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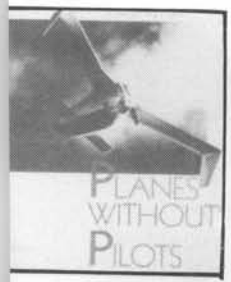
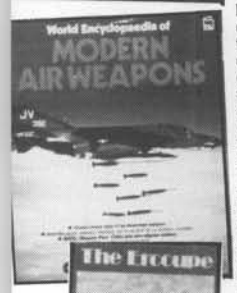


PLANES WITHOUT PILOTS: ADVANCES IN UNMANNED FLIGHT, Siuri. An in-depth look at current UAV research and ways this technology is being used in the development of "smart" weapons, unmanned attack aircraft, advanced aerial sensors, space probes, and more. Describes how specific advances in microelectronics, robotics, optics, and artificial intelligence have made recent UAV breakthroughs possible and speculates on the direction of future. 96pgs. with full color, 7" x 10", sfbd.....1244A **$12.95**



MODERN AIR WEAPONS, Chant. In this period of Middle East war, here is a definitive look at the weapons of all modern nations, including every type of air-launched system, including guns, bombs, rockets, air-to-surface and air-to-air missiles from NATO, Warsaw Pact and non-aligned countries. If you want the specs and info on the weapons being used right now, this is a fine reference. Approx. 200 photos, 312 pgs., 8" x 9", hdbd.....4485C **$35.00**

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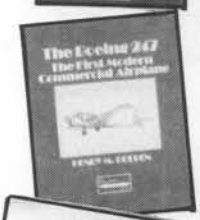

KITPLANE CONSTRUCTION, Wanttaja. A complete guide to selecting and building wood, metal or composite homebuilt aircraft. Includes tips for laying out your workshop, tools, comparison of various kits, actual building techniques, and the all-important 40-hour test period. Includes reference charts, material and hardware sources. 110 photos and diagrams. 256 pgs., 7" x 10" sfbd. 4713A **$18.95**

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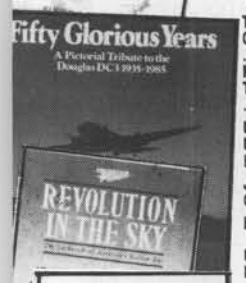

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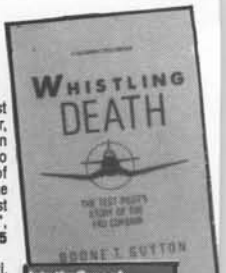
WHISTLING DEATH, Guyton. Written by the test pilot who did the flight testing of the Corsair, comes this extraordinary account of the men and women who worked around the clock to bring the Corsair into aerial action in the nick of time in the Pacific. Relating the close calls, the crash landings, and the humor as only the test pilot could. Illustrated, 320 pgs., 6" x 9", hdbd.....1896C **$24.95**



INTO THE GUNS OF PLOESTI, Newby. Ploesti, located in Romania, was Hitler's main source of oil for the war effort. It was some of the most heavily defended air space and saw some of the most costly air raids of the war. This is the first-hand account of those who flew the raids on Ploesti, complete with photos of the nose art, planes and crews. Sfbd., 6" x 9", 208 pgs., 65 ill.....2960B **$12.95**

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SCREAM OF EAGLES, Wilcox. The creation of Top Gun and the story of the U.S. Air Superiority in Vietnam. Naval fighter pilots in Vietnam tell their own story about the need for and the formation of the Top Gun School to provide realistic combat training for U.S. Naval aviators. Takes the reader inside the cockpit in a gripping narrative. Illustrated, 295 pgs., 6" x 9", hdbd.....4482D **$22.95**

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DEPARTMENTS

HELICOPTER WORLD

FEATURES

PRODUCTS IN USE (REVIEW)

CONSTRUCTION

ON THE COVER

The "Genesis" sailplane from Peck-Polymers is the subject of review on page 68. Lower right, another excellent sailplane, the Great Planes "Spirit," is also reviewed, on page 52. Lower left is Skip Ruff's radio-controlled Martian Spaceship, and you can start building it by following the plans on page 74; Part 2 of this construction article will appear in our September issue.

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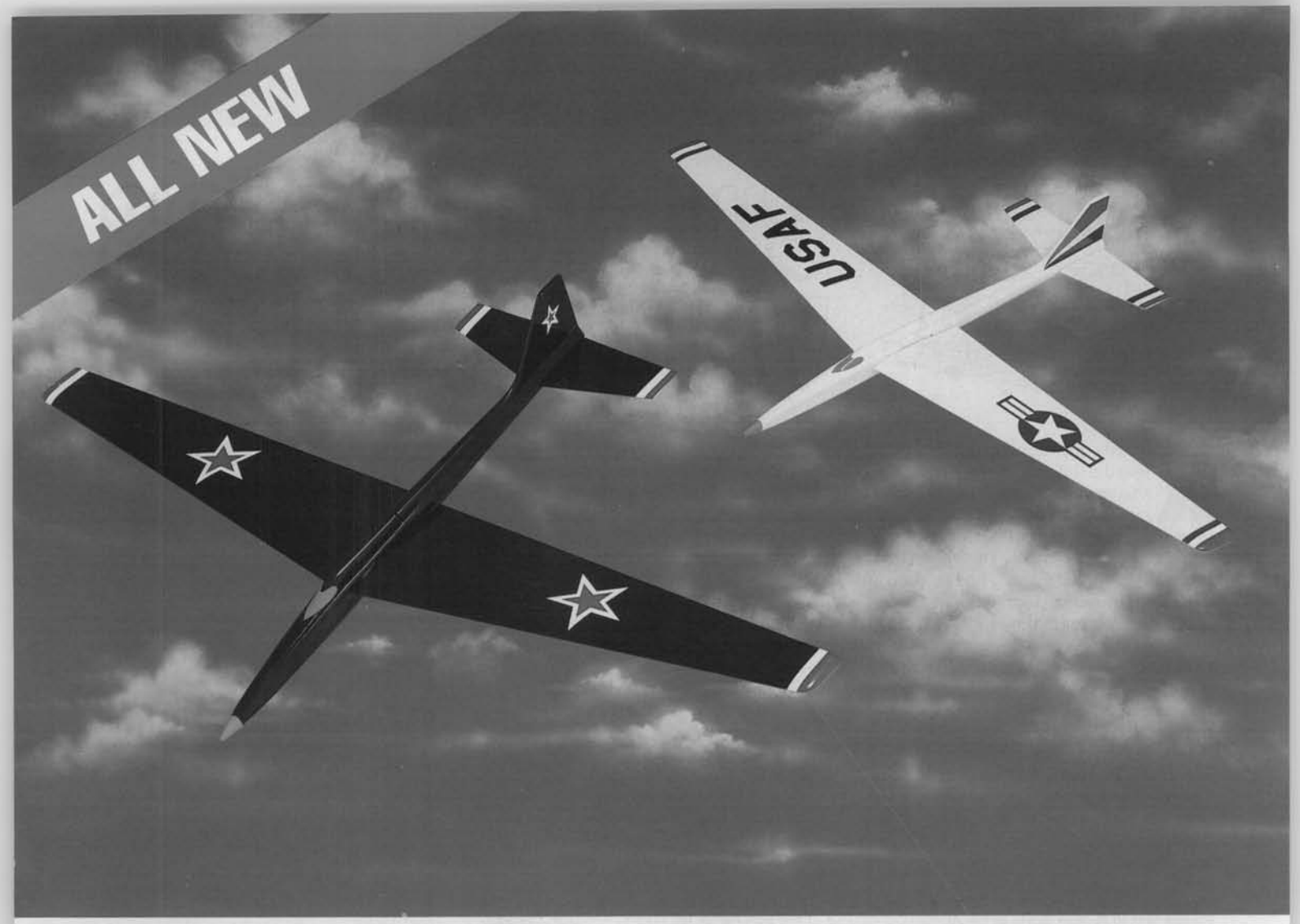

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BILL NORTHROP'S WORKBENCH

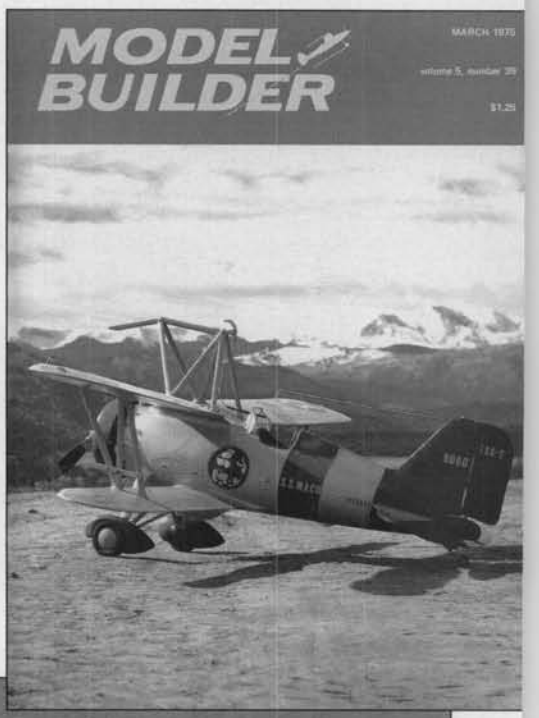
Recently the news media informed us that the remains of the airship U.S.S. Macon has been found on the Pacific Ocean floor off Big Sur, some hundred or so miles south of San Francisco, and considerably south of where it was originally believed the ship had crashed into the ocean during a storm back in 1935. Of particular interest in the report was the fact that one of the Curtiss "Sparrowhawk" aircraft that went down with the Macon, was discovered to be in remarkably good condition, and would probably be salvaged and restored.

Remembering that we had published a construction article for a control line or RC Sparrowhawk at 1-1/2 inch scale some years ago, we looked up the plan in our listings, pulled out the corresponding back issue, and discovered that the particular full-scale aircraft that model designer Charlie Smith had chosen to build was one of the Curtiss F9C-2 Sparrowhawks stationed aboard the Macon, and probably on board when it went down in the Pacific! How's that for a kind of haunting coincidence!?

THINGS TO DO

Radio controlled model aircraft will participate in the commemoration of the 50th anniversary of the infamous attack on Pearl Harbor on December 7, 1941. The event will take place at the 1991 Top Gun HydroFest on Ford Island, Pearl Harbor, Hawaii, in October.

Based on the outstanding RC Air Show put on by the Hawaii Miniature Aircraft Association (HMAA) during the 1990 Top Gun HydroFest, the Commanding Officer of the Pearl Harbor Naval Station, Captain Joel A. Porter, U.S. Navy, requested the



(Below) Fairchild 51 built from *Model Builder* plan No. 7721 by Gordon Boose, Windsor, Ontario, Canada. Placed first in Novice Scale at the Annual Concourse of the Sun Parlor RC Flyers, Windsor, Canada. Scale is one-inch, span 44 inches. Powered by geared Astro Cobalt 02 using four cells and turning an 11x6 prop. (Right) Reproduction of our March 1975 cover photo, showing Charlie Smith's model of a Curtiss F9C-2 "Sparrowhawk," as carried onboard the airship U.S.S. Macon (dirigible). More in text.

Association's return for this year's show. It is hoped that participation will include the Byron "Tora Tora" type dog fight; the Cloud Dancers, flying large scale F15s; and RC Unlimited Racers, Inc., with four of the big scale racing planes doing a Reno style exhibition. Ducted fan demos will include Bob and Patty Violett, Bob Fiorenze, and Dennis Crook. Col. Art Johnson and Frank Tiano will also be attending.

For more information about the Hydro-Fest, contact Bruce Harlow, Chairman, 775 Punahou St., Honolulu, HI 96826, phone (808) 949-6211.

• • •

Still out in the Pacific theater, Australia and New Zealand will jointly host three consecutive rounds of the FAI Free Flight World Cup Championships during April 1922. The first will be held on New Zealand's North Island, with the following two in Australia, in the states of Victoria and South Australia.

Contacts for further information on the details, dates, venues, accommodations, travel, etc. are: Australia; Richard Blackam, 7 Leslie Rd., Gisborne, Victoria 3437, Australia. New Zealand; David Ackery, 1 Tarata St., Mt. Eden, Auckland, New Zealand.

• • •

Received an announcement from Mel Larson, Executive Vice President and Director of the Circus Circus Hotel/Casino, Las Vegas, Nevada, that the Eleventh International Tournament of Champions will take place on October 22 through 25, 1992. This time the purse, always the richest in the field of radio controlled aerobatics, will exceed $100,000.

As in recent years, a total of twenty competitors will be invited from the United States and from other nations. Aircraft specifications will remain the same as in the 1990 TOC, but the following changes will apply. First, there will be no bonus flight score for biplanes. Second, the K (difficulty) factors are being reworked to be more appropriate for miniature, as opposed to full-size aircraft. Third, the three-minute free program will be incorporated into the main contest rather than being a separate event, as in 1990. And fourth, judges will be more equally divided among experts in full-scale aerobatic contests and specialists in aeromodeling.

For further information, and room reservations, contact Circus Circus Hotel at P.O. Box 14967, Las Vegas, NV 89114-4967, phone (702) 734-0410.

LOOKING FOR

Where are you, Josh Harel? We received a letter from the editor of the British magazine, *Radio Control Models and Electronics*, Kevin Crozier, who has a letter from you requesting information on the Martin Baker MB2 which was pictured on RCM&E's cover back in January of 1978. Unfortunately, your address is not on the letter, and the envelope was "deep-sixed." If you see this, or one of your modeling buddies sees it and will pass it on to you, Kevin wants you to

continued on page 6

ADVICE FOR THE PROPWORN—

BY JAKE

Dear Jake:

The last time I flew my Goldberg Eagle, the battery in the transmitter went dead. Fortunately, I had already landed, so no damage was done.

This morning, as we were loading up the car for a trip to the flying field, I remembered that I had forgotten to charge that battery since the last time out. Not to worry, I figured. My wife hadn't finished packing the picnic lunch yet, so I put the battery on high rate charge for about three minutes while she wrapped the sandwiches. That should be safe, don't you think?

Neil in New Brunswick, NJ

Dear Neil:

Absolutely, but don't try to operate those sandwiches for more than twenty minutes on only a three-minute wrapping.

Jake

• • •

Dear Jake:

Hi, it's me, Tommy Smith.

Last week, Mr. Pierpont, our science teacher, held an indoor rubber powered airplane contest in the gym. Me and my Cub Scout buddy, Raoul, entered our Sleek-Streeks.

Raoul's made a flight all the way to the ceiling and got stuck in a light. I told Mr. Pierpont that we could get it down with a helium balloon on a string. He went back to the classroom and filled up a balloon from the helium tank. We tied a string on it and let the balloon up to the ceiling. We could make it bump Raoul's plane, but it wouldn't come loose from the light.

I suggested to Mr. Pierpont that if we put some super glue on the balloon, we could get it to stick to Raoul's plane and then pull it down. He agreed, so I squirted some slow, thick super glue on the balloon. Because glue was involved, Mr. Pierpont insisted that he handle the balloon.

Since I didn't have anything to do, I decided to fly my Sleek-Streek. Unfortunately, it flew through the string and cut it as Mr. Pierpont was letting the balloon up toward the ceiling. A heater blower came on just then and blew the balloon down and out into the hallway.

A minute or two later, the balloon floated back into the gym with a toupee stuck to it and Mr. Howell, our principal, in hot pursuit. He grabbed it about six feet in front of Mr. Pierpont and shouted, "What's going on here?" Mr. Pierpont, with a string in one hand and a bottle of super glue in the other, was about to answer when Mr. Howell noticed that his hands had become stuck to the balloon.

In trying to get free, Mr. Howell must've dug his fingernails into the balloon because it popped right in his face. His toupee flew up and stuck to Raoul's airplane. Mr. Howell must've inhaled the helium from the balloon, because in a voice that sounded like a cross between Tiny Tim and Alvin The Chipmunk he squeaked, "You're fired!" at Mr. Pierpont. Then Raoul's Sleek-Streek fell down and stuck to his bald spot.

I have a technical question. Can Mr. Pierpont suspend me, if technically, he was already fired by Mr. Howell?

Your friend, Tommy Smith

Dear Tommy:

I suppose not, if you want to make an issue of it. I have a technical question for you, too. What happened to the toupee?

Jake

• • •

Dear Jake:

What kind of snow skis should I put on my airplane for winter flying?

Klaus in Stowe, VT

Dear Klaus:

It depends on what kind of winter flying you plan to do . . . downhill, slalom, or cross country.

Jake

• • •

Dear Jake:

I read in your magazine that microfilm is the preferred covering for ultra light weight indoor endurance models.

I didn't know what microfilm was, so I went to the library to look it up. I asked the librarian at the desk where I could find information on microfilm, and she told me the microfilm room was down the hall across from periodicals. I was pretty impressed that they had a whole room just for microfilm.

The microfilm room had another librarian in it. I told her I wanted to find out about microfilm. She told me to sit in front of the microfilm machine and she would get some for me to look at. I had no idea that microfilm came from machines in libraries.

The machine didn't make a lot of sense, though. It looked like a TV screen. While I was trying to figure out how the machine made microfilm, the librarian brought over some movie strips, put them in the machine, and started showing me TV pictures of pages from newspapers and books. When she was all done she said, "Well, that's how microfilm works," and asked me if I wanted to see anything else.

I was confused. I told her I wanted to see the microfilm that was for model airplanes. She brought over another movie strip and

continued on page 6

WORKBENCH *Continued from page 5*

contact him so he can relay your request to the builder of the model, one David Vaughan.

While you're at it, Josh, you might want to contact Dan Parsons, of Albuquerque, New Mexico, who campaigned the contest trail quite successfully a few years back with a beautiful model of what we are sure was the same aircraft. Dan is the guy (no charge for the plug, Dan) who markets extra lightweight fiberglass cloth for model finishing purposes. Contact him at 11809 Fulmer Dr., N.E., Albuquerque, NM 87111, phone (505) 296-2353.

CLARIFICATION

In Bob Stalick's "Free Flight" column, May 1991, he talked about the disappearance of the great little Astro Flight electric starter for Half-A engines (mine hasn't disappeared, but it doesn't get much use). Obviously, they became scarce because Astro Flight is just a little more interested in running electric motors than in starting "infernal combustion" engines, so production of the starter was discontinued.

Bob then confused the issue just a little by saying, ". . . they are available again. Contact Miller RC Products, at P.O. Box 425, Kenwood, CA 95452 (the 94952 was incorrect), or call (707) 833-5905." What Bob *meant* to say was that, yes, half-A starters are again available, but they are **not** Astro Flight's, they are a product of Miller RC! The Miller RC 1/2A Mini Starter sells for $34.00, and . . . read carefully now . . . they do have rubber insert cones for the Astro Flight starter as well. Got it?

NAME THAT MODELER

Received a nice letter from a modeler I've known for many years, though I haven't seen him since he was a youngster, Jim Bonnema. Jim's father is Vince Bonnema, a pioneer RC modeler who was a consistent winner of East Coast contests in the 1950's and early 1960's. Several of his designs were published in classic issues of *Air Trails* magazine. Jim's brother, Ken, designed and built the Reed Special biplane flown by Steve Rojecki to first place at the 1984 TOC. Ken also has had some articles published in *Model Builder*, the most remembered of which is the "Brushfire" precision aerobatic ship, published back in 1980, but still considered a competitive design 11 years later.

Anyway, Jim corrctly identified the mystery modeler pictured in the June issue as the famed Ben Shereshaw, former engine manufacturer (the Bantam 19), and designer of many beautiful models that are considered the "cream" of Old Timers, such as the "Super Bucaneer," "Nimbus," "Custom Cavalier," "XP-3," and many others. Incidentally, Jim, we saw Ben, and his son Jon, at the 1991 WRAM show, and he's looking great.

Jim also caught a boner that we committed in the January, 1991 issue. We identified Ed Kazmirski's World Championship pattern model as a "Taurus" instead of the "Orion" that it was. He designed both models, which became two of the most popular kit models ever to appear on the market, both produced by Top Flite Models, then under command of its founders, Sid Axelrod and Mike Schlesinger.

S.A.S.E. PLEASE!

We received a letter asking for information about flying bodies, not the type you see on some of our wonderful, educational movies on TV when someone pushes the button on a radio controlled bomb, but the type of flying machine that does not depend on wings, but instead, on the aerodynamic shape of the body, or fuselage. Our best answer is, "See this issue," as it features the first of a two-part article on Skip Ruff's RC version of Roy Clough's original "Martian Space Ship" design.

Our main reason for bringing this up is that often times, readers will write in and ask for information requiring a mailed return answer. Please understand that we're not being chintzy about spending 29 cents for postage, but to answer your questions, we have to hopefully only take a few minutes to come up with an answer (how much can we carry on the top of our head?), then write an answer, turn it over to a secretary, have her type the letter, bring it to me for signing, and finally taking it to the mail basket. It's not the cost of materials and postage that causes a problem as much as the time consumed to provide an answer. That time has to be deducted from the processing of plans orders, the processing of subscriptions, and the many daily requirements of keeping a publishing office on schedule. Please, when asking for a written response, send a stamped, self-addressed envelope with your request. In most cases we can jot an answer on the margin or back side of your letter, stuff it back into the S.A.S.E., and drop it in the "Out" basket.

Of course, if you write in and ask which issue a certain article appeared in "about 12 years ago," that had to do with the evolution of slope soaring flying wing gliders, we'll probably invite you to come to our magazine warehouse, so you can go through 230 issues and find it yourself! ***MB***

DEAR JAKE *Continued from page 5*

showed me TV pictures of pages from your magazine.

She must have noticed my perplexed look, because she asked me if anything was wrong. I thanked her for the slide show, but told her all I wanted was to see the kind of microfilm that covers model airplanes. She said, "You just saw one."

I gave up and went home. What in the world was going on? Can you straighten me out on microfilm?

Richard in Rhode Island

Dear Richard:

I don't know where you people get your information. You and the library are both way off base. Microfilm is a Kodak product that spies use in those tiny little cameras hidden in their tie clips.

Jake ***MB***

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- **MODEL AVIATION** magazine subscription to give you all the news you need, plus building and flying stories, month after month.
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- Newcomer support and instructor programs to promote safe flying through more than 2,000 U.S. clubs.

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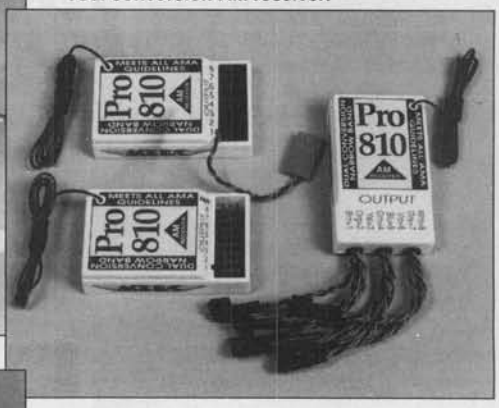
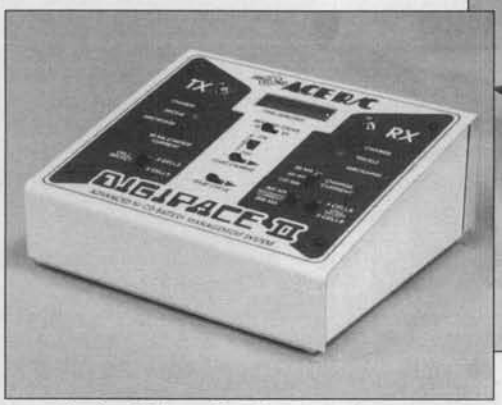
OVER THE COUNTER

The "Big Bingo" from Ace RC.

The versatile Ace RC Pro 810 narrowband, dual conversion AM receiver.



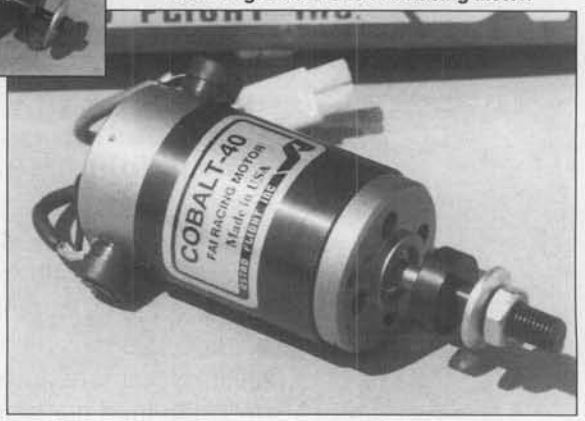


The Ace Digipace II radio system battery cycler.

