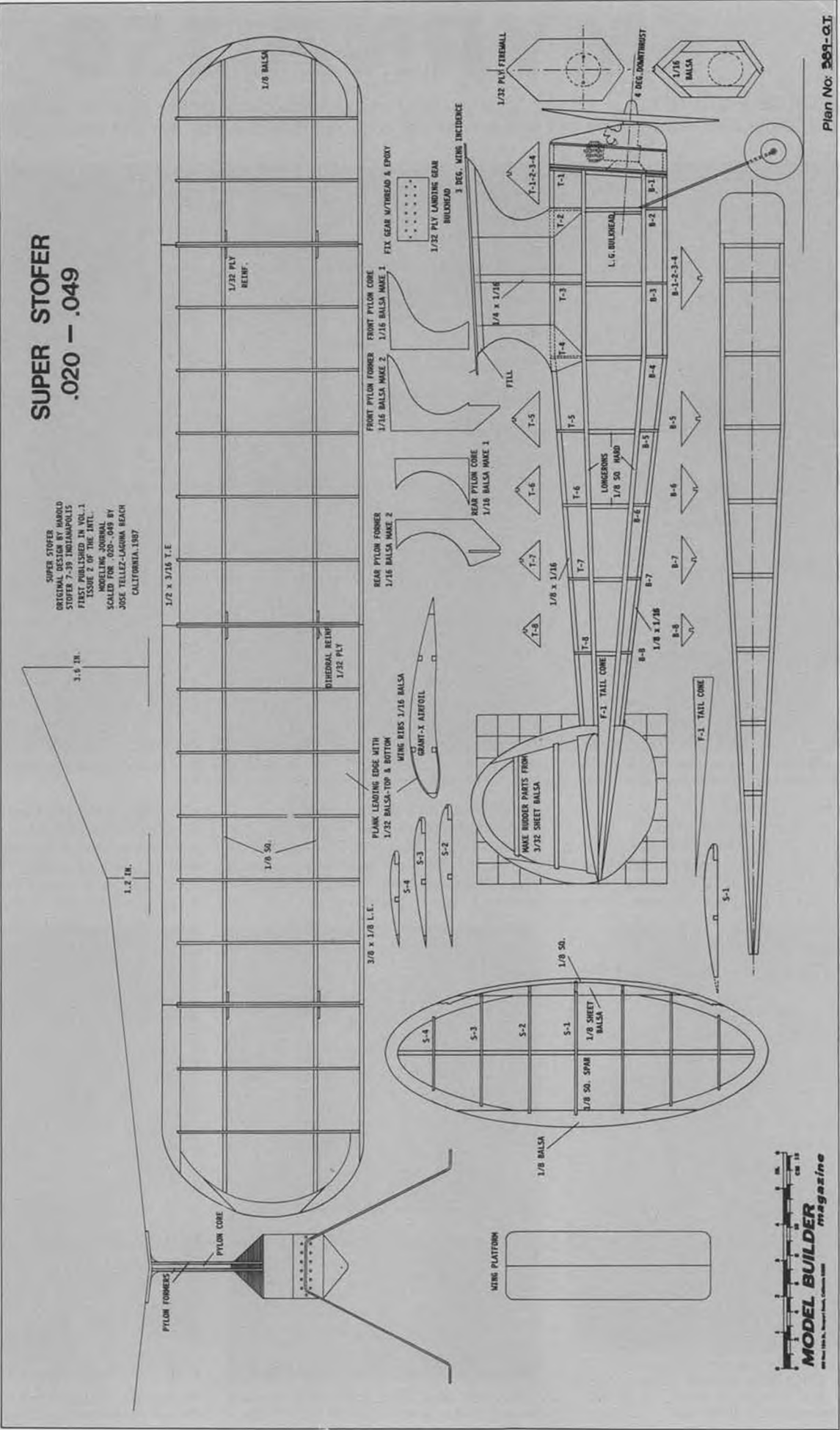


A complete set of Super Stofer bones ready for covering. Author built two at once, both covered with Japanese tissue and both powered by Cox Tee Dee .020's.

Continued on page 68

SUPER STOFER .020 - .049

SUPER STOFER
ORIGINAL DESIGN BY HAROLD
STOFER 7-39 INDIANAPOLIS
FIRST PUBLISHED IN VOL. 1
ISSUE 2 OF THE INTL.
MODELING JOURNAL
SCALED FOR .020-.049 BY
JOSE TELLEZ-LAGUNA BEACH
CALIFORNIA 1987



Plan No: 389-G.T



SMYRNA 150

By GEORGE P. BURDELL. . . In which a group of engine enthusiasts gather together in Smyrna, Georgia for an afternoon of camaraderie and engine running. High point of the day was the running of two GHQ's!



"Engine Run Day" attendees included Tom Dixon, Norm Purdy, Dick Konkle, Stu Richmond, Mickey Walker, Dave Raymond, Dick Snyder, Grayson Anderson, George Perryman, Frank Stewart, Linwood Cochran, Jim Walston, and others.

- The newsletter said:

"Gentlemen, start your engines!

"Is it the Indianapolis 500? No! Is it the Daytona 500? No! Is it Monte Carlo, Riverside, Sebring, Baja, or Road Atlanta? No! It's the *Smyrna 150!* (That's 150 yards off the

road in beautiful Smyrna, Georgia.)

"We are having our first 'Engine Run Day.' Yes, that's right. Now you can pull that engine out of the mothballs, attic, or safety deposit box and see if it will run. You can find out if your mounted engines will start

after sitting around in the dust since your last contest. Ignition, glow, diesel, anything you have is okay. If you are having trouble with any of your engines there should be enough 'experts' around to help. In fact, the main reason for this special day is to help



Here's something you don't see every day: a running GHQ! Note partially collapsed metal Perfect tank — no doubt caused by the terrific crankcase suction (uh-huh).



"HISTORY HAS BEEN CREATED!" shouts Mickey Walker as second GHQ roars to life.



All eyes are on Dave Raymond's '47 Torp 29. Ran well once points were adjusted.



Too bad we didn't have Sullivan starters back when GHO's sold for \$4.95, eh?

everybody who may be a little rusty or anyone who has never run an engine at all. And you don't have to worry about the noise bothering the neighbors; there aren't any.

"Bring any engines you want to run. If you have a field box, bring it, and any tools, fuel, props, plugs, etc. that you have. *If you have a test stand, bring it.* If you have a 'Work-mate,' bring that too. If your engine is mounted in a plane, bring it that way. We will have extra fuel on hand; diesel, glow, and gas/oil mix in case yours isn't fresh or if you don't have any. Clip-on ignition equipment will be available for test-stand running. *If you don't want to run any engines or don't have any, come anyway.* You might learn how easy it is and maybe get to be a power flier. You may want to bring ear plugs or some kind of ear protectors in case it gets noisy. Saturday, April 23, 1988, 11:00 a.m. to 4:00 p.m. at Jim Walston's. Hot dogs will be served." I read a lot of lively model aircraft newsletters and I found the preceding quote plenty interesting and plenty inviting, and I simply couldn't resist!

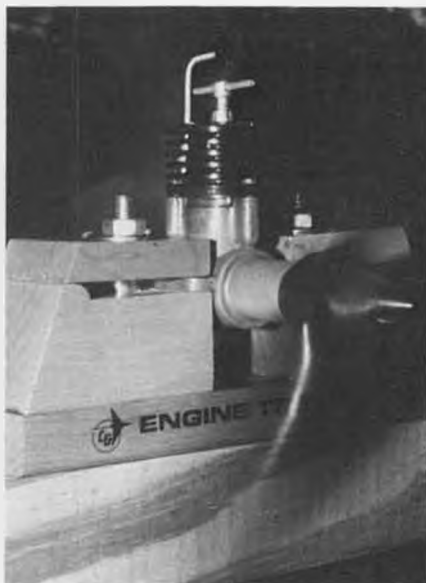
Atlanta and North Georgia is a hotbed of model building (our publisher has chosen this hub for a logical expansion of the great IMS show). There's the South East Kamikaze Squadron (SEKS), SAM 47, The Roswell Air Force (RAF), Thermal Thumbers of Metro Atlanta, and many other model groups in the area, but the idea of an Engine Run Day was something totally new. Braniff Airlines just expanded new nonstop jet service from home to Atlanta with affordable fares. That was it! I was going. I chose a couple of odd engines to take along with the iron Nikon camera and film to record the fun at the Smyrna 150 while making new friends and



Mighty Tom Dixon cranking a British made AM 10 (.06) replica diesel. He imports these and other neat items; see ad on page 71.



Mickey Walker uses his trusty Sullivan starter to get Frank Stewart's O&R 33 going.



Stu Richmond's Soviet MK-17 .09 diesel running on a 9x4 Master Airscrew prop.

renewing old acquaintances. I thought you'd like to see the very first (very successful) SAM 47 Engine Run Day.

And if you send only \$4 to Jim Walston, Editor at SEKS Talks, 725 Cooper Lake Rd.,



Author sez he had forgotten just how much racket a small ignition engine can make. This 1946 aluminum case Bantam 19 ran great.

S.E., Smyrna, Georgia 30080, he'll put you on their mailing list for the lively, information-filled, quarterly newsletter of SAM 47. Plan to attend their next Engine Run Day. Y'all come! •



Good-running O.S. 15 ignition conversion has Super Cyke points installed.



Realistic-looking Kavan 50 idles away under Dick Konkle's watchful eye. Has been flown extensively in a 1/3-scale Emeraude.

RAMBLIN' AROUND AUSTRALIA

By STU RICHMOND. . . This month our roving reporter stops in Melbourne for visits with Ford Lloyd and family, O.S. engine importer Tony Farnan, and finally Paul Straney, OZ's premier model aviation historian.

• There's a bunch of model builders in Melbourne. The metropolitan area has four million people and there are about *twenty* model clubs in the area and about *twelve* different fields. There are many well-stocked hobby shops. The O.S. and the Futaba importers are centered in that area, and the climate almost allows year-round flying. It's a hotbed of activity!

My genial hosts there for a few days were Ford and Joyce Lloyd and their son, Peter. If Ford looks familiar to you, it's because for many years he has been serving as a judge at the USA Nationals and has proven to many American competitors to be a real "fair dinkam bastard," which translates to a real bloody darn good guy! Ford is deeply involved in R/C and the MAAA jurisdiction over scale models.

Son Peter works at the Australian government's aircraft factory, is deep into engine collecting, and is a staunch free flihter who travels extensively to contests. If you think you recognize Pete, you probably do, because he has been to *ten* USA major free flight contests in as many years! The saying on Pete's model shipping box is kinda famous too. It says, "Luck improves with practice." This father/son team share the same workshop building that is partitioned down the middle; *each* has his own shop. One shop is messier, one shop is better stocked, one shop has a dirtier floor, one shop is better organized, and one doesn't seem to trespass into the other's shop. Their common bond is blood and modeling.

One of Ford's favorite models is a giant Volksplane powered by an O.S. .90 FSR. He often tows a banner behind it at model airshows that says either "Welcome to the Marunda Airshow" or "Rotary in Action." Here in the USA we're just getting into transmitter testing for frequency and band

width conformance, but Australia has had this requirement now for years and it must be tested *annually* if you want to use the equipment in MAAA competition. Testing cost, if no repair/alignment service is required, is usually \$15 per transmitter. The label carries the official MAAA emblem, the number of the authorized test/repair facility, the date, and the technician's signature. It's no different than running your car through an annual safety inspection and having an official sticker affixed each year, as many of our states require. If the Australian Tx check shows it to be wide band, then you fly with your own frequency clip, *plus the one on either side* of your frequency too! This tends to make one a bit unliked at the R/C field and encourages

equipment modernization. Guys, we've got the same thing coming here in the USA. Australians and Europeans have been steadily retiring perfectly working older technology R/C equipment. We are going to have to face up to it too.

The Australian emphasis on model safety, in addition to R/C equipment, involves the inspection of R/C models before flight at model shows. The inspector is MAAA state-certified, a printed checklist is followed, and a completing signature on the paperwork is required before flight; there's a lot we can learn from our Australian friends down under. Ford, Pete, and I spent a couple of evenings deep in model discussions. With father's (Ford) hands-on experience, son's (Pete) free flight expertise and full-



Tony Farnan displays a popular Old Timer, the Trenton Terror, originally designed in the USA by Mickey DeAngelis and now being kitted in Australia by Price-Rite Engineering.



Stu holds an O.S. FR5-300 Sirius radial while Tony Farnan (center) describes its unusual features. Ford Lloyd (right) looks on. Australia receives model products from the Orient long before the USA.



Stu examines a portion of Paul Straney's engine collection. They were on tables, in drawers, inside cabinets, everywhere!



Ford Lloyd is a major driving force in the MAAA (Model Aeronautical Association of Australia), enjoys R/C scale and Old Timers.



As well as being an engine collector, Paul Straney is also an excellent modeler, builds both F/F and R/C.



Eric Beilby is the master R/C technician at Model Engines, the hobby distribution business managed by Tony Farnan.



Peter Lloyd is a well-known engine collector and one of OZ's 200 avid free fliers.

scale technical work, and my model dumbness we got into deep subjects, like why and how does a wing lift? what's the total/individual affect of washout? how much of a wing is actually flying when an R/C model is in a flat spin? how do you get into the flat spin intentionally and how do you recover? and what's the effect of lateral area and center of gravity on spin recovery? Their language is different, but we understood and enjoyed each other. Language differences were a bit as follows:

Me	Them
Hello or goodbye	G'day
A crash	Ya' whopped it
Landing gear	Undercarriage
A good modeler	Fair Dinkam Aussie
Fully charged	Chock-a-block
Flying field	Paddock
Contest site	Venue
CA	Syno
An Englisher	Pommy (Stands for POME = Prisoner Of Mother England. Australia was settled by English prisoners.)
An early hand-launch glider	Australian boomerang

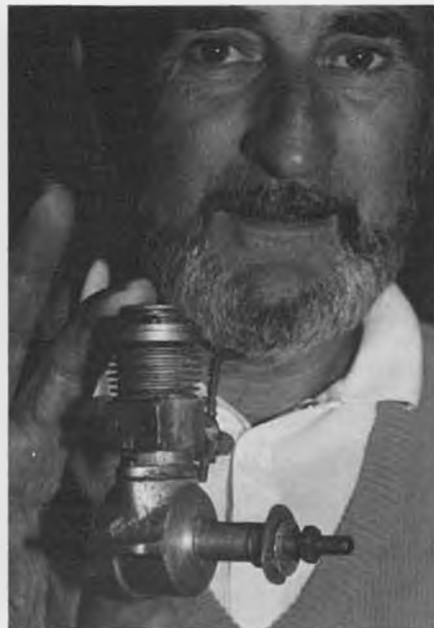
Ford arranged a visit to Model Engines (Australia) Pty, Ltd., which is O.S.'s second oldest importer (Radar in Hong Kong was first). Tony Farnan is the managing director (boss), and this is a major hobby distribution operation for the Southern Continent hobby shops. Tony's business began during his control line flying days. A youngster asked Tony to help start an engine that had been brought from Japan. He got it running,



Tony Farnan shows a cutaway O.S. marine engine. "It'll never run, Tony!" sez Stu.

was quite impressed, and decided to hunt down the manufacturer to whom he wrote, describing his Australian winning credentials and asking if a dealership could be assigned him for the Southern Hemisphere. Today this is a major hobby importing company, and son Mike is deeply involved. You'll see Tony at Toledo almost every year.

With Australia's proximity to Taiwan and Korea and Japan, it's doubtful any major domestic model business will develop at



Paul Straney's Astral Tornado dates to 1929, two years before Bill Brown's USA engines.

the manufacturing level. Many O.S. engine innovations have originated with OZ's modelers and have been fed back by Tony to the factory, been incorporated into production, and come back to Australia as better-performing engines. While I was there I saw a racing-type rotary drum rear intake for a 6.5 FAI engine that was made in a tiny test quantity and had just arrived.

Continued on page 67



This month's subject sits on the flight line in full battle dress. It's the Mig-27 Flogger D, made by RS Systems originally as a target drone for the military, now being made available to the modeling public. This one has the optional tricycle landing gear installed.

ALL ABOUT ARFS

By ART STEINBERG

• A couple of years ago one of my Marine Corps buddies exposed me to a very unusual R/C model. He was involved in a military program which had as its purpose the procurement, maintenance, and operation of aerial target drones. These models certainly met the government requirements of low initial cost and good reliability. Any damaged parts could be quickly replaced after a flight, and plenty of spare components were always kept on hand. Depending on availability, various engines and radios were used in these drones, and at the time I saw my first "Flogger D," the standard engine was a Rossi R60 front intake ABC, turning an 11x7.5 prop. As far as I know, the Marine Corps has always adhered to this size two-stroke engine and propeller combination, even though the Flogger D is capable of flight with a multitude of powerplants. To quote RS Systems, the manufacturer, "Although originally designed for a standard, non-Schneurle, muffled .60, this model has been flown with as small an engine as a .45 and as large as a 1.5 with only a few simple modifications to the engine plate and a rebalancing to bring the CG back into specification."

When I first saw the Flogger D I was somewhat amazed at its homely appearance. It was kind of boxy and ungainly looking, and it didn't seem as though it was airworthy. Launching was done by simply heaving the model into the air, and landing was accomplished by just skidding in on its belly, as there was no provision for any landing gear. I don't remember some of the details, so I am not sure if the engine was throttled, but it seems as though that kind of refinement is not considered necessary in a target drone.

When it came to flight performance, it was obvious that this model was extremely

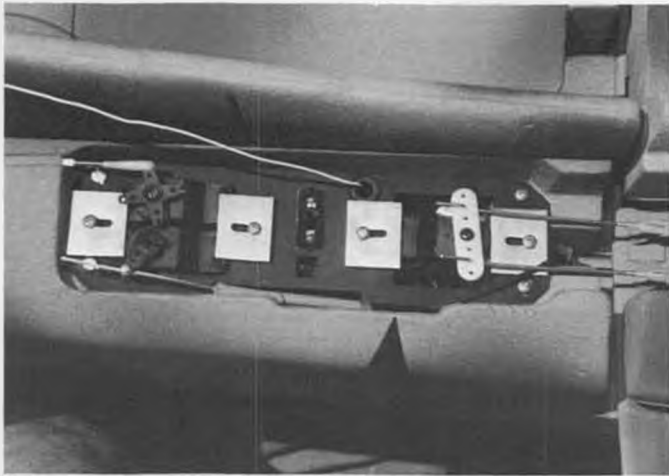
stable, and because it was often flown by low-time pilots, it really had to be easy to fly. In any event, it was considered expendable, and nobody shed any tears when one of these drones bit the dust. My buddy let me handle the controls on a couple of flights, and I found the MIG-27 Flogger D to handle much like an advanced trainer, very docile and responsive with no surprises. In the air it made a rather large target, and I never did find out exactly what weapons were used to shoot them down, but I imag-

ine the RS Systems people were kept quite busy turning these models out for the military.

One of the first questions I asked was about the availability of these drones to the civilian market, and I was told that there were no plans to furnish them to any purchasers other than the U.S. armed forces. Well, that is all changed now, and RS Systems has made it possible for anyone to own one of these interesting models. The question now is, who would want to own one of these ungainly ugly ducklings, and what are they good for? First, if you are stuck on conventional models, and think the epitome of sport flying is the perennial Ugly Stik, then this is not the airplane for you. However, if you are a little kinky and would like to strike out in new directions, maybe the MIG-27 Flogger D will help to satisfy your urge to be different. I can promise that when you roll this baby onto your local model runway all eyes will be upon you. You might even pick up some



Our columnist poses with the Flogger D. Not a small model, it's easy to see what a tempting target it can be when the Marines hold aerial gunnery practice!



Servos are retained by quick-change clamps. Even though they are out in the open with no protective covering, no exhaust residue can get to them. Steering servo is in the fuselage.



Side mounted O.S. 61 ABC is bolted to a metal plate. Tank is just a bit too high, so carb floods easily.



Esme Steinberg is dwarfed by the two cartons containing the Mig-27 kit.

loose change, as there will be some folks around willing to bet it won't fly. Anyway, because of the novelty of this project, and because I have a feeling for the macabre, I decided to have a go at the civilian version, so I made arrangements to have one sent to me.

One bright and sunny Southern California morning the UPS lady drove up (I don't know about you, but my UPS deliveries are made by a beautiful blonde) and deposited two huge cartons on my doorstep. Somehow I knew the Flogger D MIG-27 had arrived. A few minutes later the boxes were in my workshop and I was examining the contents. One carton contained the wing complete with pre-hinged ailerons, ready to bolt on to the fuselage. The other carton had a complete fuselage requiring only the attaching of the vertical and horizontal stabilizers. The latter had a ready-hinged elevator, but the vertical stabilizer was without a rudder. The model was intended for three-channel operation; aileron, elevator, and throttle. All parts were made of a good-quality expanded polystyrene foam, and

the color of the material was light gray. Mixing up some epoxy and assembling the tail surfaces was just a few minutes work, and the next decision was what to do about applying a finish to the foam. To quote the instruction pamphlet, "The model can be flown in the 'virgin state' with no finish applied (the foam is impervious to glow fuel) but also accepts finishes of latex paint (fuel-proof after drying), low temperature heat-shrink coverings, some enamel and epoxy paints (test first on an area inside of the fuselage), even lightweight fiberglass cloth can be applied."

After all, the MIG-27 is supposed to be a 1/9-scale model of the real thing, so I felt that it wouldn't be cricket to just leave the surfaces raw and unfinished. A quick consultation was held with Arthur Pesch of RS Systems, and he recommended that I paint it with ordinary latex house paint. He further recommended that I fly it without landing gear and just get an assistant to do the hand launching. I decided to go along with the house paint bit, but hand launching left me cold, as I do a lot of flying from a hard surface, and the engine is side mounted with the muffler hanging down. At the very least, the muffler would be severely abraded in landing or possibly even broken off. So I decided to install a standard tricycle landing gear arrangement. A little rummaging through my parts box produced just the right main and nose gears, plus three hardly used 2-3/4-inch wheels from some long-forgotten model. The mains were attached

to a 3/16-inch plywood plate mounted just behind the balance point, and the nose gear strut was installed in the aluminum motor mounts after drilling a couple of holes. At this point I discovered what makes this airplane so strong and why it can survive tremendous G forces as it does its job of trying to evade gunfire. Both the fuselage and the wing are reinforced by aluminum angle rods which run almost full-length. These rods emerge from the wing to become highly efficient motor mounts. The engine is not directly attached to these, but rather an aluminum engine plate holds the engine, and the plate is bolted to the mounts. This makes it simple to replace engines, especially if one would like to experiment with various powerplants. Of course, the original purpose in providing engine interchangeability was to permit quick replacement of an engine damaged by a projectile during target practice. This handy feature was also provided for servo installation, as each servo is clamped in place by a cleverly designed set of metal plates, rather than the usual four servo screws. Incorporated into the cavernous fuselage are a number of payload compartments, each of which is big enough to carry a sandwich or two with room left over for a cold drink, a banana, and a couple of Twinkies. Actually, the Flogger D is capable of lifting a payload of up to twelve pounds, so this opens up a lot of possibilities for ex-

Continued on page 88



Custom built RTF Dalotel by well-known pattern flier Dick Hanson. Dick makes this model and others in various stages of completion. This one is owned by Buck Faure.

Goldberg Models'

Sophisticated Lady

By SKIP RUFF

• "Say, that's a slick-looking ship." So goes the typical response from someone who has seen, for the first time, Goldberg Models' new electric-powered sailplane, the Sophisticated Lady.

And slick it is! Goldberg has taken the wing from their popular Gentle Lady/Electra glider and added a sleek T-tailed scale-like fuselage to come up with an attractive two-meter sailplane that is suitable for either slope or thermal flying. When the optional electric power pod is added, the ship becomes the perfect ballpark flier with clean, quiet, no-fuss operation.

THE KIT(S)

That Carl Goldberg Models Inc. stands for quality is certainly confirmed by the design of this model and the contents of this kit. All wood supplied was of good quality with such niceties as pre-formed wing leading edges and die-cut wing and fuselage sheeting. There was a bit of die-crunching on some of the wing ribs, but it was of no consequence once everything was sanded.

The hardware count includes such things as horns, clevises, hinges, tow hook, threaded rods, etc. I especially liked the vacu-formed plastic pilot/cockpit since, when painted, it greatly enhances the realism of the model. The water-transfer decal sheet has, among other things, two stylish logos for the rudder and an instrument panel for the cockpit. An excellent set of full-size plans and a fully illustrated 31-page instruction manual insure that even the low-time builder will be able to complete the

ELECTRIC MOTORGLIDER



PHOTOS BY RUSS HIATT AND AUTHOR

Two Sophisticated Ladies. One is Debbie Ruff, Skip's wife and former MB cover girl, the other is the model she's holding. Ship's color scheme is white and transparent red.

ship with a minimum of head scratching. The manual also gives pointers on slope and thermal flying and shows an optional .049 power pod for those who choose to power their model but not go the electric route.

The power pod kit, which is a separate item (part No. 678), comes with the well-known Mabuchi 550 motor pre-wired to an on/off switch, fuse, and Tamiya connector. The pod itself consists of a die-cut 1/8-inch lite-ply frame with a vacu-formed streamlined shell covering. A spinner, prop, and adapter are included along with, as in the glider, an illustrated instruction manual.

Not included is the six- or seven-cell battery pack you will need for motivation and, of course, a charger.

BUILDING

The construction of the sailplane is fairly simple, with built-up flying surfaces and a sheet balsa fuselage. About the only glitch I could find in the process had to do with the dihedral braces. On page 8 of the construction manual, photo 6 shows the brace for the rear spar glued to the back of that spar. In fact, it should be glued to the front and is shown correctly on the plans. All parts seemed to fit well, and the building progressed quite rapidly with the use of Su-



Plastic shells do a nice job of fairing in the motor pylon. Note the prop brake just below the spinner; improves glide by keeping the prop from free-wheeling when the motor is off.



Motor control / prop brake servo is mounted inside the motor pylon. Makes for a bit of a squeeze but everything does fit. Power pod kit includes motor, prop, spinner, on-off switch, fuse, connector, etc.

per Jet cyano.

The power pod is designed with the switch and actuating servo mounted inside it so that it can be added to an already completed and flown model. I would like to be able to say that things went just as smoothly here, but I did run into a couple of problems which may or may not show up in other kits. For one, since the switch sits in a die-cut hole on the pod frame, the positive wire from it to the motor (the negative wire goes from the motor to the fuse) has to be long enough to span the gap. Mine wasn't by about 1/4 inch and had to be replaced. Also, with the switch mounted as shown in the instruction manual and hooked up to a standard servo, the on/off was backwards on my throttle stick. Servo reversing on the transmitter would not have helped here because I elected to hook up the recommended prop brake to the side of the servo opposite the switch linkage, and that would have activated the brake when the motor was on, not off! The simple solution was to unsolder the wires from the switch, rotate it 180 degrees in its hole, and resolder the wires, thus reversing the polarity. Actually, it took less time to do that than it did to write this paragraph!

If you find that your prop and spinner wobble a bit, as mine did once tightened down, try positioning them in a variety of different positions in relation to one another and the adapter. By trial and error I was able to find a combination that allowed mine to run almost perfectly true.

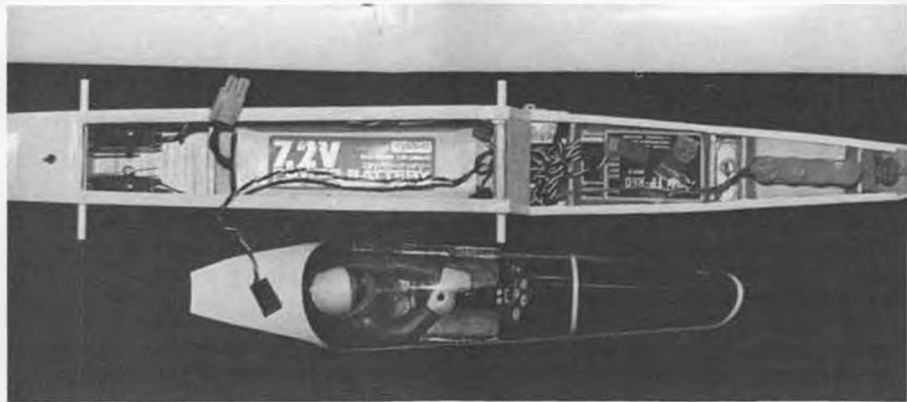
It would be wise when trimming the excess plastic from the pod shells to trim within about 1/8 inch from the indicated lines and then trim to fit. This also applies to the canopy.

RADIO

Three channels (throttle, rudder, elevator) are required, and the old adage "a place for everything and everything in its place" applies here since space is somewhat limited. There is, however, just enough room for even my ancient Futaba, although I did elect to use some small servos and a 225 mAh receiver pack. I followed the plans with one exception, that being to place the motor battery ahead of the servos for center of gravity purposes and so that changing the battery (which requires wing removal) would not involve digging it out through the pushrod linkages.

FINISHING

The model was covered with Goldberg's white Ultracote and brand X transparent red. I used the brand X because Ultracote does not come in transparent. Ultracote is a polyester heat-shrink film imported from Germany that is unique in that it comes with a paper backing. It's bubble-free, paintable with epoxies, polyurethanes, or acrylic enamels, and with heat can be repositioned without fear of color separation. I would be less than honest if I didn't tell you that it is also one of the heaviest films on the market and therefore may not be ideal for all you builders who are concerned about saving every gram of weight possible. In its defense, it is one of the strongest and most tear-resistant films available



Radio and motor battery installation. Skip deviated from the plans by placing the rudder and elevator servos aft of the motor battery — makes it easier to get the battery out if necessary.



Note the air inlet scoop just under the wing i.e.; even though not shown on the plans, this is a necessary addition to provide proper battery cooling. Skip also added a wheel and skid, which help save the underside from damage when flying off of anything other than a grass field.

and it adds considerable rigidity to any structure it is covered with. Although there have been supply problems in the past, all twelve colors should be available by the time you read this.