Astro Flight Cobalt 15 FAI Racing Motor.

The Cox Hobbies .020 RC "Turbo Centurion."

Astro Flight Cobalt 40 FAI Racing Motor.



Like they say at Ace RC, 116 West 19th St., Higginsville, MO 64037, phone (816) 584-7121, FAX 7766, "It is an accepted fact that the majority of radio failures can be attributed to battery problems." So saying, Ace has modernized and enhanced its well-known Digipace NiCd cycler to the Digipace II, with an assembled list price of $159.95. Ace's claim that it is the most advanced and versatile Nickel Cadmium Battery Management System available, is probably difficult to dispute.

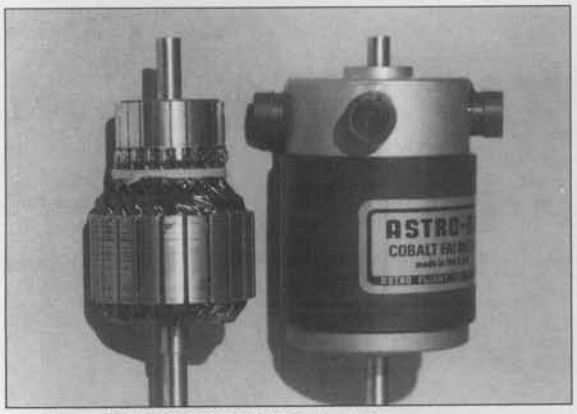
What's bigger than a Bingo? How about the "Big Bingo?" Pretty easy to recognize as a "Doc" Mathews design, the Big Bingo is Ace's latest airplane kit, definitely in the giant class. With a span of 85 inches, a wing area of 1425 sq. in., and power recommendations in the 1.08 to ST3000 two-cycle, 1.2 to 1.6 four-cycle, or Q35, G23/38 gas engine range, it fits the description. Kit features the typical lite ply "tab lock" fuselage construction, along with hardwood wing spars, lite ply ribs, and formed leading edges. The light-weight wing is two-piece for easy transporting. There's a 3/16-inch thick T-6 aluminum landing gear, with wheel pants, and a complete hardware pack with heavy duty linkages. For control, all that is needed is a basic four-channel radio system.

And speaking of radios, this has been the main game at Ace since its beginning back in the fifties. Latest offering is the Pro 810 narrowband, dual conversion AM receiver. In addition to being the perfect match-up for the new Ace Micropro 8000 transmitter, the Pro 810 will also listen attentively to your favorite existing gold stickered transmitter of most any other make, all you need do is specify the brand and the band! Not only are they available for all even and odd 72 MHz airplane frequencies, but also for the even and odd 75 MHz surface frequencies . . . particularly good news for the scale boaters, who can make good use of all eight operational channels! All the Pro 810's list in the $90 range.

@#$%&*"<}+! We just lost over a half hour of valuable word processer time! The fourth new item from Ace RC is the 1991 Catalog. There's no way you can just thumb through this thing without getting trapped! It's like opening a bag of potato chips. One thing just leads to another!

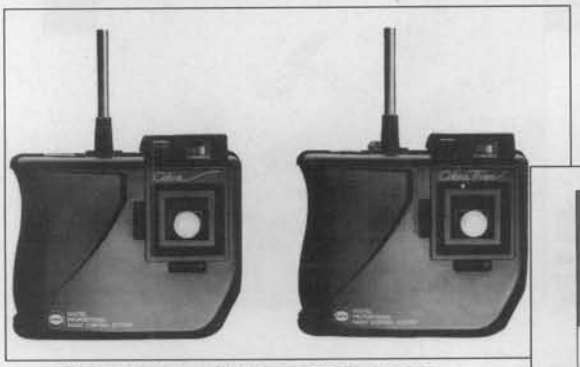
The overall theme of the catalog is "Made in America." It is basically divided into three sections: First are the products manufactured by Ace, followed by umpteen items produced by other manufacturers that Ace distributes and/or retails to the consumer, and finally the components listing . . . all the items individually available that are used by Ace to manufacture all of its products. Like we said, they could have printed the catalog

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



Astro Flight Cobalt 60 FAI Racing Motor.

The very small RCD Micro 535 FM receiver.

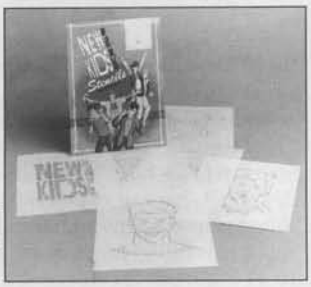


The gold stickered Cobra and Cobra Three radios from Cox Hobbies.

Latest book from Hannan's Runway. Lotsa plans!

Ducted fan T-33 from "Builder's Package" by Leading Edge Models.

Molded epoxyglass cowl and wheel pants for Goldberg Ultimate, by R/C City.



Stencils for air-brushing, from Badger Air-Brush Co.

on flypaper, it's no easier to put it down once you pick it up! If you're a glutton for punishment and know how to control your urge to spend, order the catalog for $2.00, but don't claim we didn't warn you!

• • •

Once a modeler gets past the beginning stages of using electric power for flying RC model aircraft, the selection of high quality motors becomes paramount, particularly for the flying of larger and competitive models. This is where Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292, phone (213) 821-6242, comes into the picture. Whether in boat racing, car racing and truck pulling, or electric powered flight competition, the serious modelers turn to Astro Flight for electric motive power.

Astro Flight has three new motors, all with cobalt magnets, to fill many of the needs for competition and sport flying. They are the Cobalt 15 FAI Racing Motor, the Cobalt 40 FAI Racing Motor, and the Cobalt 60 FAI Racing motor. All of these motors use a special steel field ring for maximum magnetic flux, and the new slotted silver racing brushes. The Cobalt 15 is designed for FAI 10-cell F3E sailplane competition, and features a seven-slot armature wound with seven turns of 19 gage wire. For direct drive, the Astro 8 x 4.5 folding prop is recommended. For gear drive, the Astro 4033 gear box and Astro 12 x 9 folding prop.

The Astro Cobalt 40 is designed for 21 to 24-cell Pylon Racing, and for RC aerobatic competition flying. It uses an 11-slot armature wound with six turns of 19 gage wire. For direct drive, an APC 9 x 8 prop is the way to go. For gear drive, use the Astro 4041 gear box and an APC 12 x 9 prop.

At least for now, the Astro 60 Cobalt is the big horse in the line. This is the motor that powered the Silver Medal winning United States F3E team at the 1990 World Champs. This motor uses a heavy steel four-pole field ring, and a special 22-bar armature lamination for lower hysterisis and circulating current losses. It uses four of the new slotted silver racing brushes, and a six-turn winding. The Astro 205 electronic speed control is also recommended for this motor.

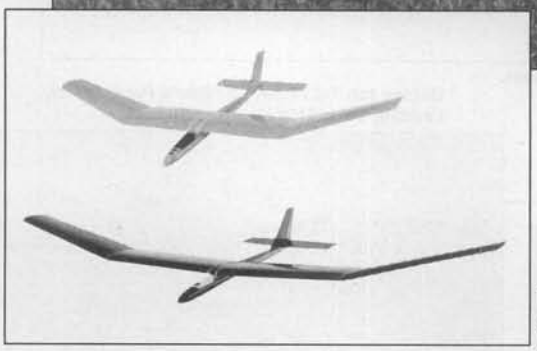
For more information, contact Bob Boucher, and while you're at it, ask him about his new, low-loss, gold-plated, polarized connectors. And be sure to tell him you read about it in *Model Builder*.

• • •

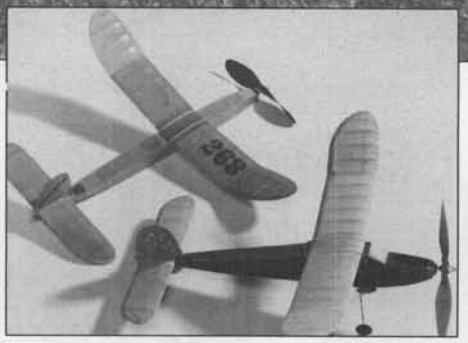
Let's give Cox Hobbies, Inc. a round of applause for the best new idea to help the raw beginner to succeed in his first attempts at radio control flying. Called the "Failsafe" radio system, it is offered as part of the complete ARF (Almost Ready to Fly) packages featuring the little electric powered "Flyboy," or the .020 gas powered "Turbo Centurion."

Both of these models are controlled by rudder only, a method of control that may not be familiar to recent RC modelers, but one that many of us cut our teeth on in the 1950's and early 1960's. Yes, Martha, we won't go into detail here, but you can control your model's altitude as well as its flight direction with rudder-only control. And to protect the novice from the major cause of

Giant scale Fokker D-VII and SE-5A from Rich Uravitch plans.



Two new RC gliders from Minimax.



Wally Simmers' Gollywock (above) and Jabberwock from Midwest Products.

crashing that comes with the earliest flights . . . over control . . . the Failsafe system prevents this. The transmitter has only two control buttons; one for right turns, and one for left turns. You *should* only push a turn button momentarily to change the plane's flight direction, and continue with momentary pushes if you want to keep the model turning in a chosen direction. However, the novice will invariably hold the button down, which would keep the rudder turned, and spiral the plane into the ground before the tyro even knew what happened. The Failsafe, on the other hand, automatically turns off a moment after the button is depressed, no matter how long you hold it down. If you want more turn, you gotta push it again, Tony! Sure, if you furiously "machine gun" one button fast enough, you could probably still spiral the model into the ground, but this will be on stupid purpose, and not by mistake!

Caution: The Cox "Failsafe" radio receiver does not meet the 1991 narrow band requirements, so will not be safe to fly with "gold stickered" radios operating in the same area. However, we can agree with the contention that the use of one of these little package RC models will be for a relatively short time-span, and that the novice who will get hooked on RC will move up to "the gold," having spent only a small amount of money in the process of discovering a great new hobby for himself!

And speaking of "gold," Cox Hobbies now offers the the Cobra radio system, with the "creature comfort" transmitter, in both two and three-channel modes, and with narrow band, dual conversion 1991 receivers! Both transmitters feature the dual control single stick, while the "Cobra Three" has an additional third channel "finger tip" control, for throttle, flaps, spoilers, or what have you.

For more information, watch the Cox ads, or write to Cox Hobbies at 350 West Rincon St., Corona, CA 91720.

• • •

RCD, Radio Control Development, Inc., 9419 Abraham Way, Santee, CA 92071, phone (619) 449-1112, FAX 1002, has just introduced the Micro 535 FM five-channel Dual Conversion receiver. Smaller than the space it takes here to tell about it (1-7/8" by 3/4" by 1-1/8"), it even takes up less space than the average two-channel receiver. And though as bullet proof as the seven-channel RCD Platinum receivers, it's obviously not armor plated, as it weighs less than one ounce! Surpassing all AMA 1991 guidelines, it is available on both 72 and 75 MHz frequency channels, and is compatible with most popular radios and connector types.

• • •

The latest book to take off from Hannan's

continued on page 108

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Protech 702	- $36.95	Astroflight 112	- $69.95
Protech 706	- $79.95	Astroflight 114	- $37.95
Protech 707	- $54.95	Astroflight 115	- $47.95
Digipace Kit	- $69.95	DMVC	- $ 40.45
Chargemaster	- $44.05	CVC Kit	- $ 27.95
Field Charger	- $35.93	Digi/Auto	- $114.95

GYROS

JR 120	$ 109.95	SG - X	$ 79.95
JR 130	$ 79.95	Futaba 153	$ 109.95
SG- 1	$ 109.95	Futaba 154	$ 64.95

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Agressor II	- $495	KBV.82	- $295
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MAX 6 PCM Heli	- $314	MAX 4 AM Air	- $114
MAX 6 FM Air	- $179	X347 PCM Heli	- $449

Futaba

2PB 2/148	- $ 54.95	7UHPS 5101	- $439.95
2PB MC112	- $ 84.95	7UHF 4/5101	- $349.95
7UAPS 4/148	- $379.95	5NLH 4/148	- $219.95
7UHFS 5101	- $359.95	9VAP 4/5101	- $629.95
7UAFS 4/148	- $319.95	9VHP 5/9201	- $749.95

Airtronics

VG4R FM	- $118.95	VG6P PCM	- $234.95
VG4R AM	- $189.95	VG7P FM	- $229.95
VG6H FM	- $379.95	SP7P PCM	- $299.95

RCD

Shredder 2CH	- $39.95	7CH FM RX	- $69.95
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Super Chipmunk	- $ 74.95	FS Spitfire 40	- $ 55.95
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		AeroStar .40	- $57.95
Flightstar .40	- SALE!	AeroSport .40	- $54.95
Avistar .40	- $109.95		
UltraSport 40	- $ 79.95	Royal 40T	- SALE!
UltraSport 60	- $ 89.95	Royal 20T	- $ 79.95

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Super Tiger S61	- $129.95	Rossi 60H	- $259.95
Super Tiger 3000	- $219.95		
		Webra 61	- $179.95
YS 45FS	- $139.95	Webra 50H	- $159.95
YS 60 Heli	- $249.95	Webra 40	- $ 69.95
YS 61 Air	- $209.95	Webra 28H	- $105.95
K&B 3.5 Outb	- $99.95	K&B 11 Outb	- $219.95

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1-800-545-4354 For **ORDERS ONLY!**

HELICOPTER	KIT	Any .30 Std Eng	MAX 5 Kit/Eng	5 NLH Kit/Eng	MAX 6 Kit/Eng	6NHP Kit/Eng
Shuttle Z Asb	$269.95	$389.95	$629.95	$609.95	$699.95	$679.95
Shuttle Z Asb/Eng	$339.95	——	$579.95	$549.95	$649.95	$629.95
Shuttle ZX Kit	$269.95	$389.95	$529.95	$509.95	$699.95	$679.95
Shuttle ZX Asb	$309.95	$429.95	$569.95	$549.95	$639.95	$619.95
Shuttle ZX Asb/Eng	$389.95	——	$629.95	$609.95	$699.95	$679.95
Enforcer	$259.95	$379.95	$619.95	$599.95	$689.95	$669.95
Enforcer ARF	$289.95	$409.95	$649.95	$629.95	$719.95	$699.95
Concept DX Asb	$259.95	$379.95	$619.95	$599.95	$689.95	$669.95
Concept DX/Eng	$359.95	——	$599.95	$579.95	$669.95	$649.95
Concept SE	$299.95	$419.95	$659.95	$639.95	$729.95	$709.95
Concept EP	$299.95	——	$ Call	$ Call	$ Call	$ Call
Concept SX	$349.95	$469.95	$709.95	$689.95	$779.95	$759.95
Whisper *	$199.95	——	$ Call	$ Call	$699.95	$ Call
Whisper ARF *	$229.95	——	$ Call	$ Call	$729.95	$ Call

Basic Package of Field Accessories

Electric Starter, Fuel Line
Glow plug, Glow Battery
Manual Fuel Pump,
Glow Clip **$44.95**

Deluxe Package

Electric Starter, Fuel Line
Glow plug, Power Panel &
Connector or Glow Battery,
Field Box, Electric Fuel
Pump, Fuel Can Fittings,
12v Battery **$99.95**

Tuned Pipes - $52.95
Mufflers From - $19.95

* Whisper packages include Gyro, Speed Controller, Micro Servos and Battery

ELECTRIC POWER

BY MITCH POLING

RATING THE PACKS

In the July column I reviewed the results of my tests with the 1500 mAH SCR cells available from CS Flight Systems. My conclusion was that these were honest 1500 mAH cells. They delivered 1500 mAH at 11 amperes drain, which is typical of currents used in electric flight. The 1500 mAH SCR cells from CS are 7mm longer and 8 grams heavier apiece than the sub-C size that is very popular. This is certainly acceptable, but now we are seeing SCR sub-C packs that are advertised as 1400 mAH. I decided to try these to see how they matched up to the CS packs.

I bought a six-cell Sanyo SCR 1400 mAH pack marketed by Graupner and cycled it "as is." This gave a capacity of 78 Am (1300 mAH) at a typical current of 11 amperes. I calculated the internal resistance of the pack by using load/no load voltage and current. No load voltage was 8.17; under load it was 7.51 volts at 11.5 amps, which calculates to .057 ohms for the pack, or 9.5 milliohms per cell. This is very good; most packs will show about 12 milliohms per cell.

By now, you all know my opinion of commercial battery pack assembly. I took apart the battery pack, stripped off the straps, and reassembled the pack with Stage III #12 flat braid for connections. The rewired pack tested at 8.20 volts/7.71 volts/11.9 amps, which works out to 0.0412 ohms for the pack, and 6.9 milliohms per cell. As you can see, the original straps and spot welds account for an increase of 38% in the resistance of the pack. The detailed discharge for the rewired packs was as follows through four 12-volt headlight bulbs in parallel:

Minutes	Volts	Amperes	Total Amp-minutes
0	7.65	11.9	——
1	7.13	11.4	11.6
2	7.11	11.4	23.0
3	7.07	11.3	34.3
4	6.98	11.3	45.6
5	6.86	11.2	56.9
6	6.65	11.0	67.9
7	6.00	10.4	78.2

The 78.2 Am translates to 1303 mAH. This is the same capacity that I got for my three-year-old 1200 mAH SCR pack that I reported on in the last column. The internal resistance of the new pack is better; the old pack is 9 milliohms per cell. Other than that, I saw no difference between the packs. I have a feeling that Sanyo has altered the test criteria for their packs. If they are rating them now at a lower discharge rate, the capacity ratings will go up. If you have the "old" 1200 packs, and are considering going to the "new" 1400 packs, be aware that they may both be 1300 mAH packs for our style of use!

If you have experience with the "new" 1400 SCR packs, I would be very interested in your opinions. So far, it looks to me like the only way to get a true increase in capacity for SCR packs is to go to larger cells, such as CS Flight Systems markets.

Jim Martin and I had a long talk at the Nuremberg Toy Fair about the problem of motor ratings. Jim is owner of Hobby Lobby International, which sells Graupner, Plettenberg, and Marx motors. Jim supplies more data about the motors he sells than any other retailer, but there is still confusion about what information will best help the buyer use the motor. Bob Kopski has made the point many times in his column that manufacturers should supply us with better motor information. It is, after all, to the manufacturers' advantage to do so. The buyer will get the best performance for his application, and buyer satisfaction will mean more sales. We all know the other extreme, such as "Super-Turbo-Mega-Purple-Stripe-Modified," "Daytona 401GE" or "520132/T"! The labels have been changed to protect the "innocent"!

The minimum information that will let a buyer completely characterize a motor is the following: the no load rpm/no load motor terminal voltage/no load current draw, along with the rpm/motor terminal voltage/current draw at any load. Six numbers is all it takes, and far less than an hour of the manufacturer's time. I think all motors should come with this information. Please note: the motor terminal voltage is *not* some "nominal voltage" that information sheets are so fond of listing. It is the *actual* measured voltage at the motor terminals. The no load information gives the "loss resistance," and the no load plus the load information gives the armature resistance and speed constant of the motor, as outlined before in this column.

The manufacturer could do more, of course. If six numbers are too much to list, then all that is needed is the "loss resistance," armature resistance, and speed constant. Just three numbers!

Finally, why not a graph of the motor efficiency, rpm, currents and power out? I consider this optional, but nice. You can, with such a graph, work out the loss resistance, armature resistance, and speed constant. The problem with such graphs is that they are usually presented in terms of a constant voltage at the motor terminals. That is not the situation in use. We have to use the motor with decreasing voltage at the motor terminals as current goes up. This makes it hard to use constant voltage graphs directly without finding the loss resistance, armature resistance and speed constant. So, I do consider them an option.

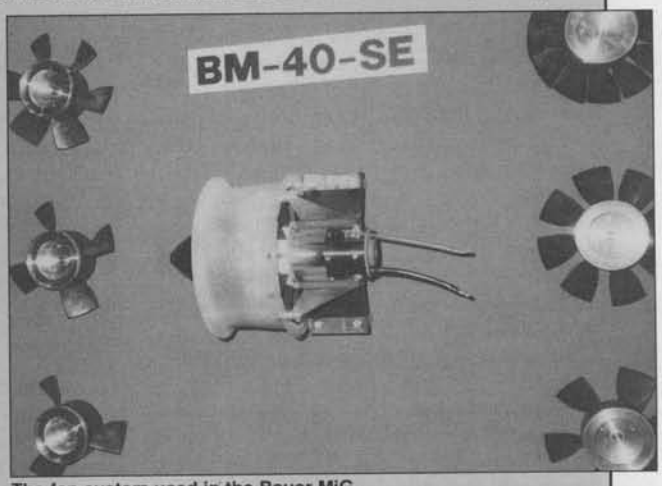
I have, in the past, said that using the input power of a motor, or using the Astro 05, 15, 40 system will give you an idea of the capabilities of the motor. That is true in a general sense, in that you can predict what the weight, wing area, or wing loading of a plane should be. However, when it gets down to the nitty gritty of what rpm, what current, and what operating efficiency you want, you need more help than that. So, how about the load/no load numbers, manufacturers? I think the manufacturers who will supply these will find that they have a competitive edge, and it doesn't cost much to do so, either! All it takes is a tachometer, DVM, and ammeter.

I finally bought a computer! I saw a good deal on a Commodore 64 with disk driven color monitors and dot matrix printer. I then proceeded to wade into Basic. It has been awhile since I did programming, and I am impressed by how closely Basic resembles Fortran, the language I learned twenty years ago. Anyhow, I now have a program that does most of what I want, given the motor/battery wiring resistance, armature resistance, and speed constant. It prints a table of the current, system efficiency (motor and battery), rpm, and power out in watts. The graph shows the rpm, power out, and system efficiency plotted against current. The graph routine is very general purpose, and can be done by a daisy wheel or dot matrix printer.

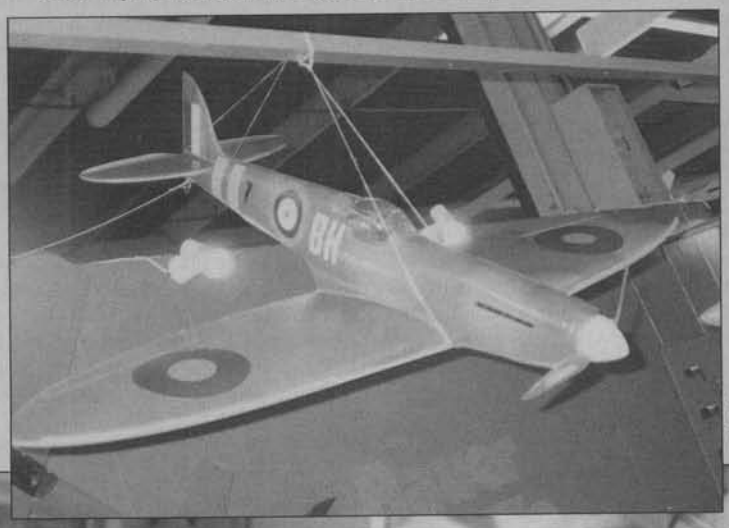
If you would like to have a copy of the program listing, send an SASE and one dollar to cover my costs. The program is written in simple Basic, so it should run on most machines with only a few changes, such as LPRINT for PRINT#3 (the Commodore

Cox's "Flyboy" two-channel beginner's model complete with radio.

The Bauer MiG-15 ducted fan (available in the U.S. from Hobby Lobby).



The fan system used in the Bauer MiG.



Spitfire and Me-109 scale models by Bauer.

A 6-7 cell sport model produced in Spain by Modelhob.

command for using a printer). For that matter, for your dollar I think I can include an instruction sheet on how to get the motor constants, and sample output, plus a list of motors/motor constants that you can play with. The program is about a hundred lines long, which is a fair amount of typing, a little over a page.

As said, the IBM PC will require some changes in some of the commands as well. But, for a dollar, you are not taking much of a risk! I think you will find it fun to try out motors on the computer. However, there are mutterings about "computer widow" around my house, and I have never heard "model airplane widow" mentioned here! So, beware that computers may be a more dangerous hobby than model airplanes! And this is with a "little" computer; I wonder what it would be like if I had one of the big ones?

Speaking of computer programs, Bill Young, who writes on scale electrics for *RC Scale Modeler*, has a set of programs available for the IBM PC. These programs will predict performance for any plane, given the wing area, weight, number of cells, operating current, and prop. The programs will also predict what prop will be best, and minimum and maximum flying speeds. I think the price is $25 with the disk. Write Bill with an SASE at 8106 Teesdale Ave., North Hollywood, CA 91605.

Bill also sells scale drawings, model plans, and photograph sets. How about a Horten IX? Bill has the plans. It was a German flying wing prototype at the end of WW II, with buried-in-the-wing twin jets. It looks like a stealth jet, way ahead of its time. Tell Bill I sent you!

NEWSLETTERS

I get several newsletters that are very good sources of information, and as I haven't mentioned them recently, now is the time! *Charge Ahead*! is the Puget Sound Electric Model Flyers newsletter. It is published every four months, and is only $5 a year! This is by far the best deal around. Send your money to Ben Almojuela, 1941 6th Ave. W., Seattle, WA 98119. When you do, include some info about your activities; the editors always like to have new material! Recent issues of *Charge Ahead!* included articles on designing electric aircraft, full-size plans for the Electro Flea (my design), reviews of electric throttles and chargers, and contest reports.

Silents Please! is the newsletter for the Silent Electric Fliers of Long Island. The editor is Don Mott, Box 461, Ridge, NY 11961. Nothing is said in the newsletter about what it costs for a year. I usually send $10 with a note to send copies "for as long as the $10 lasts." I have had no complaints from editors! *Silents Please!* has good kit reviews, conversion of gas kits to electric, inside news on the electric scene, and contest announcements for the Northeast area.

Watts Current is the club newsletter of the Westmoreland Electric Soaring Society, 332 39th St., Pittsburgh, PA 15201. It is much more like a club newspaper than the other newsletters, with lots of member news, opinions, and comments, plus contest calendars for the area. This is a lively and fun newspaper.

The Ampeer is the newsletter for Electric Fliers Only, editor Ken Meyers, 1911 Bradshaw Ct., Walled Lake, MI 48390. Subscription is $10 a year. *The Ampeer* is a very interesting mix of excellent technical information plus frank comments on some items that do not work out so well. Newsletters in general, by the way, are the best source for this inside information. Magazine writers, including myself, do not usually publish negative comments. This is basically so we do not have to deal with the hassle that usually follows doing so! I appreciate and am appreciative of the greater latitude in the newsletters. Anyhow, I save every issue of *The Ampeer*. Recent issues include guidelines for designing and building electric sport scale by Keith Shaw, prop design, reflex charging of NiCds, and local contest events. Last, but not least, Ken reminds me to tell you all that their Mid-America Electric Fly is July 20-21, in Saline, Michigan. Contact Ken at the above address, or telephone (313) 669-8124.

DEAF Notes is the newsletter for the Dallas Electric Aircraft Fliers, editor Frank Korman, 5834 Goodwin, Dallas, TX 75206. They have a fun-fly in October. The November issue had an excellent article by Keith Shaw on how to get the most out of the Sermos connectors.

Uh-oh, I'm about out of room in this column, and still no pictures! So here are some for your entertainment that I took at the Nuremberg Toy Fair. The Flyboy is a simple beginner's plane, with rudder and elevator controls, sold as a package with the radio, by Cox. I have not flown it, so cannot say what the performance is. If any of you have one, I would be very interested in a report.

Bauer Models had a completed MiG-15 electric ducted fan on display. It is not as big as I had thought, and it is much more attractive than I had thought it would be. The other photo shows the impeller for it. These are sold in the U.S. by Hobby Lobby International. Bauer also has an electric Spitfire and Messerschmitt with fiberglass fuselages and sheeted wings. The workmanship is immaculate.

The next photo is an electric trainer by Modelhob, a Spanish company. It is the 6-7 cell type, rather attractive, but I don't think Modelhob has any distributors in the U.S.

Well, for now, be informed, fly electric! My 29-cent postage USA address is: Mitch Poling, 7100CSW/MC, Box 734 PSC 2, APO NY 09220-5300; or for international postage, Normannenweg 20, 6200 Wiesbaden-Biebrich, Germany. **MB**

SIG BALSA

THE LARGEST SELECTION OF AAA AIRCRAFT BALSA ANYWHERE

STICKS - 36" Lengths

B-001	1/16 x 1/16	.10
B-002	1/16 x 1/8	.11
B-003	1/16 x 3/16	.14
B-004	1/16 x 1/4	.17
B-005	1/16 x 3/8	.21
B-006	1/16 x 1/2	.26
B-007	1/16 x 3/4	.33
B-008	1/16 x 1	.42
B-009	3/32 x 3/32	.11
B-010	3/32 x 1/8	.12
B-011	3/32 x 3/16	.14
B-012	3/32 x 1/4	.17
B-013	3/32 x 3/8	.25
B-014	3/32 x 1/2	.29
B-015	3/32 x 3/4	.38
B-016	3/32 x 1	.47
B-017	1/8 x 1/8	.12
B-018	1/8 x 3/16	.17
B-019	1/8 x 1/4	.21
B-020	1/8 x 5/16	.26
B-021	1/8 x 3/8	.28
B-022	1/8 x 1/2	.30
B-023	1/8 x 3/4	.43
B-024	1/8 x 1	.53
B-025	3/16 x 3/16	.21
B-026	3/16 x 1/4	.28
B-027	3/16 x 3/8	.29
B-028	3/16 x 1/2	.38
B-029	3/16 x 3/4	.46
B-030	3/16 x 1	.58
B-031	1/4 x 1/4	.29
B-032	1/4 x 3/8	.35
B-033	1/4 x 1/2	.42
B-034	1/4 x 3/4	.61
B-035	1/4 x 1	.70
B-036	5/16 x 5/16	.38
B-037	5/16 x 3/8	.47
B-038	5/16 x 1/2	.58
B-039	5/16 x 5/8	.71
B-040	5/16 x 1	.81
B-041	3/8 x 3/8	.55
B-042	3/8 x 1/2	.64
B-043	3/8 x 3/4	.77
B-044	3/8 x 1	.92
B-045	1/2 x 1/2	.72
B-046	1/2 x 3/4	.95
B-047	1/2 x 1	1.16
B-048	5/8 x 5/8	.86
B-049	5/8 x 1	1.28
B-050	3/4 x 3/4	1.20
B-051	3/4 x 1	1.40

BAGS OF BALSA

B-524	Bags of Balsa	3.75

ODDS & ENDS PACKAGE OF BALSA

B-534	Packages	2.65

SHEETS - 18" Lengths

B-173	1/32 x 2	.26
B-174	1/16 x 2	.28
B-175	3/32 x 2	.33
B-176	1/8 x 2	.38
B-177	3/16 x 2	.48
B-178	1/4 x 2	.61
B-179	3/8 x 2	.66
B-180	1/32 x 3	.37
B-181	1/20 x 3	.40
B-182	1/16 x 3	.42
B-183	3/32 x 3	.46
B-184	1/8 x 3	.56
B-185	5/32 x 3	.61
B-186	3/16 x 3	.67
B-187	1/4 x 3	.77
B-188	5/16 x 3	.93
B-189	3/8 x 3	1.04
B-190	1/32 x 4	.55
B-191	1/16 x 4	.64
B-192	3/32 x 4	.67
B-193	1/8 x 4	.78
B-194	3/16 x 4	.95
B-195	1/4 x 4	1.19
B-196	3/8 x 4	1.47

SHEETS - 36" Lengths

B-134	1/32 x 2	.50
B-135	1/16 x 2	.55
B-136	3/32 x 2	.65
B-137	1/8 x 2	.73
B-138	3/16 x 2	.95
B-139	1/4 x 2	1.20
B-140	3/8 x 2	1.32
B-141	1/32 x 3	.73
B-142	1/20 x 3	.75
B-143	1/16 x 3	.81
B-144	3/32 x 3	.93
B-145	1/8 x 3	1.11
B-146	5/32 x 3	1.20
B-147	3/16 x 3	1.32
B-148	1/4 x 3	1.54
B-149	5/16 x 3	1.81
B-150	3/8 x 3	2.03
B-151	1/32 x 4	1.03
B-152	1/16 x 4	1.26
B-153	3/32 x 4	1.32
B-154	1/8 x 4	1.54
B-155	3/16 x 4	1.88
B-156	1/4 x 4	2.33
B-157	3/8 x 4	2.89
B-158	1/16 x 6	2.10
B-159	3/32 x 6	2.37
B-160	1/8 x 6	2.65
B-161	3/16 x 6	3.06
B-162	1/4 x 6	3.49
B-163	3/8 x 6	4.47

STICKS & MORE

B-643	Package	3.95

STICKS - 48" Lengths

B-061	1/8 x 1/8	.17
B-062	1/8 x 1/4	.26
B-063	1/8 x 1/2	.38
B-064	3/16 x 3/16	.28
B-065	3/16 x 1/2	.46
B-066	3/16 x 3/4	.61
B-067	1/4 x 1/4	.40
B-068	1/4 x 1/2	.55
B-069	1/4 x 3/4	.78
B-070	5/16 x 5/16	.50
B-071	3/8 x 3/8	.70
B-072	3/8 x 1/2	.81
B-073	3/8 x 3/4	.96
B-074	1/2 x 1/2	.95
B-075	1/2 x 3/4	1.27

48" AAA SHEETS

B-388	1/32 x 3	.92
B-389	1/16 x 3	1.06
B-390	3/32 x 3	1.25
B-391	1/8 x 3	1.47
B-392	3/16 x 3	1.80
B-393	1/4 x 3	2.08
B-394	3/8 x 3	2.74
B-395	1/16 x 4	1.76
B-396	3/32 x 4	1.98
B-397	1/8 x 4	2.22
B-398	3/16 x 4	2.82
B-399	1/4 x 4	3.23
B-400	3/8 x 4	4.62
B-401	1/16 x 6	3.02
B-402	3/32 x 6	3.52
B-403	1/8 x 6	3.86
B-404	3/16 x 6	4.50
B-405	1/4 x 6	4.94
B-406	3/8 x 6	6.35

TRIANGULAR CUT BALSA 36"

B-416	1/4 x 1/4	.47
B-417	3/8 x 3/8	.56
B-418	1/2 x 1/2	.70
B-419	3/4 x 3/4	.88
B-420	1 x 1	1.15

LAPPED EDGE BALSA SHEETS

B-610	1/16 x 3-1/4 x 36	1.25
B-611	3/32 x 3-1/4 x 36	1.51

BULK BALSA - 3" x 36"

Not Stamped or Sorted

B-508	1/32 x 3	.65
B-509	1/16 x 3	.70
B-510	3/32 x 3	.81
B-511	1/8 x 3	.96
B-512	3/16 x 3	1.17
B-513	1/4 x 3	1.33
B-514	3/8 x 3	1.75

BLOCKS - 3" Lengths

B-251	1 x 1	.16
B-252	1 x 2	.31
B-253	2 x 2	.44
B-254	1 x 3	.44
B-255	2 x 3	.58
B-256	3 x 3	.92

BLOCKS - 6" Lengths

B-266	1 x 1	.31
B-267	1/2 x 2	.42
B-268	3/4 x 2	.47
B-269	1 x 2	.58
B-270	1-1/2 x 2	.70
B-271	2 x 2	.80
B-272	1/2 x 3	.54
B-273	3/4 x 3	.64
B-274	1 x 3	.80
B-275	1-1/2 x 3	.94
B-276	2 x 3	1.08
B-277	3 x 3	1.74
B-278	1/2 x 4	.79
B-279	3/4 x 4	.90
B-280	1 x 4	.98
B-281	1-1/2 x 4	1.26
B-282	2 x 4	1.51
B-283	3 x 4	2.37
B-284	1/2 x 6	1.13
B-285	3/4 x 6	1.33
B-286	1 x 6	1.57
B-287	1-1/2 x 6	2.15
B-288	2 x 6	2.38
B-289	3 x 6	3.35

BLOCKS - 12" Lengths

B-299	1 x 1	.59
B-300	1/2 x 2	.80
B-301	3/4 x 2	.94
B-302	1 x 2	1.14
B-303	1-1/2 x 2	1.38
B-304	2 x 2	1.57
B-305	1/2 x 3	1.01
B-306	3/4 x 3	1.26
B-307	1 x 3	1.57
B-308	1-1/2 x 3	1.89
B-309	2 x 3	2.29
B-310	3 x 3	3.49
B-311	1/2 x 4	1.59
B-312	3/4 x 4	1.78
B-313	1 x 4	1.94
B-314	1-1/2 x 4	2.50
B-315	2 x 4	3.04
B-316	3 x 4	4.82
B-317	1/2 x 6	2.20
B-318	3/4 x 6	2.70
B-319	1 x 6	3.22
B-320	1-1/2 x 6	4.39
B-321	2 x 6	4.98
B-322	3 x 6	7.32

BLOCKS - 18" Lengths

B-333	1 x 1	.91
B-334	1 x 2	1.75
B-335	2 x 2	2.37
B-336	1 x 3	2.37
B-337	2 x 3	3.49
B-338	3 x 3	5.23
B-339	1 x 4	3.00
B-340	2 x 4	4.58
B-341	3 x 4	7.32
B-342	1 x 6	5.34
B-343	2 x 6	8.20
B-344	3 x 6	13.20

BLOCKS - 24" Lengths

B-354	1 x 1	1.20
B-355	1 x 2	2.30
B-356	2 x 2	3.20
B-357	1/2 x 3	2.11
B-358	1 x 3	3.20
B-359	2 x 3	4.61
B-360	3 x 3	6.98
B-361	1 x 4	3.95
B-362	2 x 4	6.12
B-363	3 x 4	9.70
B-364	1 x 6	6.55
B-365	2 x 6	9.77
B-366	3 x 6	14.42

TAPERED CUT SHEETS - 36"

B-430	1/4 x 3	1.48
B-431	1/4 x 4	2.29

LEADING EDGE - 36" Lengths

B-085	1/2 x 3/8	.75
B-086	3/4 x 5/8	1.30
B-087	1 x 3/4	1.67

36" ROUNDED EDGE AILERON & ELEVATOR STOCK

B-441	1/4 x 1	.96
B-442	3/8 x 1	1.13
B-443	1/4 x 2	1.51
B-444	3/8 x 2	1.72

AIRFOILED SHAPED SHEETS

B-111	3/16 x 3 x 36	1.51
B-112	1/4 x 3 x 36	1.72
B-113	1/4 x 4 x 36	2.54

TAPERED TRAILING EDGE 36" Lengths

B-097	1/8 x 1/2	.45
B-098	3/16 x 3/4	.58
B-099	1/4 x 1	.78
B-100	5/16 x 1-1/4	.92
B-101	3/8 x 1-1/2	1.07

MODEL BUILDER'S ASSORTMENT

B-600	Balsa Wood Assort.	12.95

PLANKS - 36" Lengths

B-206	1 x 1	1.78
B-207	1/2 x 2	2.39
B-208	3/4 x 2	2.80
B-209	1 x 2	3.51
B-210	1-1/2 x 2	4.20
B-211	2 x 2	4.75
B-212	1/2 x 3	3.08
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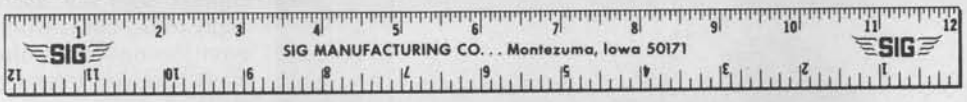

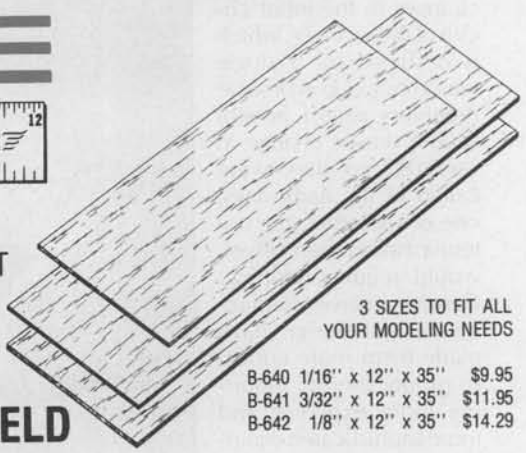

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ELECTRONICS CORNER

BY ELOY MAREZ

MOUNTING THAT ANTENNA

Receiver antennas will be our first subject of the month, in answer to a query from Jack Fletcher, of Lexington, Maine, who wrote:

"A request, please, for a learned column by you on the subject of antennas for RC receivers for both 72 MHz and amateur band 6 meter antennas. I've always thought it was a shame that beautiful scale models have to have an antenna hanging out that looks like a broken string on a pull toy. Is it possible, for example, to install something like a folded dipole in the wing of an RC plane?"

Jack enclosed a couple of wing mounted antenna sketches, which we are sharing with you. They are not practical, for reasons which we will explain as we go, but I did want you to see what it is he is asking about. Fortunately, they are not really needed either, and we will also discuss that.

There are two reasons why such antennas are impractical for RC model use. One is that the addition of such an antenna would require some changes to the input circuit of the receiver, which is designed for a single wire antenna. Even if some receivers might accept such a drastic change in "aerials," as they were called in the early days, one or the other, the antenna itself or the receiver, would require retuning. Current receiver requirements and design have made them more critical to proper tuning, requiring more expertise and more sophisticated equipment generally not to be found in the average modeler's workshop. FM receivers, which probably now account for the greatest percentage of those in use, require even more TLC; it should not be forgotten that a PCM receiver is just like any other FM receiver except for the decoding.

Technical problems of this nature are not without their solutions and it could come to pass that if a dipole antenna in one of its many forms was determined to be necessary, I'm sure they could be factory installed and tuned. However, there is another shortcoming which factory design cannot cure—the fact that antennas of this type exhibit more directional tendencies than does a simple long wire. In both the transmitting and receiving mode, dipoles are more efficient at right angles; less and less so in the directions of the ends. Antenna efficiency is measured and spoken off as "gain," and is affected by many antenna design factors. Working in the VHF (Very High Frequency) range, which we are, and at less than a full wavelength antenna, the gain obtained is not enough to excite anyone trying to increase the efficiency of a transmitter/receiver system, but it is there and would definitely be detrimental in a model, especially during nose-in attitudes while out far or low. And who needs reduced signal reception then?

Rick Lewis' Douglas Skyraider, a community design effort by him and a number of other talented friends, is an excellent example that internal antennas work well and efficiently.

Believe it or not, the antenna in the RC system, both transmitter and receiver, with one exception, has received a lot more attention than you might believe. That exception does not really apply to us, but is worth mentioning—it is the many receivers intended for RC car use only and which come with a 36 or 39-inch antenna. Ridiculous, isn't it?

Where we are concerned, the choice of antennas is governed more by purely practical reasons and convenience than anything else. That whip transmits equally in all directions. Equally poorly, but adequately, including straight off the

tip, where it is the least efficient. Some of the same applies to the receiver antenna. The two would actually work at their best advantage if they were parallel to each other, but such an attitude is seldom obtained with the constantly maneuvering airplane. These deficiencies in antenna design are more than made up with a little extra transmitter power, and with RF amplifiers and AGC (Automatic Gain Control) circuitry in the receiver. As we know, all of these things, working as a team, generally do their intended job real well.

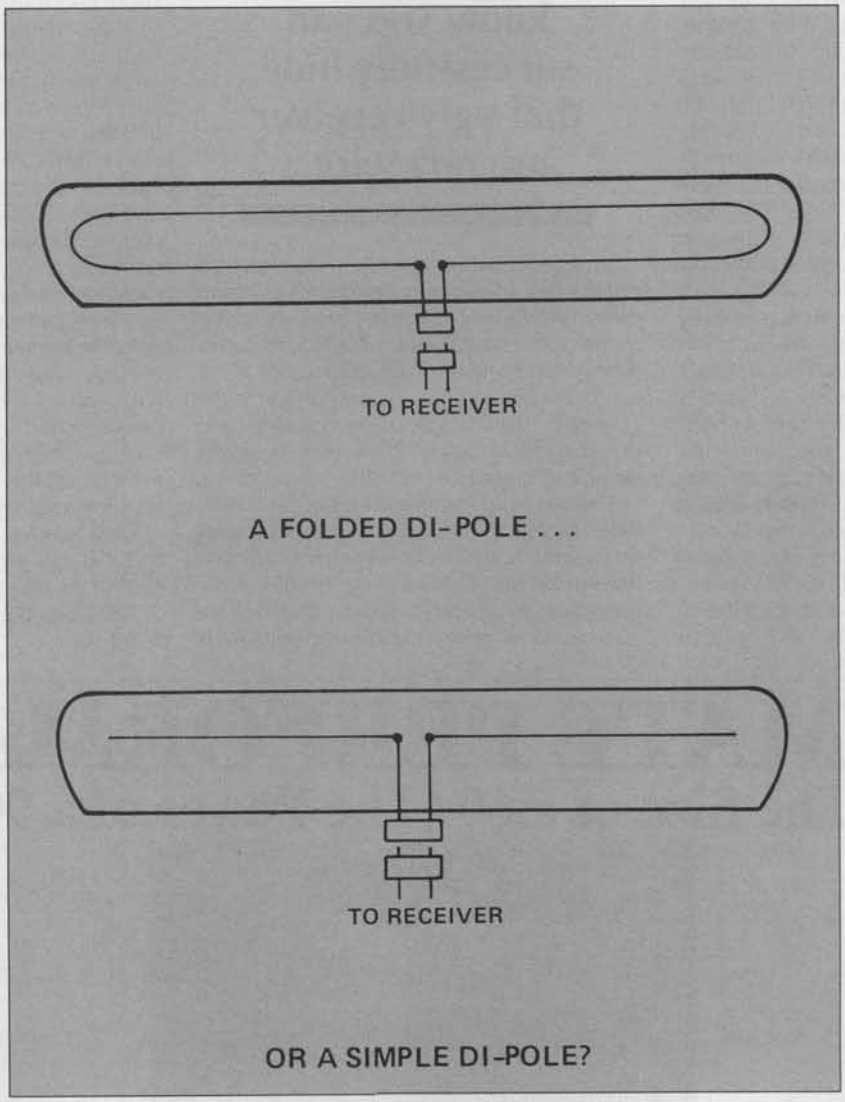
However, we still have not solved Jack's problem, that of the ugly wire dangling on top of his quarter-scale B-36. Actually, the problem has been taken care of for us. It is one of the side benefits of the new narrow band equipment requirements, and our RC systems are better than ever. And in spite of some of the griping by usually very unknowledgeable persons, they are not expensive! But that is another story. Our receivers are better, and as an example, we present to you the Douglas Skyraider of Rick Lewis of Chino Hills, California; see the photos. This airplane is about as "high tech" as you can get, with a lot of scale working features such as landing gear, flaps; even the wings fold. All of these features require a lot of metal, plumbing, wiring, extra battery packs, etc., and yet nowhere in those super-sharp pictures of mine do you see an external antenna. It uses the normal long wire antenna, all stretched out inside the fuselage! And even with all of the metal parts not found in the normal RC airplane, the radio works perfectly.

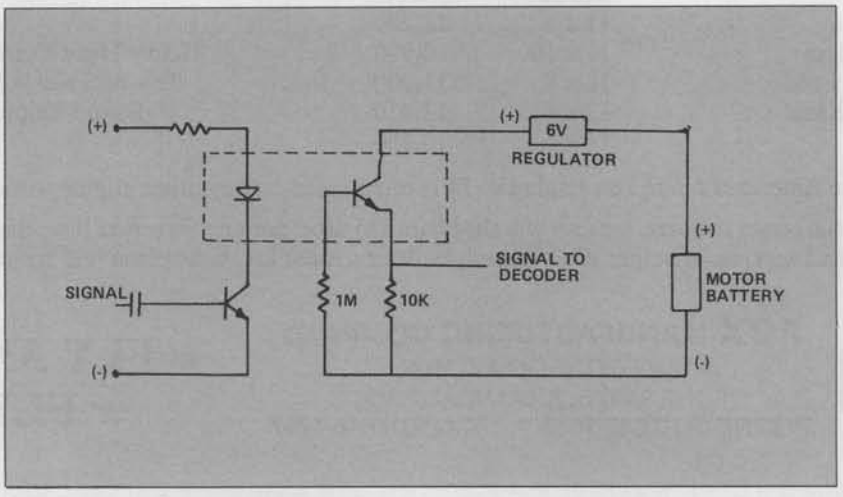
Let's explore this phenomenon a little further. Without a doubt, today's receivers, even before the stringent requirements imposed by narrow band, are far better than those we used in the pioneer days of commercially-built RC equipment. I say that because there are some of us still around from the early days of quench coils and gas tubes, when, if you wanted an RC system, you built it! Anyway, those old-time receivers were critical to antenna location relative to everything else metallic around them, and in retrospect, I can see that we got in the habit of installing the antenna externally, not from the belief that it did its job better out in the open, but simply to remove it as far as possible from everything else. And following the sage advice of "If it works, don't fix it," we've been doing it ever since.