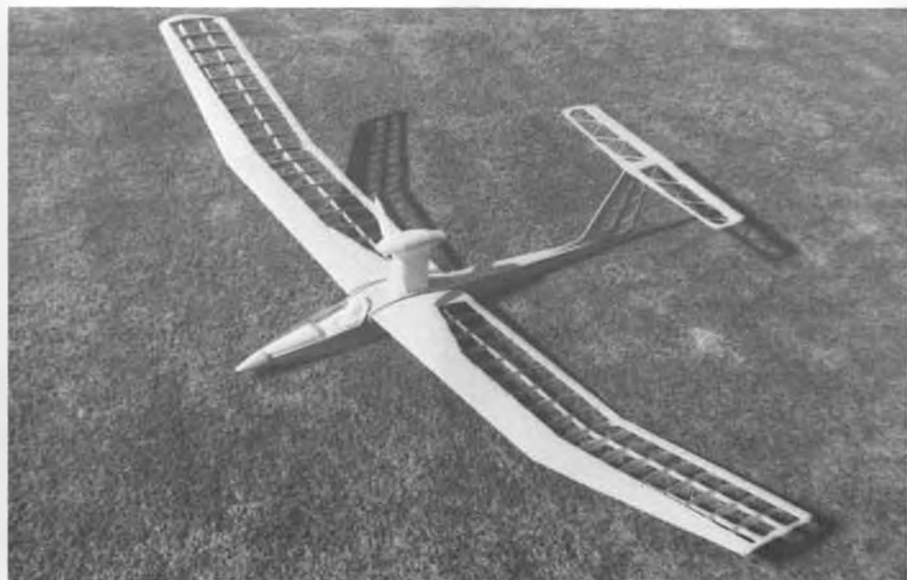
Other than the cockpit, the only paint applied was some Testors white to the rear of the canopy and the skids on the fuselage and wings (see below). The canopy frame

was simulated with 1/4- and 1/8-inch white striping tape. The 1/4-inch stuff also works well hiding the seam on the pod shell.

RECOMMENDATIONS & SUGGESTIONS

The motor battery gets quite warm in flight, and, since the glider was not designed from the outset for electric power, no

Continued on page 63



All framed up and ready for cover. Model uses conventional construction throughout. Ready-to-fly weight came out at 48 ounces.



Free Flight Scale

By FERNANDO RAMOS

• A lot of new and great items have crossed my desk this past summer. For starters, there is a nifty little device for sharpening No. 11 and 16 blades as well as surgical steel ones. This clever tool is simply called the Edjer. The Edjer has a saddle that holds the knife and blade firmly in place to get the exact 23-degree sharpening angle. It has a free-moving slider which allows easy movement in any direction. The Edjer uses the finest Smith Arkansas whetstones.

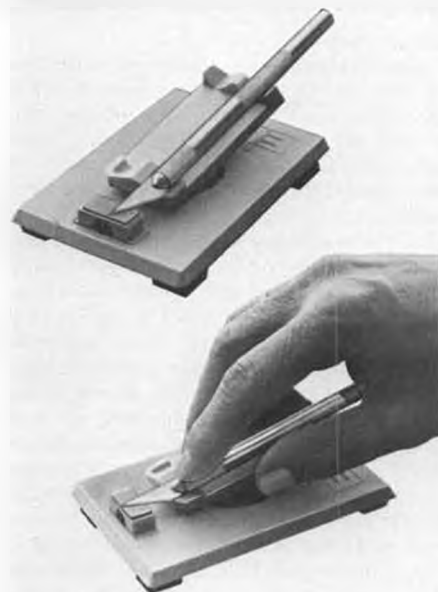
In the past I've used other gimmicks to try sharpening blades, but the success was always minimal. I keep my Edjer on the workbench, and when the old blade starts to dull, a few passes on each side and it's ready to cut balsa. Every modeler should have one. Incidentally, spare stones are available. The Edjer can be purchased from: The Edjer, 15750 Los Angeles Ave., # 74, Moorpark, California 93021. No price came with mine, but I have seen them advertised in tool catalogs for around \$8.95. Here's their phone number if you want to check: (805)529-9313.

Eric Clutton of 913 Cedar Lane, Tullahoma, Tennessee 37388, handles quite a few different diesel engines, but his emphasis appears to be with the P.A.W. English diesels. They have introduced .049 and .06 ball bearing diesel engines; both come standard or with an R/C throttle. The cost of the .049 and .06 is \$42 and \$44 or \$50 and \$52 respectively for the R/C versions. Eric also has the magnificent D.C. Dart diesel engine (new manufacture) for \$40. You may want to send Eric a large SASE for his listing of engines.

My longtime friend, Dave Shipton, is one of those rare individuals who has spent a lifetime trying to get youngsters involved in model aviation. He has a small business nestled "somewhere" in Illinois. It is appropriately called Hobby Hideaway Research and Development, RR 2, Box 19, Deleran, Illinois 61734. Dave has come out with what he calls TWO-gether kits. These are a novel concept in educational toys. They are unassembled wood models for the inexperienced modeler. Each part is pre-cut and pre-drilled for easy assembly using white glue. The model can be left in natural wood or painted. The assembled model is an attractive durable wood toy. They, of course, are not flying models. The prices range from \$6 to \$10. For further information, send Dave a large SASE. They would make a great gift for youngsters!

Basswood can be a rare commodity, particularly if you do not have model railroad shops in your area. Yet, the availability of basswood for modeling is a necessity. There isn't a single model I build that I don't incorporate basswood. It is the ideal material for laminating tail surfaces, wing tips, etc. At the Flying Aces meet this past summer, John Stott gave me a price list and sizes available that a gentleman, Joe Deppe, is cutting. They are too numerous to mention here but suffice to say he has it all. All lengths are 24 inches, but longer ones are available upon request. Again, send a large SASE to Joe Deppe, Box 125, Bolton Landing, New York 12814.

HiLine Ltd., P.O. Box 1283, Bethesda, Maryland 20817, has come out with a



Cleverly designed blade sharpening device, the "Edger", comes highly recommended by our columnist. Details in text.

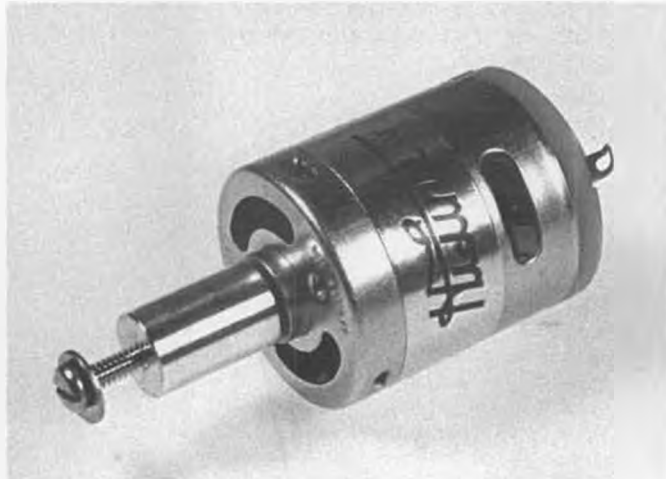
whole line of electric motors suited for small F/F scale models. These motors have been developed by Don Srull. In order to keep costs down, the motors which are provided in the kits require that their armatures be rewound. This is done so that more efficiency can be extracted from these small devices.

HiLine has several different combinations of motor kits available, along with chargers. HiLine's prices are very reasonable. As an example, they have one package they call their Dual Mini-Electric Motor kit. This has all the necessary materials to end up with two geared electric motors for \$12.95. They also have a much larger motor called the "Imp." This would be used for models that would normally be powered with a 1/2A engine, and it has a price of \$10.95. Send them a large SASE for their flyer.

I'm not finished yet, there's still more to go! Dave Diels Engineering, Inc., P.O. Box 101, Woodville, Ohio 43469, is hard at it again. Some people never sleep! Dave has recently come out with a kit of the Curtiss A-



HiLine's do-it-yourself electric motor kit, complete with all the hardware required to make a geared power system.



The "Imp" 30-watt motor from HiLine, intended to fill the need for 02 size motors. Uses three cells. Great for 36-inch Jumbo scale ships!

8/A-12 Shrike in 1/24 scale. This is a nice-sized model which can be built up either as an inline or as a radial. And, as usual, the quality of the kit is absolutely first-rate. The cost of the model is \$17.00 plus \$2.00 for shipping and handling. The decals alone are worth the cost of the kit.

Dave also has four scale Peanut models in one box, simply called 4-in-1. It includes a Brewster Buffalo, Vultee Vanguard, Bloch MB-152, and the Japanese Raider. The kits are complete including molded plastic canopies plus those beautiful decals. The cost of these four kits in one is \$26, plus \$2 for postage.

Al Lidberg of Free Flight Model Plans, 614 E. Fordham Dr., Tempe, Arizona 85283, continues to come out with bigger and better scale plans. His latest is the Napier Heston JA5 Racer. This 1940 plane was meant to assault the 500 mph speed record. The model has a 32-inch span, and the plans show how to make detachable landing gear. All of Al's work is first-rate, but this one has to be the best yet. I think that this model would make a sensational flier!

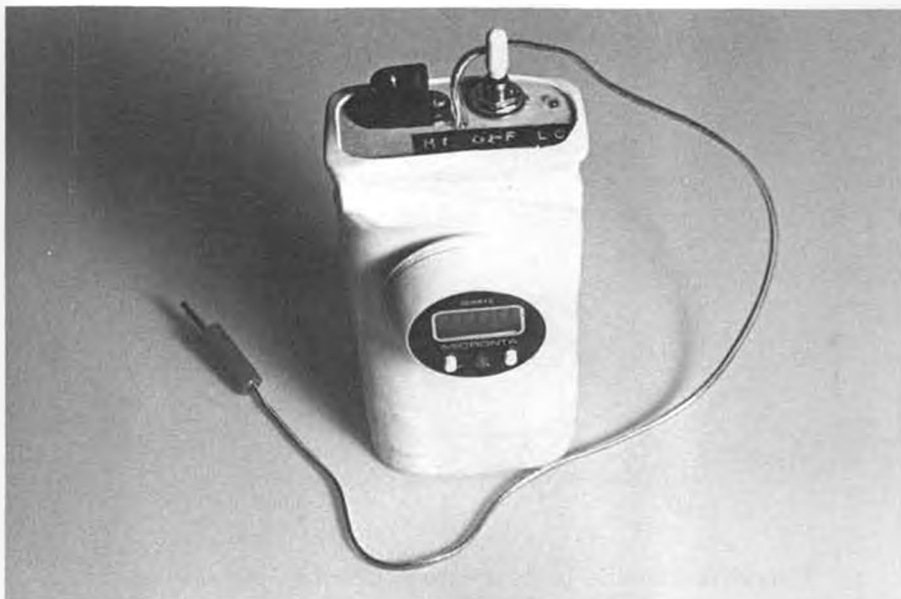
Finally, one last sensational plan service. The name is Flying Scale Inc., 1905 Colony Rd., Metairie, Louisiana 70003. Their drawings are absolutely first-rate! Some of the best scale drawings I have ever seen, and I've seen plenty! They have about 29 different scale plans at the time of this writing, with more planned. The cost is \$6 each and they pay the postage. I don't even want to tell you what they have. I want you to send them a large SASE for their plans list, and I'll guarantee that you will eventually order all they produce. This outfit has some of the finest sets of plans I've ever seen for rubber flying scale. F/F Scale modelers have it pretty darn good with all of the available plans, kits, and supplies.

Mark this date down: August 12 and 13, 1989. The Flightmasters are going to sponsor a Flying Aces-type contest here in Southern California. By that, I mean, using Flying Aces rules and events. If you remember, after the Flightmasters Annual in '87, the turnout was quite a disappointment, even though the quality of the models was outstanding. The membership decided that it might be more prudent to have this long-running contest (over 30 years) every other year. Maybe that way the "locals" would be yearning for a good old-fashioned F/F Scale contest.

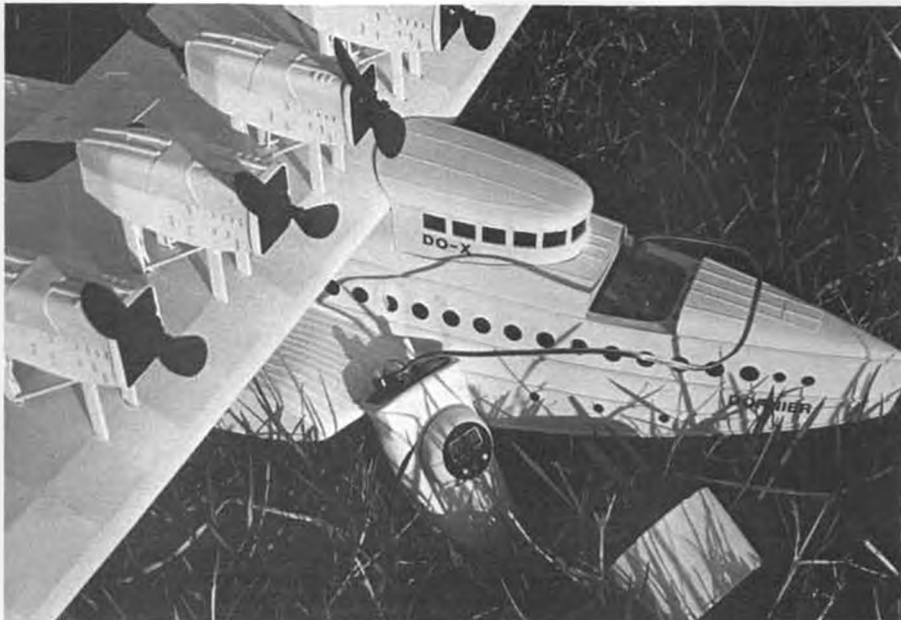
Along with this thinking, it would be a good idea to have it alternate with the Flying Aces Nats. So, here is the initial plan: The contest has been planned for the summer so that those out of state can include the event along with their vacation. At least for the first time, it will only be a two-day affair, Saturday and Sunday. Saturday will be for judging, to take place in my backyard and barn. During the judging there will be a catered meal, picnic style, so that the contestants and their families can enjoy themselves with good food and friendship!

On Sunday, flying should start promptly at 8:00 a.m. until all events are covered. Events will include the following: Rubber Scale, Peanut Scale, Jumbo Scale, and

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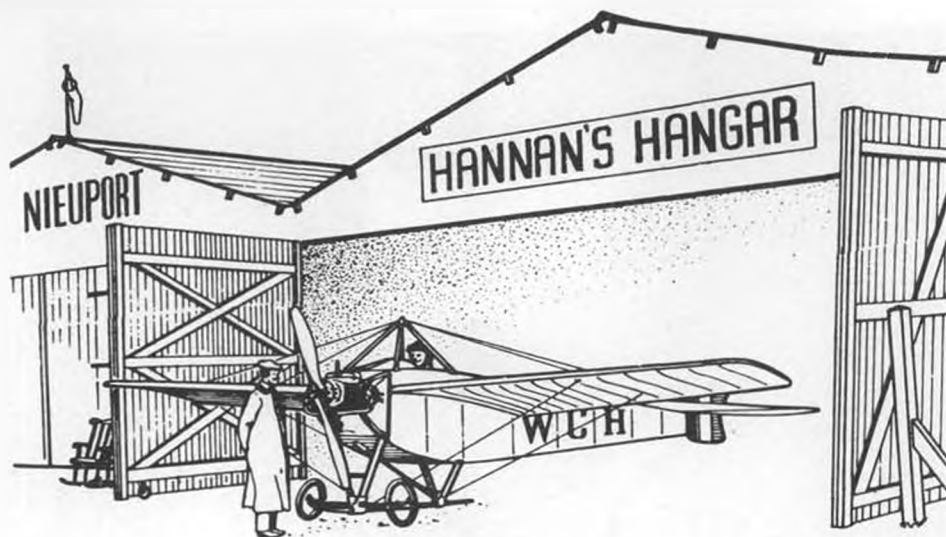
HiLine also markets a kit for this compact field charger, originally designed by Don Srull. Contains four 1650 mAh Ni-Cds, good for 15 to 30 charges on a 100 mAh flight pack.



The HiLine mini-charger being used to charge up one of the three battery packs in Don Srull's magnificent Dornier Do-X flying boat.



The seventh in Dave Diels' line of excellent rubber-powered F/F scale kits is the Curtiss SBC-4 Helldiver. Model in the photo was built by John Scates of England. Kit is 1/24 scale, spans 17 inches and comes complete with prop, hardware and decals. Text has more info on Diels kits.



"Everything should be as simple as possible, but no simpler."

• Our lead-in line this month, quoted in the *Auto Club News*, is by Albert Einstein. **HAPPY NEW YEAR**

Judging from the influx of model photographs, our readers were extremely productive during 1988! By contrast, our own output was quite limited, and we determined to find the reasons, finally arriving at the following alibis/excuses:

1. Selecting overly-ambitious projects. (Albert Einstein was correct.)
2. Excessive diversity of effort. (Too many projects underway at once, resulting in minimal progress on any of them.)
3. Reduced attention span. We find it increasingly difficult to maintain enthusiasm for prolonged endeavors. (See Item No. 1.)
4. Too much time dissipated in non-productive ways (lawn-mowing, household maintenance, television watching, etc.).
5. Efficiency falloff. (Well, after all, we are getting older.)

ON ENERGY CONSERVATION

While bemoaning the above facts of life, a letter arrived from Herb Weiss, well-known for his pre-Peanut Scale "Minute Models," published during the 1930s and 1940s in *Model Airplane News*. He opines:

"My big problem is not having enough energy to go around, and that is the main reason I am reducing my library. I have a feeling that just having things uses up energy; one feels that one really should

make use of them. And the difference between having something to do and having to do something, is a pain-in-the-neck!" (See Item No. 4 above.)

ON PROCRASTINATION

We all realize that our time is slipping away, and yet few admit it so openly as does Barry Roth, who finds himself wishing he were 43 years older so he could "retire and build Peanuts for a living." Says Barry: "My actual finished (models) are way too few because 1), I spend too much time deliberating over *what* to build next (there are so many possibilities); 2), I spend more time making motor-noises at the building board (imagination, you know) than I do at building; and 3), I just can't find all the time I want to enjoy this captivating hobby." Barry does admit that his Halberstadt Peanut placed First at the Northwest Model Expo in Puyallup, Washington; however, he still strives constantly for greater building output. He also suggests a new event, "Peanut Golf": Models are launched at tees of golf courses. Fewest flights down the fairway to a landing on the green wins! Doglegs and water hazards should provide extra excitement. Sounds like fun to us, but would the golfers agree?

Barry also envisions publishing photos entitled *Peanut Butter*, consisting of badly damaged models with descriptions of how they got that way. To start the ball rolling, he

sent along the picture of Howard Breshers's Fike, test-flown with "a monster wad of rubber." The Fike rocketed upward some 35 feet, changed its mind, and plummeted vertically into the ground. A pity. . . .

HYDRAVION PLANS

One way to avoid hitting the ground is to fly over water. That may not eliminate all problems either, however it does offer a refreshing alternative.

Illustrator Tom Hallman favored us with a photo of a 29-1/2-inch wing span vintage French R.O.W. model called the "Hydravion M.B." No, the "M.B." does not stand for *Model Builder*, but the initials of the craft's designer, which we couldn't quite make out. "M. Balary" perhaps. It seems that Tom's father, Donald Hallman, obtained the plans over 50 years ago, directly from France. Tom would like to share this rediscovery, and offers plan copies for this fine old-timer on a nonprofit basis, for \$3 folded, or \$4 rolled in a tube. Looks to be a practical proposition at a bargain price, from Tom Hallman, 38 S. 17th St., Allentown, Pennsylvania 18104.

LITTLE LEGG'S

Model builders have a long history of adapting commonplace discards to other purposes. Consider the plastic bottle-bottoms which have been converted into model cowlings. Or the cottage cheese containers which have yielded propeller blades.

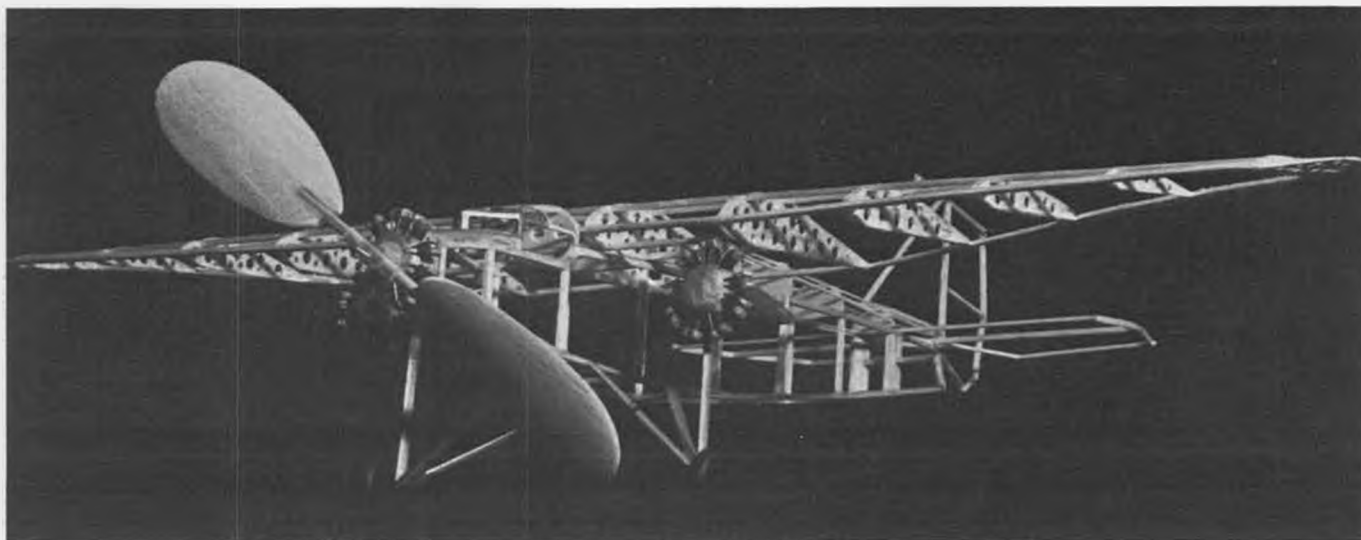
Art Grosheider, of Denver, Colorado, is carrying on in that tradition. Noticing the neat, egg-like plastic containers of Legg's brand women's pantyhose are usually thrown away, Art decided to see what could be done with them. Result? A series of whimsical models, as shown in two of our photos. Although they would be quite entrancing simply as static conversation pieces, these models have action features as well. For instance, an electric motor revolves the helicopter rotor and makes whomp-whomp noises. The super submarine is ballasted so that only its conning tower appears above the water as it skulks around in a bathtub, with electric power.

Other models, not shown, include a taxying "Mailplane," and some beady-eyed bugs which flap their wings and hop about in circles. Art finds these unique projects a pleasant diversion from more serious model subjects, and suggests that many other ideas await execution. Thought



Whimsical models from Art Grosheider, based on L'eggs pantyhose containers, include this captivating helicopter and sinister submarine. These are action models, not just display pieces.





This Ford Trimotor Peanut by Sam Welch weighs a mere 4.578 grams as depicted here. All those lightening holes in the ribs were made with a needle file *after* assembly! Quite an ambitious project.

starters: How about a Balmy Balloon? A Badyear Blimp? A Gee Bee Omelet? Why not ask your mother, wife or girlfriend to save her Legg's containers for you?

NORTHWEST SCALE WATCH

Nope, not a new type of timepiece, but a different sort of scale modeler organization. The Scale Watch is a "noncommittal gathering" of modelers from the northwestern area, with a love of free flight scale. Their interests include indoor and outdoor flying (all forms of power), sharing of ideas, plans, three-views and contest information.

The group concentrates on *fun and enjoyment*, downplaying documentation in favor of action. Their motto: "Let's build them to fly and fly them, not just look at 'em!" A newsletter is being published, avail-

able to anyone interested, for a donation of \$5 per year, to cover postage and printing expenses. Contact: Eric Dittman, 6001-219th SW, Apt. 115, Mountlake Terrace, Washington 98043. Please tell him you read about it in *Model Builder*.

FAR EAST VISITORS

Four modelers from Japan, publisher Hiroshi Ida, and Peanuteers Takashi Sugihara, Yoshindo Harada and Jiro Sugimoto, recently visited San Diego. Their first stop was at Walt Mooney's happy hangar, followed by a tour of the Peck-Polymers kit factory. Then, art director/modeler Bill Noonan served as host for a quick trip through the San Diego Zoo, and master model maker Ray Crowell guided them through the San Diego Aerospace Museum.

Mr. Harada had brought along an absolutely jewel-like Peanut Scale Curtiss Jenny, intending it to be proxy-flown in California model contests. However, the Scale Staffel club members overwhelmingly decided the model was too precious to risk in competition, and instead it will be displayed in the Aerospace History of Model Aviation Museum, where it can be admired by all.

What a pleasure to meet these fine, talented gentlemen, who again confirmed that model builders are among the friendliest people in the world. Our hobby is indeed a universal language.

SPEAKING OF THE MUSEUM

Sharing the building with the San Diego Aerospace Museum is the International Aerospace Hall of Fame, which features paintings of famous aviation personalities and memorabilia connected with them. Three additional honorees were chosen to be represented this year, including pioneer French airman/designer Henri Farman, Soviet aircraft designer Andrei Tupolev, and Burt Rutan, who certainly needs no introduction to modelers! If any readers visit the San Diego area, by all means reserve at least a half-day for seeing the splendid Aerospace Museum and Hall of Fame.

JIMMIE ALLEN

Don Campbell sent copies of the prewar Jimmie Allen Flying Club "Flight Lessons



Delightful "Patriot Pacer" Bostonian designed and built by Perry Peterson, shown here next to an oversize film advertising box.



Ooops! Sudden stop of Howard Breshears's Fike Peanut resulted in this sad scene. Photo by Barry Roth.



The framework of Tom Hallman's French "Hydravion M.B." Old Time R.O.W. model. Tom has plans available; see text.

Continued on page 68



Free Flight

By BOB STALICK

on, dear friends.

MARCH THREE-VIEW—1/2A VEE CONCEPT FREE FLIGHT

If you have been following the changes in FIC designs of late, as I have, you have seen the new V-wing ships on the field and in the magazines. These designs seem to have a couple of performance advantages over the more traditional polyhedral wing layout ships:

1. The climb seems to be straighter and more easily adjusted.
2. The glide seems to be improved over similar more traditional ships.

In addition to the performance improvements, the design of the model is simplified with only one dihedral joint to be concerned with.

So, what is it that makes the Vee ship such an improvement? It appears that the primary change is the use of a small tiplet on the wing tip. Although the exact size and shape of the tiplet is still being developed, a couple of standard practices seem to have emerged. These are: the tiplet is airfoiled on the inside (the part facing the wing tip), the tiplet is set at a toe-out angle of four degrees (the tiplet trailing edge is further out than its leading edge), and the tiplet is located on the wing tip so that its leading edge is just in front of the high point of the wing airfoil. Finally, the tiplet is angled out

• Wowee! Have you been wondering what it takes to get one of those triplet style V-wing ships going for you? If so, take a good look at this month's three-view. It's the FIC new concept transfigured to a 1/2A design. It's presented so you can begin getting your own creative juices flowing with this exciting new high performance idea.

And, now that you have heard that the AMA Nats will be held in the Tri-Cities of Washington, you are probably wondering—just where are these cities? Never fear, some information about free flight geography will show up this month as well.

And just when you thought it was safe to go out to test fly, right in front of you appears the spectre of Kodakophobia. What's a free flihter to do? Is there any hope? Read

from vertical by about 21 degrees with the wing panel flat, adding to the stability of the model.

The VEE Concept model presented here this month attempts to transfer this new FIC idea to AMA Gas classes. Take a good look at the three-view. Compared to the current AMA 1/2A class model, this Vee model has an average thickness airfoil for the wing, and a thinner-than-usual stab airfoil on a small area stab. Also note the location of the balance point. It is farther forward than what AMA Gas fliers typically use. The ship features autorudder, VIT, and a bunt system. Although the three-view calls for a Seelig Mini-Combo timer, a standard clockwork timer could be modified to produce the necessary functions. The T.D. 049 is intended to be equipped with the screw-in backplate mount that Jack's Models or Kustom Kraftsmanship sells. This mount will save a bit of weight and simplify the engine mounting.

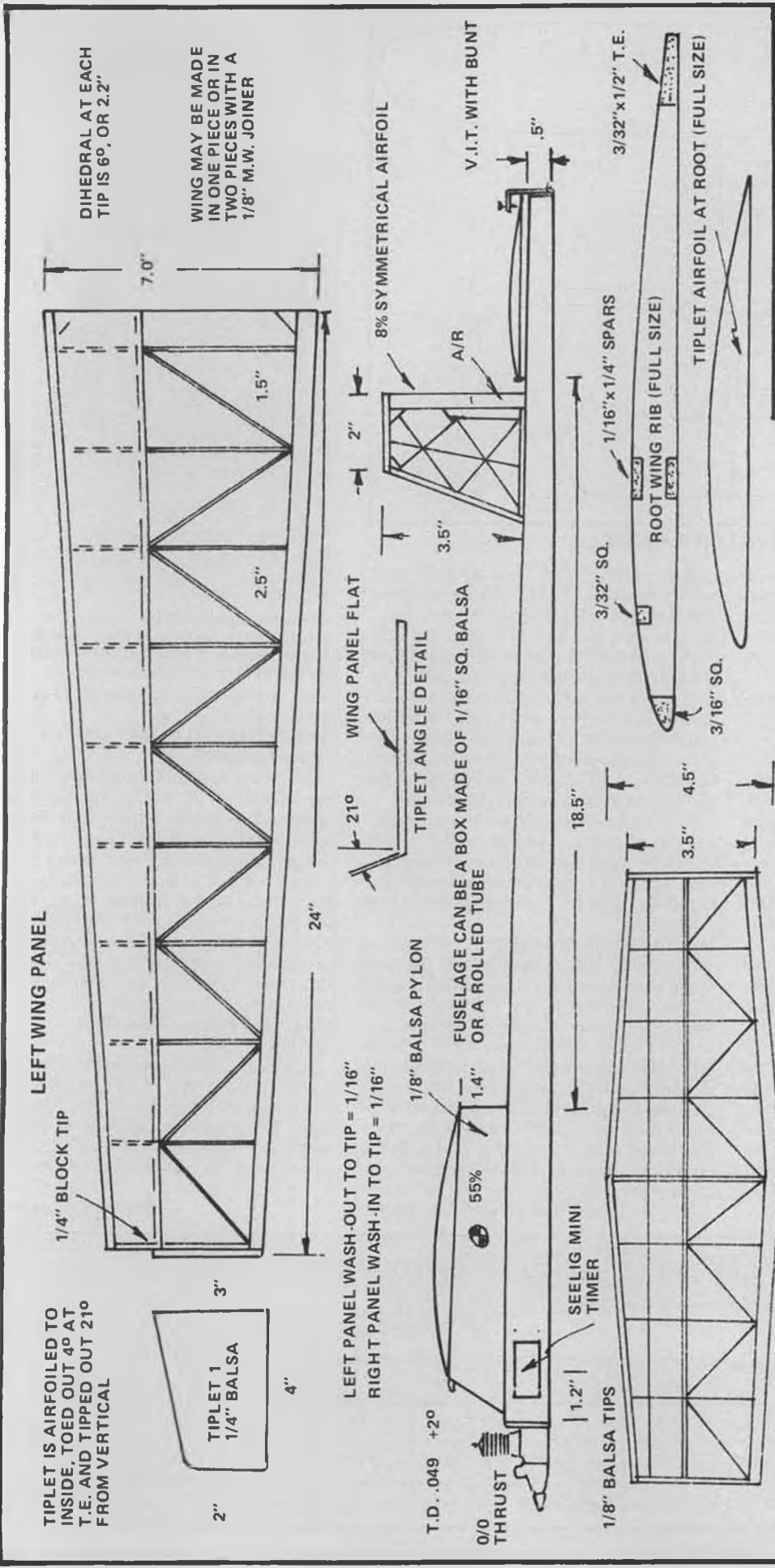
The fin is located in front of the stab and is built up—for a reason. Although I like the rear fin arrangement because of its sleekness, I tend to bump, crack, and break the darned things. Moving the fin in front of the stab creates another problem. It is not as effective, especially if you just glue on a flat balsa sheet fin. The fin needs to have some thickness—8 percent (or about 5/16 inch on this model) is about the minimum. I think 10 percent might be safer, and this would mean a thickness of about 3/8 inch at the high point. Bill Dunwoody, in an article about his SAD SAM FAI ship in 1963, had this to say about fin thickness: "A factor of considerable importance in making the ship spirally stable is the thick fin airfoil. Thin airfoils, flat plates in particular, are notoriously prone to stalling and boundary layer separation even at low angles of attack, and on the fin of a free flight power



Leland Schroeder took this shot of Ed Miller flight testing Chuck Wright's Gambler. Chuck didn't have the nerve to fly it, but Ed had no such misgivings. . . after all, it wasn't his ship!