It must be pointed out also that to a radio wave, nonmetallic non-conductive material such as balsawood and plastic, or even fiberglass and paint, are invisible. That is, the radio energy passes through them just as readily as it does through open space. Even newer composites, a modern term for nonmetallic materials, are virtually invisible to radio energy and are what make "stealth" aircraft difficult for radar to spot and track. And contrary to some misconceptions that seem to exist, radar is not any different from the radio wave that controls your airplane or brings you the Simpsons; the acronym actually stands for Radio Detecting And Ranging, and operates on a reflection of the transmitted wave. It is way different in frequency, as the higher frequencies tend to reflect a greater percentage of their energy, a greater "return" as it is called, than lower frequency signals which tend to be absorbed to a greater degree.

See how smart you get from reading *EC* and *MB*? Anyway, for the actual physical requirements of the in-the-fuselage long wire antenna, let's take another (admiring) look at Rick's Skyraider. Its receiver is centered midway in the fiberglass fuselage at the leading edge of the canopy. The antenna then runs down the left side of the fuselage, following its natural curvature. This is a large airplane, long enough to accept the full length of the antenna, but what about smaller, shorter ones?

Well, there are a couple of options, one being merely to let any excess simply exit someplace at the rear and trail behind the airplane, as a few inches of wire dangling out the back is not nearly as ugly as its full length on top. And I doubt if even the strictest scale judge is going to downgrade you for that. The far better solution is simply to "snake" it up and down in the fuselage, or better yet, work it up into the vertical fin. Most .40 and up powered airplanes are





(Above) Jack Fletcher's suggestions for in-the-wing dipole receiver antennas. Text discusses their limitations and offers practical solutions to eliminate that distracting, dangling external long wire. (Below) Astro Flight's opto-coupler circuitry as used in its speed control installations. Note that the use of separate batteries results in complete isolation between receiver and motor.

large enough to completely hide a 36-inch antenna in this manner. And, assuming that you've got a decent radio in good condition, it'll work as well as it will with the antenna fully exposed.

An internal antenna requires a little forward planning, in that you have to install a tube for it during the model's construction stage. Most anything that is light and non-metallic will do. I have often used ordinary non-waxed drinking straws CA'ed together to the necessary length. Electronic stores are a good source of insulating tubing of many types, and in fact, our own model industry has not failed us in this respect; Su-Pr-Line, one of our suppliers of flexible pushrods, makes available one of its smaller diameter inner tubes for just this purpose. It's called an "An-Tenna Tube," comes in 36-inch lengths, and is acceptably priced at two for $1.19.

Now that you know you can successfully hide that ugly receiver antenna wire, no doubt you are scouting around for the proper scale design. Well, Rick Lewis's Skyraider is available in various forms (including plans, fuselages, custom landing gear and wing folding mechanisms). Inquire directly from him at: 15486 Duke Lane, Chino Hills, CA 91709; (714) 597-1966. There are presently four of these Skyraiders in various paint schemes, look for them at Scale Masters, Top Gun and other events of that caliber.

Opto-couplers were discussed here in January, and an important clarification on their use was received from Astro Flight's Bob Boucher, who wrote: "I read your article on opto-couplers in the January *Model Builder*. I think you did a good job explaining what they are, but you may have missed the point of why we use them.

Now that you know you can successfully hide that ugly receiver antenna wire...

"We use them because they *eliminate all conducted noise paths between radio and motor. All three radio wires are terminated in the opto-coupler input. There is no common ground between radio and motor, there is no common plus 5V and there is no common signal.* The opto-couplers are designed to withstand 2500 volts between input and output circuits."

Though I did mention the isolation provided by the opto-coupler, I did not expand on it as much as Bob does. In effect, we have here more proof about how the old statement that "two heads are better than one" is so true. Most of my experience with such devices is in equipment with a single power source, requiring the need for a common ground, and obviously my thinking was geared in that direction while I was here pounding the keys. On the other hand, Bob uses an opto-coupler, shown with a driver transistor in the circuit he furnished, in equipment powered by two batteries; one for the receiver and another for an electronic speed control and motor combination. Used in that manner, no common ground, or common anything else is required, and he is correct in that any electronic garbage generated by the motor cannot find its way back into the receiver through common wiring.

I've seen Astro Flight's high-powered equipment as used by F3E fliers in action, and it does work well, so obviously the opto-coupler circuitry is doing its job. It must be remembered however, that some noise radiation can take place within the necessary wiring in the electric system. This radiation, like the signal emitted by your transmitter, does not need a solid connection on which to travel, and as much distance as possible should be maintained between the battery-speed control/motor and wiring, and the rest of the RC system, especially the receiver and its antenna.

Dear Reader, I know you did not miss the fact that you are in illustrious company. Mr. Electric Flight reads EC with you!

Next month? Well, you like surprises, don't you? **MB**

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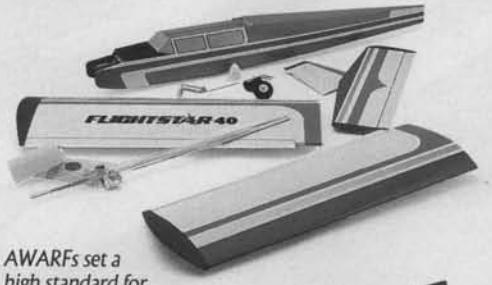

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BIG BIRDS

BY BRUCE EDWARDS

Our first Big Bird Fly-in in the Northwest this year was held in April, sponsored by the L.S.G.A.S. (Lesser Seattle Giant Aero Squadron), I.M.A.A. Chapter 163. We were not blessed with very good weather; it has been cooler and wetter than usual in the Northwest, so no one was surprised. Thirty-seven pilots brought 45 planes to fly, and after a soggy morning, afternoon sun brightened our spirits, with flying continuing into early evening. Everyone wanted some air time, because flying weather had been at a premium.

The flying was of very high caliber, with very few broken props and no crashes, which always makes those of us who are contest directors happy. It was only necessary to caution one fellow, and he already knew he was a little off course.

Harold Leininger is one of those special Big Bird pilots who not only walks away with First Place awards at the Northwest Model Expo, but also shows up to fly his beautiful planes in a very professional manner. Harold shared his finishing techniques with us at a recent L.S.G.A.S. club meeting, so members are hoping to come up with better finishes than usual, using Harold's methods. I will try to include some of Harold's ideas in a future column.

Len Bosman returned again this year, from Canada, with his rebuilt Lancaster Bomber, and it flew better than ever. Carl Berry showed us his eleven-foot-span modified Robin Hood that he flies by T.V. Unfortunately, the gremlins were working overtime, so we only saw the Big Bird fly in the usual manner.

Bruce Jones was our transmitter impound and frequency monitor specialist. He did a very fine job for us, not a single transmitter was left on, and we did not experience any radio frequency problems, except a lot of pilots were on Channel 48 and had to wait their turn. Bennie Phillips and Chuck Willcox were I.M.A.A. event co-directors, and I was A.M.A. contest director. Bennie and Chuck were indispensable in helping to put on the event, by preparing the fly-in brochure and a lot of the other details. Jim Gray did registration and I did aircraft inspection and safety.

The contest director at an I.M.A.A. and A.M.A. sanctioned event does much more aircraft inspection than normally expected. Not only are we looking for obviously faulty aircraft as we do our examinations, but we also want every plane flying to have the name, address, phone number and A.M.A. number inside. All clevises must have a keeper installed; it may be a spring, fuel tubing or a clip such as found on the newer Sullivan clevises. CDs will also be looking for receivers and battery packs that are well wrapped in foam rubber, and checking that all other components are safely and securely installed.

Larry Wheat checks out Carl Berry's fly-by-TV Cyclops R.P.V. This Big Bird is a highly modified Robin Hood 99. Would its 11-foot wingspan make it a Robin Hood "122"? It is Zenoah G-38 powered.

Dave Miner did a nice job flying his new Lazy Ace at the L.S.G.A.S. Fly-In. Has 84-inch span, 21 pounds, power is a G-38.

After attending fly-ins up and down the West Coast, we note that it is not a common practice for the CD to admonish an erring pilot (especially while flying) over a public address system. If the pilot has made a mistake, he needs to concentrate on flying back to a safe position. If the pilot continues to fly dangerously, then it is a good idea to go to his flight position and calmly request that he land immediately, then discuss his bad flying habits in private. A good CD will spend time with pilots in the pits and on the flight line, watching what is going on. In this way, he can usually head off any problems before they get out of control.

If a pilot has made a safety faux pas during a flight, he may be asked if he has a pair of scissors or a knife. Of course, he comes up with the item and then he is told that he is losing the seat of his pants for his offense, so everyone will know the CD is doing a good job. The guy will usually smile and say he's sorry, and it won't happen again. That way he's not mad; he has been warned in a humorous way, and remembers to be more careful. Careless, "to heck with the rules," fliers may suddenly find the frequency pin unavailable, and they are informed exactly why. Dick Glad always brings a sign that says it all, "Don't do nothing dumb."

One of the biggest headaches for a fly-in CD is the number of people who show up with totally inappropriate types of aircraft. We spend a considerable amount of time making up brochures that spell out exactly what is appropriate. I do not know of any Big Bird pilots who go to a Helicopter meet and expect to fly. Speciality type aircraft should show up for model airshows where all types of modeling are being presented to the public or at their own scheduled events.

A.M.A. contest directors are in a position to primarily see that flying is done according to A.M.A.'s safety code, and that all competition rules are followed. The fly-in is easiest because the only role of the CD is to see that the safety code is followed. The bottom line for me is that my job is to help those attending to fly safely and have a good time. Only repeated safety code offenders will get the black flag. Even the best pilots will occasionally make a mistake, and it is unnecessary to ruin their day with a lot of rancor. That should be reserved for the real offenders.

SAFETY RESTRAINTS

Old habits are hard to break, and one of the worst ones Big Bird pilots have is the way they restrain their planes while starting the engine. The old trick of a person hanging on to the wing or stab just does not meet

minimum safety requirements.

Mark Freer was visiting Florida last winter when he met a fellow with gashes from wrist to armpit, caused by a wayward Quadra-powered Big Bird. Can you imagine trying to give first aid to someone with multiple deep cuts up their arm? I have been to a lot of First Aid classes and would be hard pressed to handle such an accident. In the past, several of us have encouraged the use of a safety board chock system. The board allows you to push on the plane if you use a starter and restrains the plane once the engine starts. I have never seen a full-size aircraft held down by the wing during engine calibration. Usually the landing gear, the strongest part of an aircraft, is where restraint is applied. Some modelers use a stake and chain on the tail wheel, which is better than nothing.

Never stand in front of your Big Bird for a full power engine run-up, nor in the geometric plane of the propeller. Start at idle, then step to the rear, prior to applying full throttle. If the carburetor needs adjustment, cut the engine, adjust, then go to full power.

Any sized model is capable of causing serious injury, so never fly alone, because you can never tell when an accident is going to occur. There are many instances where it would have been a matter of life or death if the RC pilot had been flying alone. Always have one or two fire extinguishers handy. Most RC-related fires do not happen in the pits, but in the pilots' vehicles when they get careless with their fuel.

HOW MANY HINGES?

I was reading a biography of Major Ruben Fleet some time ago. The story line related that the Major was flying one of his famous PT-1 Trainers when an aileron came loose. As there were only two hinges on each aileron, the Major was in a tight spot. After wrestling the PT-1 to the ground, followed by a hike to the nearest phone, the factory was informed it would be installing three hinges per aileron on all PT-1s! In the past, there was a big controversy over how many hinges should be required on Big Bird control surfaces. All I can say is that there should be as many hinges as necessary to keep the aileron on the wing under all flight conditions. Because of the simultaneous failure of two servo arms, the ailerons on my Big Bee started fluttering and I had to land with rudder and elevator only. A most unpleasant task at best. Each aileron had seven Du-Bro hinges that were epoxied in place, then a small steel nail was inserted and glued on each side of the hinge. The flutter was horrendous, but the hinges did not loosen at all. So there were enough, in fact, perhaps three would have been enough! Maybe not.

The Big Bee has long strip ailerons so a lot of hinges were necessary. A plane with short barn door ailerons could probably use fewer hinges. Hinges are extremely important in the scheme of things. Poorly operating hinges can cause excessive current drain, which decreases the battery's flight time. In a bad case, high current drain may even burn the insulation off the wires and start a fire. If your flight controls will not fall loosely from the pull of gravity, they are too tight!

The servo arms in the Big Bee failed because they were not heavy enough, and they had a standoff for the ball link which created a twisting motion on the arm and broke out a piece of the arm that had the pushrod attached to it. New, heavy duty servo arms have been attached to the servos and time was taken to balance the ailerons so that they have zero deflection with the pushrod detached. Not only do the ailerons now work smoothly, but should the control rods come loose, there would be very little, if any, flutter. An additional bonus from the balanced ailerons is the fact that even less power is required to operate them. There is no static load on the servos, only the aerodynamic load under flight conditions.

Len Bosman pre-flights his Lancaster Bomber. Len has had requests from as far away as Australia for plans. Sorry, not available at this time.

Harold Leininger's Marquardt Charger was a first place winner at the 1991 Northwest Model Expo. Plane has 1700 square inches, weighs 17.5 pounds, and uses a G-38 for power.

Harold Leiningers's Jodel Robin has an 85-inch span, weighs 19 pounds, and is powered by a Zenoah G-38. The Jodel has a fully-equipped interior and instrument panel.

There are several ways to balance your control surfaces. One way is to have a weighted arm that stays outside the plane. Another is to use a weighted arm that is U-shaped, the weight entering the wing during one half of its travel. On Cessna tail surfaces or on any plane that has elephant ear control surfaces, it is only necessary to put some weight in the outer ear.

Although I totally balanced the ailerons on my Big Bee, it is not necessary to do so. Some amount of weight ahead of the hinge line is always going to be beneficial. If weight is a problem, then you will want to balance your control surface so it will not flutter in any of your airplane's flight envelope. If weight is not too critical, then balance for neutral deflection with the control rod unhooked.

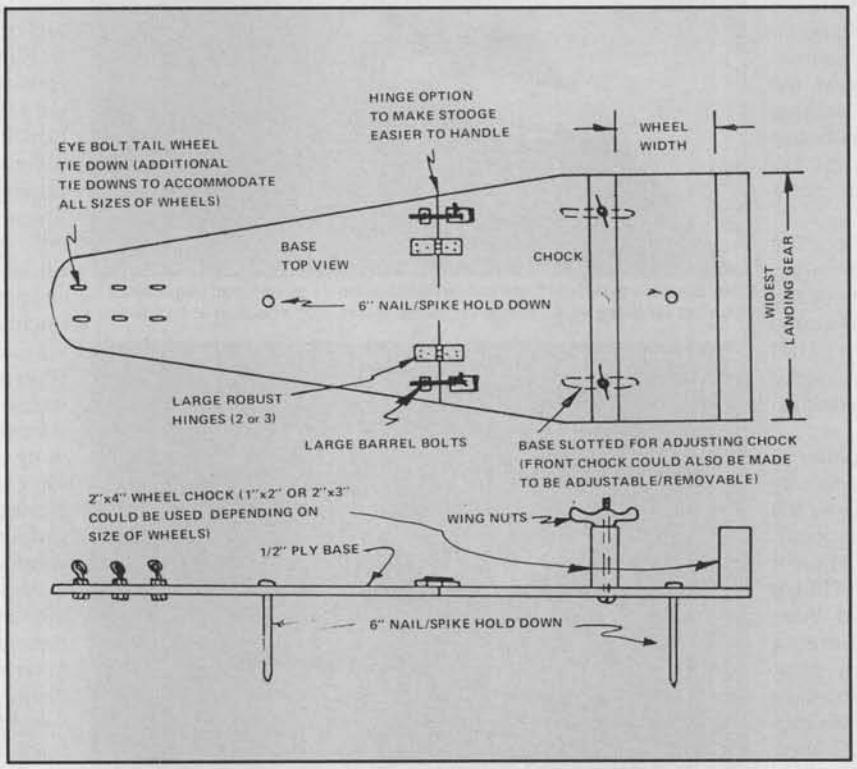
There are a lot of hinges on the market. I do not like the fabric hinges because I have yet to get what I thought was an adequate installation. I prefer Robart hinges because I am able to get a good installation with a simple drilled hole. Du-Bro and Sig make some very nice hinges that have a pin in them. It is necessary to slot the wood for hinge insertion, which is a little more tedious than drilling a hole.

The major concern with hinges is getting them in perfect alignment. If they are not lined up, the control surface is not going to operate smoothly. Flaps require even more careful alignment because it is possible to break off the out-of-line hinge, and that leads to even more work digging out the old hinge mount and realigning everything.

I will never forget working on the first

Boeing 747. We had it all jacked up and were in the process of trying out the hydraulic systems. The signal was given to actuate the leading edge flaps. A terrible noise wracked the whole plane and nearly every hinge mount was snapped on the leading edge flaps. Someone had apparently miscalculated the geometry of the hinge works, so it was back to the drawing board. It just goes to show you how important properly working hinges are, no matter what they are used on.

A good way to insure smooth operating strip aileron hinges is to lay out a line on the trailing edge of the wing using a long ruler. First, make a mark in the center of the trailing edge of the wing, about an inch from the inboard end of the surface, then another in the center of the trailing edge, about an inch from the outboard end of the control surface. Stick a big pin in the center of each mark. Lay your ruler against each pin and draw a line. I usually ask my wife to help me hold everything straight while I draw the line.



Once you have a nice straight line, it is time to carefully slot or drill out space for the hinges to be installed. If you are unsure about the number of hinges to be installed, check around and see if someone else is successfully flying the same model you are building, then check out his hinge system. Six smoothly working hinges will not load down your servo as much as two badly installed ones. It is better to use a few extra hinges than not use enough of them!

Now that you have a balanced control surface with smooth operating hinges, you may want to examine their operation with the servo hooked up. The Ace Servo Cycler is a very handy piece of support equipment, because it is not only a good idea to run any new servo for a while to insure it is flight worthy, but it is also very convenient for checking out flight control movement during construction. It is not always convenient to hook up the receiver and all of the other associated equipment, to check out the movement of a control surface. With the servo cycler and a freshly charged 4.8-volt receiver pack, you are ready to go in a very short time. The Ace Servo Cycler will work with positive or negative polarity servos, the only requirement is to follow the hookup instructions. The servo cycler works with Ace, Futuba, E.M.S., E.W.H., and Multiplex servos and probably any others as well.

BUSTING GLITCHES

In the past we have found that long servo leads and Big Bird servos may cause voltage spikes and R/F interference. One of the best devices on the market to eliminate these nasty little gremlins has proven to be Jomar's Glitch Buster. My unit has been in service over three years and is still performing flawlessly. According to Joe Utasi, Glitch Buster designer, his new model is even better than the old. The new Glitch Buster is less than half the size of the old one and uses the newer style of electronics called surface mounted technology (S.M.T.). Jomar uses only the very finest quality printed circuit boards and components, which is why they operate in the field so well and so long. The Jomar Glitch Buster works well with all types of radios; A.M., F.M., and P.C.M., if it is hooked up properly.

Have you spent a considerable amount of time and money on your latest Big Bird? It may be to your advantage to try another one of Jomar's products, "The Battery Backer." This unit senses the moment your main battery falls to an unsafe low voltage condition and automatically switches to a back-up pack. If you combine the services of a Glitch Buster and a Battery Backer, it is going to be difficult to lose your favorite Big Bird because of a battery failure, equipment induced R/F noise, or voltage spikes.

If you are using a P.C.M. type radio, voltage spikes are to be avoided because P.C.M.s are more sensitive to such conditions than other types. Many businesses find that after they have spent thousands of dollars for a computer system, their computer salesperson failed to tell them their power source cannot vary over half a volt. I spend considerable time setting up test equipment because our own power company voltage can vary from 115 volts to 125 volts during the day, which upsets computers. Then a special expensive back-up system must be purchased to protect the system.

The point is, a receiver that is using a micro processor may be more susceptible to voltage spikes, so a Glitch Buster is going to be very helpful in that regard.

If you are using pull-pull cable systems, it is a good idea to use the new Aramid cables so that your receiver will not pick up confusing signals that can come from a wire cable system. Jomar can supply you with an excellent Aramid cable that works very well on control cables or on the landing and flying wires of a cable-rigged aircraft. Aero Space Composites is also an excellent source of a similar type of cable. I believe George Sparr has three different sizes of fabric type cable, that is sheathed for U.V. protection.

How many of you are sensitive to instant glue fumes? I was about to give them up because they were so irritating. Fortunately, Satellite City came up with its U.F.O. formula cyanoacrylate adhesives. If your building time is limited because of many other commitments, the instant adhesives are very beneficial, and even moreso now that the non-irritating cyanos are available.

Big Bird Book of the Month is *Ruben Fleet and the Story of Consolidated Aircraft* by William Wagner, available at the San Diego Aerospace Museum in Balboa Park! If you wondered, like me, why your Concept "Fleet Biplane" flew so well, this book will certainly inform you. It's also available through Aero Publishers Inc., 329 West Aviation Rd., Fallbrook, CA 92028.

Send your questions and photos of Big Birds to Bruce Edwards, 8304 53rd St. Ct. West, Tacoma, WA 98467, telephone (206) 564-4416.

For information on products mentioned above, contact:

Ace R/C Inc., 116 W. 19th St., P.O. Box 511, Higginsville, MO 64037; telephone (816) 584-7121.

Satellite City, P.O. Box 836, Simi, CA 93062-0836; telephone (805) 522-0062.

Du-Bro Products Inc., 480 Bonner Rd., Wauconda, IL 60084; telephone (708) 526-2136.

Jomar Products, 2028 Knightsbridge Dr., Cincinnati, OH 45244; telephone (513) 474-0985.

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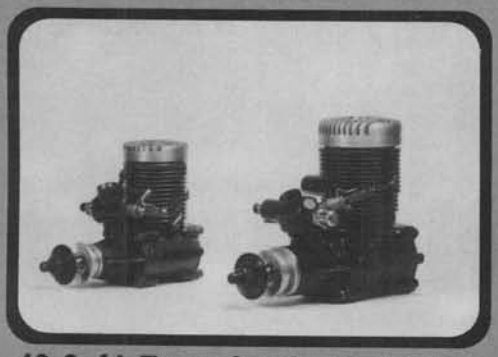

40 & 61 Front intake Gold Cup

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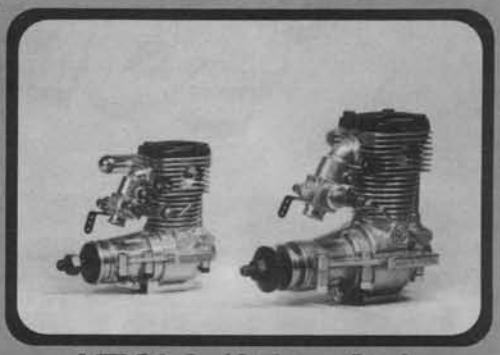
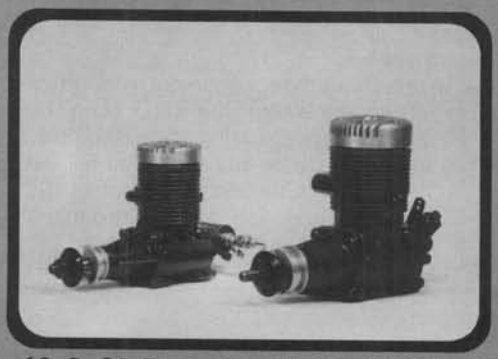


VT 21 & 49 Four Cycle



40 & 61 Rear intake Gold Cup

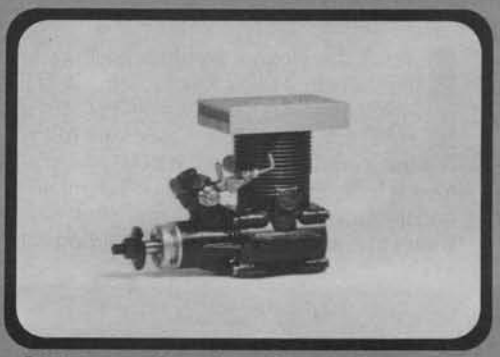
HP is well known for their ultra high quality and design innovations. A leader of model engine technology since the mid 1960's, they pioneered Schnuerle porting and rotary four cycle valves.

HP engines are produced with the latest computer controlled machinery and the finest materials available assuring you of unsurpassed quality. All engines feature hardened steel crankshafts supported by dual ball bearings, true hard chrome cylinder bores, low expansion cast pistons, forged con rods bushed at both ends, and high pressure alloy case castings.

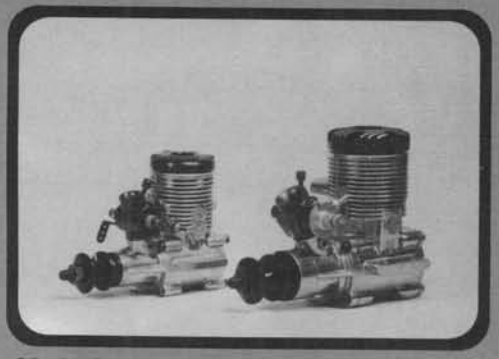
The Gold Cup series have a special black "thermex" coating to dissipate heat and are available in both ABC and ringed versions. Silver Stars are available ringed only. Of course both are Schnuerle ported.

The VT series of four cycles feature overhead rotary valves for smooth, quiet, trouble free operation. This ABC valving is supported by roller bearings never requires adjustment. With no valve float or valve spring tension to overcome you get more power and RPM's.

HP is American owned by RJL Industries, so parts, service and technical assistance are just a phone call away with the owners of the factory, not just an importer or distributor.



61 Front intake Gold Cup Heli



40 & 61 Front intake Silver Star

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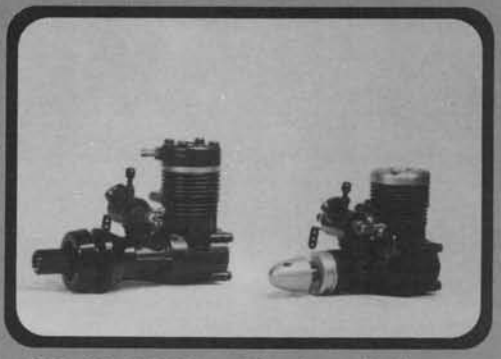
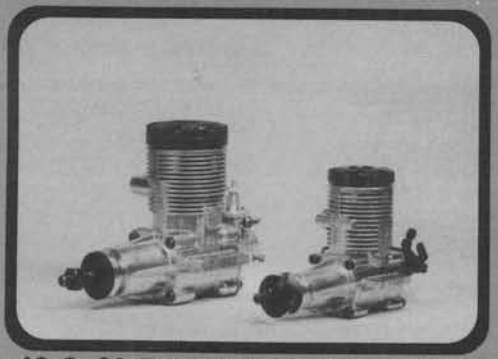
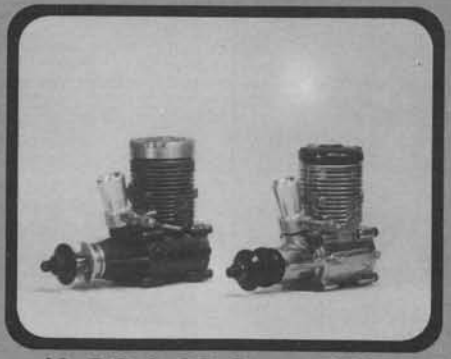


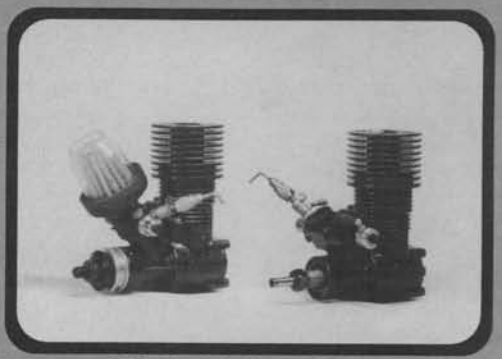
20 Gold Cup Marine & Aero



40 & 61 Rear intake Silver Star



40 GC & SS Control line



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R/C SOARING

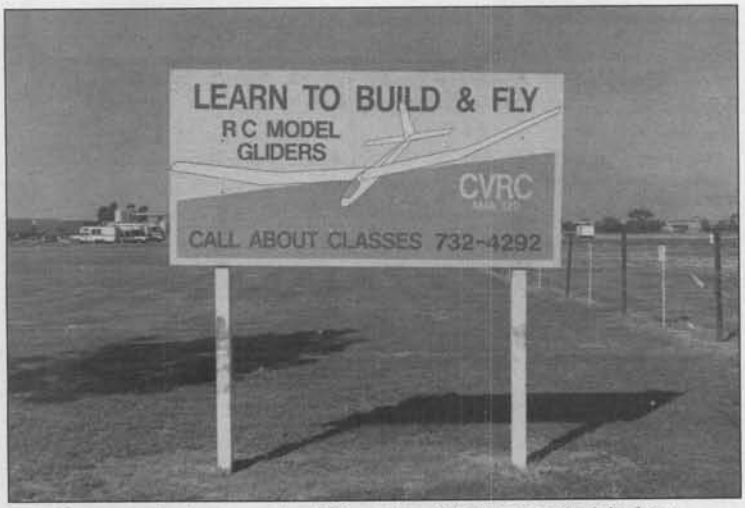
BY BILL FORREY

GETTING STARTED IN SOARING AND WHY

I don't think many would argue against the statement that model soaring is THE SINGLE most popular way to get started in RC modeling. The reasons are many, but the leading factors have to be low cost, lowest initial model building skill demands, and the fact that soaring is the quickest of all routes to gratification in model building and flying. But, that's not all.

More persuasive considerations would include soaring's least complicated, least intimidating, most gentle nature. There is no engine to learn how to run, no electric motor system to wire, no hazardous propeller, and no extra field support equipment to hassle with. It can be as simple as just a sailplane and a radio.

If preserving the environment is important to you, soaring's negligible impact can't be equalled. In model soaring, there is no noise pollution, no castor oil residue left behind on the ground or the model, no potentially dangerous or toxic fuel, and no fire danger. In the event of an accidental crash, the



If you can, look up your local RC soaring club. Many such clubs have organized beginner's programs to help newcomers "build and fly" model sailplanes. Visalia's (California) CVRC club is a great example.

Those early flights can be exciting and stressful. It helps to be flying a glider like this Dynaflite Wanderer, which is very stable.

Slope flying is a great way to get lots of stick time in a hurry. This modeler is launching a Wanderer into very light breezes, otherwise the steep ascent would be a BIG mistake! Always throw level or slightly nosedown.

The Pierce Aero Company Paragon is the ultimate, best-handling flat-bottom wing, large trainer. The 118-inch span gives EXCELLENT performance. Hands-off stability makes the Paragon practically a free-flight model!

Adults helping youngsters is CRITICAL to the future of RC Soaring. Here a qualified club instructor launches a Gentle Lady on an electric winch.

The Hobby Horn Sensoar is an inexpensive, good-flying alternative choice in a small trainer.

damage caused by the average sailplane is far less than a power plane. Because sailplanes are silent, friendly neighborhood relations are much easier to maintain. In fact, if people don't SEE you fly, they can't possibly know that you ARE flying, and THAT means flying fields are easier to get and keep.

Learning to fly sailplanes as a stepping stone to power planes has many advantages. Many of the lessons learned while flying gliders make power fliers better pilots. Skills which glider guiders must develop include the very basics of flight; learning that right and left are reversed when the aircraft is headed toward you. Learning that the radio stick acts just like a full-size joy stick, learning that low speed stalls can be avoided with proper air speed, learning that energy conservation demands smooth control inputs, learning that airspeed (kinetic energy) can be traded for altitude (potential energy) and vice-versa, learning proper landing approaches for safety and model preservation, and many other things related to flying.

You learn that air is a jumble of invisible currents which can sustain or curtail long flights. You learn how to use air currents to your advantage, cheating gravity out of a few minutes or even hours of air time. You learn how the sun heats the earth, which heats the air and creates lift. You learn how a hill can deflect air up and over, creating slope or wave lift. In fact, there is little in RC modeling that is more challenging and more rewarding than using solar energy to sustain flight.

WHAT DO I NEED TO BUY?

To answer this question, one needs to consider where you will most likely be flying. If you are alone in your interest to fly sailplanes and have a large open field available to you, that's one thing. If there is a local soaring club with electric winches or hi-starts available to you, that's another. If you have a hill or slope available to you, that's a third consideration. The first way, you will need to buy launching equipment, the second two ways you probably won't (at least not initially).

Flat-land solo soarers will need to invest a little more money than hill-climbers. A simple, inexpensive hi-start will do nicely at first.

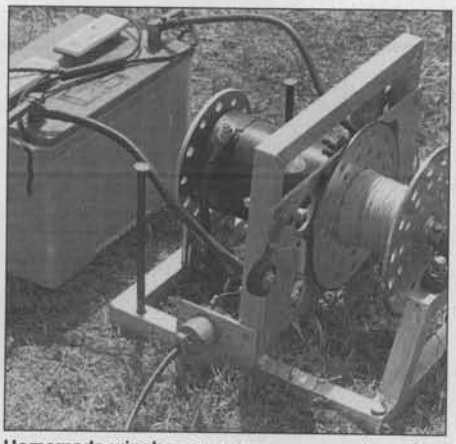
A hi-start is nothing more than a metal anchor stake, 25 to 100 feet of surgical gum rubber or silicone rubber tubing, 150 to 300 feet of 30 to 40-pound test monofilament fishing line, a parachute, pennant or streamer to mark the line in the air and on the ground, and a tow ring. Linked together, anchored down securely, and stretched out to a reasonable pull, the hi-start will provide the energy necessary to launch your model sailplane. The sailplane launches away from you the same way a kite pulls out of your hand when towed up by a friend.

With hi-starts, there are several ways to go. If you have a field that is the size of a football field (the smallest practical field size) then a short Dynaflite Standard Up-Start is the way to go. If the field is larger, try a full-size Standard Hi-Start.

BK Products, of Colorado, has very nice, short hi-starts called Aero Launchers that include a molded nylon storage reel, a rip-stop nylon carry bag, a rip-stop nylon parachute, and a welded anchor stake, all for a bit more money than the Dynaflite Up-Start. Either way is fine, but remember, the bigger the field, the bigger the hi-start, the higher the launch, and the more air time you get per launch, which makes learning to fly faster and easier.

If there is a local soaring club with a regular flying site and club launching equipment open to you, then this is your best bet. You can save the expense of the hi-start or winch, and possibly save your model from costly beginner's errors. Clubs have fliers designated as instructors, who will help you safety check your model, launch your model, show you all the soaring basics, save you from piloting mistakes, and most importantly, show you how to land. They may even have members willing to help you build your model sailplane. Ask your local hobby dealer for help in locating the nearest

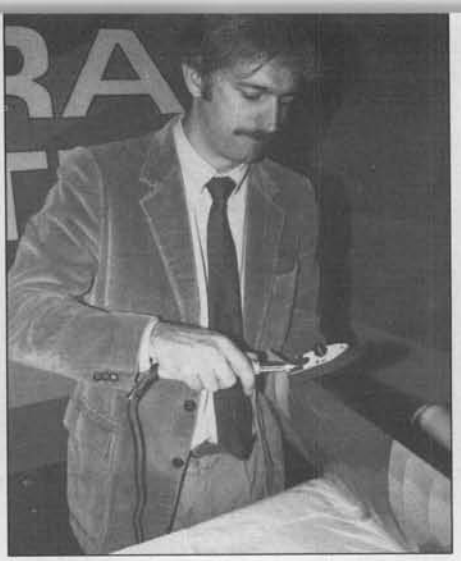
Sig's Riser 100 is a 100-inch flat-bottom wing trainer that would make an excellent choice.



Homemade winches are very common at soaring clubs. This winch is available as a *Model Builder* plan.

Ace R/C's Easy Eagle will give you a little hotter performance in a trainer airframe. Airfoil is a modified Selig with flat bottom and turbulator spars.

The Airtronics Olympic II makes a great performing trainer. The extra span of this 100-inch wing gives longer flights and more stick time.



One very handy tool to own is the heat sealing iron, shown in use. Covering a wing with a big band of color on one side will help prevent disorientation while flying.

Cy Rham is one of the last remaining manufacturers of electric winches. If you want to go "whole hog" this is what to buy in launching equipment.

club, or call the Academy of Model Aeronautics, (703) 435-0750.

WHAT GLIDER SHOULD I BUY?

There are a great number of possibilities open to you. Personally, I believe there are two basic philosophies of trainer sailplanes. Each offers an easy-to-build wood kit sailplane. Each offers the newcomer a slow, easy flying, open structure wing model with plenty of stability.

THE HOBO PHILOSOPHY

This philosophy recommends buying the least expensive 72 to 78-inch span kit model available to you. Here the thinking is that a small, fast-building, simple kit is more likely to hold your interest during its construction.

When you first learn to fly, you are going to make piloting errors. These errors will damage the model (so don't get too emotionally attached to it!). Should this cheaper model become a total loss, it will not be a great loss. This should relieve some of the stress caused by the fear of crashing, and allow you to relax a little and enjoy the learning process from the very beginning.

Repairs can easily be made to trainer models, but the model will be heavier and less pretty than when it was newly finished. The Hobo Philosophy says simply, fly the model till it cannot be repaired and flown anymore. By the time it gets THAT worn out, you will know enough about model building and flying to go onto the next step.

I named this philosophy the "Hobo Philosophy" after a cartoon vagabond caricature of a little hobo. This hobo was once the logo of the best-known example of this cheap, first-buy, two-meter class trainer sailplane, the Dynaflite Wanderer. Other well-known, and equally fine examples of the Hobo Philosophy are the Carl Goldberg Models Gentle Lady, Bob Martin RC Models Pussycat, the Airtronics Olympic 650, the Ace RC Easy Eagle, the Sig Easy Riser, the House of Balsa Two-By-Six (2x6), the Great Planes Spirit, and the Hobby Horn Sensoar.

THE PARAGON PHILOSOPHY

The second philosophy says spend the little extra money and get a nice, standard class (100-inch) or larger trainer sailplane. I would recommend this option only where you have access to a local, flat-land soaring club with active, caring members, electric winches, and a good instructor program. These new friends will be able to help you and encourage you in this bigger and more time-consuming building project. They will also be able to help you fly your model safely and reduce the chances of accidental crash damage.

This philosophy is attractive because the bigger models have superior flying performance. Generally speaking, the bigger the trainer, the easier to fly. You will learn how to fly faster because the bigger sailplane is more stable and less prone to be upset by gusts of wind, and it can remain aloft longer due to its inherently better performance, giving you more stick time and a steeper learning curve.

I've named this the "Paragon Philosophy" after what I feel is the best representative of this larger class of trainer sailplanes, Pierce Aero's Paragon (built to 100 or 118-inch span options). Other well-known examples of this class are the Sig Riser 100, the Airtronics Olympic II, and the Dynaflite Mirage (built to 100-inch span option).

WHAT COVERING SHOULD I BUY?

Covering materials have come a long way since the dope and tissue days. Modern iron-on, heat shrink, plastic covering materials are much easier to apply and much faster, too. A virtual rainbow of colors, even fluorescent colors, are available. The most

Continued on page 63

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BY RICK ALLISON

LOGICAL STEPS TO TRIMMING

This month we are going to take a quick look at the logic behind the trimming procedures we use to get our aircraft flying straight, and just how common sense fits into the picture. I've recently heard from several stressed-out and pre-ulcerous friends and readers, and if you guys think I might be using the magazine to answer my mail, well, you might be right.

Probably more stuff has been written about trimming than any other aspect of pattern flying. Some very good "cookbooks" exist, including the one recently (like, last year or the year before) published in *K Factor*, the newsletter of the National Society of Radio Controlled Aerobatics. By the way, if you are at all interested in pattern and haven't joined this organization yet, you need to do so. The monthly newsletter is a mini-magazine, with much good data and a lot of pattern-related advertising. Send 20 bucks to Suzi Stream, 3723 Snowden Ave., Long Beach, CA 90808. The phone number is (213) 429-1281. Suzi is marrying my pal, Greg Frohreich, and moving to Phoenix, but the above address should still work until further notice.

Behzad Pakzad holds his new "Meridian," kitted by Piorun Models; a beautiful flying airplane.

As I was saying, a lot of stuff has been written about trimming, most of it from the viewpoint of, "If the airplane does A, then do B, and if that doesn't work, do C and D, in that order. If this fixes A but causes F, you must do G, and then go back to B and start all over. Of course, if the airplane is not doing A, but is in fact doing the exact opposite of A, then reverse everything in the proceeding paragraph while standing on your head and facing due east, unless the prevailing wind is from the east. In that unfortunate case, you must..." and so on. If you have read this sort of stuff before and found it confusing and maybe a bit tough to follow, you are perfectly normal.

I don't mean to say that there isn't a lot of very good data contained in the often-convoluted trimming explanations we sometimes read, because there is. Most of the time, the reasoning is excellent and the advice is sound. You just have to progress to the point where you understand it before you can understand it. See what I mean? Hmm, this may be tougher than I thought...

What is needed, I believe, are some logical concepts on which to hang our data, kind of like a guide to understanding trimming guides. Understanding what you are trying to accomplish is more important than memorizing a list of symptoms and cures. Comprehension dissipates confusion. We need to talk a little about some generalities, and then lay out some concepts.

Let's talk just briefly about WHY we trim. I'm tossing this in here because I know some otherwise very smart people who really can't be bothered to take the time necessary to get an aircraft flying straight. They would rather just go fly, trusting their golden thumbs to carry the day. This isn't terribly swift. When you go up to that flight line, you need an airplane that will help you in every way possible, and not be another obstacle to overcome. A well-trimmed airplane is at least several orders of magnitude easier to fly, and it allows you to concentrate on producing reasonable geometry in the sky instead of trying to stay one jump ahead of a perambulating airborne train wreck.

Practicing with an out-of-trim airplane is even dumber, because about 7/10ths of what you manage to learn will be related strictly to what extra control input it takes to make that particular airplane track through a reasonable set of maneuvers. Trim first, practice later.

For our first generality, accept the premise that trimming is a circular process; a chicken and egg deal. If you start with a chicken, you get an egg, and if you start with an egg, you get a chicken. Chickens are not legal in any of the pattern classes, although some of my friends do claim to fly dogs, pigs, and turkeys. Fun aside, what I mean is that often you will come up against a situation that necessitates a basic change to put it right, like moving the aircraft's balance point. Such a basic change might (and probably will) affect not only whatever problem you were trying to cure (say, a pitching problem in knife edge), but also other aspects of trim such as the amount of downthrust needed to maintain a vertical upline, or the amount of aileron differential needed to maintain a good axial roll. Trimming is interactive, and sometimes you will need to go back to square one and readjust your adjustments. The trick is to know when to do that, and when not to.

Which brings us to the following idea: Not all aspects of trim are equally important to everyone at all times. Possibly I will be burned at the stake for uttering such heresy, but 'tis true, all the same. It is possible to live with some trim problems, and not with others. As you progress from class to class, the list of problems you can live with gets shorter and shorter. In this way, trim problems are a little like women. The older you get, the fewer women you are able to live with. However, the list of women who are willing to live with you also gets shorter, so hopefully it all works out.

Let me explain. Novices need a stable airplane that loops straight. Sportsmen demand that, AND an airplane that does

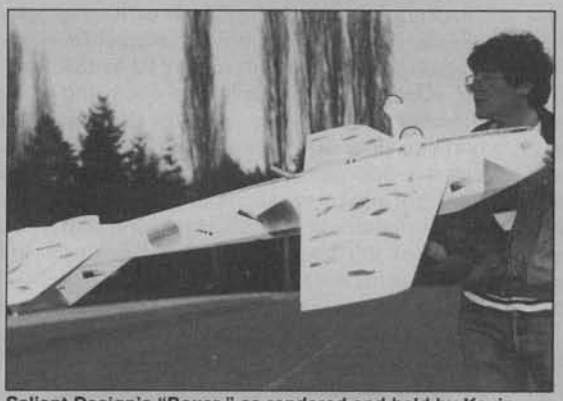
consecutive rolls well, AND an airplane that flies well inverted. Advanced pilots need all of the above AND an airplane that draws straight vertical lines, AND an airplane that knife edges well, and so on through the classes to FAI. FAI pilots need airplanes that do everything perfectly. These perfectly trimmed airplanes are not terribly easy to come by, which is why FAI pilots sometimes can be observed walking around and staring into space while scratching their heads and talking to themselves.

The above idea of different levels of performance requiring different levels of trim isn't always a hard and fast deal, however. Even the most squared away novice is going to have a tough time performing stall turns with a plane that has excessive roll couple ("roll couple" is the tendency for an aircraft to bank as well as yaw with application of rudder control). And obviously, the absolute ideal would be for everyone to have a perfectly trimmed airplane. Unfortunately, we do not live and fly in an absolutely ideal world . . . which brings us to the next idea.

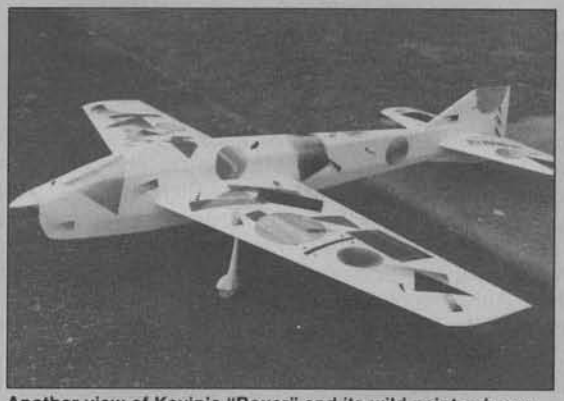
I also know folks who get so involved in ceaselessly trimming and retrimming their airplanes that they forget to practice. This isn't any smarter than practicing with an out-of-trim airplane. It is important to know when to stop trimming and start practicing. As trimming is a circular process that never really is finished, you need to learn to recognize your personal point of diminishing returns. With today's computer radios, some types of minor (very minor) problems can be successfully mixed out, so living with a bird that falls a tiny bit short of total aerodynamic Nirvana isn't nearly as painful as it used to be.

With that thought in mind, maybe it's time to say a few words about computer radios and mixing. I have some good friends who are "purists," and they view the idea of using radio mixing to sort out a trim problem with the kind of horror that most of us reserve for child molestation and robbing poorboxes. They proclaim it to be cheating, not playing the game, and just definitely not done by the better classes, old chap. Not being an old school tie pukka sahib type, my thoughts on the matter are a bit more pragmatic; that is, it either works or it doesn't. Mixing is a trimming tool, just like lead weight, shims, or a razor saw.

Someone once defined aerodynamics as the art of aerial compromise. That's not a bad definition of trimming, per se. Most often, the best possible state of trim that is "reachable" or practical for a particular airplane will involve at least one and maybe multiple compromises. Maybe that perfect vertical upline trim means having to either live with a slight pitching problem in knife edge or taking a saw to the airframe. Maybe the choice is either to live with a little bit of roll couple in one knife edge or the other in an otherwise perfectly trimmed bird, or cut the wing to readjust the dihedral and perhaps risk making matters worse. Only you can decide just how badly you need to fix something. If you have reached a point where the problems are few and tiny, maybe "dialing it out" with the radio is a reasonable choice. After all, is mixing really any less legitimate a solution than running around with both ailerons drooped or reflexed, or having a wing saddle shimmed to deliberately tilt one wing tip up or down?



Salient Design's "Boxer," as rendered and held by Kevin DeShazer of KDI, Inc. Notice the trick wheelpants, now available from KDI, assembled, with wheels made of polypropylene, for $25.00.