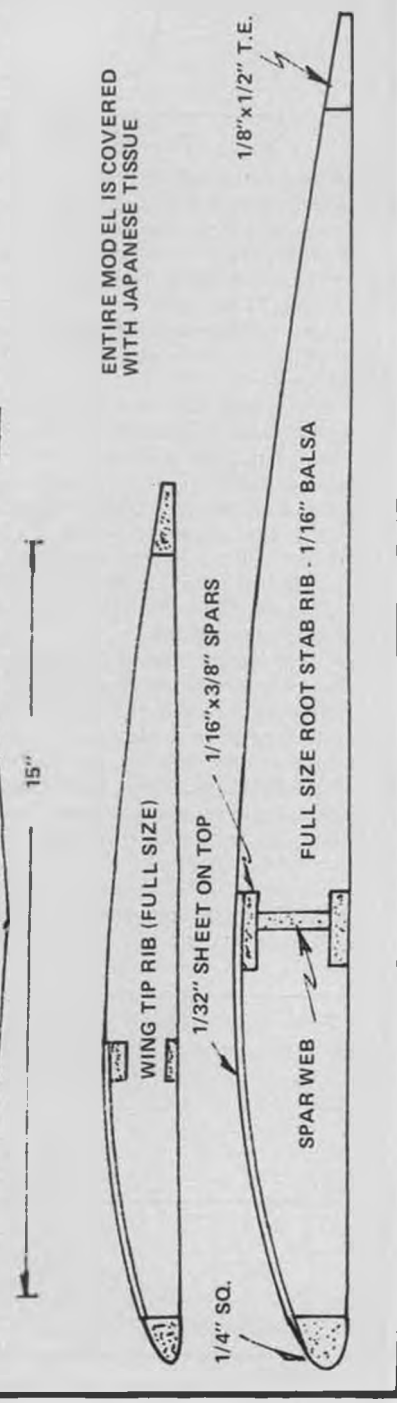
Ralph Cooney with his state-of-the-art F1C V-wing model. Note the tiplets and shallow dihedral. Text has more details on this design feature. Site is Harts Lake Prairie, in Washington. Stalick photo.

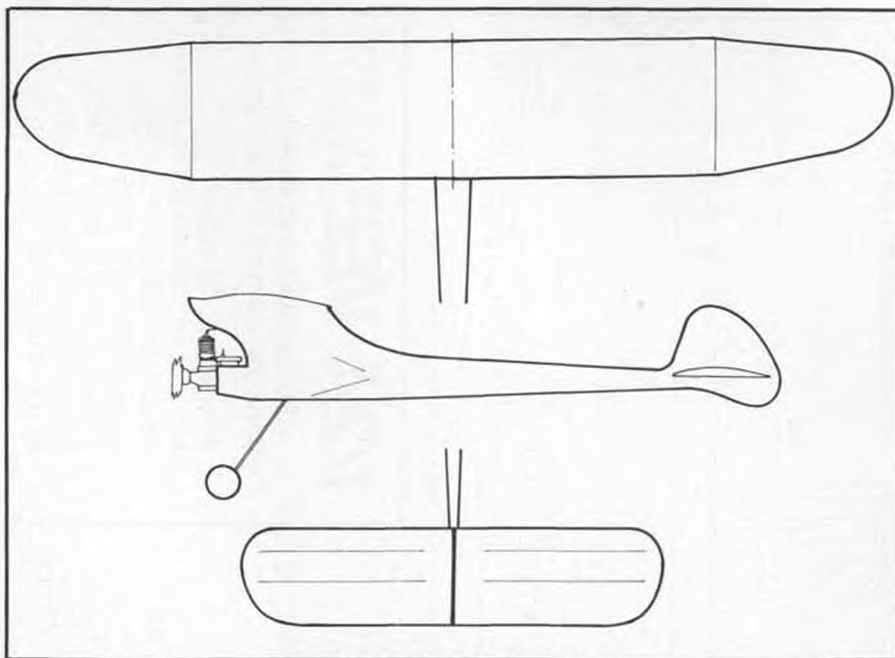


1/2A VEE CONCEPT MODEL

Designed by Bob Stalick
Based on Current F1C Designs

Wing Span: 48 inches
Wing Area: 264 square inches
Stab Area: 60 square inches
Wing Airfoil: 8% thick at 35%
Stab Airfoil: 6% thick at 35%
Flight Pattern: Right/Right
Scale: 1/4"=1.0"





MARCH MYSTERY MODEL

model, this can result in erratic control of the model's turn. The qualities which make the thin, low lift section desirable on the stabilizer make such a section very poor for the fin." Coincidentally, the fin thickness on SAD SAM is 12 percent.

I have come to the conclusion that the location of the fin is of less importance than the thickness.

So, as you look further at the plan, note that the amount of dihedral in the wing is very low. Typically, a model of this size would have a dihedral angle of about twice what the 1/2A Vee has. Looking further at the wing, note that the wings are very slightly washed so that the right wing has more angle of attack than the left. This should necessitate very slight right rudder tab, but no other offsets.

The bunt system should be simple, but may be a mystery to the newcomer. Essentially, the stab is held in the climb position by a very short wire or aluminum stub that is mounted in the fuselage just in front of the stab trailing edge. This stub keeps the stabilizer angle of attack correctly set for the climb. As the engine is flooded off, the timer releases a line and the wire or aluminum stub snaps out of the way. The stab, being held down by the spring-loaded autostab line, pops the trailing edge down about 3/32 inch. This causes the model to

change quickly from vertical climb to a more horizontal, gliding attitude. At about one second after the bunt, the timer releases that autostab line, and the stab pops up to the VIT arm which is set for the glide mode. The autorudder is usually actuated about the same time as the autostab release—some fliers do so just before the autostab, some immediately after. The primary purpose for the autorudder is for a transition to glide, but fine tuning of the glide circle should be done by stab tilt.

So, there are some of the ideas surrounding the 1/2A Vee Concept model. If you want to try your own, the ideas in the three-view and in this column should help you. Good luck and let me know how you did with yours.

MARCH MYSTERY MODEL

Okay, Old Timers, here is one that you might know about if you are up on your old British model magazines. This ship was designed by one of the more prolific and successful English free fliers of the time. In fact, his designing skills were influential in shaping free flight design in the world. This ship was one of his postwar efforts and qualifies for the Ignition Nostalgia event. So, if you know what it is, drop a card with the correct response to Bill Northrop at your earliest convenience. If you are the firstest with the correctest, then you win the big



Peter Salberg gets both feet off the ground while launching his Class B Starduster. Shielia Salberg observes. Placed 2nd at Fresno Gas Model Club Annual. Schroeder pic.

prize—a one year subscription to *Model Builder* magazine.

MARCH DARNED GOOD AIRFOIL —Benedek 8403B

Back to the Benedek airfoils. Since this issue seems to be dedicated to power models, this is the section that George Benedek introduced to be used on earlier high performance FAI power models. It has a slight amount of undercamber, but it is quite thick at the leading edge, which means that it will be a forgiving section that should be easy to trim. Any kind of structure should be appropriate for this airfoil, as the trailing edge is not so thin that it requires special consideration.

1989 NATIONALS—TRI-CITIES, WASHINGTON

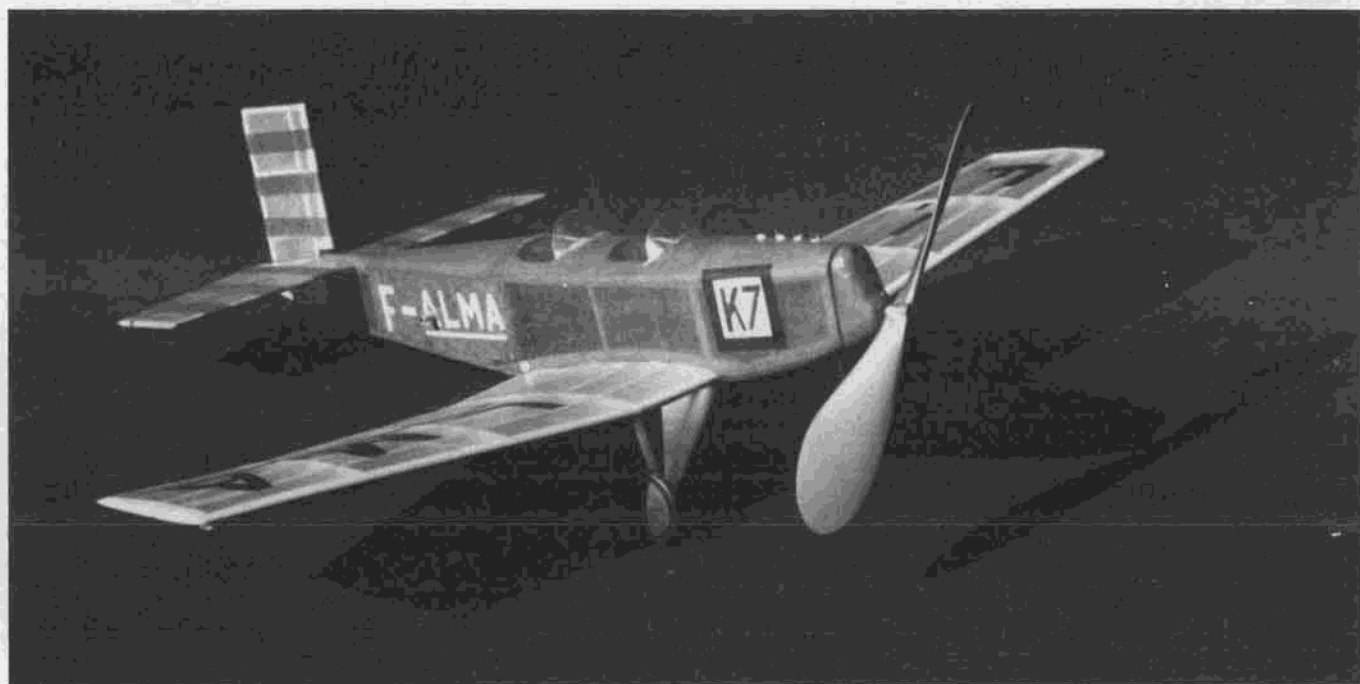
So, you ask, where are the Tri-Cities? Take a look at your map of Washington state. Move your finger east from the Pacific to about 100 miles from the Idaho border and about 140 miles south of Spokane. There you should find Kennewick, Pasco, and

Continued on page 84

DARNED GOOD AIRFOIL — BENEDEK 8403B



STA.	0	1.25	2.5	5.0	7.5	10	15	20	25	30	40	50	60	70	80	90	100
UPR.	2.10	3.95	4.75	5.90	6.60	7.20	7.95	8.35	8.50	8.50	8.20	7.50	6.50	5.25	4.00	2.30	0.35
LWR.	2.10	1.00	0.60	0.20	0.05	0.00	0.25	0.45	0.55	0.65	0.75	0.83	0.90	0.80	0.65	0.40	0.00



FARMAN 352

By WALT MOONEY. . . We go back to the early '30s and the Tour de Europe for this colorful French light-plane. It's an easy-to-build low winger that will consistently turn in flights of a half-minute or better.

• The three-view for this airplane was found in the Polish book *Miedzynarodowe turnieje lotnicze 1929 to 1934* by the Polish author Marian Krzyzan. Marian sent me a copy as a gift, and it is a delightful addition to my library, which will undoubtedly provide an inspiration for other models. This book covers the aircraft designed for and flown in the Tours of Europe during the early thirties.

The airplanes flown in these competitive tours were quite often painted in an interesting manner, and the model is made with the authentic color scheme. The tail surfaces have red and white stripes. The fuselage is red with white registration letters. The wing has black lettering. The com-

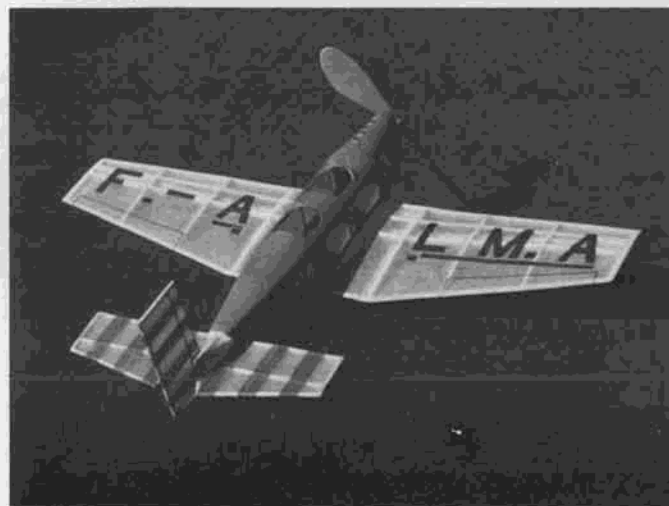
petition number "K7" is black on a white square surrounded by a black border. The color scheme adds to the charm of this model.

The model was originally built with the scale tail surfaces in the hope that it might be made to fly that way. It was a fruitless hope, for with the scale vertical it would swap ends in the first three feet of flight. With the vertical tail doubled in area, it would fly with the scale horizontal but was not very stable. So a larger horizontal tail was also built, and the model flies quite well, getting a duration of 36 seconds as a best official flight at a recent contest. The model weighs 13 grams complete with a 14-inch loop of 3/32 rubber and nose ballast to

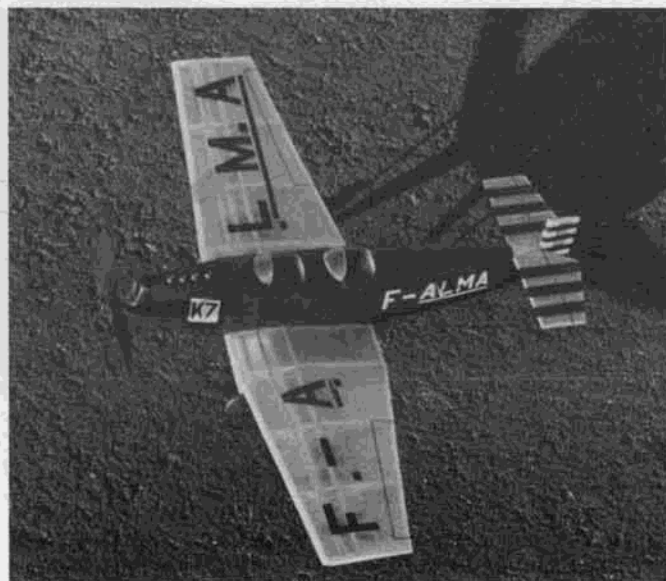
put the balance point at the center spar.

This model is built in the time-honored stick and tissue manner. Two side frames for the fuselage are built directly over the plans. The only tricky part of this operation is making the wing saddle, that is, the parts of the lower longerons where the wing will be located. This part is laminated out of two pieces of 1/16 square balsa. Simply push in a line of pins at about a 1/4-inch spacing along the contour that will match the top of the main wing ribs and bend the two sticks to match the shape, pinning them in place after putting some cement between them. Now pin the bottom longerons onto the

Continued on page 64

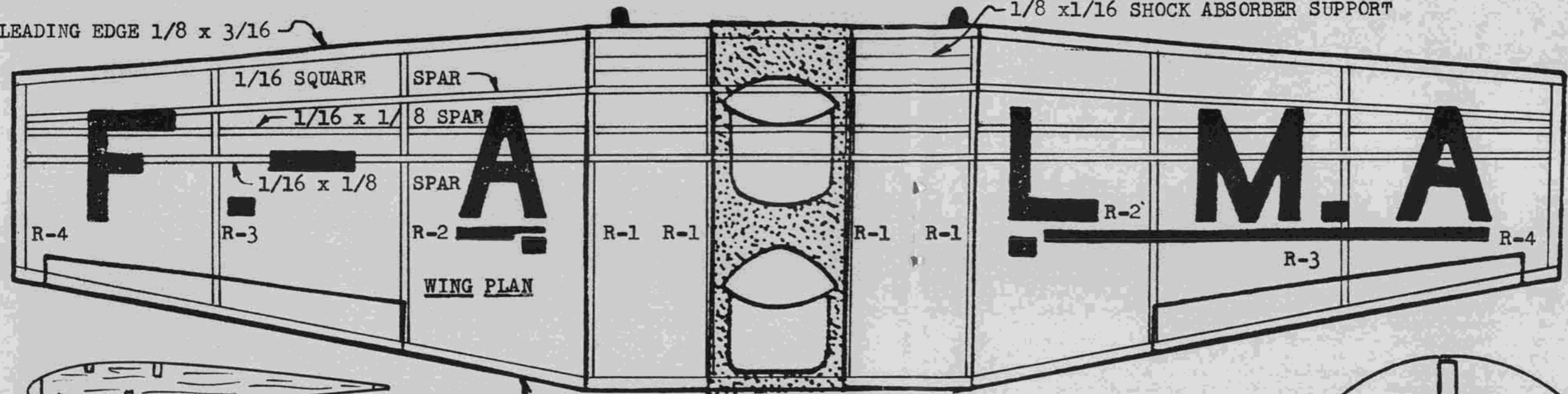


Original model (right) was built with the scale size tail surfaces, which proved to be way too small. Photo above shows the final configuration, with a much larger fin and horizontal stab.

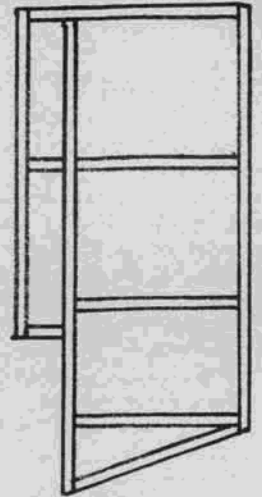


LEADING EDGE 1/8 x 3/16

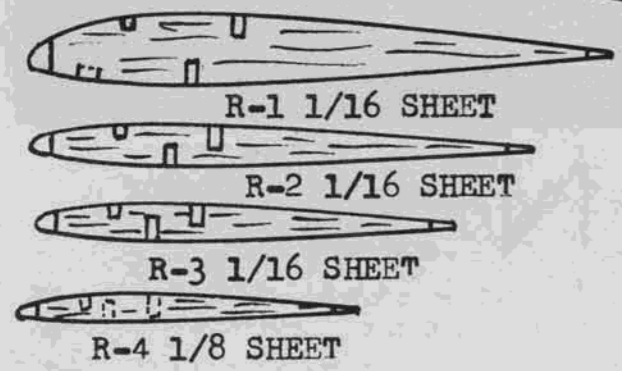
1/8 x 1/16 SHOCK ABSORBER SUPPORT



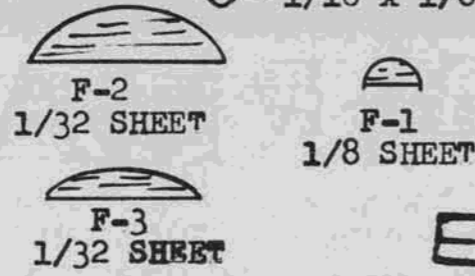
WING PLAN



FLYING VERTICAL
ALL PARTS 1/16 SQ.



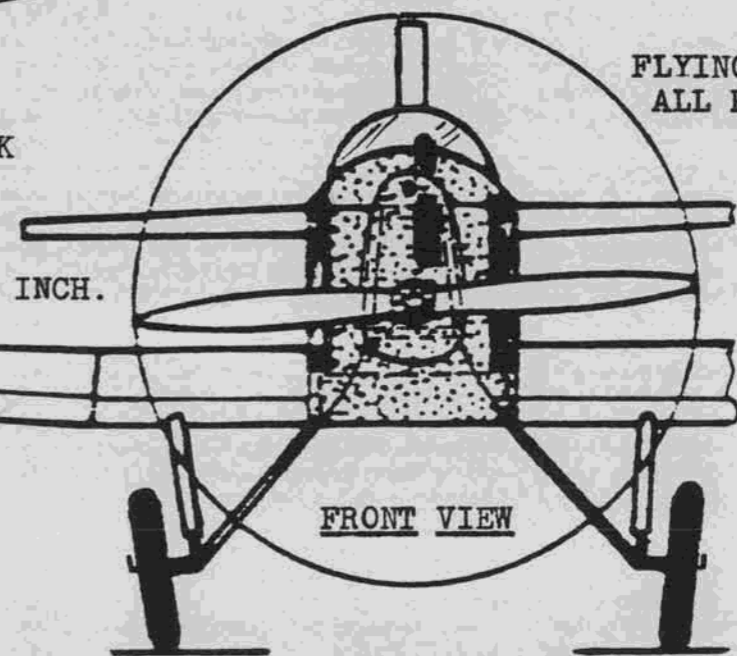
R-1 1/16 SHEET
 R-2 1/16 SHEET
 R-3 1/16 SHEET
 R-4 1/8 SHEET



F-2 1/32 SHEET
 F-1 1/8 SHEET
 F-3 1/32 SHEET

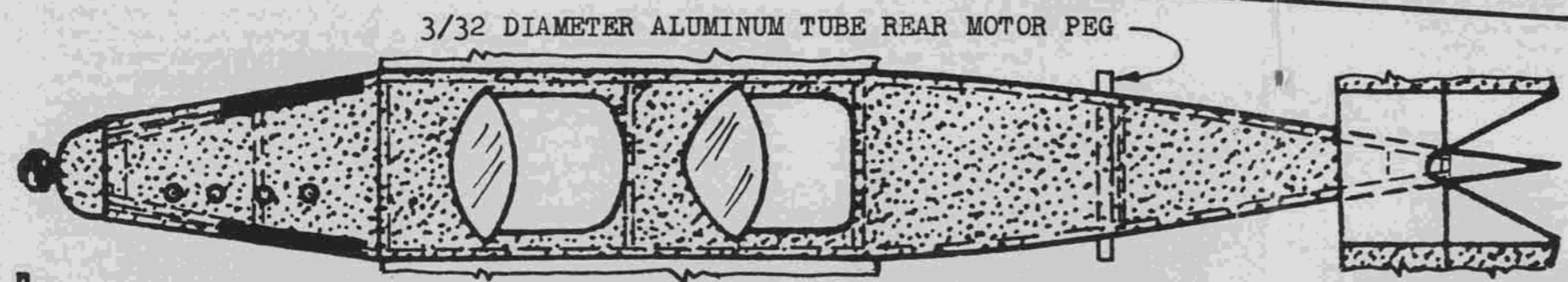
COLOR SCHEME IS RED AND WHITE WITH BLACK REGISTRATION LETTERS ON TOP AND BOTTOM OF THE WING. USE THE LIGHTEST WEIGHT TISSUE YOU CAN FIND FOR COVERING. INCREASE THE "SCALE" DIHEDRAL SHOWN BY 1/2 INCH.

1/16 x 1/8 TRAILING EDGE



FRONT VIEW

"SCALE" PROPELLER DIAMETER SHOWN, USE A 4 1/2 INCH DIAMETER PLASTIC PROPELLER FOR FLIGHT.

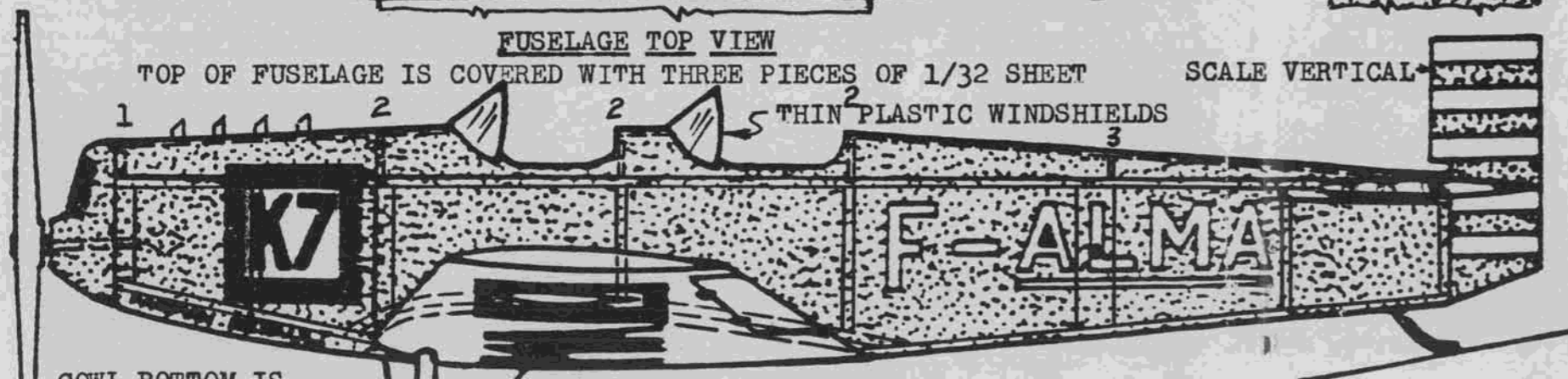


3/32 DIAMETER ALUMINUM TUBE REAR MOTOR PEG

FUSELAGE TOP VIEW

TOP OF FUSELAGE IS COVERED WITH THREE PIECES OF 1/32 SHEET

SCALE VERTICAL



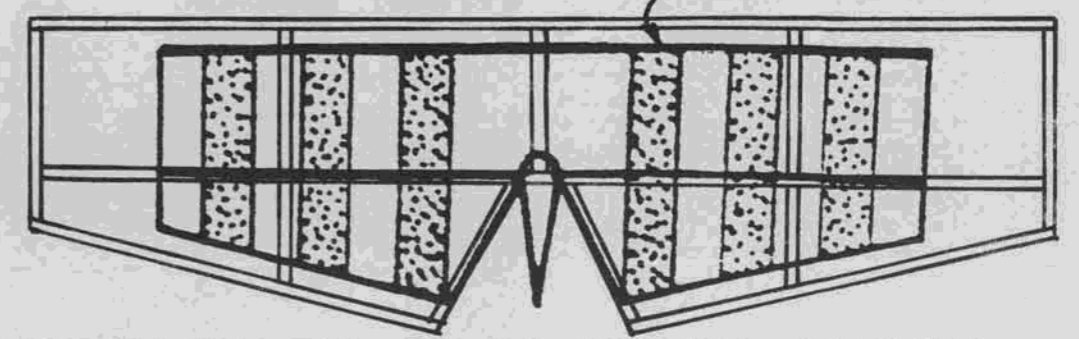
THIN PLASTIC WINDSHIELDS

COWL BOTTOM IS CARVED FROM 3/16 SHEET Balsa

FUSELAGE LONGERONS ARE 1/16 SQUARE, WING SADDLE IS TWO PIECES LAMINATED TO TOP OF R-1 CONTOUR

HARDWOOD TAIL SKID

SCALE HORIZONTAL



FLYING HORIZONTAL TAIL, ALL PARTS ARE 1/16 SQUARE.

FARMAN 352

Walt Mooney 12-11-88

Control Line

BY JOHN THOMPSON

• It is late autumn as I write this column, with heavy rain falling outside; flying sessions are squeezed in between rain showers here in the Northwest. I'm fortunate enough to live in an area where the flying never has to stop, but the fliers do have to learn to dress for all kinds of weather.

By the time you read this it will be the dead of winter, and many of you will be confined to the workshop, getting ready perhaps for the coming summer of flying.

This reminds us that, even where the flying goes on all year, it definitely has its seasons. Does your club vary its activities to reflect the seasons?

My club, the Eugene Prop Spinners, finds the fall and winter an extremely productive time in terms of building up the strength of the club.

The experienced fliers are available to spend some time working with new prospects that were attracted to the hobby during the summer. Some of them may have become interested way back in May when the club hosted its big annual contest, but it's October before they really got flying.

But, as the contest season wanes and everybody is back from vacations and it's too early to be working hard on next year's projects, the Sunday flying can begin in earnest. We've seen several new fliers get in the air, a lot of planes and engines being swapped around, and good turnout for the flying sessions.

It's a good time for clubs, while weather permits, to schedule some special events for beginners such as flying how-to sessions, low-key flying games, auctions, demonstrations, etc. As winter approaches, depending on the weather in your area, you may want to move the instructions indoors to cover building techniques. The Prop Spinners hold an annual winter banquet. Fliers bring their families for a pot-luck meal, their planes for show and tell, and there usually is some kind of indoor entertainment. (A flying contest with dime-store balsa gliders in a banquet room can become quite a spectacle.)

In our region, the winter is a good time to get newcomers baptized in competition, with our low-key winter racing contest series, the Northwest Sport Race Drizzle Circuit, which is well under way by the time you read this.

If a club uses the "off-season" well, it could have a whole new crop of enthusiastic fliers ready to go by the coming year's contest and good-weather flying season.

And where might they go? Well, there are contests and flying demonstrations everywhere. For a couple of examples, read on...

COME FOR A VISIT

The Pacific Northwest, where this column originates, has a rare opportunity to issue an invitation to control-line model aviators the world over. Come visit us in 1989.

This is the year that, for the first time ever, the U.S. National Model Airplane Championships will visit the Northwest. Dates are a little earlier than the traditional Nats dates. The world's biggest model airplane contest will be from July 15 through 23 in the tricity area of Washington state (Richland-Pasco-Kennewick). This is in southeastern Washington, about 30 miles from the Oregon border. Early reports from the Academy of Model Aeronautics are that all modelers can expect excellent flying facilities.

Write to the AMA for your entry form and plan to be here in July—you'll enjoy your stay! The address for entry forms and information is: Academy of Model Aeronautics, 1810 Samuel Morse Drive, Reston, Virginia, 22090. Send \$1 for postage and handling.

Of special interest to C/L modelers, Northwest fliers are planning to request permission to run the two popular Northwest racing events, Northwest Sport Race and Northwest Super Sport Race, as unofficial events at the Nats. This has not been submitted to AMA at this writing. Watch the Nats schedule in AMA publications for details.

Big contests for C/L are nothing new to the Northwest, however, as the Northwest Regional Championships on Memorial Day weekend is one of the biggest in the country and the Raider Roundup, also known as the Washington State Championships, a week after Labor Day, also is a large contest. The most prestigious one-event C/L contest in the region is the annual June Bladder Grabber for AMA combat.

Clubs and contest directors are welcome

to send me information about the events in their areas. I'd be glad to include mention of upcoming meets and some information about the meets afterward, if you send it.

Remember, the realities of magazine publishing require significant lead time. I am writing this column in November, to be published in the March issue, which is distributed around the first of February. So, get your information to me three to four months ahead of time to be assured that I can consider it in time for publication.

Similarly, if you've written in to ask a question or to submit some information, don't be discouraged if it takes a while to see it in print. In addition to the normal lead time for the magazine, I also devote some editions of the column to special topics, and that means the "mailbag" has to wait a month.

But I do try to answer as many questions and letters as I can in the column. That means it's time this month to take a break from our series of "how to get started" columns and look into the...

MAILBAG

We'll start off with an item that's not really about mail we've received, but it's a "mail" item nonetheless, and an idea that might be of interest to clubs and regional organizations everywhere.

Here in the Pacific Northwest, contest sponsors for nearly 10 years depended on a regional newsletter put out by volunteers which carried a regular contest calendar. The newsletter also served as a mailing service for flyers about contests. With the apparent end of the newsletter, officials begin looking for a new way to make sure that the word gets to everyone about coming events.

The result was something informally known as "The List." One flier in the AMA district was informally designated as the custodian of a comprehensive regional mailing list. It turned out to be your columnist. With the help of contest directors, the



Top three at the 1988 Combat Classic, from left: Chuck Rudner, 3rd; John Stubblefield, 1st; and Steve Hills, 2nd. Photo by Frank Williams. See text for brief contest report.



Combat Classic action: former Combat World Champ Tom Fluker Jr. tunes the Fox while his father, Tom Sr., hangs on. Williams pic.



This time it's John Salvin doing the holding as Norm McFadden gets things going for flier Mike Petri at Combat Classic. Williams photo.

old newsletter mailing list and energetic flier-photographer-official Jim Cameron, I have assembled the list in my home computer. When a contest director wants to make sure that his publicity goes out to everyone interested in C/L in the region, he sends me an envelope and a nominal fee to cover my postage and handling expenses, and I mail him "The List" in the form of mailing labels. All the local club has to do is to stick the labels on their handbills and mail them. In the meantime, the list is constantly updated by reference to sign-up sheets from each contest.

It's a system that can work in any region. All it takes is the cooperation among contest directors and club officials, and the willingness of one volunteer to be the "Keeper of the List." I keep the Dist. XI list on Hypercard software in a Macintosh computer. There are similar database or mailing programs available for other types of computers as well.

Good luck with your version of The List. (Make sure my name and address is on it!)

I received a wonderful letter from one of the true pioneers of the control-line hobby, J. Robert Smurthwaite of Baker, Oregon. As you may recall from previous publications, Bob is the "J Robert" behind the famous "J Roberts" three-line control system and other products. He also is one of several people who apparently developed control-line systems independently in the late 1930s and early 1940s, a contemporary of such other pioneers as Jim Walker and Oba St. Claire. I have not been fortunate enough to meet Bob in my travels to C/L meets in the Northwest during the past decade, but I've often heard of his reputation and have looked forward to running across his path some day.

Unfortunately, it turned out that what prompted Bob to write was a grievous error that I made in a previous column, in saying that Bob was from Grants Pass, Oregon. Well, even though I have lived in Oregon for some 15 years, I still occasionally mix up the names of the Western Oregon town of Grants Pass and the Eastern Oregon town of LaGrande (Bob's previous residence) though the two towns are hundreds of miles distant from one another. Bob actually has

moved to Baker, also in Eastern Oregon, where he was born and lived most of his life.

At any rate, I apologize for the error. Bob reports that a new modeling business enterprise is beginning to get started, and he plans to produce several new products.

Here are some excerpts from Bob's letter:

"I developed the three-line system, the first variable power controls for model aircraft engines, the most successful scale and Navy Carrier models ever produced, while here in Baker. I also had designed and manufactured thousands of models for Jim Walker's company in Portland here in Baker after the war years.

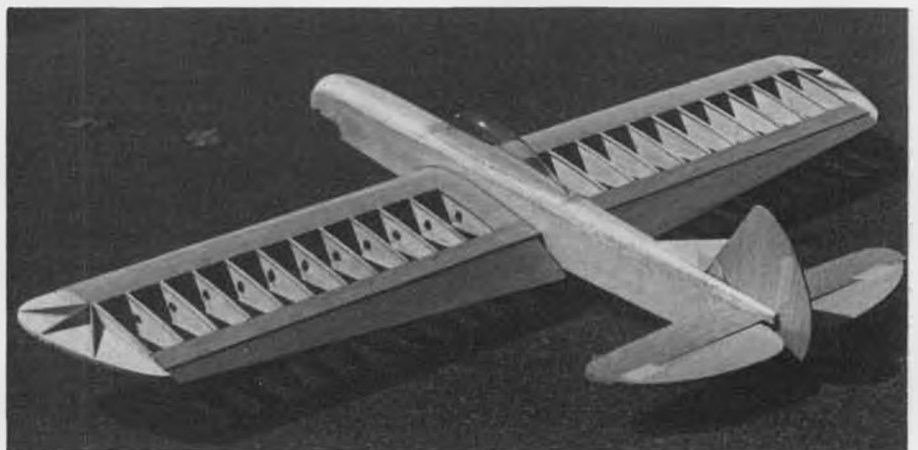
"I met Jim Walker in July 1942 just after passing tests as an Army Air Force cadet and sworn into military service in Portland. I was told that I would have a few months waiting period before orders would come to report for training. I had a scale control-line model with me and flew it on the Grant High School field for friends I was staying with, folks who formerly lived in Baker. Jim lived nearby and came to the field no doubt when he heard my Ohlsson 60 'Custom' engine. It was probably the first scale model using control-line ever seen. I had designed and built it two or three years before that time. I learned to fly it without any previous knowledge or view of any other controlled flight. My control system was quite com-

plex, but it worked beautifully in that model. Jim was impressed and most inquisitive. I did not know who he was until I had flown the model a couple of times. I wound up spending the next few months working with him. That was always the basis between Jim Walker and my efforts. He was most considerate, generous, and a keen, highly tuned athletic type at that time. His coordination was truly amazing. I thought I was pretty good, but he was quick to perceive my strange notions or ideas.

"Those few months in Portland saw several new products go into production. We revised a couple of his older gliders and perfected other products which were already in development stages. I look back on that association as a royal treat for me. I got paid very well for having all that pleasure, too. I got to know some of the factory personnel and definitely know some facts about the origin of control-line flight, which some folks just don't seem to want to accept. . . .

"Jim Walker did more for model enthusiasts, industrial folks, anyone involved with model airplanes, than any other human ever to walk on this planet. That is absolute fact. Why do folks try to discredit the man? It really makes me angry to read articles in model magazines written by people

Continued on page 80



"Oriental" structure as assembled by Russ Graves. Kits for this and other older C/L models are available from Control Line Classics, 1788 Niobe Ave., Anaheim, CA 92804.

the INSIDERS

INDOOR FLYING REPORT

By DAVE "VTO" LINSTRUM

• Instead of an Obscure Aircraft feature this month (send in your personal candidate for this today—any full-scale aircraft that is little-known, seldom or never modeled as a F/F), we are going to treat you to a full-page drawing of a VFA! That's a Very Famous Aircraft, in this case the man-powered Daedalus, named for the Greek Free Flight Ornithopter Man from mythology. You will recall that when Daedalus and his son Icarus flew over the Aegean, Icarus rose too near the sun (like a F/F in a Taft thermal) and melted the wax on his feathered wings, thus a crash and splash in the sea below. Interestingly, the Daedalus man-powered aircraft made the same kind of landing in the surf in 1988 when the Greek pilot/powerplant encountered a gust on approach. Flying for over four hours from Crete to Santorini, he harmlessly (to him) dunked in the drink when the fragile carbon fiber tubular boom failed just forward of the tail, causing a maneuver that also snapped the right wing spar. The whole aircraft collapsed, but the records were set and no one cared. Worldwide media had a field day with the news.

We thank Daedalus Project team member Mark Drela of MIT and Bob Meuser, Editor of NFFS Free Flight, the National Free Flight Society Digest, for the excellent drawing that shows many details of the Daedalus. It is certainly the World's Largest Indoor Model, built ultra-light and flown outdoors. The structure is very hi-tech (very little balsa; it's heavier than foam) and the airframe/power train was designed by a team that included several "Insider" aeromodellers. Like Paul Macready, of Gossamer Condor and Gossamer Albatross fame, these guys knew how to build fragile microfilm indoor endurance models. The same principles—make it light, strong, and match the prop to the power (human, not Pirelli rubber)—still apply to the full-scale craft.

The fully detailed and dimensioned drawing by Mark Drela—who is also expert in another human power area, the Indoor Hand-Launch Glider—tells the story. We tip our indoor flying sweatband (it gets humid in the Macdill Hangar) to the entire Daedalus team for their outstanding efforts. Remember how Lindbergh inspired aviation enthusiasm in 1927 by flying to Paris? We hope this Greek/American effort will cause similar resurgence in both full-scale and model aviation.

BUTCH HADLAND TRIM TIPS

Continued from the January issue, here are indoor scale trimming techniques from

expert Butch Hadland of England:

Flying high-wing models left is very exciting. Takeoff is usually followed by a very tight left-hand turn, gradually widening out until the model assumes circles of wall-banging proportions; okay outdoors, but frowned upon indoors. To be safe, high-wing models should be flown to the right.

My low-wing rubber ships, on the other hand, always fly left. Flying right against torque is suicidal, and should be avoided at all costs. My current stable of low-wingers includes a Heinkel He 100 (the 1939 world speed record holder), a Mew Gull, and Howard Hughes H.1 in short-wing configuration. All utilize the same trim, and all fly



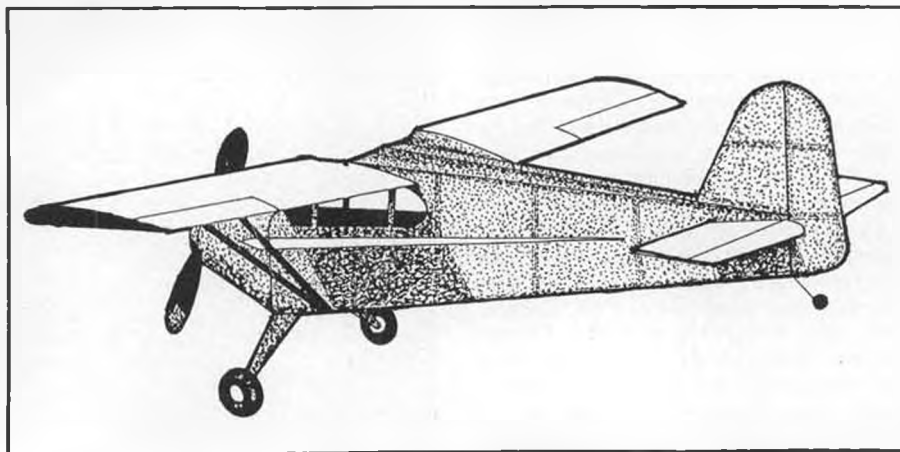
Holland's Edmund Liem concentrates on launch of his F1D microfilm ship at USA sponsored World Champs.

really well (all are Peanuts). The setup is:

1. 1/8 to 3/16-inch wash-in, left-hand wingtip.
2. 1/16 to 1/8-inch washout, right-hand wingtip.
3. 2-3 degrees left rudder.
4. Forward CG (10 to 12 percent).
5. Up elevator, 1/16 to 3/32 inch.



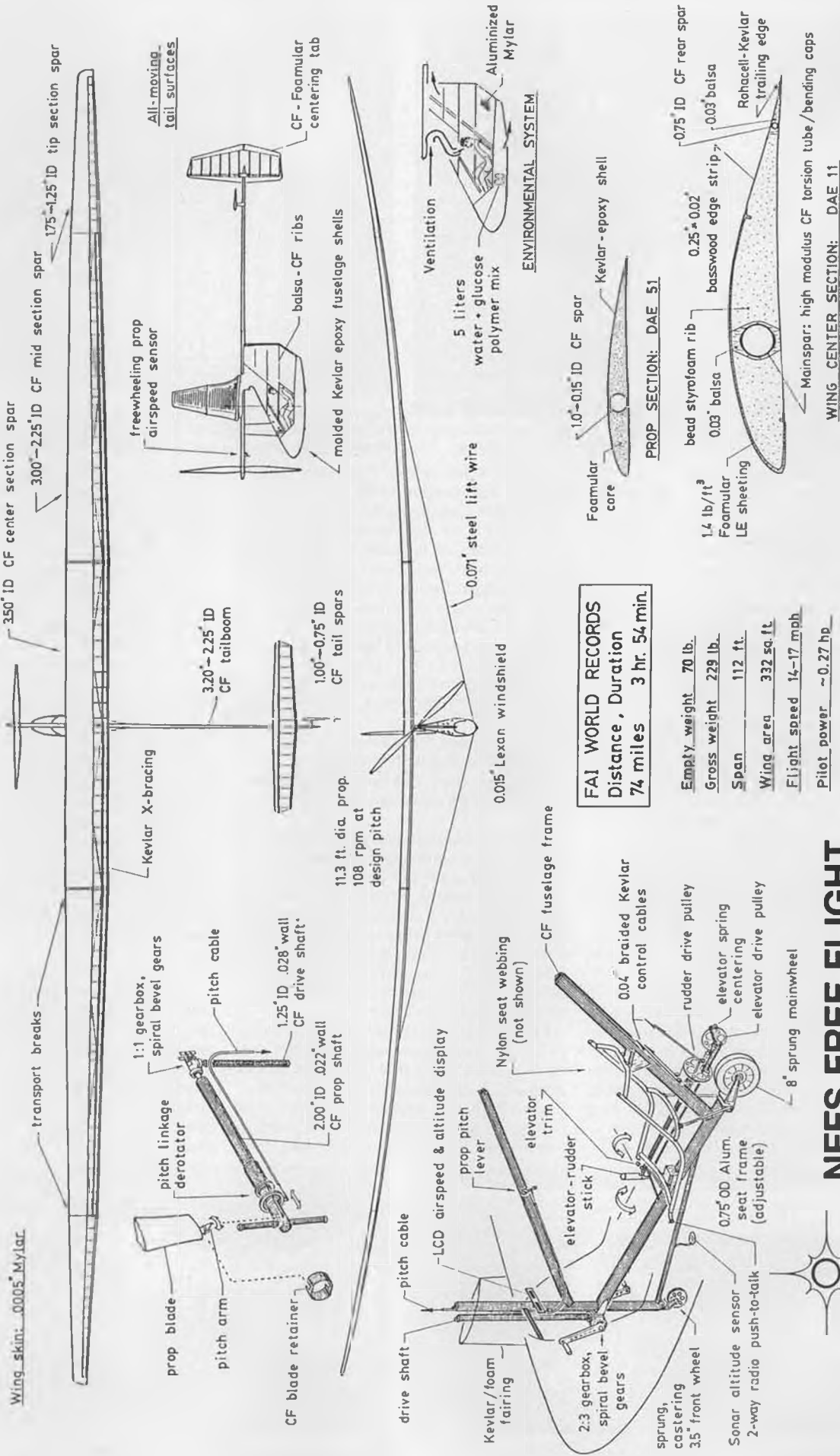
Long Island "Insider" Bob Bender builds his exceptionally fine scale models in this basement workshop. Main mess is the pool table — his models are immaculate and clean!



Line drawing of the Wittman "Big-X", available as a Peanut Scale kit from Gene DuBois. See text for info on the other DuBois kits available.

DAEDALUS: World's Largest Indoor Model

Drawing by Mark Drela



FAI WORLD RECORDS
 Distance, Duration
 74 miles 3 hr. 54 min.

Empty weight 70 lb.
 Gross weight 229 lb.
 Span 112 ft.
 Wing area 332 sq. ft.
 Flight speed 14-17 mph
 Pilot power ~0.27 hp

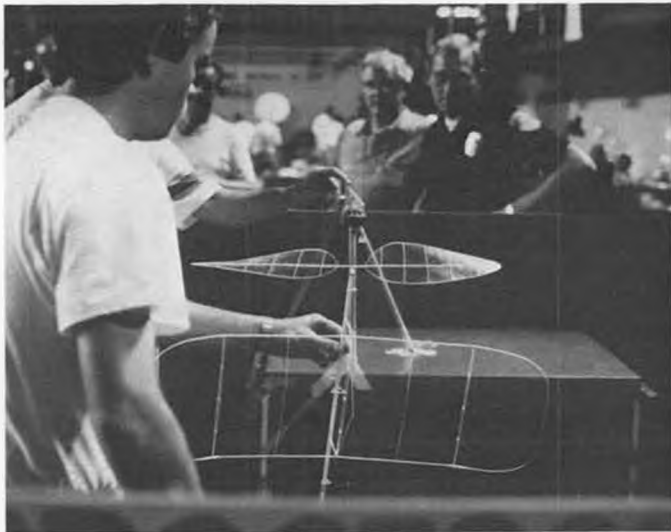


NFFS FREE FLIGHT

Mark Drela 27 April 88

DAEDALUS
 HUMAN POWERED FLIGHT TEAM

ΔΑΙΔΑΛΟΣ



Unidentified German team member weighs his F1D microfilm model at the 1988 Johnson City World Indoor Champs. Graunke photo.

6. 3/32 to 1/8-inch downthrust.

7. Some models may need 1 degree left thrust.

If you will examine the above, you will see that virtually every "tweak" works in opposition, resulting in a constant diameter left circle under full power, and approximately the same diameter circle under cruise and approach conditions. Very safe and predictable. Using this trim is for power-on during the complete flight only. If your motor becomes unproductive at altitude (above ground!), then your model will spiral to the right, coupled with deep stalls. I cannot comment on low-wing CO₂, as yet because I haven't built one. However, high-wing and bipes I have.

Always turn left with CO₂. Trying to fly right, fighting all that torque from a relatively high-pitched prop, is a tremendous waste of energy. I still use the forward CG coupled with up-elevator configuration on CO₂, once again because it is so safe. This setup was discovered accidentally when I built a Sig "Mr. Mulligan" with standard CO₂ power. What used to be a fairly willowy flight pattern was transformed after the model hit the wall. The CO₂ bottle on board moved forward about two inches due to the impact and was (of course) inaccessible. To offset this change in CG, now about 10 percent, the elevators were adjusted up about 1/8 inch, and the model flew great, indoors or out. It has now worn out two Telcos and is flying as well as ever.

As there is no power burst with CO₂,

trimming is less tricky than with rubber models, but unfortunately nearly every charge differs, changing power and weight. However, my models seem to cope with these changes, and provided that our gas cylinder is on or near the CG, no significant flight changes should occur. My high-wing CO₂ models have the following trim:

1. Slight wash-in, left-hand wing.
2. Slight wash-out, right hand wing.
3. Forward CG, 10 to 15 percent.
4. Up-elevator to counteract item 3.
5. 2 degrees right thrust, to counteract torque.
6. 1 to 2 degrees downthrust.
7. Straight, or slightly left rudder.

This trim gives constant diameter left-hand circles on power-on and "flight idle" power.

CO₂ and rubber-powered bipes are trimmed in a similar fashion, except that wash-in and wash-out are applied to the lower wings only. When setting biplane rigging angles, I use the American method. Only the leading wing has incidence, the trailing wing is set at zero. This method and a forward CG, coupled with up elevator, will cure the average biplane's tendency to be over-elevated and crazy.

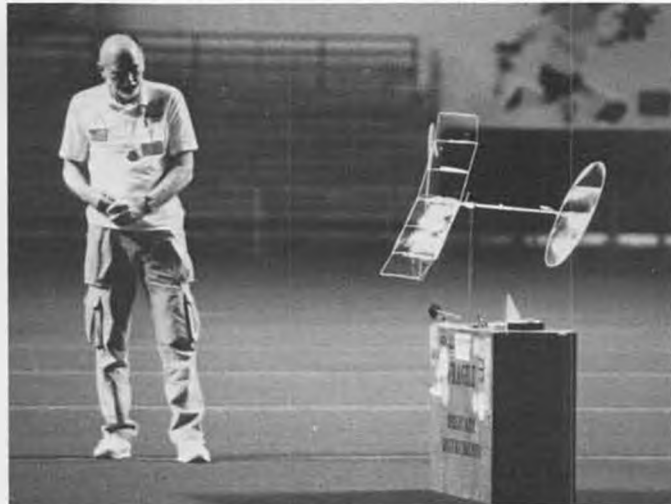
Do not forget to charge your gas cylinder, or to put enough turns on your rubber motor to make it taut before you adjust for CG position. A charge can weigh up to 6 g. (Brown Twin, 6 cc tank), which in my Lacy's case is 20 percent of the model's weight, and I should think that rubber would be

comparable. Keep sparklette cylinders in your pocket to generate some heat, for they dispense gas much more efficiently when warm. Use no other method, though, to warm cylinders.

Use as long a rubber motor as is practicable. This minimizes high initial torque power burst, gives a more even power curve, and allows many more turns for longer flights. My Peanut Lacy uses a 24-inch loop of .083 rubber, and takes 2,100 turns, resulting usually in a 60- to 70-second flight. My Heinkel He-100 (with 6-inch Peck propeller trimmed to 5-1/4 inches) flies about 45 seconds on a 17-inch loop of .100 rubber. The Mew Gull is similar. As a comparison, my inch-to-the-foot Lacy with dual nose-blocks (CO₂ and rubber) uses four strands of .100-inch rubber in a 36-inch loop and flies for 70 seconds, while the Brown twin with 6 cc tank has flown the craft for 2 minutes, 24 seconds at West Baden, Indiana, in 1980. The Sig Mr. Mulligan flies for about one minute with the standard Telco.

GENE DUBOIS PEANUTS

There are plenty of cottage industry manufacturers of Peanut Scale kits (two of the best for indoor are Indoor Model Supply and Micro-X; see their ads in the back of this issue), so you will pardon us if we have not reviewed the offerings of Gene Dubois until now. Gene is a certified scale nut and has been doing research and designing scale ships since Earl Stahl went offstage. His de-



Top scoring USA W/C team member Cezar Banks is intense as he puts full winds into the rubber for a winning flight. Note torque meter clipped to top of model box — see Hint of the Month.



Gene DuBois Peanut kit of the Farman "Sport" is a neat stick-and-tissue French flyer from the 1920's.



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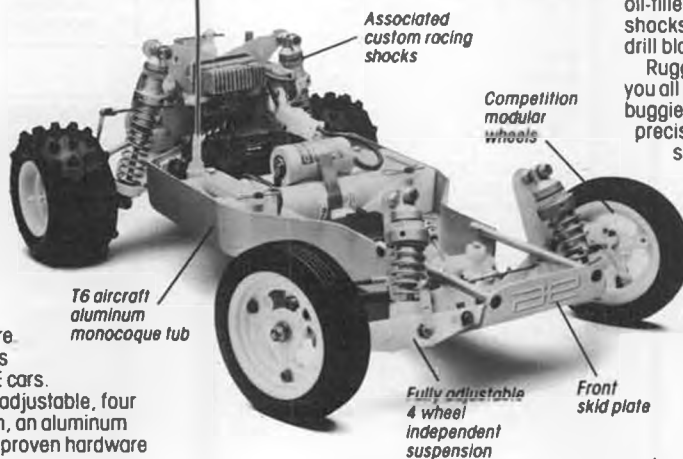
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signs are chosen from the ranks of little-known full-scale aircraft, perhaps not true Obscure Aircraft but still intriguing.

One of our favorites is the Farman Sport biplane from the early twenties. We built one of the Farman Cart Postal variants—a Sport body and tail with a humongous barn door wing—but this little French flivver is a new one to us. We now have one of the kits and hope to build it for flying next spring, when things get serious with the MIAMA club meets in Tampa.

The Sport is a neat little radial engine, open cockpit biplane with all the Farman trademarks, including a swept-tip fin and scalloped trailing edges on the wing and tail. While Gene built the prototype in yellow and includes yellow Japanese tissue in the kit, we wonder what happened to the famous Farman red? A fine flying machine in any color, it will make you a fan of the French.

If you prefer the home-grown designs, how about an EAA beauty from the pen of Steve Wittman; his Big-X homebuilt. It has super proportions for endurance. We recommend it for simplicity, easy trimming, and high flight times. A word of warning: if you compete in a crowd like we fly in, you will need to lighten up these kits considerably to get high times indoors. For your kits, write Gene Dubois, Box C, Acushnet, Massachusetts 02743. Send him \$1 for a complete catalog, with designs not shown in the photos.

HINT OF THE MONTH

Our HOTM is again a simple one, for a

compact model stand with a disposable, yet readily available base. Make a "grabber" out of a 1 x 1-1/2-inch piece of household foam sponge, split halfway through so it will accept a motor stick. Cut a hole in the bottom and insert a 6-inch length of 3/16-inch wood dowel and affix with Hot Stuff. This dowel is then taped vertically on a soda can (empty or not) at the contest—no need for a big base in your tool kit. •

Soph. Lady. . . Continued from page 45

provision was made for cooling it. It would be a good idea to provide intake and outlet air ducts in the battery compartment for this purpose.

As designed, the power pod becomes a permanent part of the wing. A simple modification that would make the plane much more versatile would be to mount the power pod on a thin plywood plate that in turn would be held onto the wing by the rubber bands. This would permit the removal of the entire electric system for slope soaring, hi-start, or whatever, and would not add any appreciable weight nor detract from the appearance. In fact, something quite similar to this is depicted for the .049 power pod.

Other than a tow hook and tail skid, no protection is provided for the bottom of the aircraft, and unless you fly off a well-manicured lawn, you will need some. For the fuselage I added a 1/8 ply and 1/16 wire skid along with a 1-1/4-inch wheel. I also glued a couple of 1/8 ply skids onto the

wing at the polyhedral breaks.

One option shown on the plans that I did not use (and wish I had!) is to make the wing tips removable. Doing so will allow you to transport the model in the smallest of cars.

FLYING

With one ounce of nose ballast, the all-up flying weight came out at 3 pounds (48 ounces), yielding a loading of 11 ounces per square foot on the 633 sq. in. wing. A check of motor rpm showed a peak of 9100 with the 8x4 Tornado nylon prop supplied. You should get between 4 and 5 minutes of good useable climb power with a 6-cell 1200 mAh battery pack. Once I had reduced the control surface throws to two inches total on the rudder and a half inch total on the elevator (the instructions specify more) I found the model to be extremely easy and forgiving to fly, and most enjoyable on calm, quiet evenings. In fact, it is not uncommon to get nearly 12-minute flights by just putting around, switching power on and off, and never getting over 50 to 75 feet high. Naturally, the nearly 70-percent increase in weight and added drag due to the electric system will deteriorate glide performance somewhat, but I still found the model capable of remaining aloft on moderate lift. If you adjust your switch and prop brake linkage properly, you should be able to shut the motor off after about 2/3 movement of the throttle stick and use the bottom 1/3 for engaging and disengaging the prop brake. When freewheeling, the prop acts as an airbrake (especially as speed increases) and allows fairly rapid descents

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without picking up too much speed.

As a trainer or as an introduction to electric power, I can think of no finer craft than this model. I thoroughly enjoyed the Sophisticated Lady, and I think you will too!

In closing, I wish to thank Gary Hamilton and Russ Hiatt for their help with this project.

Choppers. . . . Continued from page 19
blade drag. From wind tunnel tests, theoretical calculations, and flight tests, the blade does look promising.

The test vehicles we are using are an unmodified Schluter Champion with an Air-

tronics Spectra PCM7 radio, an unmodified GMP Special Edition Stork with a Futaba 7H radio, and a radically modified GMP Cobra with an Airtronics Module 7H radio. The objective is to see how fast we can fly with a stock Champion. We hope to break the existing record with a stock Champion and our new blades. The idea is to show that stock helicopters are highly capable as they are. Then we will pull out all the stops on the highly modified Cobra to really smoke the record. Like employing a streamlined, teardrop shape Heim's Lockheed 286 fuselage, retractable skids, advance main rotor blades, higher harmonic blade controls, MACS custom tuned exhaust,

Legend's Delta-3 flybarless head, tilted shaft, etc. All the helicopters are powered by an O.S. 61 Long Stroke with pump. My chief test pilot is Mike Johnson. We have him flying a four-bladed Champion in the Mojave Desert now. Joe Tuzen is the project manager who is responsible for surveying the land, certifying the timing devices, setting up the course, and calling the shots. This project would not have continued so far without the help of many other enthusiastic modelers and industry support. To all the people who have given me a hand: thank you very, very much.

Even if we won't be able to break the 100-mph barrier in the near future, all the technology that we have learned in this research project will trickle down to you, the readers and the manufacturers, through this column. So, start the subscription and you will learn all the high-tech tricks that other helicopter columns do not offer. There won't be lengthy articles on rotor blade balancing. Rather, I will concentrate on bringing you insights to interesting helicopter phenomena through scientific reasoning. This column will be a must for the tinkerers, scratch builders, contest fliers, inquisitive-minded modelers, and people who want to squeeze every bit of performance out of their helicopter. I plan to make this column the powerhouse in state-of-the-art R/C helicopter technology. New concepts, and the very best in high-tech helicopter kits and accessories will be showcased here.

Finally, I welcome any idea or suggestion. You can send them to P.O. Box 692, N. College Park, Maryland, 20740. You can also call me at home, (301)589-0855, or at work (301)454-8601. See you next month. •

Fast Choppers Continued from page 21

puter time just to run one case. With this in mind, I have written a simplified Fortran program designed specifically to calculate the theoretical performance of a model helicopter. The program is well commented, so the reader can run it on any computer that understands the Fortran language. Figure 4 is an example output for a Schluter Champion in hover. Table 1 is a summary of a few different cases that I have run using this helicopter performance prediction program. Copies of this program are available at no charge by sending an SASE to the RCMB office and asking for the helicopter evaluation program.