Another view of Kevin's "Boxer" and its wild paint scheme.

Reaching a decision in such matters is made more difficult by the fact that trim problems can be roughly separated into two types: Those that are the result of warps, misalignments, or poor building practices, and those that are inherent in the aircraft design. If the problem is simply a crooked airplane and you know it, then the answer is pretty easy. You cut and realign. If, on the other hand, the problem is one that has been designed into the airplane, all the realignment in the world might not help, because the real problem might be insufficient tail volume, a poor choice of airfoils, wrongly sized or placed control surfaces, or a bad distribution of lateral area. Sometimes, it isn't so easy to tell the difference, but if you suspect you might be trying to cure a birth defect, my advice is to ask the most experienced person you can find who has experience with the same design.

One type of design problem you can usually cure is a poor force arrangement, i.e., wrong incidence in the wing, stabilizer, or both, or perhaps a side or downthrust offset which isn't right. Often, these sorts of things aren't even the poor designer's fault. Airplanes of the same design are seldom really identical, and the settings on the plans might have produced a state of perfect trim in the prototype, given the prototype's weight, powerplant set up and exact balance point location.

Time for some concepts to think about when trimming.

1. Trimming starts during the building process. Take time to measure and align correctly. It is far easier to build a straight airplane than trim a crooked one.

2. Of all the factors which influence aircraft trim, the most important is Balance Point location. Move the BP, and nearly everything changes. For this reason, start the trimming process by setting the BP location. If for some reason you have to change the BP location, be prepared to start again from the beginning.

If no Balance Point is shown on the plans, you can try this home grown recipe of mine. Measure your tail moment arm (from 25% of the MAC [Mean Aerodynamic Cord] of the wing to 25% of the MAC of the stab, or from the wing MAC to the elevator hinge line if you're lazy). Measure the MAC of the wing (adding the root chord to the tip chord, dividing by two, and then hunting for the spot on the wing that most resembles that measurement, is the lazy method for this one). Assuming your stab is of average size (20-25% of the wing area), divide the moment arm by the MAC. If the resulting number is 2.75 or greater, set the Balance Point at 33-34% of the MAC of the wing. If the number is 2.5 to 2.75, set the BP at 28-32% of the MAC. If the number is smaller than 2.5, set the BP at 25-28% of the MAC. If your stab is smaller than average, shade the numbers to the low side (BP further forward). If your stab is larger than average, the reverse is true. This will give you a good initial placement of the BP, and better than 90% of the time, you won't have to move things again. This method works for most of the flat bottom, semi-symmetrical, and of course, for the symmetrical airfoils we see in RC.

As a final rule of thumb, you may take it as fairly certain that if it takes more than just a dab of down to hold level flight inverted, you have a nose heavy condition. This is providing that you haven't managed to build in a bunch of up thrust, of course. I do not jest. I have seen this airplane, and helped trim it.

3. When trimming, it is helpful to start by thinking in terms of, "What do I have to do to the airplane to cause me to have to move the control surface in question in the direction it must go to solve the problem, while still maintaining level flight trim?" Example problem: aircraft pitches towards the canopy (up) in both knife edges. Needed action: add downtrim to elevator (positive to stab) without causing loss of level flight trim. Solution: move the BP to the rear, thereby causing a need for downtrim in level flight.

This is a lot easier than going, "Lessee, the sucker pitches to the canopy so it needs either negative in the wing or positive in the stab, or is that positive in the stab or negative in the wing?"

Not only is the above litany confusing and hard to remember, but it usually won't work, even if you get it right (to which lots of people with adjustable stabilizers can attest), until you move the BP. Why? Well, near as I can figure, with the BP in the original location, you have done nothing to change the static margin of stability of the airplane, and you haven't altered the total nose down pitching moment of the airplane. You can crank the incidence angles all over the place but any combination of main and tailplane settings which produces balanced level flight at the same aircraft weight and speed as before is going to produce about the same pitching force in knife edge as before.

All you really will have changed will be the amount of drag produced by the flying surfaces at their new rigging angles and the amount of drag produced by the fuselage (which will now be at a new alignment angle relative to the direction of flight). Plus, you have now realigned all your thrust offset settings as, being the conventional type, you probably have your engine bolted to the fuse. If all you really needed was a little more or less drag or a downthrust adjustment, this will sometimes work. More often, you will need to adjust the BP *AND* the incidence angle of the wing or tailplane (even if it's just a few clicks of elevator trim or drooping or raising the ailerons a couple of clevis turns, what you've effectively done is change the angle of incidence of the surface in question). And then readjust your downthrust, if necessary. Whew! I knew this would get complicated sooner or later.

4. One major problem can cause multiple minor problems in other flight modes. For this reason, identify and fix the major stuff first. Often the minor problems will vanish when this is done. If you do things in the reverse order, you will likely have to do everything again. Example: a misaligned or warped wing panel or aileron can (but not always . . . this isn't an exact science) cause the following list of problems: Drifting in or out in loops, roll couple in knife edge and stall turns, drifting to one side in vertical lines, pitching in knife edge, differing aileron trim as speed changes, wing drop entering and exiting squares, and likely several other nasty items I either haven't yet run into, or can't remember.

Now, you could add wing weight to one tip for the loops, adjust the side thrust for the verticals, play with elevator differential for the squares, use the radio mixing to fix the knife edge and roll couple problems and remember which wing is likely to drop when you slow down so you can be ready with some opposite aileron . . . or you can fix the wing or aileron misalignment. Of course, the real nightmare scenario (and one that happens all too often) is that you will do that whole long list without really fixing much of anything, and THEN find the real problem, fix it, and have to go back and undo all the stuff you did before.

5. If you are considering using the mixing in the radio to help solve a problem, trim down to the problem that the radio can help you with. Example: the BP, thrust offset settings, and incidence angles that produce straight up and down lines cause a slight pitch to the top in right knife edge and to the bottom in left knife edge (this is a very common problem with "all on a line" midwing designs using large diameter props and large amounts of right thrust). The choices: live with or attempt to fix the pitching in the knife edges or live with some tendency to drift in the verticals. The radio solution: trim for the verticals and dial out the knife edge problem, because the opposite isn't possible. You can't fix a thrust offset problem with mixing (Please don't tell me to mix elevator or rudder to throttle. I'm not a purist, but I do have my limits).

The "non-radio" solution might be to try differing incidences in the stab halves . . . if the stabs are plug-in adjustables . . . shim one side or the other of the wing saddle, or add some negative to the wing. Sometimes, this will work. Very often, it won't, or if it does, it will cause another problem somewhere else . . . like in the vertical lines which were formerly perfect, or in looping maneuvers.

Another way the radio can help as a trimming tool is to allow you to separate problems. You might have both a pitch and a roll couple problem in knife edge. The dilemma here is determining if the roll couple is being caused by the pitching problem (if the wing is still lifting . . . not completely unloaded . . . most yawed airplanes will have some tendency to roll, depending on the design), or if it is a separate problem related to incorrect wing dihedral. Temporarily dialing out the pitching problem (unloading the wing) can help you determine just how many worms you have in your can. As for myself, I still wouldn't consider slicing on the wing until I had at least a semi-permanent fix in place on the pitching problem.

6. If a previously well-trimmed bird suddenly starts flying like a dog, don't panic and start changing stuff around in an effort to alleviate the problem. Such an occurrence usually means that something has come unscrewed, unglued, unhooked, or otherwise has changed relationship to the whole. It is time to emulate Sherlock Holmes rather than Chicken Little.

For example, I once had a well-trimmed airplane (the Cursor prototype, as a matter of fact) suddenly develop a nasty wing drop every time I pulled angle of attack. I checked every pushrod, clevis and screw. I checked the alignment of every flying surface. I scrutinized and re-tweaked all the control throws. It was a week before the Nats, and nothing was working until a friend related a tale of a similar problem with another airplane that had turned out to be a loose piece of wing covering.

Bingo! A loose piece of Monokote trim on top of the wing in question (nearly invisible at rest) was lifting with every increase in angle of attack (increase in pressure differential), and momentarily destroying airflow over the surface of the wing, causing a loss of lift and the wing drop. I ironed the sucker back down. End of problem, except for all the control throws I had reset in an effort to trim out the wing drop. The obvious moral is to think first, and tweak later.

That's about all the common sense stuff I know about trimming . . . except to tell you that trimming is just about all common sense. Use the trimming guides, but refuse to be confused by them. There are no techniques which are more "correct" than others. If it works, it works, and if it doesn't, try something else. Be an S. Holmes, not a C. Little. If all else fails, you can always hack the thing to death with a machete and bury it in the back yard at the dark of the moon. This technique isn't great as a trimming solution but it is usually a surefire cure for ulcers and stress headaches, plus it frees up your weekends.

I know that new airplanes are being born every minute, but nobody is sending me baby pictures. Color snaps are fine. Until next time, see ya' at the field . . . Rick Allison, 15618 N.E. 56th Way, Redmond, WA 98052. **MB**

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CHOPPER CHATTER

BY JAMES WANG

Helicopter aerodynamics is a fascinating subject, that I got started writing about for RC magazines purely by coincidence. About four years ago, my office mate, an expert on helicopter aerodynamics, was a professor teaching and researching helicopter aerodynamics. We had many conversations, and one day I decided to jot down some of the fundamental concepts on helicopter rotor blades. Then, I thought, why not send it to a model helicopter magazine, as many RC helicopter pilots probably would be interested in learning more about rotor aerodynamics. My first article, "What is the State of the Art Rotorblade," was published in England's *Helicopter International* magazine. I then followed with another article explaining how to incorporate Delta-3 feedback to the main rotor head, and another on modifying the Bell-Hiller mixing ratio to improve stability and controllability.

From these three articles, I received many calls and mail, and I decided to explain some more about helicopters; after all, writing articles for RC models is a lot more fun than writing technical papers on full-size helicopter research. Furthermore, it is nice to know that some of these ideas have now been incorporated in many production helicopter kits. For instance, Delta-3 feedback is now used on

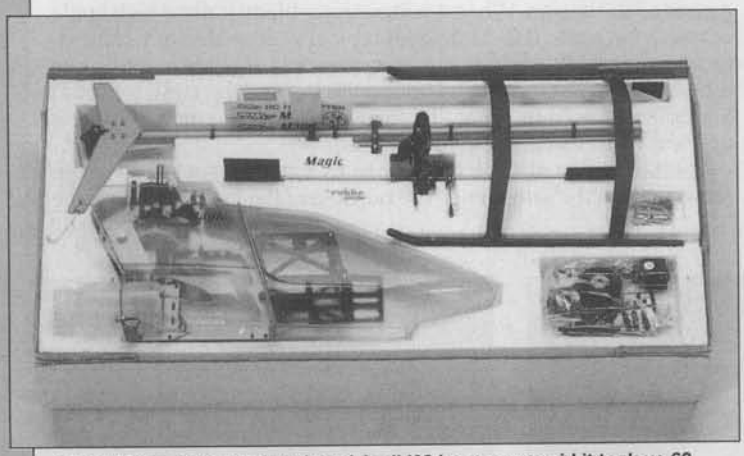
Robbe/Schluter's 1991 helicopter-only catalog, 40 pages, full color, is now available. Call Robbe at (201) 359-2115 to obtain this pretty catalog. One of the new items shown is this aft fairing for the Magic. It is made of canopy plastic material and costs around $30. A similar one is available for the Champion.

GMP flybarless and Elite rotor heads, on the new X-Cell rotor head, and recently even Schluter decided to have Delta-3 angle on its 1991 Magic, Scout, Junior and Whopper. The Elite rotor head also incorporated a very high 90-percent Bell-Hiller ratio. I was also very glad to talk to Alex Gauss of Virginia because based on my first article, he made a swept-tip three-airfoil fiberglass blade. He gave me a set to try, and it does very well.

This month we will have some excerpts from my first article, which surveyed the fundamental concepts in model rotor blades; in the following months, we will zoom in on picking the best blade planform and airfoil for model helicopter uses only. First, there is not one single ultimate airfoil, or ideal blade planform. It all depends on the type of flying you do . . . hot dogging, FAI, collective pitch or fixed pitch design, etc. A rotor blade going through the air generates both lift and drag. The amount of drag determines the engine power required to turn the blades.

There are basically two types of drag produced by a wing or any rotor blade; induced drag and profile drag. Induced drag results from the fact that our blades are not infinitely long, and any moving airplane wing tip or helicopter rotor blade tip always causes the air to swirl at the tip. This swirling air is called a vortex. It disturbs the air flow around the wing, thereby producing a drag called induced drag. On a humid day, we can sometimes see the swirling vortex trailing off a 747's wing tips as it takes off and lands.

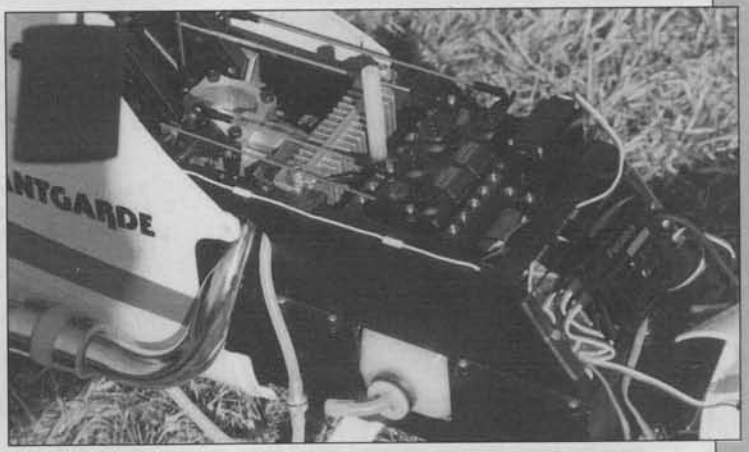
To minimize the induced drag, we must do two things. First, we want to have high aspect ratio, which means long and slender blades, because this would push the tip vortex far away and thus minimizes its damaging effects on the inboard part of the blade. The trailed vortex is also responsible for some of the impulsive noises we hear as we do a high-G turn or pull out. It is called "blade slap" or



In our Magic review in March and April '90 issues, we said it took us 60 hours to build, paint and set up our Magic. Now Robbe has just introduced the ARF Magic and ARF Junior 50. This picture shows that the ARF Magic has the main rotor head, tail gear box and boom, main frame and transmission, servo tray and skids completely done. Just take them out of the box and bolt these four items together and add a radio and engine. Now the time has been reduced from 60 to 10 hours. The ARF Junior 50 even comes with a Webra 50 and muffler already installed.

Remember the blue Legend on our June '91 cover? That same Legend belongs to Jim O'Brien, and is now inside this Heim Bell 222 scale fuselage. The belt drive tail rotor is replaced by an X-Cell 60 tail rotor system. This picture was taken before the model was painted. Jim also programmed the Futaba 9VH such that when he hits the throttle hold switch, the landing gears will remain retracted until he raises the collective stick above one-half for the flare, then the gears will pop out automatically.

Author's friend Richard Baker flies his lightweight, fast Robbe Avantgarde 60-size helicopter. The mechanics are Heim and 80% plastic. The transmission sounds very good; like a turbine engine spooling up. Very quiet because all the gears are plastic.



The inside of the Avantgarde. An Enya 60 and tuned pipe is used for this 9-pound model. The cabin is plastic and the canopy is just like a normal clear canopy, but with aft fairing.

"blade vortex interaction" noise. From the name you could probably have guessed what they are already. The noise results from the second blade encountering the trailed vortex from the previous blade. Note, there is no such thing as whisper mode as in the "Blue Thunder" movie!

The second method to minimize induced drag is to build a twist into the rotor blade, which is commonly called "washout." Ideally, a hyperbolic twist gives the minimum induced drag for helicopter rotor blades. That means the blade is twisted 90 degrees from the root to the tip (Aerodynamically this produces a uniform induced velocity). This is ideal only for hover, and it hurts the performance of very high speed forward flight. In general, an 8 to 10-degree linear twist from the blade root to the tip will give excellent compromise, by improving the hover and low speed forward flight efficiency, and reducing retreating blade stall at high forward speed.

Profile drag is the other major group of drag that I have mentioned. One source of profile drag is air viscosity. The word viscosity means stickiness. For example, oil has higher viscosity than water. And water has higher viscosity than air. As our rotor blades slice through the air, the air tends to stick on the blade surface and drag the blade backward. This is called "skin friction drag." The only way to minimize skin friction drag is to make the blade surface as slick as possible.

The second source of profile drag is the thickness of the blade. As the blade moves forward, air is displaced around the blade. This produces what the aerodynamicists call "form drag." From the name you could have guessed that the magnitude of the form drag depends on the form or shape of the moving object. The more streamlined the object, the less the form drag. Form drag is minimized by choosing a good airfoil design. When a wing or rotor blade stalls at high angle of attack (around 10 to 12 degrees typically), then the form drag increases tremendously, because now the wing or blade is acting like a blunt body. Just try putting your palm outside the car window at 50 mph, first holding it parallel to the horizon, and then twisting it upward 10 to 15 degrees, you will see.

Form drag can also be minimized by tapering and twisting the rotor blade at the same time. The purpose of the taper is to keep the

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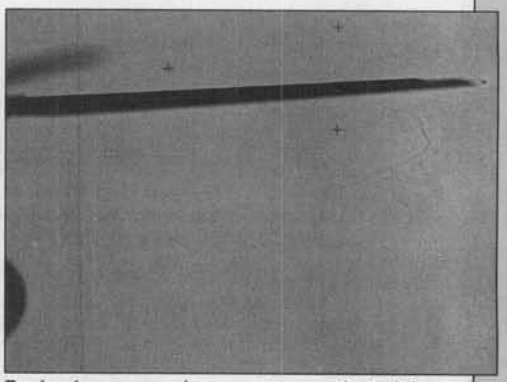
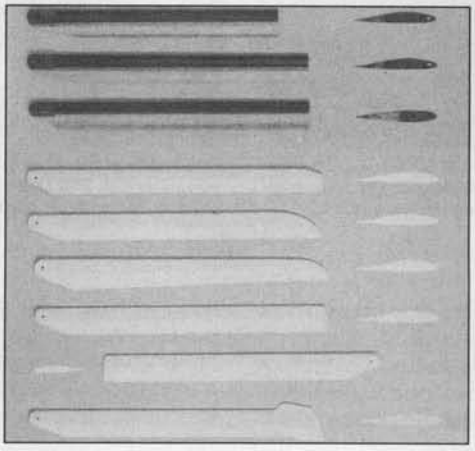
In the text, we talk about "blade tip vortex." This is a picture from a wind tunnel test of a helicopter done by the author's colleagues at the University of Maryland. If you look carefully, you can see the dark lines spiralling down from the tip of the rotor blade. These dark lines are the center core of the blade tip vortex. On the left is the nose of the helicopter fuselage. This picture is captured using a wide-field shadowgraph technique, which uses a bright strobe to freeze the blades' motion. The dark lines are shadows formed on the tunnel wall. The dark line also means the air density is much higher at the vortex core. The objective of the research is to examine how the rotor downwash interacts with helicopter fuselage.

This is an interesting way to mount the long receiver antenna. A long nylon tube is bent around the front canopy and attached to the landing strut. This is on Gary Frank's old Cobra. Modern base-loaded antennas offer almost just as good radio range as the uncut antenna.



For beginners, we always recommend a training gear system. If it is made of two 36-inch long, 3/8-inch diameter dowels with a whiffle ball at each end. Epoxy 3/8-inch washers at either end of the ball to allow the ball to spin, but not slide. For 60-size helicopters, you may want to use 48-inch long dowels.

For 1991, Robbe/Schluter has introduced two new MD500E scale fuselages. These are white gel-coated. Large size is for Magic 60, small one is for Junior 50. The fuselage kits include the scale-looking high landing gear set.



Here are some different styles of model rotor blades and airfoils. The top three are wood, the bottom ones are fiberglass. Glass blades average around $120, but they are beautifully finished, balanced and ready to use. The top two airfoils are called cambered-reflexed. The third airfoil is symmetrical. The sawed-off and swept-tip blades reduce induced drag. Tapered blades also reduce drag. The bottom most is the BERP blade. Blade tip designs were discussed in November and December 1989 *2*Model Builder*1* issues. This month and next, we will talk about blade drag and airfoils. The above model blades are sold by Robbe/Schluter.

Helicopter WORLD

KALT WHISPER ELECTRIC HELICOPTER, PART II

BY JAMES WANG

This month we will conclude our review on the Kalt Whisper electric RC helicopter. Last month we discussed the basic characteristics of the Whisper. These are the key points: It is extremely easy to fly, having very pleasant and predictable handling characteristics; the model feels very light in flight, like flying a butterfly; cyclic and tail rotor controls are very responsive; collective response is decent, but nowhere as good as 30-size gas helicopters; it is great for flying in calm weather (because of its light weight it gets blown around on windy days); the model is very fragile and not very crashworthy; flight time on 1100 mAH NiCd battery pack is around three minutes; micro servos must be used; a peak detector type charger that can charge 8-cell NiCds is recommended; $200 per kit is not too bad; a mini-gyro is recommended; and the model really is not rugged enough to be a beginner's first model helicopter, but due to its docile handling, any beginner with one or two gallons of fuel on gas helis can fly the Whisper.

First on the agenda is the landing gear design. The strut material is too brittle. The struts are of the same material as the molded side frames. We think the struts should have been molded out of a more pliable material. To compensate for the stiff landing gear struts, Kalt has devised a shock absorption system. Each landing strut is held onto the main frame by two 2.5mm bolts. This is just like the arrangement used on the X-Cell, Legend and other pod-and-boom models. However, in between the struts and the main frame, a 1/4-inch piece of silicone fuel tubing is slipped over the 2.5mm bolt. The tubing acts as a cushion to absorb the shock from hard landings. The idea works pretty well, but you must cut each piece of tubing to perfect length to "optimize" the shock absorption ability. Once this is done, the system actually works quite well.

The Kalt Whisper electric RC helicopter is extremely easy to fly. In totally calm weather, even beginners can fly it. Author's friend, Peter Chen, who has only been flying RC helicopters for a month, had no problem hovering Wang's Whisper while Wang took the picture.

Please note that the instruction for installing the shock absorbing fuel tubing was not mentioned in the beginning of the manual. Instead, it was mentioned on the last page of the manual as an update. Mike complained that he had to take the landing gear apart and insert these pieces of tubing. Therefore, if you are going to build a Whisper, have a look at the last page of the instructions first (In fact, it is always recommended that you read through all of the instructions before starting construction).

In the unfortunate event that you do break a landing strut, here is how I have repaired mine. Use some slow CA glue and accelerator to glue back the strut. Then add a patch of 3/4-ounce fiberglass cloth on both sides of the strut. Then more CA glue. You can add some baking soda to make a fillet, too. Then add some more 3/4-ounce cloth and more CA glue. In total, three layers of CA and 3/4-ounce cloth on each side will do. Epoxy will not work.

Accelerator is great stuff! Normally, thin CA glues will run. Once accelerator is sprayed on the CA glue joint, the CA will cure instantly. If sufficient slow CA glue is dropped at a joint, the kicker can cure the CA and form a very strong clear fillet. I have even used the slow CA and kicker to repair expensive eyeglass frames that were accidentally dropped.

The NiCd battery is held onto the bottom of the model via two nylon tie wraps. These tie wraps are reusable, which means you can pull on the little tab that bites into the stripe and loosen the tie wraps. Even though they are reusable, they are not the most convenient to work with. The tie-wraps are each secured to the landing strut by two 2mm bolts. The 2mm bolts go through two holes in the tie-wrap. The bolts make the tie-wrap weak near the holes. We have one tie-wrap broken off near the hole. Probably a hook and rubber band system would have worked better. Folks, please avoid using CA glue on nylon tie-wraps at anytime. CA glue makes most nylon tie-wraps brittle.