Now you can possess very powerful artillery that can evaluate all the model helicopters on the market, and can also help you pick the optimal blade, rpm, and weight for your mission. Good luck using it. •

Peanut. . . . Continued from page 53

plans, cementing them to the ends of the laminated parts. Now pin the top longeron in place on the plan and cut and cement the uprights in place. The uprights at the very front and above the wing leading edge are 1/16 x 1/8, and the one for the rear motor peg is 1/16 x 1/4. Make the 3/32-diameter holes for the peg before you cement them in place so it can be done with the uprights

laid one on top of the other. The best way to make the holes is to use a sharp knife point to sharpen the end of a piece of 3/32 aluminum tubing and then to twist the sharpened end through the balsa. The parts should be held down securely on a piece of scrap balsa or cardboard so the tool makes a neat hole, rather than splitting out the far side, which will happen if the parts are holed with the part held in the hand or otherwise unbacked.

When the two side frames are thoroughly dry, remove them from the plans and separate them from each other using a thin blade, then assemble the basic fuselage box using the top view to obtain the proper crosspiece length. Note that at the very front the 1/16 x 1/8 crosspieces are not the same length; the top one is shorter.

After the basic box is completed, add the top formers where they are shown in the side view. Then using soft 1/32 sheet balsa (or thinner sheet or bond paper, if you so desire) cover the top of the fuselage and then carefully cut out the cockpit openings. From the nose to the wing leading edge on the bottom the fuselage is covered with a piece of 3/16 sheet balsa, which is carved to the contour shown in the front view.

The nose block is carved to shape from block balsa and is backed with a piece at least 1/8 thick that is a snug fit in the front of the fuselage box. Use a piece of 1/16 diameter aluminum tube or a Peck-Polymers thrust button as a bearing for the wire propeller shaft. The model in the photos is flying with a 4-3/4 diameter Peck-Polymers plastic propeller.

Start to build the wing by cutting out all the ribs required. Pin the center spar down to the work board. Now put the trailing edge in place; it should be directly on the work board for the center four ribs and at each tip rib it should be blocked up 1/8 inch. Now cement all the ribs in place and add the leading edge. Block the leading edge up as necessary for cementing to the front of the ribs. Let this assembly dry completely. Remove it from the plans and crack the leading edge at the outer "R-1" ribs to give the wing the dihedral shown in the front views. Cement the dihedral joints and then add the two top spars to the wing assembly.

The horizontal and vertical tail parts are all 1/16 square balsa, and the assemblies are built flat directly over the plan.

Decorating this model is the key to having an authentic replica of one of the "Tour de Europe" contenders. The article accompanying the JN-1 Peanut plans last month covered in detail how to make tissue color trim. The methods used will be used for the FARMAN F352.

Cover the entire model with white tissue. Water shrink the covering; just fog on a light spray of water and let it dry. Now give the model two coats of thin dope.

All of the colored areas are reproduced by double covering with colored tissue. The most difficult area is on the fuselage sides. Get a piece of tracing paper and make a tracing of the fuselage side color pattern. Now take two sheets of red tissue and place them under the tracing and cut out the letters and the white square for the competi-



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tion number. One of the resulting pieces will be suitable for double covering the left side of the fuselage. The other piece will need to be cut into a couple of pieces so that the lettering can be turned around for the right side. Make sure you save the center of the "As" to fill them in on the double covering.

The other markings are black and can be cut from two layers of black tissue and doped in place where they are required.

The windshields were cut from the plastic packaging that surrounded a couple of C cell batteries. They can be readily made from thin, flat plastic, but it is easier if your plastic already has the right curvature.

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Use standard adjusting techniques for flight but make sure the model balances on the center spar. Adjust gliding flight with tail setting and powered flight pattern with thrust line changes. •

Pretty Bird. . . Continued from page 15

beveling the trailing edge to conform to the ribs. When lifted from the plan, add the leading edge spar on the bottom. Vertical grain webbing between ribs is glued to the rear of the main spar. Add the tips next; these can be made from four laminations of 1/16 x 1/4 balsa strips or 1/4-inch sheet balsa, or, as I did, you can use hard 1/8-inch aluminum welding rod to make the bow with hard balsa supporting triangles. This same method was used for the tail outlines for extra strength and light weight. Your local welding supply shop should be able to sell you a few three-foot lengths.

Decide whether you want a one- or two-piece wing and epoxy in either the 3/16 I.D. brass tubing with supports or the 1/8 ply dihedral brace, and angle the center ribs accordingly. Four balsa blocks are glued into the center section to receive the 1/4-20 nylon wing bolts that fit through the blocks into tapped 1/4-inch plywood nut-plates in the fuselage. Sheet the wing center section with 1/16 balsa sheet.

TAIL ASSEMBLY

Using stringy, fairly hard balsa for the tail members, the outlines can be laminated from 1/4 x 1/16 balsa strips or bent from hard 1/8-inch aluminum welding rod or, if you don't care about weight, cut the whole thing from medium C-grain 1/4-inch balsa sheet. If you wish to be able to disassemble the model for travel, epoxy into the stab two 1/4-inch plywood pads, drilled and tapped as necessary. The built-up tailplane should also have corner gussets as in the fuselage.

FINISHING

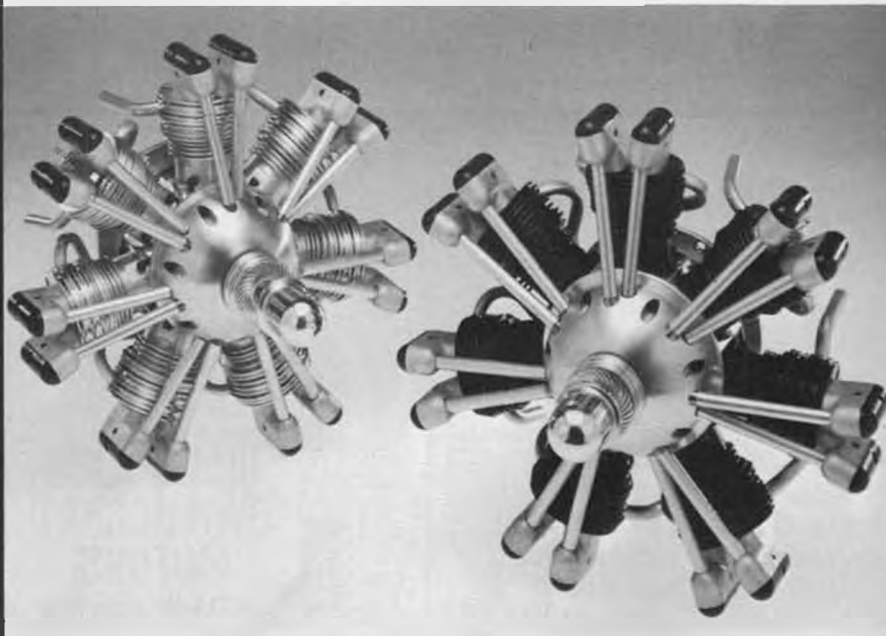
The choice of covering is up to you. A good quality of heat-shrink film would certainly be the lightest way to go, and if you are skilled with it, use it. I used Sig Koverall and Supercoat butyrate dope. I felt that such a light structure needed a lot of skin strength that wouldn't peel with wear. This may weigh a few ounces more than heat-shrink plastic, but it is more permanent, and it's waterproof if you like float flying.

FLYING

After installing the radio and checking it thoroughly, be sure the balance point is where it is marked on the plan or even a little ahead. Shift the radio as necessary to achieve this balance. I have to admit to making the first flight of this model at a club fun-fly, and 10 seconds after takeoff greasing it under a limbo three feet high. However, I don't advise anyone to test any model at a crowded flying site.

Many people don't like taildraggers because they tend to nose over and generally have poor ground handling. The Pretty Bird doesn't like to nose over and can handle direction changes up to 40 degrees on take-off or landing. All I can say about flying is that it will do anything the power you provide permits, *but slowly*. Inverted flight is fun because it flies so slowly everyone thinks it will stall, yet snap rolls and spins

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are violent but stop immediately when controls are neutralized. Landings are a joy since it will come in nose high, without dropping either wing. Try it, you'll like it. If you have any questions or suggestions, contact me at 352 Park St. N., Peterborough, Ontario, Canada K9H 4P5. Happy flying! •

Ramblin. Continued from page 41

Australia is the marketing test ground for made-in-the-Orient model products. The Model Engines' huge warehouse was chock-a-block full of engines and kits and accessories I'd never seen before! I suspect the items that sell the very best in OZ are the ones we finally get to buy here in the

USA.

The Lloyds arranged an overnight visit with Paul Straney who is their country's model aviation historian, owns a significant model engine collection, and is an avid model builder. It was one of those super evenings most modelers just dream of having. USA's Bill Brown built his first model engine in 1931, but Paul showed me a piece of true Australian model history; he owns a made-in-1929 Astral Tornado made down under by H. Allenby. The engine is a world treasure. Paul is a retired flight engineer from Ansett Airlines and continues his aviation love affair through drawing and building his own free flights and R/C models. Paul had scaled and built a Taibi Power-

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house just right for R/C 1/2A Texaco, and I urged him to send the plans to MB along with other fine designs of his.

Next month we visit the Futaba importer, hobby shops, talk pattern flying, get to a model magazine publisher, and come back home.

Old Timer. . . . Continued from page 36
members of the pylon is made up from three pieces of 1/16 balsa (shown on the plans). These formers will fit like a saddle on top of the frame. Although not shown on the plans, add some scrap pieces of balsa where the pylon joins the fuselage. This will allow you to neatly attach the covering around the pylon area.



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Most of us seem to get lazy and omit the cowl from our F/F models. On this model, it would be a real shame. The cowl is the simplest possible to build, makes the model really look neat, and, furthermore, is almost a necessity in terms of keeping the balance point where it is supposed to be for good flying. The cowl is built up from a back frame shown on the plans, a shaped front block, and some 1/16 balsa sides. I cemented two small plastic blocks on the firewall, which accept the screws holding the cowl in place. Don't forget that you will need some openings for engine cooling, air to exhaust, and for access to the glow plug. The front block should also have a generous opening to accept cooling air around the cylinder.

The wing and tail surfaces are straightforward and need no comment other than one

more reminder to keep that rear end light. I built two models; one ended up with a slightly heavier tail, which required some added nose weight to get it flying. I had built up a neat-looking set of wheels made from 1/32 plywood with aluminum tubing hubs and "O" rings from the plumbing department for tires. These survived on the model with the light tail; the other one had to be outfitted with a set of heavier Williams Bros. wheels to achieve proper balance.

The model should balance somewhere between 50 and 60 percent or somewhere near 3 inches back from the leading edge, then adjust the stab incidence to achieve a good glide. Stabilizer tilt is the best way to get a good glide turn, and engine thrust adjustments can then establish the power pattern. A right spiral climb and a shallow left glide seems to please the Stofer.

Good luck and let me know if you liked the Stofer as much as I do! Jose M. Tellez, P. O. Box 733, Laguna Beach, California 92652.

Big Birds. . . . Continued from page 13
needed for absolute protection.

As soon as I get the time, I'm gonna try a no-nitro mix to see how some of my four-strokers respond. Nino may have something there.

CONTEST NOTICE

We've just received word that the Billings Flying Mustangs (IMAA Chapter 203) are planning to host their first IMAA Regional Fly-In on June 9, 10, and 11. The event will be sanctioned by both the IMAA and the AMA.

For more information, contact Donald Herington, 1401 Central Ave., Billings, Montana 59102.

Al Alman, 16501-4th Avenue Court East, Spanaway, Washington 98387; (206)535-1549. All my best wishes for the holidays, and take good care of your bod; BE SAFE in the shop and at the field. And keep those cards, letters, and pix a comin'!

Hannan's. . . . Continued from page 49

and Final Examination." After studying the lessons and answering the test questions, a prospective Flying Cadet took the Examination page to his participating neighborhood grocer. Those who successfully passed the test received handsome bronze Cadet wings.

Although we knew of Jimmie Allen model planes, radio programs, and gasoline company promotions, we had not known of the grocery store connections. In fact, the "Colonial" stamped on some Jimmie Allen wings pins was a brand of bread, as disclosed by this testimonial: "Greetings Flying Cadets! After a busy day, I like to go home to a substantial meal of good nourishing food, with plenty of fresh Colonial Bread. There isn't a day goes by but what I eat Colonial Bread in one form or another. . . Take my advice, stay with Colonial, it's good every time." Jimmie Allen. So now you know.

MORE NOSTALGIA

Gerald E. Myers, of Redway, California, sent us a reproduction of the St. Louis Globe-Democrat newspaper of May 23, 1927. In case that date may not ring a mental bell, it was soon after Charles Lindbergh's successful Atlantic crossing. Since his plane had been sponsored by citizens of St. Louis, it is not surprising that enthusiastic coverage would be given to the epic flight.

This newspaper is a kind of "time-machine," enabling a reader to return to that pivotal point in aviation history. Have things really changed that much? Well, in some ways, yes; in other respects, no. Sure, the paper's price was only two cents in 1927, however even back during that time there was an excess of crime, politics, and politicians. Some things never change. . . .

On the brighter side, reading about Lindbergh's flight in his own words so soon after the event is truly inspiring. No historian, however talented or well-motivated could possibly achieve the sense of immediacy Lindy himself could offer:

"It isn't true that I was exhausted. I was tired, but I wasn't exhausted." "Other men will fly the Atlantic as I did, but I think it is safe to guess that none of them will get any warmer reception than I got." "I look forward to the day when transatlantic flying will be a regular thing." If this sampling whets your appetite for more, you may order your own copy of the newspaper, complete with all the advertisements and comic strips of the time. The cost is a modest \$2.50 postpaid (in the USA) from Project Start, 6001 Berkely Drive, P.O. Box 5955, St. Louis, Missouri 63134. Profits from the newspaper sales go to worthy programs for disabled people in the St. Louis area.

SOLAR POWER

Model Builder contributor Daniel Walton constructed a solar panel system for recharging his electric-powered R/C models in the field. Dan's arrangement allows him to charge one battery pack while he is flying his model with another. The only difficulty encountered so far is that curious spectators tend to cluster too closely around the solar panels, thereby shading them from the sun! Dan's answer to that? "Guess I'll have to build an elevated stand."

PEDAL-POWER PLANE PRIZES

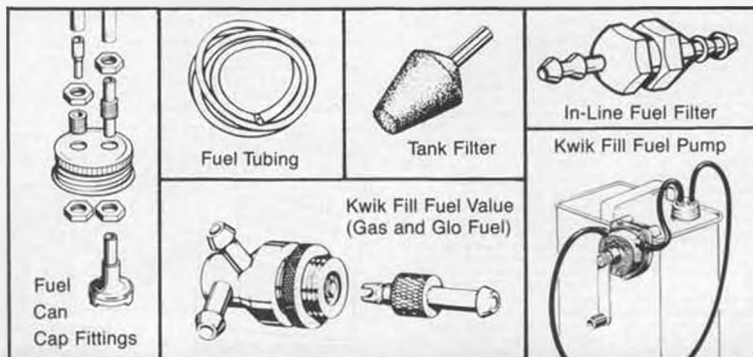
From the November *TWITT* (The Wing Is The Thing) newsletter we learn that the Royal Aeronautical Society of Great Britain has announced two new Kremer person-powered aircraft prizes. One involves high-speed endurance over a 28-mile course which includes figures of eights around two

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pylons. The other competition requires rising off and landing on water. Should be interesting!

TIGHT LINES

We continue to enjoy the Greater Delaware Valley Kite Society newsletter. Devoted primarily to kite building and flying, it also incorporates a smattering of aviation trivia, bizarre humor, and a schedule of forthcoming events. And even a reminder that this is the 60th birthday of Mickey Mouse!

How about a bubble-making machine? Although intended as a wind-direction indicator for kites, it should serve equally as well as a thermal detector for model fliers, especially if, as is suggested, a bit of helium is introduced into the bubbles.

Tight Lines subscriptions are available from the editors, Leonard M. Conover and Theodore Edward O'Bear, P.O. Box 88, Newfield, New Jersey 08344. A money-back guarantee is offered; if you don't like the publication, you will receive an immediate refund, with "no strings attached." At \$6 for six issues, how can you go wrong? **MASOCHISM, ANYONE?**

Perry Peterson, builder of that cute Bostonian model in one of our photos, is trying to find color information for the 1920 Snyder Baby Bomber, and says:

"If all I modeled was J-3s and P-51s, this would not be a problem, but that would be too easy. . . umm, I wonder if most scale modelers enjoy the punishment we sometimes inflict on ourselves?"

THOSE IDENTIFICATION MODELS

During World War Two there was an urgent need for models to teach aircraft recognition, and the government initiated a program to have such models produced by school shop classes.

Recently we heard from Michael J. Patti, who attended Haaren High School in New York at that time, and he well recalls carving some of those models and painting them the required flat black. Additionally, Michael still has a certificate of appreciation issued by the United States Navy Bureau of Aeronautics. The diploma conferred upon him the honorary rank of Lieutenant (Junior Grade) Aircraftman. Dated 2 July, 1942, the document bears the names of Harold G. Campbell, Superintendent, and Admiral J.H. Towers, Chief of the U.S. Navy Bureau of Aeronautics.

Later, plastic models supplanted the wooden models, and today both types are sought-after collectors' items. Wonder how many were actually produced?

MODELS IN THE MEDIA

Larry Kruse was among those mentioned in *Time* magazine's coverage of our hobby. Larry was kind enough to share a letter he received from Hugh Sidey, who authored the *Time* article, from which we have extracted the following:

"You can't imagine what a pleasure it was for me to meet and talk with model builders—wonderfully normal folks. For too long I have been completely claimed by the people of politics and power. Time to change. I was inspired seeing you and your models and hope I gave the hobby a bit of a lift." Larry Kruse was also interviewed by Kansas newspaper reporter Mike Berry, and

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thanks to Wink Peck, we received a copy. Model building was presented in a favorable light, and we particularly appreciated the following anecdote told by Larry:

"A little blue-haired lady came up to me one time and said, 'Mr. Kruse, I don't think you've ever grown up!' " Recalling his continuing infatuation with model planes, Larry replied: "Thank you, ma'am, nor do I intend to."

SIGN OFF: ONLY A COINCIDENCE?

Herb Weiss was reminiscing: "I visited New York in about 1940, and the only person I knew there was Frank Zaic. I went to the Radio City Music Hall theater, and there was Frank Zaic, five rows down from me. Well, after all, there are just so many people in the world!"

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R/C Soar. . . . Continued from page 30

gorilla arm can get, but it does give the weak arm or back a good launch. We call it Zip-Start because it does give a fast launch. We limit the pull to three pounds.

". . . At our club meeting last Monday, the members set aside the month of July for our Third Annual HLG Contest. The contest will be AMA-sanctioned and will be flown on Sunday, July 9. As in the past, we will be asking the manufacturers of hand-launch products for help and backing to add to our prize list.

Modeling Accessories

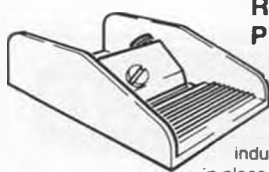
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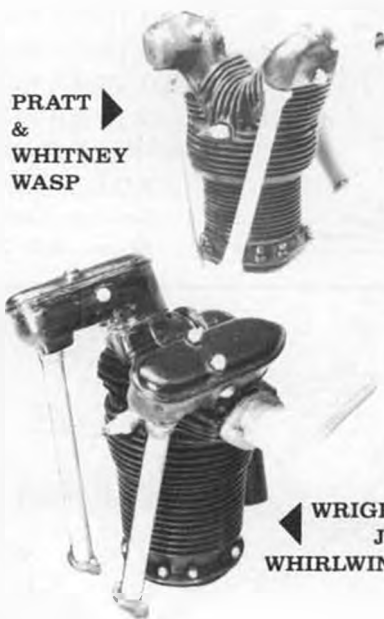
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"Hope you can use some of the enclosed material." Going over the "enclosed material" I was impressed by the wide variety of designs flown in last year's Southwest RCHLG contest. There were eleven contestants registered, two of them flew Flingers (a *Model Builder* plan and a Larry Jolly Model Products kit), and then there were one each of the following: modified BODST (JM Lupperger Plans kit), modified Flipper (Bridi Aircraft Designs kit), Zinger (*Model Airplane News* plan), Wristocrat (Top Flite kit), Kastaway (Bridi Aircraft Designs kit), Paraphrase (Scott Whitney Models kit), Poquito Primero (Buzz Waltz kit), Pivot (Dodgson Designs kit), and one unnamed original design.

For more information about the Texas contest, contact Bud Black at 1322 Magnolia Dr., Richardson, Texas 75080; (214)235-0867.

SOARING SKILLS SYMPOSIUM

LeRoy Satterlee, Publicity Chairman of the Eastern Iowa Soaring Society, 1604 Huntington Road, Waterloo, Iowa 50701, sends the following press release:

"For the third straight year, the EISS will be hosting the Soaring Skills Symposium.

"The format this year will be that of a Soaring/Electric Fun-Fly. EISS members will be available to help you with your soaring-related problems, no matter what they might be. We have three LSF Level V fliers (Jim Porter, Terry Edmunds, and Alden Shipp), a Nats winner, and the 1988 Great Race winner (Rusty Shaw) on hand to assist you. Many other EISS members stand ready to offer help or advice as you may require.

"If you feel you don't need assistance with anything, come and join us anyway for two fun-filled days of flying and camaraderie.

"We'll be doing some cross-country work, so if you have never tried that, this will be a good opportunity to jump in the truck and participate.

"Actually, all manner of things will be going on, more or less continuously, including F3B, thermal soaring, electric flight, and on and on!!

"Come out and join us, almost 150 people did last year.

"The site is the antique aircraft airfield in Blakesburg, Iowa. Blakesburg is located about eight miles west of Ottumwa, Iowa, on county road H41. Camping, with showers and electricity, is available on the field. A first-class antique aircraft museum is located on the property as is protection for your planes in the event of a rainshower.

"Food will be catered to the field at mealtime on Saturday with a banquet and social time Saturday evening. Swap shop space is available to individuals or manufacturers. You may come early on Friday if you wish.

"The dates are May 27 and 28. Flying begins at about 8:00 each day.

"Prices as follows: primary participant \$5/day, additional family member \$1/day, swap table space \$5/day, camping (any vehicle) \$5/day, and Saturday banquet \$8.50/person estimated.

"A raffle will be held and door prizes will be given both days, so be sure to attend."

WIND TUNNEL INSIGHT

I recently received a letter from Carl G.



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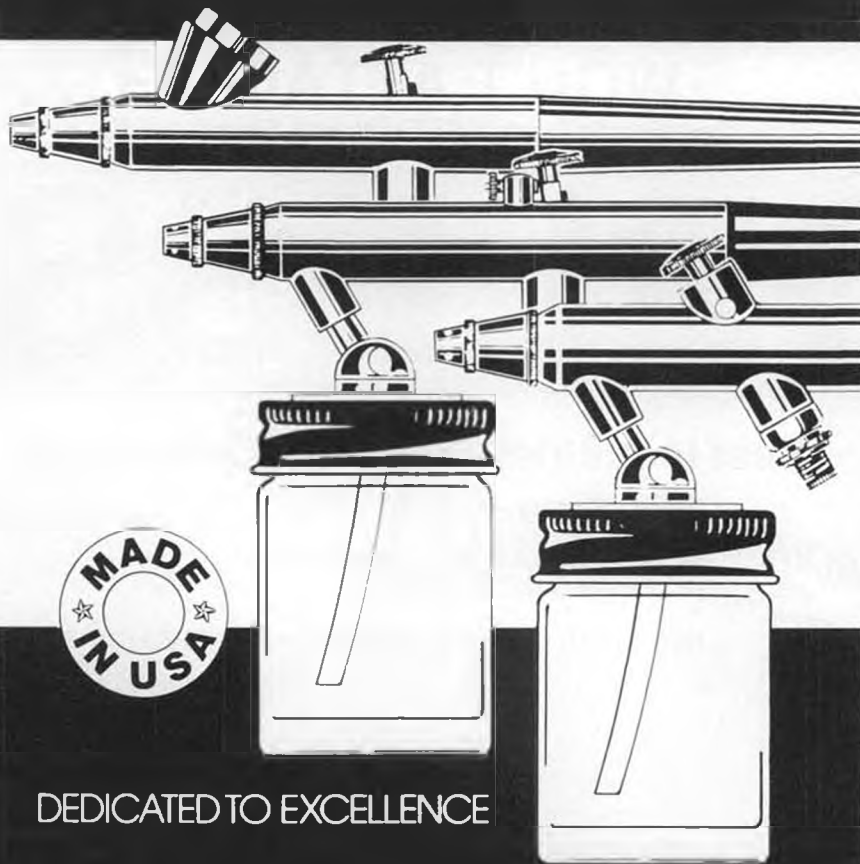
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Schaefer, Jr., relating to my December column about the Princeton experiments conducted by Michael Selig and John Donovan.

"I've just finished reading your column in the December 1988 issue of *Model Builder* and was very interested in the results reported by Donovan and Selig at Princeton University. Although I'm just a beginner at model gliders, my interest in the Princeton research goes back to my days as an undergraduate at Virginia Tech. While I was at Virginia Tech, my faculty advisor and I were involved in two separate research programs which investigated the low Reynolds number performance of Wortmann airfoils. Of particular interest was the behavior of the boundary layer in the pre- and post-stall region. We looked at a number of phenomena that ultimately influence the stability of the boundary layer; e.g., wind tunnel turbulence, aspect ratio, sound pressure pulses, etc. As you can see by the enclosed AIAA technical papers, we determined that all of these parameters to a very large degree will affect the stability of the laminar boundary layer for Reynolds numbers below about 500,000.

"As you pointed out in your column, there does appear to be considerable data scatter for the data collected in the various wind tunnels. I beg to differ with you on the issue that a wind tunnel is 'no better or worse than anyone else's.' On the contrary, low Reynolds number research is very sensitive to the wind tunnel environment. Our research showed that a mere 0.06 percent (!) difference in wind tunnel turbulence level could completely mask the presence of the laminar separation bubble that usually forms close to the leading edge of laminar flow airfoils for Reynolds numbers below 500,000. As you'll note in one of the papers I've enclosed, the conclusions stated that 'even moderate [wind tunnel] turbulence and noise levels may give seriously deficient information regarding the stall characteristics of the wing.' You'll also note that we show a comparison between the Virginia Tech low speed wind tunnel (with a turbulence level of about 0.01 to 0.02 percent) and the wind tunnels at Stuttgart, one of which has a tunnel turbulence level of 0.08 percent. You can see a tremendous difference in the CL vs. alpha plots and the drag (CL vs. CD) polars. I do agree with you, however, that comparing data for different airfoils in the same wind tunnel can help determine the relative merits of those airfoils, but only if the tunnel environment is relatively 'clean.'

"One other thing I noticed in the Princeton data was how gentle the Eppler 214 stalled at a Reynolds number of 60,000. Usually, airfoils operating at Reynolds numbers below 70,000 to 100,000 display stall characteristics similar to flat plates, and one would expect an abrupt stall at a moderate angle of attack (again, see the enclosed papers).

"Before I close, I would just like to say that I was pleasantly surprised with the technical orientation and quality of your model soaring column. I thoroughly enjoyed it, and I hope that the papers I've enclosed might shed some light on the interpretation

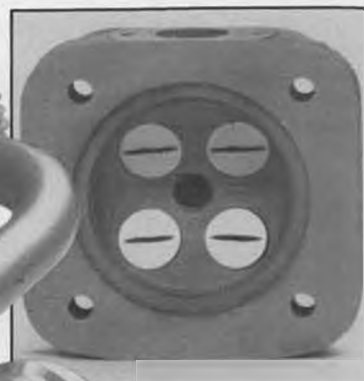
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of the Princeton data." Thank you, Carl, for the kind words. The papers you sent are appreciated, as are your words of enlightenment on the subject of wind tunnel data.

AIRFOIL OF THE MONTH: EPPLER 222

This is one of Eppler's newer sections. It has excellent low Reynolds number performance (50,000 to 100,000), which makes it a good choice for models that fly slowly or have small chords. It is 10.17-percent thick, has an optimum lift coefficient between 1.0 and 1.2, and a zero lift angle of attack of -3.65 degrees. It is recommended by Eppler for radio control thermal gliders and elec-

tric power motorgliders with Reynolds numbers between 100,000 and 150,000. It bears a resemblance to the Eppler 211 which is a well-proven, excellent airfoil. The E211 is used on at least one electric power motorglider being kitted in the U.S. (the Midway Co. Ultra Mark IV designed by Mike Charles). It was designed about six years ago but is still quite competitive. The theoretical polars for the E222 show one E211 curve at 100,000 Rn for comparison. The E222 looks similar in overall performance.

As with all Airfoils of the Month, if you give the E222 a try, please let us know how you think it performs compared with your own experiences.

TIME TO FLY

Thank you for reading this column! Your feedback and input is always welcome. Please note that my address is 3610 Amberwood Ct., Lake Elsinore, California 92330, and my phone number is (714)245-1702. I moved here several months ago, so please update your mailing list if it hasn't already been done. Thermals!

Electronics... Continued from page 27

idiot-proof; no matter how careless I am now, I cannot get the charger connected wrong or overcharge the pack. It has LED indicators and even a charge meter to tell me that all is well and that I will not be embarrassed with a 'meltdown' in front of all my friends.

"Stripped of all its frills, the circuit consists of the external source battery of 12V and the Ni-Cd battery to be charged, 7 cells at 1.2V per cell (8.4V). If these two batteries were connected together, current would flow from the source battery to the Ni-Cd battery pack. But too much current would flow, so an appropriate resistor is placed in the charge circuit. In this circuit, the resistance is the sum of R4 and R5. The value of the resistance is adjusted so that the desired amount of current will flow.

"Sanyo 800 mAh cells are fast-charge rated at a charging current of 1.2 amps for 1.5 hours. In the field, one hour is plenty of time to have to wait for a pack to charge, so the charge schedule may be changed to 1.8 amps for 1 hour for the same results.

"One drawback with a simple charge circuit such as this is that the charge current changes as the Ni-Cd pack goes from completely discharged to fully charged. This is due to the terminal voltage of the cells rising during charge to their final terminal voltage of 1.3V per cell, while they may start out at less than 1 volt per cell. So, as the pack charges, the difference between the source battery voltage and the Ni-Cd pack voltage becomes less and less. It is this voltage difference, divided by the fixed value of resistance, which determines the charge current.

"This type of charger, which uses only a series dropping resistor, is most effective when charging 6- or 7-cell packs from a 12V auto battery. Packs with more cells than 7 must be charged from a battery source greater than 12 volts. Field charging these high-voltage packs usually requires the use of two or three car batteries connected in

series to supply enough voltage to charge the pack. This circuit, intended for seven-cell packs, includes a variable power resistor, R4. It is adjusted to maintain a more or less constant charge current from beginning to end of charge. The bad news is that one must adjust R4 several times during the one hour charge time. The easiest approach to the constant current charge problem is to ignore it; install the value of charge resistance to give an average charge over the one hour time, and forget that it starts out at more than 1.8 amps and ends at less than 1.8 amps.

"Without the variable charge current feature, the meter is pretty useless, so it may also be deleted. To simplify the circuit, merely delete M1 and R8. Then change R4 to a 1-ohm, 10-watt fixed power resistor.

"In operation, this is the sequence of events: The source 12-volt battery is connected by means of clip leads. If the polarity is correct, LED D1 glows. So far, so good. Next, the other set of clip leads is connected to the Ni-Cd pack. LED D2 will glow if this has been connected properly (note: D2 will not glow if the Ni-Cd pack is completely dead). Now, with these two LEDs glowing, it is safe to start the charge. Turn on S1. This causes several things to happen at once. First, IC1 is reset and then it immediately begins to time out (one hour). While it is timing, it turns on Q1, which pulls in the relay and completes the charge circuit. As long as the relay is pulled in, LED D3 glows. This tells you that you are still charging and that the time is not yet up (so wait a little longer). When the charge time is up, everything shuts off, the relay drops out, and the charger quietly waits for you to return to a fully charged pack.







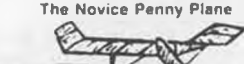
"IC1 is an integrated circuit timer with a built-in frequency divider. The components R1 and C1 are selected so that the internal oscillator runs at 18.2 Hz. It then divides that frequency by a factor of 65536, and this (trust me) gives a timeout of 3600 seconds (one hour). If other charge times are desired, use the following formula to determine the value of R1: $R1 = 0.06622 \times \text{time in seconds}$ (answer is in Kohms).

"The charger is built into a 'project box' from Radio Shack. All components are mounted on the metal front panel, and the battery leads are long enough to reach where you want them to. Large battery-style clips are installed on the source battery leads, while small alligator clips are on the Ni-Cd leads. All the battery clips are Radio Shack items. There are several holes drilled in the plastic box for cooling of the power resistors.

"I purposely saved comments about the meter, M1, until last. Mine is a surplus meter which has a basic 10 mA movement. R8 converts the meter to read volts (across R5). Now the voltage across R5 is proportional to the charging current. Hence, the meter can be calibrated in charge current. Simple, yes? Actually, it takes some knack to recalibrate old meters to make them read what you want them to read, but the job is actually easier to do than it is to explain about it. Trial and error often works faster than lengthy calculations."

Well, there is certainly little I can add to

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that in terms of explanation or construction hints. Just bear in mind that while this is a field charger, it is not one of the super high current devices that many seem to think they can't live without. Notice that this one takes an hour, a whole 60 minutes, but remember that at that rate you'll be charging and using the same battery next summer, while your friend who insists on charging his packs in ten minutes will have gone through a dozen or more of them. If an hour is too long between flights, and I agree that it often will be, it is still cheaper to buy more than one pack and alternate their charging and use than to cook one pack continuously in an effort to save time. Incidentally, though Floyd seems to use only seven-cell packs, the charger can be used for lesser numbers, and probably as

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many as eight cells at lower charging rates with the proper adjustments to R4.

We've discussed meters enough in the past few months so that you will know how to adapt whatever meter you might have or can obtain cheaply to read the desired output current. Oh, yes, that 2-ohm 12-watt variable resistor, R4. At high wattages, such items are generally referred to as rheostats, and while not exactly scarce, are not Radio Shack-type items, as are most of the other parts required. You might actually find it easier to pick up a handful of low-value fixed resistors and connect them in various series and/or parallel configurations to arrive at different values for different rates. By adjusting the value of this resistor, you will be able to obtain some higher rates if you simply have to have them. In all cases, the rule of thumb is "keep it cool." Thanks, Floyd, for another useful and interesting idea.

METERS AND RELATED SUBJECTS

These keep coming up, as they do in Floyd's material above. And rightfully so, as meters properly installed and interpreted give us a kind of running EKG as to the condition of electronic equipment. Reader Dave Waldorf, of Burlington, Iowa, has this to say on the subject:

"I am a technician by trade and, from time to time, construct equipment to satisfy a need I have at the time. I've found a good source of meters, cabinets, boxes, rheostats, pots, etc. Most of this equipment is ex-



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military, and of the highest quality, even though used in most cases. I've always received what I ordered, and it always met or exceeded my expectations.

"Fair Radio Sales has been around awhile, but as far as I know is not really well known. I submit this to you only for your information, possibly for your readers also, at your discretion."

Sharing is one of the things this column was built on. The address of Fair Radio Sales Co. is: P.O. Box 1105, 1016 E. Eureka St., Lima, Ohio 45802; (419)223-2196. Dave also sent the pages that list meters in the Fair Radio catalog, and he is correct, there are a lot of high-quality items available for almost giveaway prices. The list includes, believe it or not, a 2-ohm, 25-watt rheostat for only \$1.50. He is correct in that the company is probably not too well known in R/C circles, but it is not completely unknown, as I remember buying parts for my Mac II transmitter from them.

Eloy Marez, 311 Mesa Dr., #10, Costa Mesa, California 92627. •

Electric. Continued from page 31

about halfway along the length of the pack. The two ends of the pack are positive and negative, and you will have to cut away heat-shrink there too. The cutaway areas can be covered with tape when the pack is in normal use. Some car racers use their chargers to break in the motors; set the current at one to two amps and let the motor run. Some chargers will overheat, so check

to see that this does not happen. There are motor break-in machines too, advertised in the car magazines.

Many motors are broken in between half an hour and an hour of running. Hard brushes will take longer. Pull the brushes to see how they have formed to the commutator. Ideally, the brushes should have a perfect half-moon-type curve right to their edges. Some car racers then round off the sharp edge to prevent chipping of the fragile edge. I usually don't do this, but when I do, I use a fingernail emery board; it does a smooth job. The motor power stays the same when you do this. When you put the brushes back in, be sure to put them in exactly the same way they came out. The brushes will often "feather" in the direction of rotation and if they are put in backward they will chip and undo all the break-in! Many brushes have the pigtail offset to one side. I make a habit of setting brushes with the pigtail towards the back of the motor so I will know for sure which way the brushes should go.

Sometimes I do take a shortcut on break-in. You can dip the motor in water while it is running at half voltage and wait until the water starts to show black color. Pull the motor out immediately and blow out the water. The brush hardness has a lot to do with how long the motor can be in the water. Soft brushes take only a count of five, most brushes will be done by a count of fifteen, and very hard brushes won't break in at all! Be conservative and check the brushes immediately upon the appearance of the black color. I have broken in many motors this way, and they show the same performance increase as those broken in the usual way. All have given excellent service and none have failed. However, I see in some articles and books that there are dire warnings that water break-in will affect the motor badly in some way (never specified). So, I'll pass that along too. Take your choice.

I fly floatplanes a lot, and have dunked many a motor with no damage. After I have blown water out of the motor, I run it for a minute or so to get out remaining moisture. As an example of water break-in, I tached a Dymond (United Model Products) motor on a Cox 6x3 gray prop, six Sanyo SC 1200 cells, at 13,300 rpm and 10 amps before break-in. After break-in, the motor tached at 14,200 rpm and 12 amps, a power gain of 22 percent (using rpm cubed). Note, by the way, that the efficiency of the motor stayed the same, since the current draw went up by 20 percent too. Break-in decreases the resistance at the brushes to accomplish the power gain. By the way, this Dymond motor had the hardest brushes I have encountered, other than the Mabuchi can-type motors. Running it at half voltage in the water did not work! I finally resorted to full voltage. Even so, it took about a minute of running to seat the brushes. UMP/Dymond includes a very complete info chart with their motors. This was model 102, 28 turns of .022 wire, wet magnets, medium brushes (69.8 percent copper, 30.0 percent carbon, .2 percent alloys), and 20 degrees of advance timing (a lot!). It sure would be great if other motor manufacturers had such a complete data sheet with their motors.

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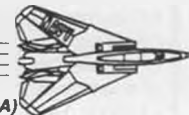
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After the motors are broken in, they will run very well as long as they stay clean. The effect of particles in the motor is dramatic; there is much loss of power. Offroad motors are very vulnerable to this; the dirt that gets into the motors is rich in iron and iron oxide particles, which then stick to the magnets. This creates a lot of drag. The commutators also get a lot of carbon on them due to heat buildup. The commutators will look gray or black instead of a bright coppery color. The cure for all this is to dip the motors in a solvent designed for cleaning motors. I dip them while running on half voltage in Citra-Safe (1-limonene or orange oil) for a count of ten. If the motor has been raced, a lot of black grit comes out of the motor in this step. Then I remove the brushes, blow out any liquid remaining, and inspect the commutator and brushes. The commutator should be shiny clean, and the brushes should be well formed. I dry the brushes with paper towel, and put them back in the motor. Citra-Safe evaporates fairly slowly; allow five minutes for it to clear out. If it is not cleared out, it can carbon up the commutator. Finally, I put a drop of turbine oil (sold as such by appliance parts stores) on the front and rear bearings. Sometimes I put a small amount of molybdenum disulfide grease on the bearings as well. The following table shows the power increases with the Twister and Associated offroad stock motors on six Sanyo 1200 mAh SC cells turning a Cox 6x3 gray prop.

Motor	After 4 Races (Dirty Motor)	Citra-Safe Dip Turbine Oil (Clean Motor)
Associated	15,200	16,500
Twister	14,900	16,500

An increase of 1300 to 1600 rpm is a power increase of 28 percent to 36 percent. When you are racing, the difference is obvious; acceleration from the start and the top speed around the track are so great that you have to be very careful not to go out of control. These motors were dirty, they had been raced, and a lot of black crud came out of them when the motors were dipped. Air-

craft motors will not encounter dirt and dust very often, and will stay clean much longer. However, the commutator can get a lot of carbon deposit on it eventually. If so, a Citra-Safe dip can increase the power. I find that if a motor is already clean and the commutator is shiny copper, the Citra-Safe dip does not make any difference. Citra-Safe is sold in volume (5 gallons, \$100) by Inland Chemical Company, 1918 Milwaukee Way, Tacoma, Washington 98421; (800)552-3100. Citra-Safe is used for cleaning electronic circuits, and it is often called "orange oil." It smells like oranges and is distilled

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from orange skins.

Most car racers do the same procedure, but use "Electrowhirl," also called "tri" or "safety solvent." It works the same way as Citra-Safe. It is readily available and is used as a cleaning solvent. It evaporates almost instantly, an advantage over Citra-Safe. The chemical name is 1,1,1-trichloroethane. However, I cannot use it. I am a chemist, and because of long-term exposure to solvents, I am sensitized to them. "Tri" gives me nausea, disorientation, loss of coordination, and temporary memory loss. It may also cause liver damage. If you wish to use it, use it outdoors, never indoors (no matter how well ventilated), and wear rubber gloves. Even so, remember that the effects can build up.

Is break-in and maintenance worth the effort? I have flown many planes with no break-in other than a couple of runs on the motor with no prop beforehand, and flying has been quite satisfactory. On the other hand, when I do break-in in motors properly, the extra power is like having an extra cell in the pack, and the extra climb and extra power for stunts is very satisfying. Take your choice! When I am racing offroad cars, there is no choice; you do a careful break in and you do maintenance, or you will lose

the race right at the starting line as you watch all the other cars leave you behind!

And now for what readers are doing. John Mountjoy sent a photo of his Electrostreak; it is very attractive in red Micafilm. It is available both in plans from *Model Aviation* (Nov. '87) and as a kit from Great Planes. The Great Planes kit includes a Goldfire 550 motor (I think it is similar to the DSC motor) and 7x6 prop for a retail of \$74.95. John says it is very aerobatic (it looks it!). He has powered his with an Astro cobalt 05, seven 1200 mAh cells, Jomar SC-1 throttle, and 7x6 prop. It is a four-channel ship and weighs 39 ounces! Span is 44 inches. If you are interested in an aerobatic electric, this looks very good.

Don Hughes sent photos of his and Russell Culp's winning electric free flights. Don won first at the 1988 USFFC in class A. Russell won first in class B. Don calls his plane "Shocer Treatment," it has 340 square inches, is powered by a geared and reworked AP-29, six 450 mAh cells (now using six 700 mAh cells), weight 18.3 ounces. The plane originally was a Mel Schmidt Shocer 400, but has been much modified. Russell calls his plane the "Summerwind"; it is 500 square inches, powered by a geared Astro cobalt 05, and uses ten

450 mAh cells, flying weight 30 ounces. As you can see, these models are very professional, and show that electric free flight can be right up there with gas free flight. Thanks for the photos, Don!

Last but not least, my friend Mike Kometz and I were looking at the Bridi kits at the Puyallup show last year, and we both agreed that they looked very good for electric. Mike bought a Warlord 40 and built it for his Astro cobalt 40. He did a beautiful job, in blue and white with pinstriping. It came out at 5-1/2 pounds ready to fly, just 1/4 pound more than the 5-1/4 pounds specified on the box. The span is 51 inches, and the wing area is 540 square inches. Mike uses a Jomar throttle and eighteen 900 mAh cells to power it. The Warlord is fully aerobatic for four- to five-minute flights. Mike is very pleased with it, and plans to try it on floats! I think the Bridi kits in general are very well made, well designed, and have high-quality material. They are priced reasonably too. Bridi makes everything from high wing trainers to gliders to sport pattern planes. Their designs are for gas, but they are very easy to convert to electric; Mike didn't change anything as far as I know. Till next time, fly clean electric and enjoy life more!

Control Line. . . Continued from page 57

who know absolutely nothing about the truth. I do know and I know several others who lived through the working years when so much was developed for the millions of youngsters ever since. Jim and Bill Walker were responsible for that crusade. They literally knocked themselves out doing things for the benefit of youngsters. Their company sold more than 232 million flying models in their years of business there in Portland. They had the world's largest model factory for many years and employed hundreds of people over the years. Jim Walker never stole ideas from anyone."

(Bob's letter, only part of which is quoted here, refers to a legal dispute which cropped up in the 1950s and has been written about in recent years over the control of the rights to the bellcrank control system. It was a complicated legal matter that involved the Cox model company and the late Oba St. Claire, whose own control-line system was developed in the late 1930s. All of the parties involved, it seems, were true model aviation pioneers, but the business aspects of the hobby resulted in some bitter feelings which persist in some quarters even today. However, I have not been aware of anyone who set out to discredit Jim Walker, whose contribution to the hobby was immense and undeniable. jt)

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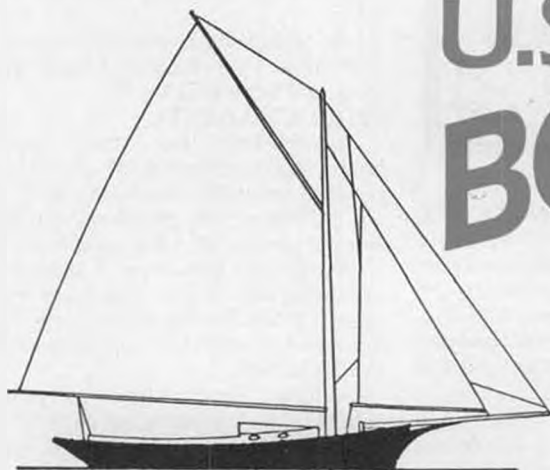
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tomers than Walker did. Maybe I can claim equal credit for my products, as I "learned" how to put in that kind of effort it takes to do just that while working with him. Jim didn't live long enough to enjoy my three-line system or the tremendous radio control systems we now are enjoying. Think of the millions who got started with model flying because of his efforts."

* * *

And now, a mission of mercy, on behalf of Ron Fentiman of Perth, Ontario, Canada. Ron is looking for a particular old-time C/L airplane. If anyone can help him, please drop him a line. Here's his story:

"This is to request your assistance in tracking down the object of a severe case of nostalgia which has me firmly in its grip.

"I was bitten early by the sky, airplanes and all things to do with aviation. I built and flew small gliders, then rubber-powered models, then eventually I graduated to 'gassies,' just U-control, then later on to free flight as well. I joined the Royal Canadian Air Force in 1951 and gave all my models, engines, and associated paraphernalia to the local Air Cadet Squadron of which I had been a member. Years later while instruct-

ing on T-33s at RCAF Station MacDonald, Manitoba, I got back into control-line flying again when I came into possession of a partially built Trixter Invert Jr. and a McCoy .29 Sportsman. I had a lot of fun with that model, but eventually it bit the dust one day when the elevator hinges broke and the model when straight in.

"I retired two years ago with 35 years and three months of service in the Air Force, and now have the time and a strong urge to get back into the modeling scene. Recently, I was visiting an old Air Force buddy who lives out West. He and I were at MacDonald together in the mid-fifties and flew control-line together. We were talking about the Trixter Invert Jr. when he said, 'Here, you might want to build this,' and he handed me a copy of the December 1984 *Model Aviation* magazine, opened to page 76, where the article and plans for the Trixter Barnstormer began. I was really pleased with this and he gave me the magazine to take home. What really grabbed my attention, though, was, after arriving home, I was leafing through the magazine and I just about fell over when I came to page 19, for there was a photo of a Scientific Cyclone, which

was my first 'gassie' in 1947, which I powered with a Hurricane .24 engine. What a nostalgia trip.

"Now for my request. I would dearly love to obtain a kit, or the plans, or just a good three-view drawing of the Cyclone. I plan to build a control-line replica of my first model and, possibly, to scale it up for an R/C version.

"The photo of the Cyclone which appeared in the December issue of *Model Aviation* was shown in Bill Winter's column, and the caption indicated that Lou Roberts was the owner/flier.

"Any assistance you could provide me in obtaining a kit, or the plans, or a three-view for the Cyclone would be greatly appreciated." Well, readers, you've come through in the past (I got plenty of information about autogyro plans). Can you help Ron out? He would appreciate it if anyone with the information he seeks mail it to him at the following address: Bgen Retd. R.W. Fentiman, RR 6, Perth, Ontario K7H 3C8, Canada.

* * *

Frank Williams of Houston, Texas, provides a late news flash with the results of the U.S. Combat Classic in Houston, October 25 to 30, the new third leg of AMA combat's high-stakes triple crown. Contestants—55 entered but 46 showed up—flew for a \$2,000 first prize, a Carver stereo second prize, and other prizes in a triple-eliminate format. Others in the triple crown are the Money Nats in Los Angeles in April and the Bladder Grabber in the Seattle area in June. Pat Willcox was the contest director.

Weather was in the 70s and overcast, with calm breezes; more than 130 matches were flown.

John Stubblefield emerged as the winner, with Steve Hills second, Chuck Rudner third, and Steve Wilk fourth.

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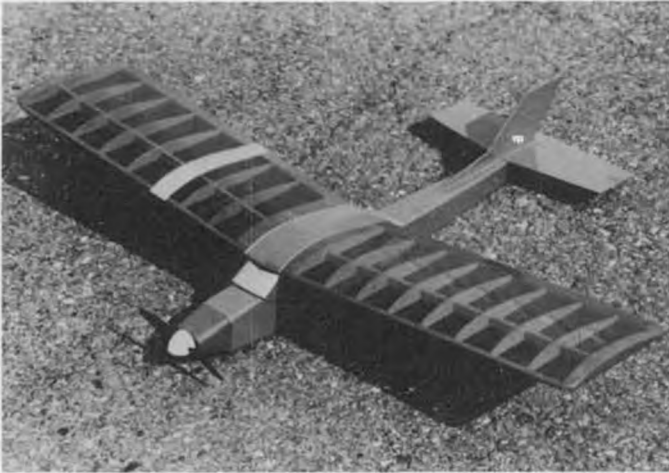
We sometimes hear even in our local hobby shop that there aren't any kits or C/L products available anymore. Well, don't you believe it! Every month my mail brings news of new items. A few samples:

*Perhaps the best array of modern and old-fashioned C/L kits I have seen in many years is in the catalog of Dox Generix kits, from sport, to stunt, to competition combat, to 1/2A trainers.

Examples: Doc's Kliper (.21-powered combat plane), Wasp (wooden AMA combat plane), Hornet (slow combat), Tommy-Hawk III (Updated 1950s design for sport, stunt, trainer), Generix-Streak (sport-stunt-slow combat), Manx Kat-7 (tailless biplane), Wild Turkey (1/2A sport-stunt-combat), Atomic (mouse racer), American Boy (1/2A stunter for reed engine), Pair-O-Dox (Double combat kits for slow or fast), Viper-ette (foam version of "Bear" Bearden's fast combat plane), Jasper (1/2A combat double kit), Pattern Master Jr. (mid-sized, .15 to .30 stunter), Dox-er-Smitt (semi-scale sport-stunt-slow combat), Doc's Zero (semi-scale sport-stunt-slow combat), Pattern Master Sr. (profile stunter), and No-Blur (foam-winged profile version of Nobler). Write: P.O. Box 111, Jasonville, Indiana 47438.

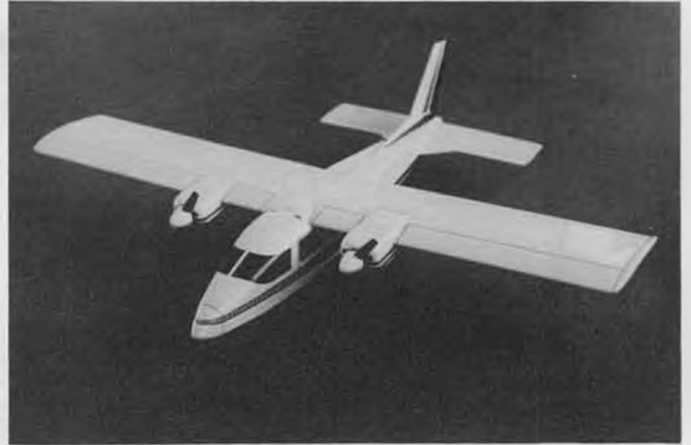
*Stangel Enterprises offers plans and instructions for a 1/2A scale-like profile

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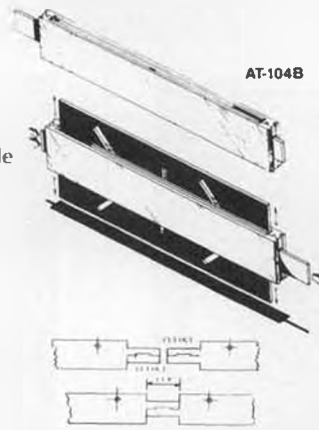
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trainer, the Cessna 152, along with step-by-step instructions for making your own kit, building and flying it. Write: Stangel Enterprises, P.O. Box 336, Waukesha, Wisconsin 53187.

*Kustom Kraftsmanship's new catalog includes 60 new items in addition to the many competition items Joe Klause has carried for years. Among the new items are the new Control Line Classics stunt kits.

*A profile stunter called the Prowler, designed by Bob Hunt, is available from Aero-smith Model Aviation, Athens, New York 12015.

*Old-timers! All American Senior, Barn-stormer, profile P-51 Mustang, Yak 9, and more, available from T.C.A. Ltd., 2080 McLennan Ave., Richmond, B.C., Canada V6X 2N5.

*We've had inquiries about monoline equipment. How about the array of fine replicas of the old Stanzel handle units provided by Dale Kirn, 283 North Spruce Drive, Anaheim, California 92805? Try a torque unit from Morris Monoline Gear, by

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As always, your letters, questions, and photos are welcomed! John Thompson, 1505 Ash Ave., Cottage Grove, Oregon 97424. •

F/Flight. Continued from page 52

Richland. These are the Tri-Cities. They are located 392 feet above sea level in a semi-arid climate. The mean high temperature

during July is 91.3 degrees, with 9 days in July exceeding 90 degrees. The average annual precipitation is 12.5 inches, but July has a mean precip of only .18 inches.

The area is well known for its rolling hills where wheat and other grain crops are grown, as are potatoes and wine grapes.

A free flight site has been located, and it is suitable for a Category I contest. The actual site is situated on land owned by the U.S. Department of Energy on the Hanford Reservation. It is 13 miles due north of Richland and is 1.5 by 3.0 miles of flat, undulating topography. The site is accessible by two public highways. No obstructions are on the field, which has a cheat grass covering. The mean wind speed is just under 10 mph during July and it blows from the N-N.W., which is diagonally across the field. If models drift from the field, another mile of drift area exists before crossing a railroad track. After the track, many more miles of open fields are present. According to Chris Weinrich, who has visited the site, the actual field condition resembles Taft. Bob Waterman and Ralph Cooney also visited the site with Chris, and they all concur that it is an excellent F/F site.

The potential glitch in the works is that the use of the field for the Nats will need to be approved by the U.S. Department of Energy, who is the owner. If approval is not obtained, and that should be known by the time you read this article, an alternate site will need to be located. However, the area has many square miles of open space, so locating an alternate site should pose no real problem.

By the way, the Tri-Cities are serviced by Greyhound, Burlington Northern, AM-TRAC, Delta Airlines, U.S. Air, and Horizon. Other major airlines service Spokane. A number of trailer and camping facilities are available within the Tri-Cities. Columbia Park is one area and can be reached by calling (509)783-3118, and The Arrowhead R.V. Park is another. Contact them at (509)545-8206.

The Indoor site has not been finalized at this time either, as the AMA is strongly favoring the Pasco Ice Arena. This site has been pronounced unsuitable by the indoor fliers—due to a 42-foot-high cluttered ceiling. Local indoor fliers are promoting the use of the Kibbie Dome and have reserved it for the day before the Indoor events and the two days of the Indoor events. The Kibbie Dome is in Moscow, Idaho, about two hours drive away from the Tri-Cities, and is one of the best indoor sites in the USA. More on this as the story unfolds.

Since 1989 is the centennial celebrating the Aircraft Industry in Washington, a sizeable amount of energy is being expended by the state to make the Nats a state-wide event. I understand that the Tri-Cities officials are enthusiastic about the Nats, as well. The red carpet should be out for all of us.

See you all there!!

BANANA LIQUID AND SNEAKER JUICE

Back in the deep recesses of my memories, I vaguely recall a product that was common on the hobby shop shelves of my youth. It was called Banana Liquid. I never really knew what it was or what it was used

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CH0016	12V Wet Cell Battery (5.5 amp)	19.99	12.99
CH0036A	1.5V Glow Plug	2.10	1.99
CH236	Circus Handcrank Fuel Pump	15.99	11.99
IM63003	Silicone Fuel Line (Large)	3.20	2.99
K0603032	Circus Training Gear	16.99	13.99
JRS506	JR 506 Servo (Reverse Direction)	38.99	26.99
JS6HZ	Circus 6 AM Heli Radio (CH12,38-56)	244.99	169.99
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CH0036A	1.5V Glow Plug	2.10	1.99
K01000551	Heloball Muffler	25.99	23.99
ROY78461	12V Electric Starter	48.95	28.99
ROY79238	12V Wet Cell Battery (5.5 amp)	16.95	11.99
IM63003	Silicone Fuel Line (Large)	3.20	2.99
MCDRC101	McDaniel Ni-Starter (w/Charger)	28.95	23.99
JS6HZ	Circus 6 AM Heli Radio (CH12,38-56)	244.99	169.99
JRS506	JR 506 Servo (Reverse Direction)	38.99	26.99
CH236	Circus Handcrank Fuel Pump	15.99	11.99
K06030301	Circus Training Gear B-28	16.99	11.99
HELITIPS	Circus Heli-Tips Booklet	—	FREE
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for, and until two months ago, I still didn't know. Recently, while flying Gollywocks with Mark Sexton, I inquired as to how he had gotten such a sealed finish on his fuselage.

"Banana Liquid," he said.

"Banana Liquid?" I, exclaimed quizzically.

"Sure, you give the fuselage a coat or two of clear dope, and then you give it a coat or two of Banana Liquid, and the tissue is sealed up tight. No rubber lube to leak through, and it keeps things neat and clean."

"Where do you get it?" I queried.

"Art supply places."

"So, the hunt began. I dropped over to the local university and began rummaging through their shelves in the Art section. No banana liquid. I inquired of the young folks

at the checkout stand.

"Never heard of it," was the response.

"Try the extracts shelves at Safeway," was the other.

Undaunted, I sought out a couple of local art specialty shops.

"Wow, sounds far out . . . what do you do with it? How do you use it, I mean?" said the aging hippie behind the counter.

I called Mark on the phone, "I'm having no luck at all finding Banana Liquid."

He said, "It's called Banana Bronzing Liquid, and it's made by a company called Luco." Then he made the offer, "I'll pick up a can of it for you next time I drop in."

I offered Mark a bottle of sneaker juice in trade, and we had a deal. (For the uninitiated, sneaker juice is a homemade concoction that comes from grinding up old used sneakers—the canvas ones are the best—and bottling the juice into Windex-type spray bottles. To use: just spritz some on your model chasing shoes or on your best free flight. The result is a faster, if smellicious, shoe or model. It's the experience of the sneaker juice that makes the difference, I'm told.)

At the Autumn Thrash in November, Mark and I exchanged. Since then, I have used the Banana Bronzing Liquid on my Gollywock, and it does seal off the tissue. Since the stuff is a little on the thick side, I had to thin mine down with Carter's Universal Solvent. Brushes on just fine.

I never did ask Mark what he thought of the sneaker juice.

T.D. PROP SCREWS

Got a nice little package in the mail a few days ago from James Bocckinfuso, 52 Jefferson Blvd., Pt. Jefferson Station, New York 11776. Jim is a member of the Skyscrapers and offers a deal to anyone who is looking for replacement or new prop screws for their T.D. 049-051. As you undoubtedly know, the stock part uses an unusual 5-40 thread, and it has a slotted head so that a regular blade screwdriver is the only way to get them on and off. Jim had a special order of socket head hardened stainless steel cap screws made. In order to get some, he had to order many hundreds more than he and fellow Skyscrapers can use. If you want one or more, send 50 cents each plus some postage offset. Stop gouging holes in your

hand, and get your prop snugged up real tight at the same time.

KODAKOPHOBIA AND OTHER FREE FLIGHT AILMENTS

The free flight field is a photographer's delight. Where else can you experience a wild variety of color, sound, and kinesthetic energy? For each of us, the opportunity to unleash the family camera on such occasions is just too much, so off we go happily snapping away at the unsuspecting free flihter. As a hobby journalist, of course, my snapping has a different meaning. I am trying to get that model just at the moment of launch, or just as the wheels clear the runway on takeoff—so I can have a good to great picture to send in to this column.

I have enlisted the help of my wife, Barbara, to cruise around the field looking for such moments of opportunity. I even bought her a camera as a birthday gift so that she could take pictures for *Model Builder*.

It wasn't until last spring that I noticed an ominous side to this picture-taking business. Both Barbara and I were out taking *Model Builder* pictures (since I had damaged all of the models I had brought to the meet, I had little better to do). It was then that the dread realization hit me—many models that crash are affected by something other than bad luck or poor construction.