The main rotor head on the Whisper is the proven Kalt hingeless rotor head design. Unlike the X-Cell rotor, there is no floating axle. And unlike GMP Elite or Prohead, there is no teetering pin. And unlike the Kyosho Concept, there is no flapping hinge for each blade. The beauty of hingeless rotor design is that each blade is allowed to flap individually by elastically bending the thin composite flexbeam hub. The advantage is that there is no teetering slop like

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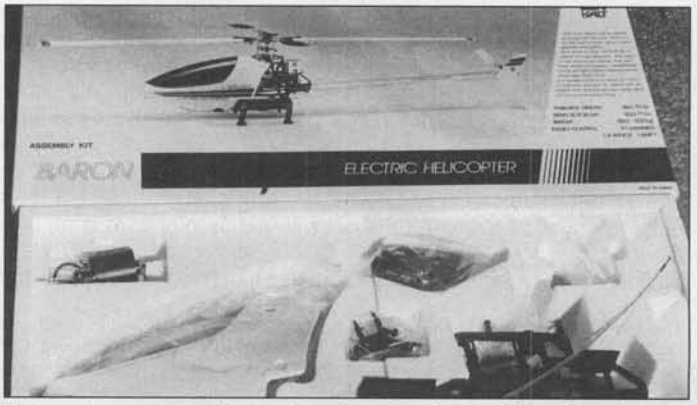
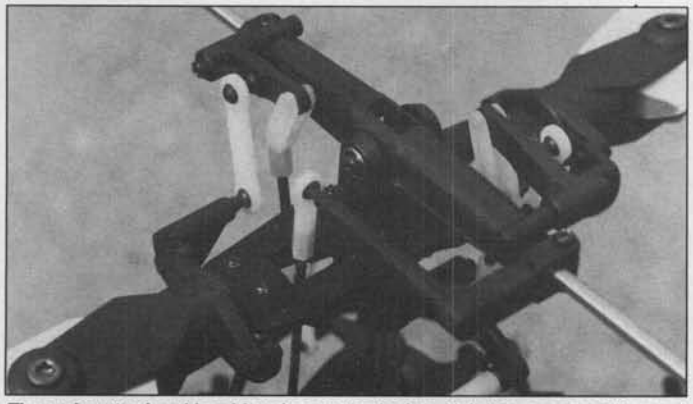
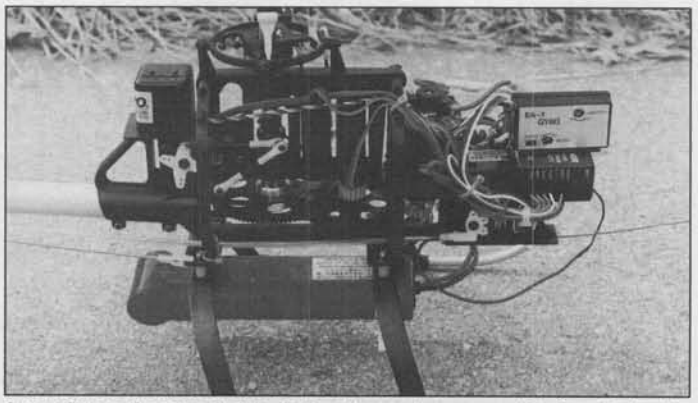
The Whisper in a very stable hover. The 8-cell 1100 mAH rechargeable NiCd can be seen strapped to the bottom of the helicopter. The tail boom and tail blades are located quite low to the ground. Tail fin doubles as skid. Total flying weight is 2 pounds, 12 ounces. Ideal for flying in your front yard. Kalt has available a fiberglass Tow Cobra scale fuselage for the Whisper. The glass fuselage weighs less than 200 grams, and costs around $160.



Two versions are available: an almost-ready-to-fly, or a kit version, shown here. The kit version is $30 less and took the author and a friend two evenings to build and two evenings to install the radio and check the control settings.



The main rotor head is a hingeless rotor design. Kalt has successfully used the hingeless rotor on the Baron 30, Cyclone I, and the Enforcer. The thick and heavy Hiller paddles and soft flapping characteristic make Whisper very easy to hover, almost too mellow. We recommend the flex plate on Whisper AND Enforcer to be made twice as stiff.



A very interesting swashplate design. It uses two concentric rings instead of a solid swashplate to reduce weight. Very good idea. The Kalt gyro is located at the back above the collective servo. The gyro amplifier is mounted at the front above the receiver. The center of gravity of the helicopter comes out perfectly at slightly forward of the main shaft. Notice the gap between the black landing strut and the black fuselage frame; there is white fuel tubing placed there to absorb hard landings.

Concept 60.
The wait is over.

The only .60-sized machine designed specifically for both beginners and top-level FAI pilots.

SPECIFICATIONS
Total Length: 47.25"
Total Height: 17"
Main Rotor Diameter: 60"
Tail Rotor Diameter: 10.25"
Weight: 9.9 lbs.
Gear Ratio: 9.79:1:5:38
Main Blade Type: Laminated Wood, Weighted

KYOSHO®

The evolution of .60-sized helicopters has resulted in many designs with positive flight characteristics.

But you consider more than just flight performance when buying a model. Feature for feature, Kyosho's new Concept 60 scores much higher than comparable R/C helicopters. Here's how.

For simplicity and strength, its design surpasses all models– from fun fly and general competition helicopters to FAI competition-only machines.

And since the Concept 60 is designed by world champion Shigetada Taya, designer of the Concept 30, its flight qualities are a given.

The one .60-sized helicopter made for both beginners and serious competition fliers.

For stable hovering, Taya has given the Concept 60 a fully articulated, dual dampened flapping head. Optional lightweight stabilizer blades offer greater mobility for aerobatics.

For advanced competition, the streamlined rotor head lets you achieve the all-important blazing top speed needed for entry into F3C maneuvers.

The Concept 60's large diameter rotor span, coupled with a long tail boom following state-of-the-art Japanese competition trends, provides leverage and stability for the prettiest loops, rolls, and rolling stall turns any judge could expect.

Fast assembly and easy maintenance give aggressive pilots maximum air time.

Among the innovations incorporated into the Kyosho® Concept 60 is its landmark SRS construction: strength, rigidity, and simplicity.

Its total flying weight is a mere 9.9 lbs., so the most skilled hot dogger can whip the Concept 60 around with ease.

With the Concept 30, Kyosho proved that precision manufactured plastic parts are the only way to go for strength. Refined for the Concept 60, the same construction increases your air time by reducing possible repairs.

Ask your hobby dealer today for a close look at the new standard for .60-sized performance, Kyosho's Concept 60. The wait is over.

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JET TRAILS at TOLEDO

(Above) Jerry Caudle's trophy-winning F-86 Sport Saber. More info in text. (Right) Don Tuttle's F4E is fully loaded and ready for bear! It uses an O.S. 91 Byrofan unit and features panel lines, flaps, retracts, full flying stab and cockpit detail. (Far right) Jet Hangar Hobbies' two-tone gray F-4 Phantom 100% scale fighter, 44-inch wingspan and 68-inch length. Uses Turbax III fan.

BY SCOTT STAUFFER

Well, it's time once again for my annual pilgrimage to the Toledo Expo. This year marks the thirty-seventh year of a show that can be described as "the Mecca of modeling," one of those events I feel every modeler should attend at least once. This year was no exception, with over 200 exhibitors and thousands of spectators attending each day of the April 5-7 show at the now familiar Toledo Sports Arena. Of the three days, Friday had the largest crowd of spectators, although Saturday and Sunday were not too shabby. *(Buying was also heaviest on Friday, as modelers rushed to pick up bargains before exhibitors sold out. wcn)*

The first person I talked with at the show was Larry Wolfe of Jet Hangar Hobbies. I had heard he was developing a new fan, so naturally this was the first thing I asked him about. Larry reached into a box at the back off the booth and produced the very fan I'd come to see, prototype Number 1. It's approximately five inches in diameter with a nine-blade impeller. Each of the nine blades is individually fixed on the aluminum hub, making each blade easy to replace if necessary. The blades are slanted back a bit and have a hefty pitch to them. They look a lot like real turbine blades. This impeller feeds six wide and highly curved stators, which also support the shroud and machined aluminum engine mount. The mount fits nicely around the O.S. 91 DF engine.

To maximize the fan's performance, Larry contracted the CAD design services of Allied Signal Corp. The result is a fan that's radically different from anything JHH has produced to date, so much so that he doesn't even have a name for it! Next, Larry showed me a videotape of its first test trials. He installed the fan in an old F-86 with a ready-to-fly weight of 11 pounds. Because the engine was new, he kept the setting rich for the first flight. He started with 17,000 rpm, which flew the plane quite well. I was impressed that it flew an 11-pound plane at all, turning that speed. On the second flight, he tweaked the engine to 20,300, again still not full bore, but this also flew the plane

continued on page 96

(Above left) F-15 Eagle at the JHH booth, uses twin Turbax 1's and K&B 7.5 DF engines, is 86 inches long. Patterned after Phil Avon's world champi-onship plane. Kit sells for $700. (Above right) Bob Boswell added extra ordnance to his Yellow A-4 Skyhawk. It was entered in Military Sport Scale. Uses Dynamax O.S. 91 fan and has loads of surface detail. (Left) Bob Boswell added extra ordnance to his Yellow A-4 Skyhawk. It was entered in Military Sport Scale. Uses Dynamax O.S. 91 fan and has loads of surface detail.

ALL ABOUT ARFS

BY ART STEINBERG

TELEMASTER: A GOOD WAY TO BEGIN

Over the years, I must have flown a dozen or more Telemaster models of many sizes and descriptions. It seems as though half the beginners who show up at our local field in search of flying instruction start out on this venerable old trainer. So I, along with the other experienced instructors, usually manage to accumulate quite a bit of Telemaster stick time.

Over the years, Hobby Lobby International, Inc., has been providing Telemaster kits in almost every conceivable size, usually powered with a .40 to .60 engine, but I imagine you could pick out almost any engine ever made, and it probably has been mounted in a Telemaster at one time or another. I've seen this model powered with two-strokes, four-strokes, twins, ignition engines, and even electric motors, and in every case the airplane performed much the same. One exception is the Telemaster built by a fellow club member that had a twelve-foot wingspan and a Quadra engine. It flew, but not too well, and that underpowered model is presently undergoing a re-fitting with an even larger engine.

As far as the Telemaster is concerned, it's a dependable and stable trainer, right up there in the top half-dozen designs available on today's market. While I always appreciate using it for primary and basic training, I think most accomplished RC pilots should have one in their stable, ready to take on the more mundane tasks which come along in this sport. In addition to its eminent qualifications as an ideal first airplane, it's also highly suitable for aerial photography, glider towing, and for use as a reliable test bed for new engines and radios, smoke systems, bomb drop mechanisms, or whatever else comes to mind. Many advanced modelers like to keep one around for such purposes, and the Telemaster does double duty by always being available for training purposes. For these reasons, RC clubs which offer training to newcomers often use the Telemaster as their standard workhorse.

Telemasters are easy planes to construct, given their straight line design and lack of compound curves. Anyone with even a minimum of building experience should be able to do a creditable job of putting one together. A while back Hobby Lobby introduced a framed-up, ready-to-cover version, and this proved quite popular among those who would rather fly than build. Now this respected firm has outdone itself, bringing to the RC flying public an almost-ready-to-fly edition of its classic trainer, the Telemaster 70 ARF.

Let's make it clear from the beginning that this airplane is not one of the run-of-the-mill look-alike ARF trainers being imported from the Pacific Rim area. Not that the ARFs of Oriental origin are necessarily of poor quality. Many of them are first-rate items, nicely manufactured, and a terrific value for the money, but ARFs manufactured in the good old USA are as rare as American-made television sets. You can search the world over and not come up with an ARF which is so completely ready for your engine and radio as is the Telemaster 70 ARF. As the name implies, the wing span is seventy inches, an ideal size for a trainer, as large models are more visible in flight and tend to be more stable. The wing area is 695 square inches, and the fuselage measures 47 inches

Rich Anderson of San Marcos, California, with Madeleine the Wonder Whippet and the Telemaster 70 ARF.

The Telemaster, with its flat bottom airfoil and lifting horizontal stabilizer, makes a great flying combination with Hobby Lobby's Merco .61 engine.

in length.

Most of the more complete ARFs require that the wing be joined at the center section, and that the tailfeathers be glued on, and that is also true of the Telemaster 70 ARF. However, it is almost unheard of for ARFs to have their control systems pre-installed at the factory, and in this respect, this month's featured airplane runs rings around its competition. Instead of utilizing wood pushrods or the plastic tubing variety, it relies on sturdy, flexible metal cable pushrods, sliding in plastic sleeves. These come expertly mounted in the fuselage for elevator and rudder control, and in the wing for the ailerons. All movable control surfaces are factory hinged with "Oracover," resulting in tight, gapless hinge lines for maximum efficiency in performing flight maneuvers.

The Telemaster 70 ARF may be set up as either a taildragger or a tricycle-geared airplane, and the manufacturer has indeed facilitated this option choice for the buyer by building two sets of landing gear support assemblies into the fuselage, one near the forward edge of the wing, and one near the trailing edge position. However, hardware is supplied only for the taildragger version. If the builder desires the tricycle-gear version, it will be necessary to obtain a nose gear assembly and an additional wheel. As I enjoy flying taildraggers because of a slightly greater challenge, and because installing a nose gear requires additional work, I stayed with the two-wheel configuration. Besides, the kit had a dandy tailwheel assembly with a handsome little wheel already mounted, and this was firmly secured on the axle with a hand-soldered retainer! It would have been a shame not to use this beautifully made accessory.

The main landing gear was the bent sheet aluminum type, which is far superior to the piano wire landing gear which, because it is less expensive, seems to be the norm in most ARF kits. A wire gear tends to be a lot more bouncy and requires rebending on a regular basis. The main gear installs in about five minutes using two bolts, as all the mounting holes are pre-drilled. An excellent pair of lightweight main wheels was supplied, and were easily attached to the landing gear with machine screw style axles, all part of the excellent hardware provided in the kit.

Preparing the Telemaster for flight was a pure joy, because everything went together so beautifully. Though it only took me about four hours, I kept pausing to marvel at the many impressive features Hobby Lobby had managed to pack into this first class, deluxe ARF. For example, the extensive use of lite-ply along the full length of the fuselage made for an exceptionally strong airframe. Nowhere were plastic or synthetic materials used. The wing halves were connected by a strong center joiner made of 3/8-inch thick plywood, and I felt entirely comfortable with the strength of the wing assembly.

One of the most impressive features of this new model is its fuelproof "Oracover" covering job. The model is done up in a bright, highly visible red and white color scheme with black trim. The solid red bottom of the wing is a distinctly different design from the top, which is predominantly white, so there is no mistaking the attitude of the model when in the air. The Oracover seems to be at least as high a quality shrink type covering as I have ever used.

Oracover has a less glossy finish than MonoKote, and in this respect I like it better, as its somewhat matte appearance looks more full-scale. It can be shrunk with either a heat gun or an iron, and it works fine with high heat. It can be repaired with MonoKote, and the red seems to match MonoKote red perfectly. Exhaustive flight testing has thus far proved Oracover to be one of the toughest coverings I have ever seen, as the pebbles on our dirt field have yet to cause even the slightest damage.

It might be well to mention at this point that the Telemaster 70 ARF is available in two very different versions, gas engine or electric motor powered. I understand that the electric version is supplied with a motor, but my Telemaster was intended for gas power. In keeping with this, a top-quality Sullivan 10 oz. Nev-R-Leak fuel tank was included in the kit, though the capacious fuel compartment could have held a much bigger fuel tank.

THE MERCO ENGINE

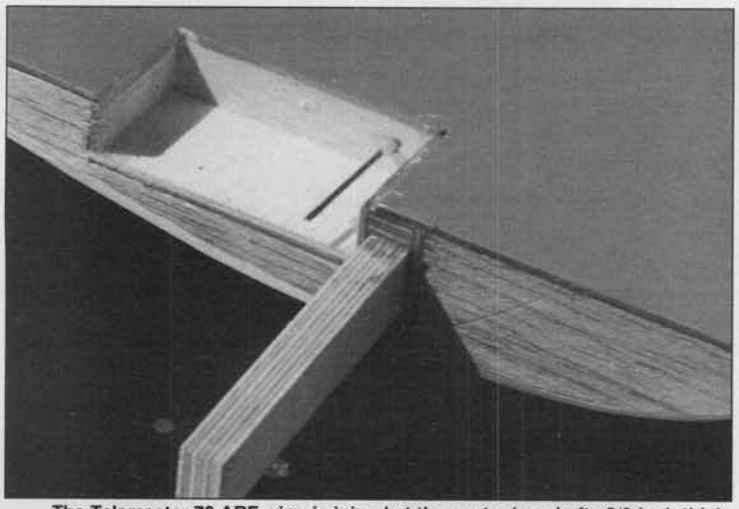
The power range specified by the manufacturer is for either a two-stroke engine ranging from .35 to .45 cu. in., or for a four-stroke engine in the .45 to .61 size range. I was somewhat surprised when Hobby Lobby sent along one of their Merco .61 two-stroke engines to be installed in my Telemaster 70 ARF, as this seemed well above the specified power range. At first, I found it hard to believe the Merco was a .61 displacement engine, as it seemed as small and as light as many of today's .40 size powerplants. I installed it on the sturdy hardwood mounts in the nose, attached a balanced 11x7 wood prop, and installed the black plastic spinner supplied with the Telemaster.

The wing was mounted and secured in place with rubber bands, a number of which were furnished by the manufacturer. Out came the old kitchen scale, and the model was found to weigh 6 lbs. 11-1/2 oz., dry and ready for flying. Wing loading was calculated to be 22.25 oz./sq. ft., nice and light for this kind of airplane. The balance point was just where it was supposed to be, 3.75 inches behind the wing leading edge, somewhat farther back than I expected, but the heavy construction of the fuselage results in a slight tailheaviness. However, the horizontal stabilizer has a lifting airfoil, so this somewhat rearward balance point works out well.

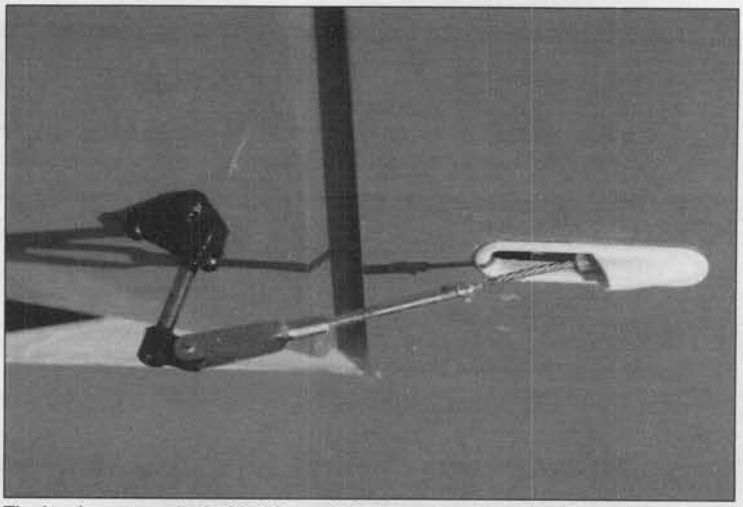
Before commencing flight tests, I decided to perform a few break-in runs on the Merco, so I familiarized myself thoroughly with the manufacturer's instructions. True to European form, the fuel specified was FAI type,

Nice visible color scheme makes the Telemaster stand out even under overcast skies. Author is enthusiastic about the Oracover covering.

Clearing the trees with room to spare, the Telemaster gently sinks down to a picture-perfect landing.



The Telemaster 70 ARF wing is joined at the center by a hefty 3/8-inch thick plywood spar. This, plus plenty of balsa sheeting, provides much strength.

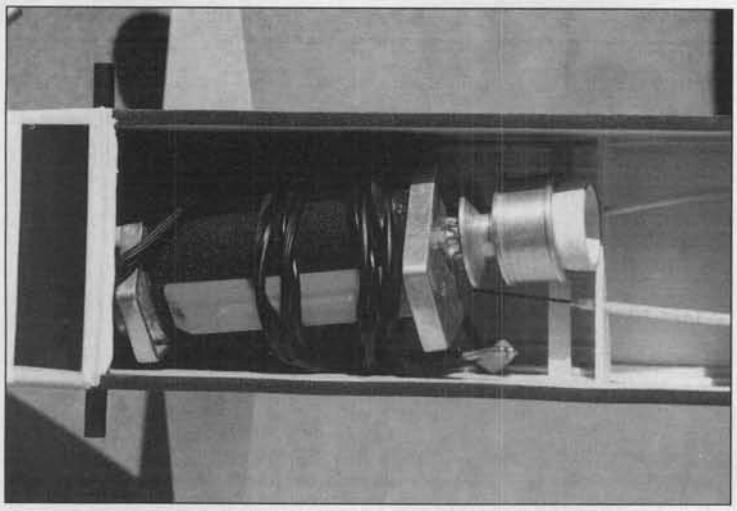


The hardware supplied with this model is first class. Note the infinitely adjustable aileron control horn, the metal clevis, the flexible metal cable and the streamlined fairing. All of this is factory-installed.

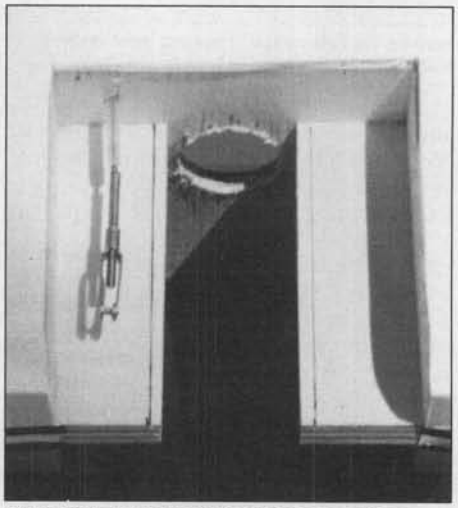
containing no nitro. I chose to use my usual Powermaster 5%, because it contains a generous percentage of oil and is kind to all my two-stroke engines.

It is not my practice to do in-depth evaluations of engines. I leave that to the experts who specialize in that. Besides, Stu Richmond did an extensive report on the Merco .61 in the May 1991 issue of *Model Builder*, and those who are seriously interested in buying a Merco should make a point of reading his article (Actually, people interested in model engines should read everything Stu writes about engines). However, I would like to present my general impressions of the Merco .61.

This engine is an old, proven, established design, and not of the Schnuerle-ported variety which is so common today. It is not intended to haul high performance airplanes around, or to render straight up, vertical climbs. It is a faithful workhorse, designed to be steady running, reliable in starting, and it does much better in the torque department than in turning up high revs. This is backed up by the ridiculously small diameter of the carburetor throat, far smaller than we have become used to these days. It is a ringed, ball bearing engine, and is ideally suited to the Telemaster 70 ARF. Powerwise, it is probably equivalent to one of today's more modern .40 size two-strokes, or a .60 four-stroke. However, this engine looks like it is made to last forever. Considering that it does its job with restrained rpm, it should be really long lasting. After three or four ten-minute runs, the Merco displayed a strong, steady top end, an exceptionally low and reliable idle, and instant transition from low to high speed, so it was judged ready for flight testing.



Plenty of room in the Telemaster's fuselage. Besides the radio, you can also carry a spare engine starter or a tool kit.



The built-in motor mounts are just as solid as they look. Most suitable engines fit in quite easily.

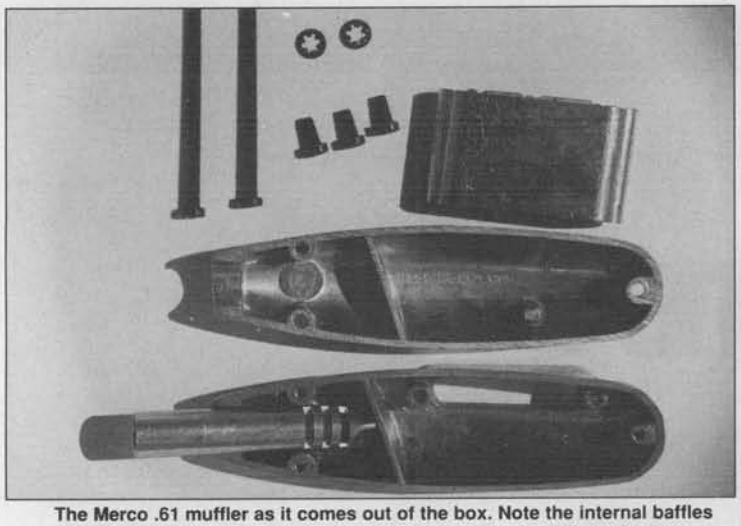
In contrast with most imported model engines from the Far East, this one is manufactured in Great Britain, the place where Rolls Royces come from! Available exclusively from Hobby Lobby, the Merco .61 is remarkably inexpensive, selling for only $111.00, a real bargain. Mercos are also available in four other displacements, .30, .35, .40, and .50, all priced proportionately less than the .61.