Both of us were standing at the takeoff boards awaiting an ROG launch of a model that was in a flyoff. As the ship was readied for flight, we snapped a few pix. As the ship cleared the takeoff boards, we snapped a couple more, trying to get the instant of liftoff forever recorded. The model climbed off the boards, picked up speed, turned sharply to the right and spiralled into the ground with the engine running. A total wipeout. No explanations, as this ship had many flights behind it and was flying well all day. The flier had no idea what had happened.

Then it was John Lenderman's turn. He had been flying his trusty Gollywock all day with max after max on the charts. The model has flown that way for at least 20 years. I took a couple of pictures for *Model Builder* as he launched, and the ship climbed like a rocket until the motor ran out. Then, inexplicably, the nose came down and it did a shallow dive into the ground.

I could go on with examples. I personally believe that Clarence Bull, Greg Davis, Bill Giffen, and other prominent free flihters here in the N.W. have been the victims of what I now know as Kodakophobia. I have defined Kodakophobia as a model's unreasonable fear of crashing immediately following the taking of a picture.

It may be that Kodakophobia applies only to pictures taken for publication in *Model Builder*, or it may be that such pictures only exacerbate the latent tendencies of the model's fear, but whatever the cause, beware when you see the photographer sneaking up to take a picture for publication.

I wonder if an answer to Kodakophobia is to use Fuji film? Could we then develop Fujiphobia? The mind boggles!

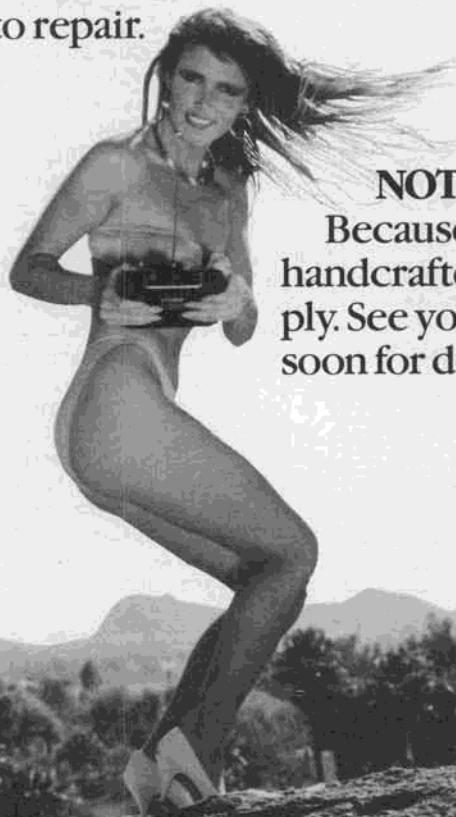
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THE END FOR MARCH

Well, that about wraps and ties it for another month. I trust you are planning your building activities for the upcoming summer. If you are fortunate enough to live in an area where outdoor flying continues during the winter, catch a thermal for me. •

ARFS. Continued from page 43

perimentation with video cameras or whatever else comes to mind.

Speaking of payloads, let's take a look at some of the specifications of this unusual model. The fuselage length is 74 inches, with a maximum width of ten inches. Wing-

span is 67 inches with a mean chord of 12 inches, resulting in a wing area just a little greater than 800 square inches. However, the load lifting ability is greatly increased by the fuselage, as it is airfoil-shaped and probably doubles the aerodynamic efficiency.

The time had now come to get on with the paint job, so I started making the rounds of the local hardware stores looking for pint cans of latex paint. Forget it, latex paint comes mostly in gallon cans, and you're lucky if you can find quarts in your local store. I finally did locate a source of quarts, so I bought three cans, one sky blue for the undersurfaces, and one each of tan and

green for the camouflaged areas. I intended to slap the paint on with a brush, but one of my associates offered to professionally spray paint it for me. He did a very nice job, and I have enough paint left to do about a hundred more models. I managed to find a little white latex paint left over from the last time I painted the bathroom, so we used that on the canopy.

On completion of the painting I installed the radio system, which consisted of my new Airtronics dual conversion 1991 FM receiver, four standard servos, 500 mAh battery, and switch harness. I know you've been paying attention, so now you should be asking why I installed four servos in a three-channel airplane. The answer is that the fourth servo was provided exclusively for nosewheel steering. This servo could have been connected to the rudder output of the receiver, but I decided it would be simpler to use the aileron output for ground steering, so I used a "Y" cable and connected both the steering and aileron servos to the same output function on the receiver. At this point I cut out eight red stars from a sheet of red MonoKote trim and applied them to the appropriate locations on the fuselage, wing, and vertical stab. This little touch seemed to add a lot of authenticity to the model. My Rossi .60 was presently being used in my ARF El Diablo, so I installed my O.S. .61 ABC with standard factory muffler. With the model came a high-quality 16-ounce tank, which fitted perfectly into the pre-formed compartment on the starboard side just aft of the engine. I set up my kitchen scale and weighed the fuselage and wing separately. The total weight of the finished model came to a meager seven pounds and ten ounces. I just couldn't believe that such an enormous model could weigh so little, as one would expect an airplane of this size to weigh anywhere from twelve to twenty pounds. It finally dawned on me that this was really a state-of-the-art project in which a great amount of time and professional engineering had been invested. No doubt this inherent lightness is another important factor in the load carrying ability of the Flogger D.

I checked the balance point and was surprised to note that the model was substantially nose-heavy, balancing about six inches in front of the point specified in the instructions. As all the electronics were mounted in the tail area, and the only extra weight in the nose was the nosewheel assembly, I was unable to account for the nose-heavy condition. I decided to leave things the way they were, in hopes that maybe it would still fly well. Anyway, I just hate to add ballast to a model. Next came a few engine running tests and some taxi trials in my backyard. I like to get an engine properly tuned before heading out to the field to test-fly a new airplane, and I did run into a small design snag while starting up the engine for the first time. It seems that the fuel tank compartment is located slightly higher than the needle valve and the fuel gravity feeds, resulting in carburetor flooding during the starting procedure. I imagine this could be remedied by cutting away some of the foam under the tank floor, which would lower the tank enough to stop

The Mirage 550.™

The only thing that's ordinary about *this* electric sport-trainer is its price tag.



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the flooding, but I really didn't want to change anything. The way I managed to get around this problem was to prime the engine, then clamp the fuel line going to the carb with my thumb until the engine fired up, at which time I removed my thumb. This system has worked well thus far, except that I have to leave a clamp on the fuel line when the tank is more than half full and the model is parked.

After about an hour of running I was satisfied that there were no obvious bugs, no loose screws, and that the engine was secure in its mounting, so I put everything on an overnight charge and waited until the next day.

Saturday morning was unusually overcast when I arrived at my favorite 800 feet of hard paved runway. The crowd wasn't flying, as they were waiting for the sun to break through, so they had plenty of time to gather around the MIG-27 to watch my preflight procedure. Because of my careful preparation, it took only about five minutes to assemble the model, fill the tank, start the engine, and taxi out to the end of the runway. I pointed her into the very light

wind, which was almost at zero velocity, and applied full throttle. After a couple of hundred feet I applied some up elevator and the nose appeared to lift slightly, but the mains were still firmly planted on the ground. Applying full up did not improve the situation any further, except that I no longer had ground steering, as the nose-wheel was not making sufficient contact with the ground while the elevator was in the up position, and there was no rudder to assist in steering. I chopped throttle and applied full down elevator to abort the takeoff. After two more repetitions of this performance, I knew that the balance point would have to be moved back to the recommended position before this bird would fly.

Back in my workshop I bored a hole in the tail and added enough lead to bring the balance point back the required six inches. This took a full pound of ballast, but in this case it just couldn't be avoided.

My next trip to the field yielded an entirely different result. This time I firewalled the throttle and pushed the stick forward during the takeoff acceleration. I now had very positive ground steering, and at about

a hundred feet into the takeoff run I eased the stick back and she gently came unstuck and was flying. Suddenly the ugly duckling had turned into a graceful swan, and in the air the resemblance to a full-size MIG-27 was remarkable. It flew as I remembered, just like the military version I had handled a couple of years earlier. The MIG does outstanding rolls, but lacking a rudder she will not perform your standard hotshot maneuvers such as spins and snaps. It is meant to be flown in a stable pattern, and looks best when doing so, but I imagine some pilots will manage to figure a way to wring her out. Landing proved uneventful, except that I found I did better when applying some power to keep the speed up a bit. This helped to settle her in quite nicely.

The Flogger D doesn't need a skilled pilot, as any average sport flier can handle her docile ways. Assembly is ridiculously easy, and if you skip the painting she can be readied for flight in about two hours from the time you open the box. Almost any powerplant you have will do the job, so cost is minimized.

This project is certainly different from the run-of-the-mill airplanes we usually fly, and if you want to fly something quite unusual, this would be an excellent way to go. The only problem I have had thus far is that my flying buddies have been threatening to bring their shotguns to the field to see if the Flogger D is really a good target drone. This model is available at many dealers, or contact the manufacturer, RS Systems, 5301 Holland Drive, Beltsville, Missouri 20705; (301)474-2900.

BOOK REVIEW

Books devoted strictly to the subject of ARFs are extremely rare. In fact, I've never seen one. However, just such a book has recently been published, and its title is *How to choose R/C Ready-To-Fly Airplane Kits*. The co-authors are Douglas R. Pratt and Chip K. Smith, and they appear to know their subject quite well, as I found the material most interesting and informative. This handy little book consists of 112 pages divided into 13 chapters. The first chapter is an introduction to RTF and ARF kits, and each of the succeeding 12 chapters is devoted to one manufacturer's or distributor's line of models. Interspersed among the pages are over 60 excellent black-and-white photographs taken by Jennifer Pratt. The authors mention quite a few models, but nineteen are selected for in-depth evaluations. These mini-reviews consist of discussions of the particular construction or assembly procedures for each model, plus tips on radio installations and flying hints. A few of the models covered are trainer types such as MRC's Trainer Hawk, and the rest range from intermediate sport types to high-performance models such as the Royal Telstar equipped with retracts.

This book is easy reading and highly entertaining. The print is large, the paper is high-quality with a matte finish, and the pages are loaded with flying and construction hints, and numerous extraneous bits of information. For example, at one point the authors digress into an evaluation of the Fox .45 engine, eventually reaching the conclusion that it is a "wonderful engine." Else-

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COVERITE

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where we encounter a detailed discussion of the authors' method of pinning hinges. There are literally scores of these helpful secrets, and reading them is absolutely fascinating. I must have read this book through at least three times, and I managed to find something I missed every time. The instructions on flying various models are beautifully written, and I can almost feel the sticks in my hands as I go through the steps with the authors.

I must point out that in my opinion the authors have written a book on a subject that is really too vast and complicated for a comprehensive presentation. Only a tiny

smattering of available kits are covered, and many outstanding ARFs have been excluded entirely. Actually, it is very difficult to write an up-to-date book on ARFs, as many kits are discontinued before you can get a write-up into print, while hardly a week goes by without a plethora of new kits being introduced. It's not possible to keep up with today's constantly changing prefabricated model market. The authors have not really lived up to the name of their book, as they have not provided information on how to choose an ARF. Instead, they have randomly chosen a few kits and they have explored these in a very professional

manner. Their real accomplishment is that they have given us a detailed peek into a number of the kits on the dealer's shelves, and perhaps one or more of them may strike our fancy enough to prompt a purchase.

Even though this book doesn't live up to the promise in the title, it is nevertheless engrossing and a delight to read. It is written for the beginning or intermediate R/C devotee, so take my advice and go curl up with this book on a cold winter night. You won't be sorry. Available from Motorbooks International, P.O. Box 2-Rev., 729 Prospect Ave., Osceola, Wisconsin 54020; (800)826-6600. Price, \$12.95.

ARFS IN ACTION

In recent years it has become the practice of many competition pattern fliers to have their models custom built by professional model builders. Dedicated pattern fliers spend a great deal of their time practicing, and much of their time is also taken up by traveling to contests. This leaves little opportunity for building, so they often turn to a custom RTF model. The handsome Dalotel pictured in this month's column belongs to Buck Faure of Encinitas, California, and it was constructed by Dick Hanson of Murray, Utah, who is a well-known pattern ship designer and builder. Though Dick supplies models in various stages of completion, this particular Dalotel was covered in Super MonoKote and delivered ready for engine and radio installation. Buck powered it with a long stroke O.S. .61 engine with pump and Hatori pipe. Ready-to-fly weight came to seven pounds and four ounces, and Buck says the Dalotel is an outstanding flying machine. He particularly likes its steadiness in flight and feels it is perfect for turnaround events.

Well, faithful readers, it's time to land and refuel, so until next month keep those letters coming to me at 2267 Alta Vista Drive, Vista, California 92084; (619)726-6636. Your comments and/or questions are always welcome.

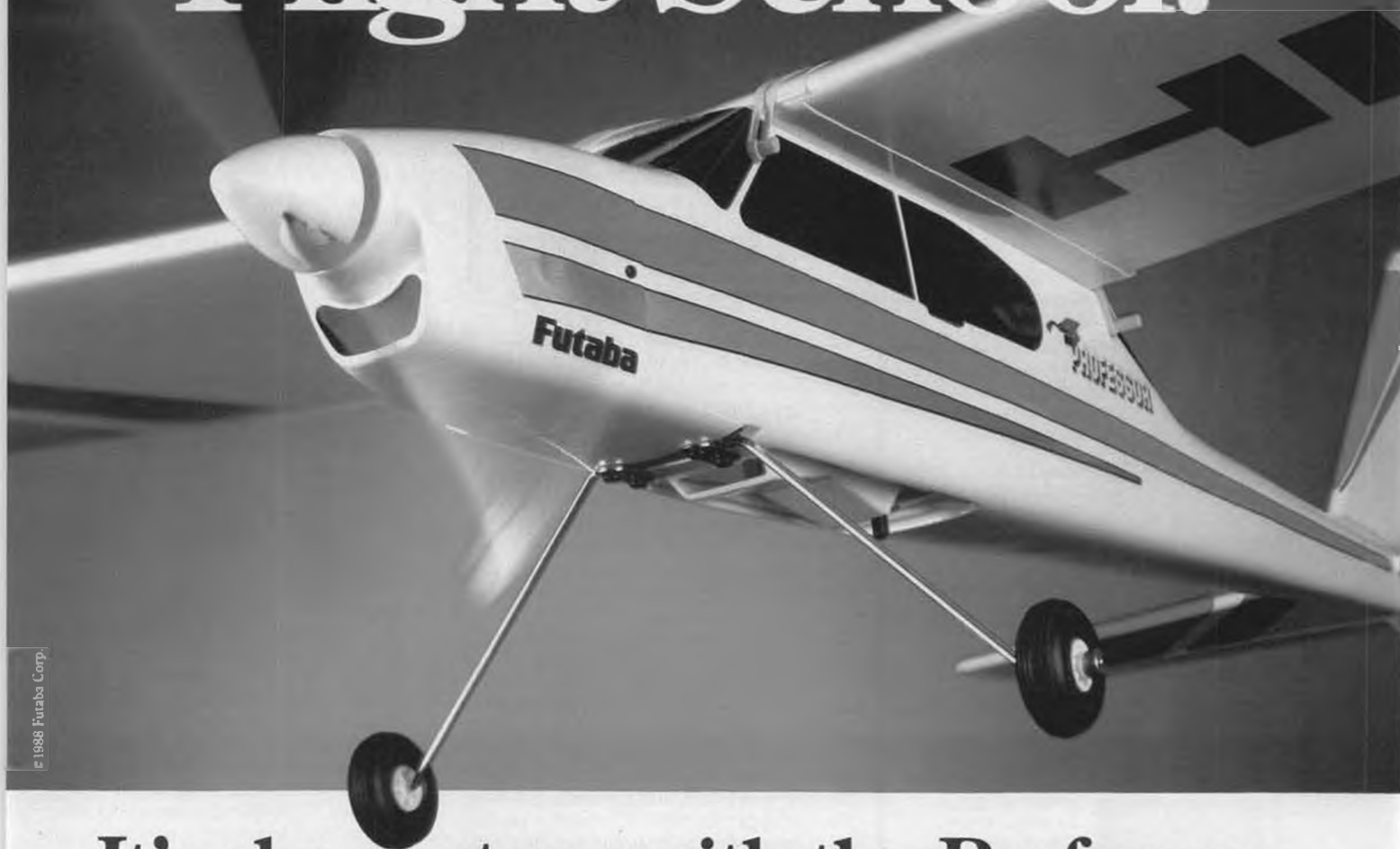
Tech. Stuff. . . Continued from page 26

wood bearing plate in the foam before we glassed the surface, but there is an easier way. After glassing, mark where the base of the horn is going to be, put a toothpick through under each corner of the base and epoxy it in. Clip and sand both sides flush and mount the horn, using the nylon nut-plate on the back side. The short toothpick columns will take plenty of compression load from the mounting screws, and the fiberglass in shear will transmit the torque to the control surface.

CONCENTRATED LOADS

It is obvious that foam and thin fiberglass will need a bit of help in taking concentrated loads such as the motor mounting, wing mounting, and landing gear mounting. Structural engineers talk about "fanning out" a concentrated load. Sometimes putting on more layers of fiberglass locally will do the job, but I usually use a little plywood in these places; plywood firewalls, wing-mount bulkheads, and gear attach points. If a ply bulkhead is to come through the foam to the surface of the plane, make it slightly undersized and fill the resulting

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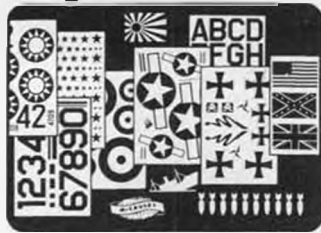
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groove with Micro-fill or Model Magic to get a smooth sandable surface as we discussed before.

If the bulkhead is made still smaller, to fit inside a foam section, epoxy it in place, then epoxy in several strips of fiberglass around the plywood-to-foam joint, to spread the load out to a larger area of foam. Epoxy in such glass angle strips for added strength even if the bulkhead does go through to the surface. If you can fiberglass the entire inside of the foam, so much the better. If we give it enough thought and effort we can design very strong light composite models. With no thought we will make junk that will come apart in the air.

TECHNIQUES FOR FIBERGLASSING

Some modelers put epoxy on the surface to be glassed and then immediately put on the glass cloth. Others put the glass cloth on the dry surface to be covered and work the epoxy through the cloth to bond it. I prefer the second method in most cases. (The second method is almost essential when working with glass cloth weighing a fraction of an ounce per square yard.) For composite models of average size, I use glass cloth from .6 oz. to 6 oz., but mostly 1.5 oz.

Method number one consists of pouring unthinned epoxy onto the surface to be covered, spreading it out and removing the excess with a squeegee (medium-stiff plastic wallet cards work best) and then applying the cloth, usually by smoothing out the oversize piece of cloth on a table, inverting the epoxy-wet part, and pressing or rolling the part onto the cloth. If the part is squeegeed rather "dry," as it should be, the cloth, now stuck to the part, can be stretched, patted, or squeegeed down, and generally smoothed. If there is too much epoxy at this point, the cloth tends to "float" out of position, with the epoxy acting as a lubricant. If the surface is semi-dry, it is also much less messy to work. Don't fill the weave of the cloth with glue at this point; that is a later step. If you have trouble making edges stick down, wait until the epoxy just begins to gel, then stick down the trouble spots.

As previously discussed, put on extra layers of cloth where they are needed for strength. Remember the diamond-shaped doubler concept of fanning out loads (see January column). Put on added layers as soon as the previous layer is set. That not only speeds up the job, but the bond between layers is probably better than it would be if the under-layer was completely cured first.

Fiberglass cloth is pretty flexible, considering that it is made of glass, but it is stiffer than regular cloth. It will wrap nicely around curves, provided the radius of the curve isn't too small for the weight of the glass cloth. In my experience, 1.5-ounce glass will wrap around a 1/8-inch radius leading edge of a stabilizer or fin okay, but that is about the limit. An internal radius is more trouble than an external one because the cloth must be in compression to hold itself into the curve. Let's say 1/4-inch mini-

mum internal radius for 1.5-ounce cloth.

Trailing edges of wings, empennage, and control surfaces are much sharper than my 1/8-inch minimum external radius for 1.5-ounce glass, so I use lighter glass around the trailing edges. Glass up to 3/4 oz./sq. yd. will wrap well around a radius as small as .01 inch. (If you need knife edges sharper than that, I recommend steel.) For a control surface, as an example, cover it entirely with a single piece of 1.5-ounce glass wrapped around the leading edge. When that has set, trim the excess cloth off flush with the trailing edge and wrap a one-inch-wide strip of fractional-ounce glass around the trailing edge, and epoxy it in place.

With the lightweight glass cloth, you may have a problem with the weave pulling out of line from handling, and the stuff likes to bunch up when being applied. These problems can be minimized by using application method two: putting the cloth in place dry and brushing or squeegeeing thin bonding epoxy through the cloth. The epoxy mix must always be low viscosity to penetrate the cloth well, regardless of the weight of the cloth. Refer to the January column for instructions on thinning epoxy.

Fortunately, EnviroTex Polymer Coating epoxy, which is available at Standard Brands stores and other places, is low enough viscosity to work fine without thinning. Mix it thoroughly and pour it on top of the glass cloth in the center of the area to be glassed. For average and heavy weight cloth, a plastic wallet-card squeegee is a much better tool for working the glue into the dry cloth than a brush is. Squeegee the pool of epoxy out in all directions, which will pull the cloth tight and smooth and minimize the chances of the cloth sliding out of place. Squeegee this epoxy bonding coat quite "dry." After the last layer is set, but not completely cured, sand off any lumps or other irregularities carefully, but do not sand the whole surface. We don't want to weaken or cut the glass fibers.

FILLING THE WEAVE

The fill coat is unthinned epoxy poured on and squeegeed rather dry to keep the weight down. If the part is small and has a relatively flat area, the two parts of the epoxy can be poured and mixed with the squeegee right on the surface of the part. This saves glue and is much less messy than transferring the epoxy from a mixing container or card to the part. If you have mixed too much, squeegee the excess off. If the mix isn't enough, mix another batch on the surface and continue to squeegee. Epoxy only one side of flat parts at a time. A fuselage can be epoxied all over at one time, but plan how you are going to support it to cure. The problems are the same as with painting.

When using coarse fiberglass fabric, such as the six-ounce, I put micro balloons in the fill-coat epoxy to reduce the weight. Maybe it would be a good idea with medium grades of glass cloth too. With very fine cloth, the diameter of the balloons may increase the squeegeed-layer thickness, and actually increase the weight. Have any of you run any tests?

Do not substitute any other material for the epoxy weave-filling coat. Some



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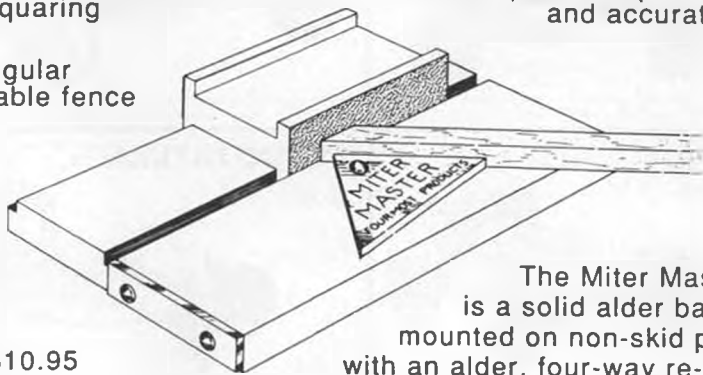


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modelers who use lightweight glass in the finishing of balsa models, fill the weave or even bond the glass down with primer or paint. They can get away with that because their models are structurally adequate without the glass cloth. What we are doing here is quite different. Here the epoxy/fiberglass is the structure. The glass cloth alone is good in tension, but has no compression strength. We give it compression strength by thoroughly encasing each glass fiber in epoxy or polyester resin, so the fibers can't buckle when they are loaded in compression. Primers and paints are usually formulated with plasticizers to keep them flexible so they won't chip. They would not support the glass in our structural applications nearly well enough. Polyester resins would, but it stinks up the house, and according to Jack Lambie, epoxy is 37 percent stronger in compression than polyester.

If you still think you would like to use something other than glue for the weave-filling coat, consider my final warning: Most primers, paints, and polyester resins dissolve foam, and the foam isn't yet well

enough sealed. Model airplane soup, anyone?

As soon as the epoxy fill coat is set but not completely cured, sand the part all over with medium-grade sandpaper. The yet-soft glue will sand easily and the removed material will ball up like eraser crumbs, leaving the sandpaper relatively clean. Don't oversand and cut too many glass cloth fibers. It is not necessary to sand with fine paper at this point, since it is common practice to use a filler or sanding primer to smooth the entire surface, and the primer will fill the rough sanding marks. The primer is especially necessary to fill and level the slight valleys at the edges of the reinforcing layers of glass.

I use K&B Super Poxly two-part primer, and then K&B Super Poxly two-part paint, on the theory that with the epoxy base, sticking with epoxy materials straight through should provide the best possible adhesion. Both K&B primer and paint can be either brushed on or sprayed on. Beyond that, you are on your own. Finishing models is not one of my better skills.

MIRACLE METHOD

There is a variation on a technique that I described to you last December that can eliminate most or all of the priming and sanding. Take a sheet of .005 to .01 Mylar large enough to wrap around and completely cover the part to be glassed, such as a wing panel (no compound curves). Give one side of the Mylar a coat of parting agent wax and let it dry. Put a layer of fiberglass cloth on the waxed Mylar and epoxy it down. Use pigment in the epoxy, if you want to eliminate painting too. After the epoxy has set, squeegee a coat of slow-curing epoxy loaded with micro balloons all over the foam core. Immediately wrap the Mylar with the layup around the "wet" foam core, in proper alignment, and hold it firmly in place all over until it is cured. With a foam-core wing, this holding can be accomplished by putting the uncured Mylar-covered wing panel back in the shells or "offcuts" that were left when you cut that foam core from the blank. Perfect fits. Weight the top offcut uniformly to assure complete bonding of the glass fabric to the foam. When the epoxy is completely cured, peel off the Mylar sheet, and you should have a finished glass-smooth high-gloss foam/fiberglass part.

Always apply the glass to the mylar, not to the part. If the part is glassed and then wrapped with Mylar, part of the surface will end up glass smooth, but bubbles will be trapped leaving voids in the surface. Mylar sheet is available in various thicknesses in stationery stores.

Warning: There must be no low spots in the foam core, and getting stiff Mylar to conform to the leading edge radius of a wing is difficult. If the Mylar is too thin, on the other hand, the surface ends up wavy. The one wing I have built this way was smooth, but it had imperfections, and it was not easy to make. The process may be more useful in finishing parts of fuselages, empennages, and floats. I recommend only that you experiment with the method.

I am a big fan of epoxy over polyester resin, but we must be aware of its toxicity to many people. Minimize your exposure. The warnings on the labels are not to be ignored. Jack Lambie reports he ignored them, got caught, took years to get over the reaction, and now looks "twenty years older." Composite construction of models has a lot of potential, but don't assume you will have no problems with it. It is still experimental, and our techniques for working with these materials are still in their infancy. At this time composite construction is probably slower than conventional construction, but it will get faster as we learn more tricks and get more experience and practice.

CREDITS

To give credit where credit is due in this relatively new field of composite model design and construction: John and Sylvia Valentine did pioneering work which was published in the September 1984 issue of RCM. As previously mentioned, Jack Lambie's book, *Designing and Building Composite R/C Aircraft* (Zenith Aviation Books, 1-800-826-6600), is excellent. Dan Parsons provides a paper on glassing technique

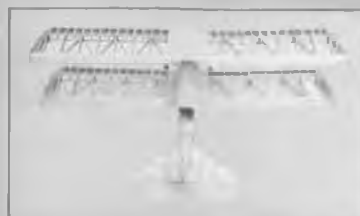


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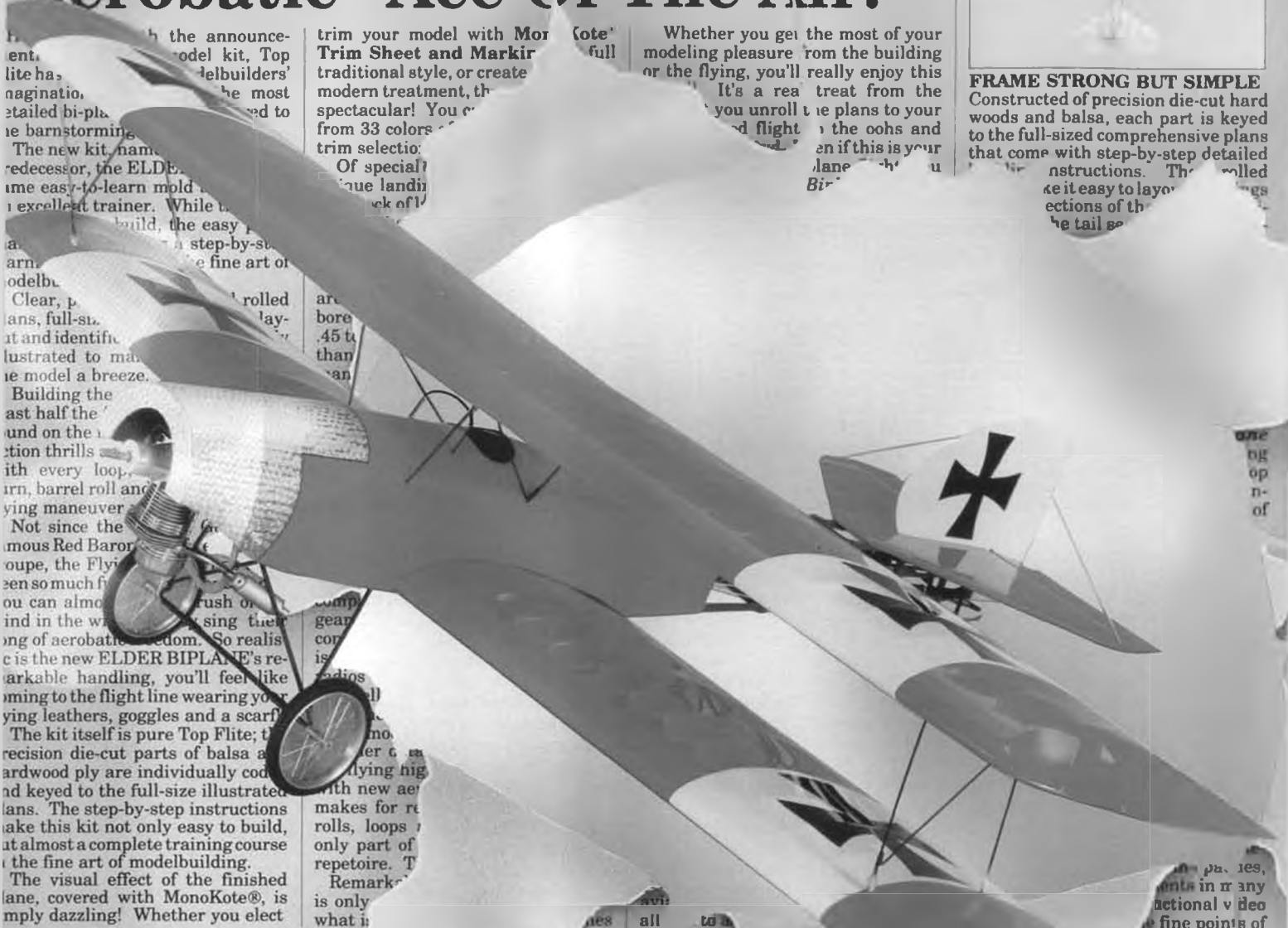
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number two. You can reach Dan at (505)296-2353. Technique number one was taught to me by my friend Paul Weston. I learned several tricks from Ray Hamel in his two video tapes on foam cutting. Ray's number is (817)692-4475. Dow Chemical's literature on their various plastic foams has been very helpful. Some engineering work on composites that I was involved with at Boeing and a course I took on plastics have been useful background.

I'm sure I've also learned much in this area from other sources, but those are the ones that come to mind. I don't agree with any of these people completely, however, nor will you agree completely with me. Differences of opinion make pylon races and different airplane designs. Also, what any of us know is a drop in the bucket of knowledge. A columnist, incidentally, is not one who knows all the answers (as if you hadn't noticed). A columnist is one who is hopefully one step ahead of some of his readers and is learning at least as much as they are. Happiness is a warm puppy and learning to design better models.

Plug Sparks. . . .Continued from page 35

madness for me until some months later it arrived in the local hobby shop. Cox knew how to promote sales."

OVERLOOKED BUT NOT FORGOTTEN

Recently this writer received a flock of photos he had submitted for use in his column over the years. Also in the large box

were a considerable number of letters with photos from modelers who were quite enthusiastic about the Old Timer column.

In picking through them, a letter from Tom Mountjoy caught my eye with a Photo (No. 5) taken at East Patterson, New Jersey, in 1940. Seen in the photo is Tom Mountjoy holding his Gull Wing Sportster which later appeared in the July 1941 issue of *Flying Aces*. Tom's model was powered by a Forster 99 with a hand-carved propeller. Flew it 21 times in a row without a scratch (what luck!).

Tom would like to know who are those fellows directly behind the tail? Tom also adds he won the Beauty event that day. Fortunately, only one official flight was required. (Col. note: this guy is just plain lucky!)

SCAMPS ANNUAL

Here is a report submitted by Jim Adams (*SAM Speaks* newsletter editor and *SAM* President) as written by Tom Alden, the visiting fireman from Canada. As Jim remarks, "Our Canadian cousin, Tom Alden, was the Sweepstakes winner again, for the zillionth time." Some interesting photos were received of the competitors. First of all is Photo No. 6 of Jim Robinson with a Jasco Flamingo, Ohlsson 60 powered. Although still being trimmed out, he placed third in the Class C Cabin event.

Tom Alden reports the weather at Taft was in the high seventies and eighties on both days with very little wind. This made for light thermals and very close competition.

Seen in Photo No. 7 is a much looked-at project by Jim Adams. This model, scaled from the Zaic publication, "Nationals in Pictures" authored by Walter Farunk and Frank Zaic, is the "Cruiser" as designed and flown by Andrew Peterson of Los Angeles. It has taken time to trim out but it shows good promise for future meets.

We must have put the "whammy" on Clarence Myerscough by printing a pic of his Tambe in the December issue. This hot-climbing model provided the most spectacular crash of the day. A few barrel rolls, fold a wing, and then that inevitable death dive. Seems like sparless construction doesn't make the wing any stronger.

Naturally in the report it appears that Alden is in a class for picking thermals all by himself, as he won the Wakefield event with a perfect 15:00 score.

A few more comments about the meet rather than list a rather lengthy report of winners. Maybe the boys know what they are hollering about when they say the Elfin diesel-powered Interceptor by Chuck Atkinson was maxing easily in the light air. Despite the claims of superior power, this writer looks at the problem from the standpoint of does it make the required eight ounces per square foot of wing area. At 10 oz. per sq. ft. in O.T. R/C, there doesn't seem to be this problem.

In closing off this report, Tom Alden mentions a beautiful Red Zephyr, built by Dick Lyons, as presented in Photo No. 8. Taking advantage of the light winds on Saturday,

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Dick was able to post the spectacular time of 42 minutes in 1/2A Texaco. Man! It's tough when they not only look good, but fly equally as well!

READERS WRITE

This is my favorite section of Plug Sparks, mainly because it shows what the average modeler is doing and thinking. One might regard this as the "grass roots of model aviation." First off, R. D. (Dick) Hawes, 9220 No. 52nd Ave., Omaha, Nebraska 68152, writes to say that in regards to the November issue of *Model Builder* and Bob Fenske's study of the Stanzel Tiger Shark, he doubts if the ancestry was actually the Curtiss P-37.

Dick says he would have started with the Brown B-3 racer. Looking at the side view of the later version of the B-3 presents the idea that the Tiger Shark design may have evolved from the Brown Racer.

To confirm his suspicions, Dick says the B-3 and Tiger Shark have straight wings with elliptical tips while the P-37 has a tapered wing. The vertical fin and rudder of the B-3 are practically a dead ringer for the Shark, where the likeness for the P-37 falls off with the straight edges of the P-37 tail.

In any respect, Dick says the Tiger Shark is more B-3 than the Curtiss P-37. He further says he will not pursue this any further, as it is too much research work. He does like the B-3 and considers it one sexy machine!

Sweden: Sven-Olov Linden sent in Photo No. 9 a few years back. This shot (lost in the files for quite some time) shows a group shot of the 1939 American Wakefield team

showing off their models at the Goodyear Airship Base at Bendix, New Jersey. Seen from left to right are Ralph Baker, of Santa Ana, Jim Bohash of Detroit, and Jack Thames of Pittsburgh. For their time, the boys were given a ride in the blimp over New York City.

MORE READERS WRITE

Don Belote, former manager of the Toledo Weak Signals Trade Show, sends in Photo No. 10. Taken in 1946, the large plane in the group belongs to the older gentleman, Art Christian (died 12 to 15 years ago), with a Buccaneer C Special. Special note should be taken of the engine, a Morton M-5. To top it off, the model is a control line job.

Don sez he saw it fly several times (he was only 12 then) and always remembered how quiet the engine was. He reports the other fellows in the photo are all members of the old Toledo Model Manglers Club. The fellow with the hand-launched glider is Joe David, who has the distinction of having started the Weak Signals in 1952.

Massachusetts: About time we got this Photo No. 11, dated 1973, out of the files! Seen in the pic is a very well done Buzzard Bombshell by Andrew Kovacs, 146 Old Oaken Bucket Rd., Noswell, Massachusetts 02061.

Seems to this writer that we ran this photo many years ago, as it was submitted as a possible cover photo. However, Andy did such a nice job, a good picture is worthwhile anytime.

The model was scratchbuilt with MonoKote covering, powered by an Enya 35 and controlled by a Cannon set. Neat looker!

SAM 1: Perry Peterson sends in Photo No. 12 to show the first SAM Chapter is still alive and kicking. Taken at the Rocky Mountain Free Flight Champs and SAM 1 combo Labor Day meet, Darold Jones was one of the competitors in the "Gollywock Only" event. All Gollywocks fly well and this one was no exception.

Last but not least is a photo taken of the columnist at the Independence, Missouri, airport back in the early seventies. Seen in Photo No. 13 is John Pond leaning on the propeller with his good friend, Bryan Wheeler.

Later on, Bryan's buddy, Jim Root, took Pond for a ride in the J-3. With a bit of head wind, automobiles on the freeway were actually passing us. A fun airplane!

SAM ITALIA

As reported by Fernando Gale, SAM Italia (Chapter 62) is growing like mad with a membership of over 150. Ferd sends us Photo No. 14, which shows what he considers a real first: a radio-assisted rubber model.

Although this has been done successfully by Tony Naccarato at the Pasadena I.M.S. show, something like this is always of interest. The model shown is an original 1940 Wakefield model that has been restored by Valter Ricco (from the original plans, no less!).

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Ferd says this is a nice solution to those exhausting cross-field retrievals. The M.D. 7 originally designed by Dante Mangini of Genoa cannot compete with the regular Wakefield models. However, if enough R/C rubber Wakefields are built, possibly a new category can be set up.

For those interested in the radio gear, this is the tiny Futaba mini-receiver used in conjunction with a Cannon mini-servo.

FREE PLUG DEPARTMENT

Just received an interesting announcement from John Targos, who runs ARGO-USA, 3229 Dianora Drive, Palos Verdes, California 90274. Most of the O.T. modelers are aware he handles the Dunham Engineering replica engines (Orwick, Oliver, Elfin, etc.), but this letter contained the news that he is now marketing a "SAM" mug.

As can be seen in Photo No. 15, this large-handled coffee cup comes complete with the SAM decal in brilliant red, white, and blue colors. What a way to start the day right, particularly at a contest!

Oh, yes, seven dollars will fetch you one immediately.

MORE FREE PLUG INFO

Michael L. Schulz, owner of Airmen's Supply Co., P. O. Box 1593, Norfolk, Nebraska 68701, writes to say after the pic of Lain McLeod's Easy Built Fairchild Ranger appeared in the November issue of *Model Builder*, he had to write to inform one and all that he does stock the entire line of Easy Built kits (at competitive prices!).

Most all kits date back to the forties, but the Easy Built people are constantly adding to their present line. Mike says the latest ad-

ditions are new rubber-powered versions of the Bleriot, Pilatus Porter, Pober Pixie homebuilt and an electric powered PB.Y. The latter is due out shortly.

Mike goes on to say *Model Builder* is the greatest magazine of all and so is the Plug Sparks column (natch for both!). Mike says he is not old enough to remember the thirties and forties, but some of his earliest memories are sitting on a chair upstairs in the big house watching big brother fly those huge models in the early fifties. Hooked forever!

MISS AMERICA O.M.T.

As a final wrap-up to Carl Schmaedig's report on the prototype Miss America, the main reason for losing the model was "eyedropperitis." Every time they released the model (and the engine stopped), Frank and Carl would add a few more eyedroppers of fuel to the tank. After two or three flight attempts, it didn't take long to fill the tank! That and the difference in economy between the Baby Cyclone and the Brown Jr. did the model in!

NEW SAM CHAPTERS

In a rather surprise move to this columnist, a splinter organization has developed in the Fresno Gas Model Association known as SAM Chapter 72, who title themselves as the "Senile Antique Modelers." SAM 72 is specializing in what they call "uncontests." This is what SAM is all about—fun, above all else. Editor Jim Harris is one of the Fresno members who is spearheading the O.T. movement. Their first "uncontest" featured certificates to prove they are not fooling about keeping their O.T. activity on an enjoyable basis.

Another new club, SAM Chapter 74, has been organized by Jack Tatum in the Clear Lake area of Northern California. Jack is the newsletter editor of the Clearwater Modelers Club publication called *Ups and Downs*. Tatum will probably be unavailable as the newsletter editor, as he and his wife Dee are making a ship cruise tour with the Gene Krupa band. (Jack is an expert saxophonist himself.)

Jack also wants to emphasize that the CARPS (the SAM contingent) are still part of the Clear Lake modelers. This is a club within a club! The CARPS (Clearlake Aero Rubber Power Squadron) announce they are wasting no time getting started by announcing a challenge meet with the Marin Aero Club. How about that? The CARPS vs. MAC meet. Has a euphonious ring to it.

THE WRAP UP

This time we have an obit to end all obituaries. Sad to report, but the Reno International SAM Champs is no more. The following letter to Jim Adams explains it all.

This letter is to update you completely on the status of the Reno SAM Champs, as originally proposed. The major difficulties that have arisen are as follows:

1. Despite repeated attempts, the inability to secure complete unencumbered use of Stead Air Base.
2. The withdrawal of the AMA Nationals originally scheduled to follow the June 11 through 17 SAM Champs on June 18 to 24.
3. A no-confidence vote at the Annual SAM Executive Meeting brought about by a letter of complaint by SAM Chapter 3, SCIFS, regarding the proposed free flight area(s). This complaint was based on re-

ports from three FIF contestants attending the West Coast Champs.

4. A general indifference to the amount of inordinate work, time, and money (none charged to SAM) invested by this Contest Director. The idea of an International SAM Champs appears to be too ambitious a project.

5. An inspection tour by a SAM ad hoc committee: Adams, Angel, Pond, Bekins, and P.R. man Marra, of the available flying sites, resulted in a vote to try for the large dry lake area 25 miles east of Carson City. (Carson City is 25 miles south of Reno.)

6. Investigation of the Dry Lake near Stagecoach reveals the property is privately owned rather than under the Bureau of Land Management (BLM). The owner has been located and a letter prepared requesting use. Major problem is that no approval for use has been received to date.

7. Based on the foregoing, this Contest Manager has suffered considerable deterioration in health from worry, sleeplessness, and serious heavy chest colds approaching pneumonia stage. Also, I have been advised by SCIF Secretary Myers that the Reno altitude could be injurious to my health.

8. In addition, to protect my undisputed integrity, straight forward honesty, and the long-term support of any and all Old Timer activities since 1962, I feel that the time has come to resign from the idea of a SAM International Champs. I respectfully request you release me from such duty.

As far as I am concerned, the International SAM Champs has been destroyed by exaggerations, mistruths, rumors, and hearsay. Truly a shame for all the people who were willing to participate and help run this meet.

Inasmuch as the International Champs are now moribund, this letter will be published in the "Plug Sparks" column to let one and all know the contest situation at Reno. The following activities in the Reno-Stead area are cancelled:

1. Stead Air Base (including all auxiliary fields), R. Marra, P.R.
2. Convention Center (AMA), Dan Hebers via Vince Mankowski.
3. AMA Nats, John Worth.
4. MECA "Grando," Robert Cowles, MECA.
5. All Standard SAM R/C events, Don Bekins.
6. All Standard FIF SAM events, Jim Persson.
7. Nostalgia Champs, Ralph Prey.
8. Lee Renaud Memorial, Joe Beshar.
9. Control Line O.T. events, WAM Myrtle Coad.
10. Special O.T. Glider event, Larry Horacek, S.S.S. & SAM 26.
11. International 50th Anniversary Wakefield, SAM 35.
12. Jimmy Allen Races, Jim Root & SAM 41.
13. All Balsa R.O.C. (Jr.), Pharis Models.
14. RTF Special Delta (Jr.), Ernie Johnson.
15. Proposed Indoor Meet, SAM 8.
16. Special R/C Electric Events, SAM 21 Roselle.
17. Ohlsson 60 Event, SAM 30 Nicholau.
18. Ohlsson 23 Event, SAM 27 Bekins.
19. Letters of Notification, SAM 35, SAM



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24. Airborne (Australia), Merv Buckmaster, Ed., Colin Borthwick.

25. Proposed Zipper-Only event, Jim Thomas.

26. R/C Team Demo, Eut Tileston.

We could dwell on the subject but to no avail. However, this writer is not completely discouraged and will continue to support SAM. You can't please everyone, and in this case, a small vociferous minority. •

F/F Scale. . . . Continued from page 47

Power Scale (the latter cannot start until 9:00 a.m. due to field regulations). There will also be two mass launch events, WWII and Golden Age. For the mass launch events, the models will not be scrutinized too closely, just as long as they are not "ghost" models. They will not be judged like the other events. Remember, these models will not be judged by AMA rules but rather by the F.A.C. rules. These provide bonus points for those unusual airplanes, plus all events are hand launched! So, please get the August date down on your '89 calendar. We are going to try and make

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INDEX TO ADVERTISERS

Ace Radio Control	77
Airtronics, Inc.	6 & 7
AI-Tec Products, Inc.	84
American Jr. Aircraft Co.	71
American Sailplane Designs	65
Associated Electrics	62
Astro Flight Inc.	83
B & D Model Products	88
B & P Associates	92
Badger Air Brush Co.	74
Beemer R/C West Dist. Inc.	90
Bob Holman Plans	88
Byron Originals	Cover 2
Cannon Electronics	92
Carl Goldberg Models	89
Circus Hobbies	85
Classified Ads	101
Conley Precision Engines, Inc.	75
Coverite	92
Cox Hobbies Inc.	91
Culpepper Models Inc.	88
Cygnat Software	76
Davey Systems Corp.	63
Dick Hanson Models	84
Doylejet	98
Du-Bro Products	69
F.A.I. Model Supply	107
Fabtronics	65
Flyline Models, Inc.	90
Fourmost Products	98
Futaba Industries	93, Cover 3
G. M. Precision Products	68

Galaxie Model Co.	105
Hayes Products	68
High Sky	103
Historic Aviation	1
Hobbico	95
Hobby Horn	78
Hobby Lobby International	65
I. M. S. Atlanta	96
Indoor Model Supply	77
J'Tec	80
Jed's Shade Canopies	82
Jim Walston Retrieval Systems	103
JM Lupperger Plans	86
Joe's Hobby Centers	88
John Pond O/T Plans	71
Jomar Products	86
K & B Manufacturing	65
K & S Engineering	90
K & W Enterprises	77
Kalt Helicopters	85
Major Decals	94
Micro-X Products	94
Midway Model Company	64
Millicott Corporation	72
M. K. Model Products	97
Model Builder Binders	107
Model Builder Full-Size Plans	106
Model Builder Subs.	100
Model Rectifier Corporation	Cover 4
Northwest Hobby Supply	61

P.A.W. Diesels	80
Pacer Tech (Zap)	80, 82
Peck Polymers	64
Pierce Aero Co.	64
Polk's Model Craft Hobbies	98
R/C Model Car Subs	102
R/C Buyers Guide	81
Robart Manufacturing	66
Rudi Tesa Posters	78
Satellite City	73
Sermos R/C Snap Connector	76
Sheldon's Hobbies	101
Sid Morgan Vintage Plans	76
Sig Manufacturing Co. Inc.	4
Super Tiger	5
T & D Fiberglass	71
Technopower II, Inc.	67
Teleflite Corporation	68
The Hobby Box	103
Thorpe Engr. (Star Hawk)	87
Toledo Show	66
Tom Dixon	71
Top Flite Models, Inc.	99
U.S. Boat & Ship Modeler Subs.	81
Uber Skiver	108
U.S. Free Flight Champs	107
Walt Mooney Peanuts	79
Williams Bros.	72
Windsor Propeller Co.	72
World Engines	3
Yellow Aircraft & Hobby Supply	79
Zenith Aviation Books	70

this a most desirable event! Let me end this by saying that this Flightmaster contest is in no way trying to compete with the Flying Aces Nats. All we are trying to do is to get some fun back in F/F Scale out here on the West Coast!

For those unfamiliar with the F.A.C. rules we will make them available, plus I will print a condensed version in this column. •

Byron Bullet. . Continued from page 23

marginal, yet rudder functioned normally. The Bullet set itself up in a skidding turn and continued to orbit the field with Marty and Dave handing the transmitter back and forth. The engine, which was running at high throttle, but very roughly, finally quit,

and the Bullet pancaked in a nearly level attitude. Within seconds we saw flames erupt; Marty dashed to the site with a fire extinguisher. When the fire was put out and the model was inspected, the cause of the episode became apparent. The tuned pipe ruptured at the dome (the end farthest from the engine). This directed hot exhaust onto some of the radio components and caused the partial loss of control. The battery pack was charred beyond recognition when it was pulled from the airframe.

"Marty notified the Byron factory of the pipe failure and even sent a video tape of the flight for their observation. Within several weeks, the factory released test results to us and suggested a fix. It was determined after numerous factory engine runs that the tuned pipe temperature of a Rossi .90 burning 10-percent nitro fuel was substantially higher than the same engine burning 20-percent nitro. I am not sure why, but Byron's test consistently demonstrated that the 'hotter' fuel produced lower exhaust heat (at least the pipe was cooler).

"We switched to 20-percent Byrojet fuel and went through the bench-run process again. A second cylinder head shim was added to lower the compression slightly, and consistent runs of 20,200 rpm were achieved. This translated to a static thrust of more than 13.5 pounds.

"There was no evidence of stress on the new pipe during the bench runs; however, installation in the model would provide the acid test.

"The model was passed back to Mr. Malchione who strapped on the transmitter and proceeded to fly the Bullet now sporting a new fuselage, new tuned pipe, and partially new radio. This time, all went perfectly. The model displayed an excess of thrust; its airframe should be very happy with a smaller engine, such as the Rossi .81 or O.S. .77. The Bullet's speed and vertical ability was outstanding. This model could clearly hold its

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own against other high-performance jets. The most notable characteristic was the superb smoothness of the model. Marty had the surfaces set in accordance with the manual which provides perfect control harmony.

"After nearly six minutes in the air, Dave landed with half-full tanks. There was no evidence of damage to the tuned pipe, nor was there any evidence of charring to the airframe.

"A few final observations about our experience and the project: I have always said that Byron Originals is one of the most responsible and professional firms serving our hobby. They deliver what they advertise and they have a history of supporting their products. Our Bullet project is further evidence of this. The Bullet was designed and test-flown by the factory before the Rossi .90 was available. The model was proven using earlier smaller engines in numerous pre-production prototypes before it was released to the general market.

"The Byron factory truly impressed me with their immediate attention to the prob-

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Earl Stahl's 1939 Wakefield entry for rubber power, in a new plan drawing.

lem, and their suggestion of a fix. It should also be noted that Byron does not manufacture the tuned pipe, yet they have assumed much of the responsibility to make the system better.

"In sum, I consider the Bullet to be an excellent value for experienced modelers who want an introduction to jet flight or who are looking for a simple model to accumulate more jet experience without risking a complex scale subject. The Rossi .90 is clearly the most powerful ducted fan engine in general distribution. Its operation with the new Byrojet fuel is breathtaking. Our model achieved a thrust-to-weight ratio well in excess of 1:1.

"I would suggest, however, that if you plan operations from grass fields, you should lengthen the landing gear and use larger tires. The Bullet sits close to the ground and could use a greater rotation angle for more positive soft field takeoffs." •

Counter. Continued from page 9
Hills, California 92653.

* * *

"Avistar 40" is the name of the new ARF R/C ship from Great Planes. This is a 40 powered model of very conventional design that is being marketed as a four-channel trainer for novice pilots. The Avistar 40 features all-wood construction and comes pre-covered with heat-shrink plastic film in a red/white/blue color scheme, leaving only minor assembly and installation of engine and radio—a few hours work at most. Wingspan is 60 inches.

Also from Great Planes is the new Hobbico expanded scale voltmeter, which can be used to test your 9.6-volt transmitter packs and 4.8-volt airborne packs. The instrument tests your batteries under a simulated load, and by interpreting the readings you can get an accurate picture of your bat-

tery's discharge characteristics.

Both the new Avistar 40 and Hobbico ESV are available from your dealer or from Great Planes, P.O. Box 4021, Champaign, Illinois 61820. •

Jake. Continued from page 11

pended to answer your letter. My writing tablet was in my briefcase which was in an overhead compartment 14 rows back and on the other side of the airplane. That was the nearest available space. The briefcase was wedged tightly under my hat and coat, and under the bowling ball that had been carefully placed on top of my hat and coat.

I hope I've given you the flavor of modern air travel. As to my advice about taking the plane . . . don't! Hitch a ride in the back of a garbage truck, cattle car, or sewage tanker. In the long run, you'll arrive fresher and in a better mood.

Jake

Dear Jake:

August 8, 1988, or 8-8-88, occurred this year amidst much hoopla from the psycho-numerologists and the rest of the lunatic fringe. Anything out of the ordinary happen to you that day?

Thomas in Trenton, New Jersey

Dear Thomas:

Not a thing. That fate-by-the-numbers stuff is a bunch of baloney.

Jake

Dear Jake:

Enclosed please find a summons for your appearance in Manchester County Traffic Court. You will be required to enter a plea on the speeding ticket issued to you at 8:08 p.m. on August 8 for exceeding the speed limit by 8 mph on Route 888 at the 88-mile marker. Issuing officer is Sgt. Aldo Hewett, badge No. 88-888. Court time is 8:00 a.m. Should you decide not to contest the ticket, you may mail in the \$88 fine plus \$8 court costs. Send your check to: Clerk of Records, Manchester County Court, Department 8, 888 South Madison, Manchester, Oregon 88888.

Roscoe W. Richardson
Clerk of Courts

Dear Jake:

One of my students showed me your dissertations on aerodynamic half-life. I found the concept that an aircraft's ability to fly erodes with time intriguing and began research of my own. My findings have confirmed your claim that loss of subatomic aerion particles through radiation is responsible for the phenomenon. I have also verified your definition of aerodynamic half-life as the time it takes for an aircraft to lose half of the aerions it originally had, and therefore, half of its ability for flight.

While the majority of my results have supported your theories, I have found a skew in the data which indicates that local geography may affect aerion radiation between terrain and aerodynamic half-life? If so, please explain. Thank you.

Professor Ottmuth in Columbus, Georgia
Dear Professor:

There is indeed a very strong relationship between an aircraft's half-life and the geographical area in which it is flown. Organic features of the landscape, such as tall trees, seem to lessen aerodynamic half-life. No one fully understands the scientific process at work, but it has been proven that model airplanes flown through a stand of trees do not last as long as ones flown over flat, featureless ground. Perhaps the photosynthesis process carried on by the trees absorbs aerions and therefore saps the airplane's flight capabilities.

Atmospheric conditions also affect aerodynamic half-life. Studies show that aircraft flown in rain, lightning, and high winds have a lower life expectancy than those operated in clear, still air. Again, the scientific principle is not clear, but it is likely that aerions are washed away and/or blown away by the rain and wind. One researcher in Pismo Beach, California, also believes that the static electricity in lightning can reverse the charge of an aerion particle and change it into an antiaerion. If this turns out



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to be true, it would explain poor flight characteristics in thunder storms, because antiaerion-laden objects have aerodynamic half-lives near statistical zero.

For those of you unfamiliar with the antiaerion, it is a gravity amplifying subatomic particle which increases the attraction between an object and the Earth, and therefore makes flight virtually impossible. A good example of an object with a high antiaerion content would be either a Buick or Nell Carter.

Jake

Workbench. . . Continued from page 11

thin and thick viscosities.

A bonus feature of the new UFO cyano is that it is also WFF, or White Foam Friendly (we made that up), in that it can be used for bonding white foam without a protective primer. Now you can add spars and wood skin to foam cores without any additional steps.

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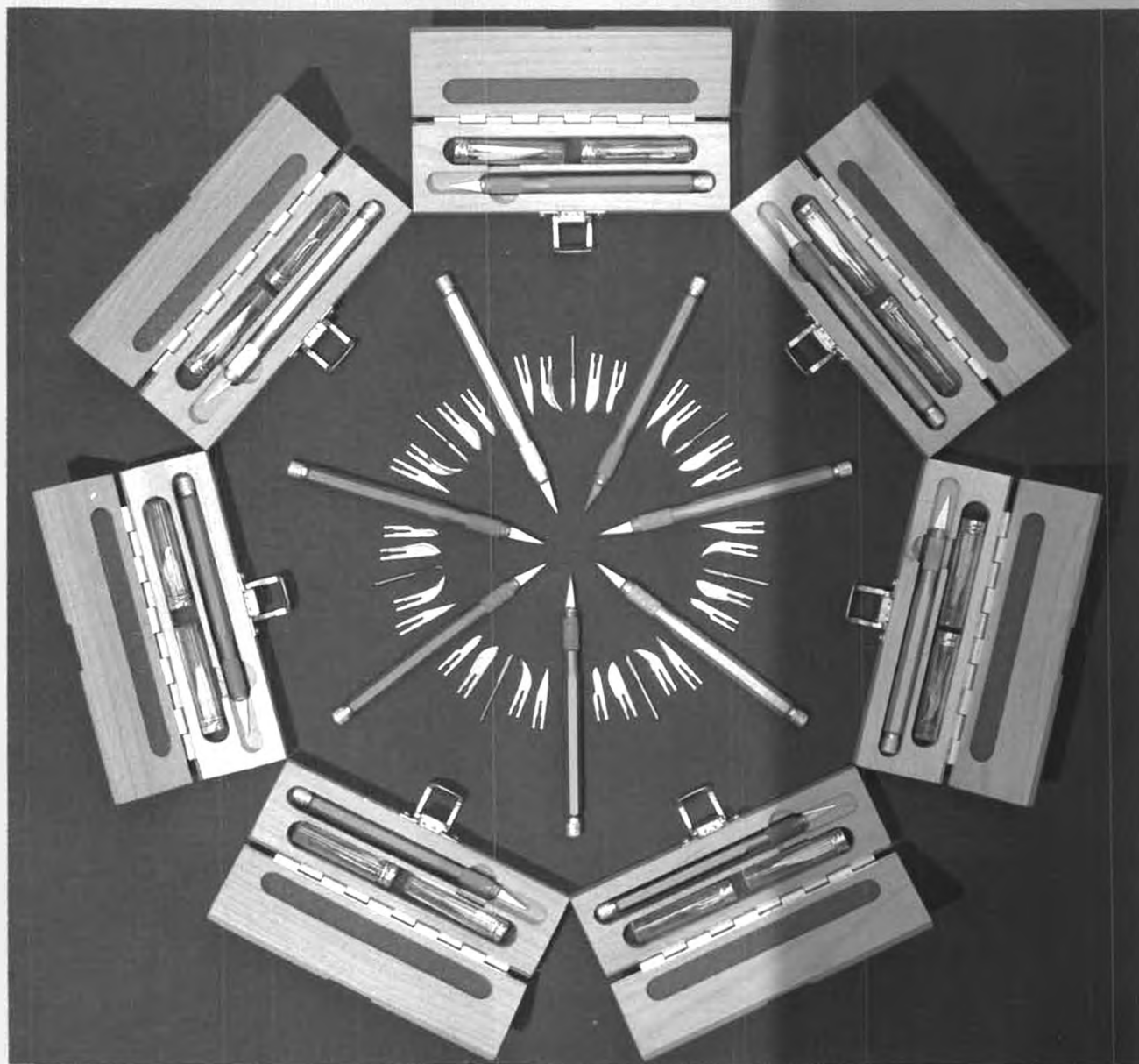
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7UAP PCM 1024 transmitter with trainer system and RF module.

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An inside look at the R129DP shows the exclusive Futaba PCM 1024 microprocessor and surface mount construction (SMT).

while the 7UAF is equipped with an R128DF/8 Channel, dual conversion FM unit.

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