Two things about the Merco .61 absolutely astounded me. First, it was practically vibration-free! When the engine was operating and I rested my hand on the airframe, I could hardly feel any vibration. It didn't seem to vibrate any more than an electric motor! We all know how the airborne radio system hates to be shaken around, and so I was very pleased with the smoothness of the Merco.

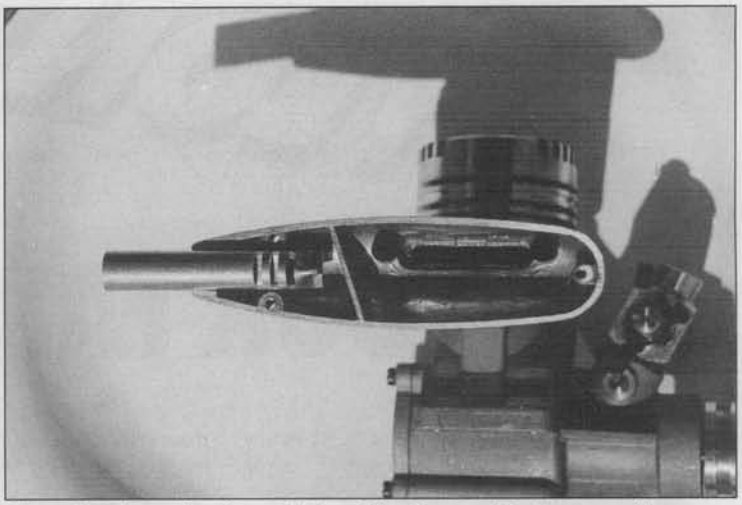
What I found even more surprising was the unexpected quietness of this engine, right up to and including full throttle running. The muffler is a tiny thing, about the size one finds on most .25 engines, so I thought it was more for show than serious sound reduction. How wrong I was! This diminutive muffler knocks the exhaust noise down so low that when it was running at my field, all the other engines drowned it out. While the Merco .61 may be an old fashioned design, its muffler is absolutely sta~te-of-the-art, head and shoulders above practically every muffler around today. This superior performance is due to a unique baffling system, plus an adjustable exhaust pipe which has vertical slits inside the muffler. I tried various props, including the new noise reducing types, and found that the Merco stayed about as quiet with all of them.

I have but one criticism of the Merco .61, and that is the wetness when running. Fuel residue seems to come out of every seam~, so cleaning up the airplane takes a bit more time than usual. However, a wet engine can be considered to be a well-lubricated engine, and should result in a longer lasting powerplant. Therefore, I didn't consider this to be a significant problem.

Flight testing of the Telemaster 70 ARF held no surprises, as it flew just like all the



The Merco .61 muffler as it comes out of the box. Note the internal baffles which reduce the exhaust noise so well. Assembly takes five minutes.



Mounted on the engine, the small size of the Merco muffler is apparent here. The outboard half of the muffler needs to be attached to complete installation.

ones I had ever seen or piloted; straight and true, steady and level. It does everything one could demand of a basic/intermediate trainer. However, unless it is grossly overpowered, don't expect snappy rolls and spins. It will, however, do a slow-motion imitation of most radical aerobatic maneuvers, and that's why a lot of people want to own a Telemaster. Or they may want to stick a camera inside for aerial photography. Or strap a glider and a release mechanism to its wing. Or just fly in a very relaxed manner, doing lazy touch-and-goes, giving flying lessons, or just plain having fun! Get one and keep it in your stable. You'll be kept busy thinking up new things to do with it for a few years.

The Telemaster 70 ARF and the Merco .61 are available from Hobby Lobby International, Inc., 5614 Franklin Pike Circle, Brentwood, TN 37027. Their telephone number is (615) 373-1444.

I'm proud to say that I've been able to personally answer every letter received from readers of this column, even those who forget to include an SASE. However, recent postage increases have forced me to strictly require a stamped return envelope. So remember that your inquiries and comments are always welcome, and my address is 2267 Alta Vista Drive, Vista, CA 92084. Readers who have a pressing problem can reach me by phone at (619) 726-6636. As I'm out flying most mornings, the best time to call is in the late afternoon or early evening. I can also be reached by FAX: (619) 726-6907, so talk to me about ARFs! **MB**

PYLON

BY WAYNE YEAGER

HELP OUR FAI TEAM!

First, an appeal. The 1991 FAI Pylon Team will be defending the World Championship this coming October in Wangaratta, Australia, and expenses over and back are quite high. AMA is sending this team over to represent the USA, and does cover many of the expenses, but due to budget restraints, AMA cannot pay for everything, for example: car rentals and gas for the rentals. The team will need several minivans, because large vans as we know them are unknown in Australia. Calculating a minimum of ten days rental, times four or five vehicles, may result in a few thousand dollars for this one expense, not counting some others. Anyway, we can use some help financially and if you can see your way fit to help out, mail to 38235 Castle, Romu-

The 1991 F3D (Pylon) Team booth at Toledo. (See text) Team member, Henry Bartle (left), and 1989 team member Bruce Richmond were very active over the weekend selling hats, patches and pins to raise money for team expenses. In the center is "Miss Weak Signals," Michelle Stroud.

Pylon equipment available at Toledo included kits manufactured by Kevin Matney, of Matney's Models, including the Latsha designed "Rivets," an "AJ II," an "ME-109," and a "Toni," all for Quarter Midget.

Dickie Rich, of Ritch's Hobbies, is holding the main parts of his Quickie 500 kit, the "Texas Outlaw." This kit is mostly pre-built with skinned wings and all fuselage and tail feathers finished, radii included. Dickie also distributes the Jerry Small Form I kits, "Polecat" and "Pitts Pellets," and has Rossi 40 backplate mounts, plus any nitro content fuel you desire.

Paul Stenberg of "Paul's Flying Stuff," who manufacturers the Form I "Denight Special" plus the Quickie, "Thunder Quickie II," and several versions of bar stock engine mounts.

This is "GAS," Gager Aircraft Supply, or as we used to call him, "Fast Jimmy." Jim is very active in kitting pylon planes which include a "Heinkle 100-D," a "Minnow/LR1A," an "Estrellita," "Spitfire," "ME-109," and a "Tsunami," all Quarter Midget Kits, plus a Form I version of the "Estrellita." Above is his latest, a Quickie kit called the "Patriot 500."

In the "Performance Specialties" booth is Dave Shadel (right), current World Champion in FAI Pylon, who distributes the "Nelson" line of racing engines plus several other race related products. In the center is the man himself, Henry Nelson, who produces a fine line of precision products, and on the left is Clark "Blutto" Wade, 1990 AMA Nats Form I Champion, who was working Shadel's booth.

lus, MI 48174, with checks made out to "1991 USA Pylon Team Fund." Even a few dollars would be a great help.

The first Quickie race in the mid-south every year is in April, and the name, "Music City," usually is accredited to Nashville, however, no offense to the C&W fans, but us racers should rename it, "Crash-Bang-Pow-Womp-Bingo City" (The last is for those who T-Bone pylons).

Believe it or not, they lost 30 airplanes over the two-day meet!! That's a full contest in itself. I'm not usually one to emphasize crash statistics, but it was inevitable at this meet. Just follow the recipe. Every ingredient needed was present. First contest of the season for many, meaning slightly rusty thumbs, a high concentration of skilled flyers who all wanted to start the year on a positive note resulting in no one giving up the right-of-way, unfamiliar flying field, and winds of some force. Mix this together, pour into Tennessee, and keep the oven low because they will generate the heat.

There were contestants from Texas, Missouri, Ohio, North Carolina, Ohio, Kentucky, Illinois, Georgia, Michigan, plus probably some places I've missed, and as it draws from such a wide area, it should be understood that this speaks well for the management and staff.

Racing on Saturday started with (Expert class) Bob Lamb (former Quickie record holder), who zeroed, Frank Schwartz, Paul Geders who managed the win, and Jeremy Chinn. The second heat was a real indicator of the competition as "Fast Freddie" French from Texas was soundly done-in by Jim Katz with a 1:24, Joe Ruh with a 1:27, and Brad

Trophy winners of "Day Two" in Nashville. (Front R-L) Doug Whitaker-1st, Mike Pate-2nd, Jerry Salisbury-3rd, Joe Dodd-4th, and Dana Swah-5th. In the back (right) is Jon Lemmons, holding Whitaker's "Fast-time" and "Trophy Dash" hardware. Left is Craig Grunkemeyer, holding his "Fast-Time" and second place trophy's from "Day One."

Clayton with a 1:32. I'm sure Freddie was thinking, "whoooooeeee, I came all the way from Texas for this abuse?"

This continued for five rounds, 18 lost airplanes, and the first day ended with this kid, Mike Pate, the winner. A kid you say? Come-on you guys. What are you doing letting a 16-year-old kid beat you? You guys are older, more sophisticated, experienced, wiser (Ha!) and should be teaching these youngsters what it takes to win in Quickie.

You would think so, but not with the talent of a guy like Pate, who was "Best Senior" at last year's Nats, finishing in the top five with the big boys, so this "Kid" as I loosely call him in jest, is actually a tough racer for his young years and will do nothing but get better . . . unless he discovers girls, which has taken some of our young guys in the past. Mike finished with a best time of 1:17.27, only .40 slower than the 1:16.87 of Craig Grunkmeyer, who finished second with "Fast-Time" for Day One. The other top five finishers were: Paul Geders-3rd, Joe Dodd-4th, and Freddie French-5th.

In the "Standard" class, Santiago Panzardi was the winner, followed by Stan Cochran-2nd, Greg Meyer-3rd, Glenn Kendrick-4th, and Kevin Burner (good race name)-5th. Day Two's racing had a few less entries because of the first day attrition, however, nothing else changed because racing is still racing, racers will be racers, and occupying the same space at the same time by two different airplanes was still the norm.

After 12 more re-kits, Glenn Kendrick won "Standard" with times of 1:30, 1:26, and 1:29, which will most certainly move him up with the big boys. Kevin Burner was 2nd with respectful times in the 30's, Santiago Panzardi, who won the first day and also will undoubtedly move into "Expert" was 3rd, Greg Meyer was 4th, and the top five rounded out with Wayne Pewitt.

"Expert" times were lower than the first day and racing was tighter. No one finished with a perfect score, however, Doug Whitaker, who recorded a zero on day one, was really smokin' on Day Two and registered times of 1:17.52, 1:16.80, 1:14.43, 1:18.18, and 1:16.46, all under the magic 1:20 line which is used as a target by the go-fast people. Mike Pate also smoked his competition with all "teen times," good enough for a first place tie with Whitaker and a fly-off resulting in Doug placing first.

North Carolinian, Jerry "Mr. Steak" Salisbury, won three of his five heats, was second in the other two, and finished third in the race. Jerry works very hard for his finishes and I'm certain he was pleased with the outcome. Fourth was Joe Dodd, who is always up there somewhere because of consistency, and 5th was local guy, Dana Swah, who recorded a best time of 1:18.86, which ain't exactly chopped liver!

As an added attraction, the racing concluded with a trophy-dash, which is gaining popularity on the local level. Most follow the same criteria, which pits the top 12 flyers, by times, against each other in a round-robin. The beauty of this type of competition is that regardless of finish position, especially if bad luck has struck like flame-out, nose-over, whatever, if you are fast, you still have a chance for some hardware.

Four heats of three planes each are run and the four winners are run against each other for a final dash. The pre-heat winners were: Steve Kovach, who cranked in a time of 1:15, along with Doug Whitaker, Dana Swah, and Jerry Salisbury, who, to digress, covered his plane with this new-on-the-market, day-glo film covering which made it extremely visible in the air (looked good).

Anyway, as they always say, the final was thrilling and was closely contested by Salisbury and Whitaker, who finally pulled away in the last couple of laps and won everything on Day Two, the race, the dash, and fast-time. Doug is another guy who works very hard to excel, and his top-five finishes around the country are an indicator of his homework. Having Jon Lemmons for a caller is also a big help.

The race was professionally run by Dave Bowman and Dennis Green, along with a supporting staff, resulting in this writer finding some excellent potential Nats help. A few of them expressed an interest, and I hope they can make themselves available, because they all were a good bunch. The co-sponsors were two local clubs, the Middle Tennessee RC Society and the Music City Aviators, and both deserve a pat on their backsides for a "good show."

On a different subject: the new Nelson Quickie engine is certainly creating a bunch of c and c (conversation and controversy). We have a very unique situation with this engine, because it is a great engine and will undoubtedly cause everyone to change over, to stay competitive. The problem as most see it is the cost. Sticker shock has struck many and all kinds of rash statements are being made like, "It will kill Quickie," "I can't afford one," and "This engine should not be allowed in an entry level event." First, Quickie is an entry level event only at races utilizing a handicap or standard system. Otherwise, it has progressed into a very professional event considering the number of Form I people who fly the event.

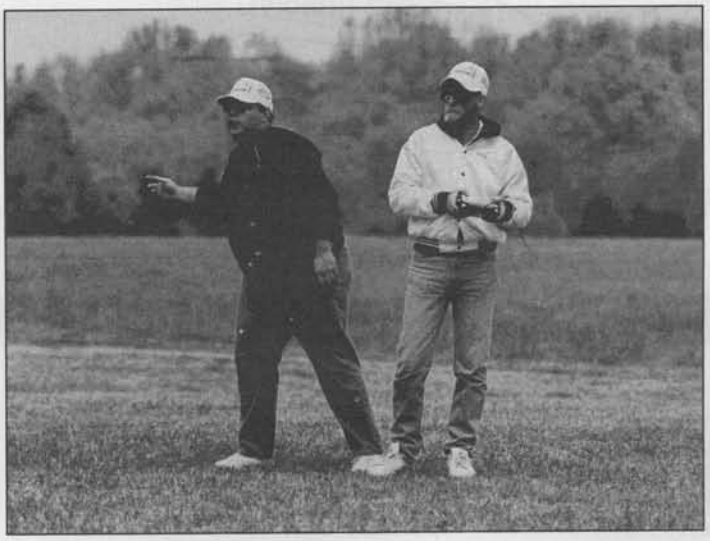
From the cost standpoint, people have short memories, especially when adding up how much they've spent on their current engines. Three years ago, the very same arguments circulated concerning the Rossi and more recently, the Webra. "Too much money," "Gonna kill Quickie," and so on, ad nauseam. The Nelson is twice the cost of the others, yet I can't remember all the people who have stated they had to buy three or four Rossi's to get one that really ran. They also were forced to buy additional engines to get parts, and so on and on ...

I would be willing to bet most racers have

just as much money tied up in other engines as the price of a Nelson, however, there is a big difference. You do not buy several Nelsons to get a good one, because Henry produces a quality product and chances are, most differences are hardly measurable. In addition, unlike some other engines, parts are available. Break a crank, bust a needle valve, strip a head . . . no waiting for overseas shipments because Nelson supports his product with parts availability.

Another difference with using Henry's engine: It was designed for racing, whereas most engines that we utilize were, in actuality, designed for sport. Therefore, it requires a difference in building technique for the additional speed. There are already stories starting to surface about flutter where flutter didn't exist previously, wing strength being less than thought, and other problems associated with speed.

No doubt about it, models must be built accordingly. Wings should be sparred. Control surfaces must be gap-less. Super light weight wood should not be used on tail surfaces because flimsy wood will result in unwanted flutter. On the plus side, people who loved Form I because of the speed, can now get back into some good racing with Quickie because a Nelson powered Quickie is undoubtedly faster than Quarter Midget which ain't all bad. The only drawback I see is that races must be set up in two classes for fairness to everyone, because the Nelson is in a class by itself and will dominate the other engines by a wide margin.

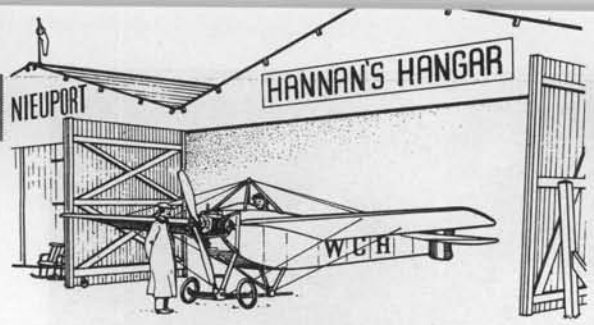


Interesting styles noted here. Grunkemeyer's intensity is easily seen while caller Joe Dodd breaks out in the "Hokie Pokie."

An example of this is Lyle Larson from California, who after turning a 1:17 at a local race, bought a new Nelson during the race, bolted it on, and set a new Quickie record of 1:04, which will probably be broken before this gets into print. He also turned a 1:03, but it wasn't turned in by the CD because it was set in a fly-off, which NMPRA does not consider. Guys who were smokin' at the Nashville race I described above would be lapped!! This is impressive, but you can understand, in fairness, there is not much choice on a local level but to run two classes.

Locally we run a handicapping system for the novice and the advanced flyer, which is called the "CAPS handicap" and anyone running a race could run this system for one class and run another for the super engines like the Nelson, or others that could appear on the market.

Racing could then go on as usual, waiting for the next controversial subject. Ain't racing grand? Bye. **MB**



BY BILL HANNAN

"ALL ART IS CONCERNED WITH COMING INTO BEING"

Our lead-in line this month, by Greek Philosopher Aristotle (384-322 B.C.) serves as a suitable segue for our first topic: What is art?

A column or two ago, we featured a little item suggesting that model building may be a true art form. Jim Woods, artist and modeler of Seattle, Washington, offers these thoughts on the subject: "Art is concept!! That's all! Everything else that produces the final work, a stage play, a painting, a new landing-gear design is **craft**!

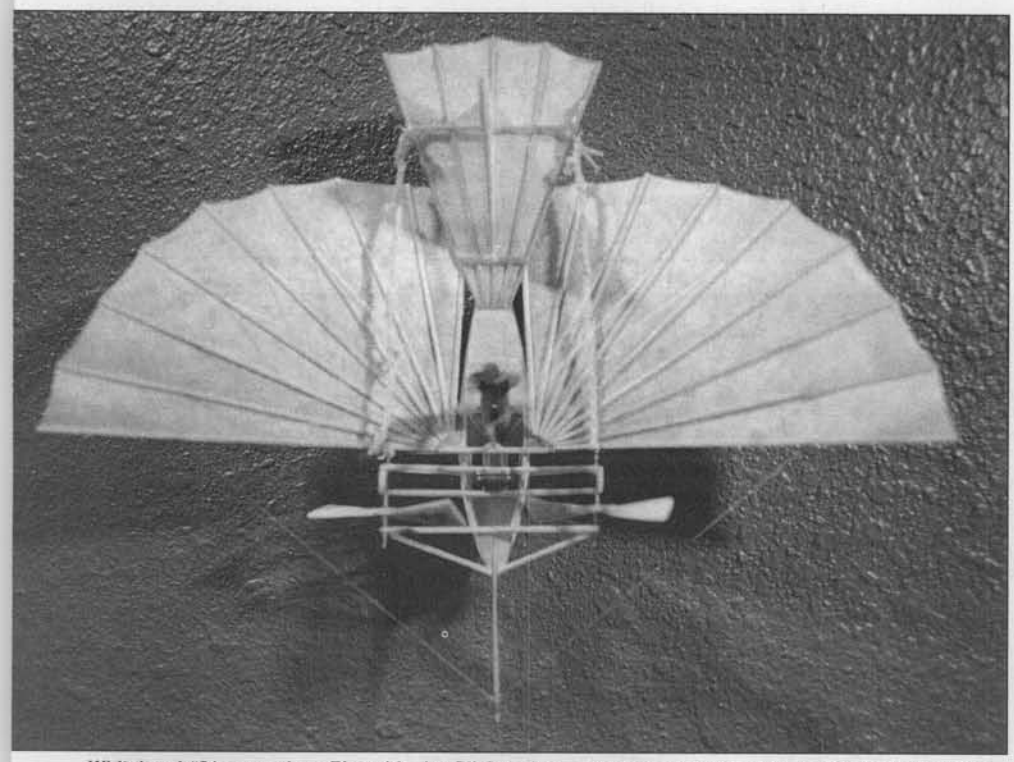
"Art for the individual must be in the eye of the beholder and should not be proffered by `missionaries' as to what art is or is not. The artist, be he painter, writer or engineer, must use the associated craft to communicate his concept. A concept dies aborning without the craft to give it birth. Yes, (Lockheed designer) Kelly Johnson was an artist. His genius of concept was brought into being by the craft of aircraft production."

Jim adds another quotation, from artist August Renoir (1841-1919), speaking about Leonardo da Vinci, to underline his commentary: "He bores me. He should have stuck to his flying machines."

MORE READER FEEDBACK

In an earlier column, mention was made of Carl Faberge, one of the world's most talented artisans. We said he would have been a fabulous scale modeler. Dan Meisner, of New York, wrote in to explain that Faberge and his associates did, in fact, produce scale models, and sent along documentation from a book entitled *Carl Faberge, Goldsmith to the Imperial Court of Russia*, by A. Kenneth Snowman. One example was a highly ornate and detailed miniature Imperial coach, which was housed inside one of the fabled Faberge eggs. Measuring a mere 3-11/16 inches in length, the coach featured rock-crystal windows, platinum tires, opening doors, fully upholstered interior and diamond-decorated enameled exterior. George Stein, who made the coach for Faberge, carried out the entire project without the aid of any magnifying lenses, however, taking fifteen months to complete the model!

A second Faberge scale model was a tiny clockwork-driven train, measuring just under 15 inches in length when assembled, but designed to be stored dismantled, inside a 10-3/4 inch high egg. A faithful reproduction of the Trans-Siberian Express, the engine and tender was fabricated from gold and platinum! Don Meisner speculates that this incredible production may have inspired Z-gauge model railroading.



Whitehead #21 monoplane Pistachio, by Gil Coughlin, of Tacoma, Washington, was based upon Ken Johnson's *Model Builder* plans.

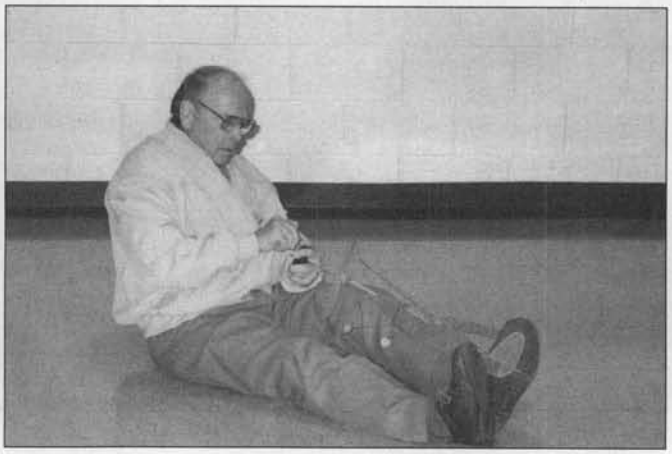
RUBBER-POWERED JETS

A friendly rivalry has developed among Hewitt Phillips of Virginia, David Aronstein, of Washington, and Bob Bender, of New York, in improving the performance of their rubber-driven ducted-fan models. Each has exceeded 30 seconds, and at least two of the flight times followed R.O.G. starts. Pedro Perez, who witnessed Bob Bender's model flying, reports that it held him spellbound, and "They make a peculiar sound which puts them in a totally different ballgame."

The next step? **Scale** rubber-powered jets!

GETTING GOING

Beechcraft engineer Dan Walton, of Kansas, credits his aviation interests to his



Bob Worley, of the Columbus, Ohio, Fancyburg Flyers club, demonstrates stoogeless winding. He must build strong stabilizers! Photo via Marvin Kincaid.

aunt Myrtle, who first took him to see the model flying at Sepulveda Basin in California, many years ago. As he put it: "Hooked! We started on Jetco Thermic gliders and North Pacific Sleek Streeks . . . the simple, inexpensive stuff is what really started the ball rolling. Guess that's why I've always tried to take a simple model along to fun-flys, displays and indoor demonstrations. The 1/4-scale RC, FAI, Free Flight and other competition-oriented planes all have their place, but it's lost on young children and other beginners. In order to get them started, it must be perceived by them as `achievable.' That's why the Comet Phantom Flash, Peck R.O.G. and Stringless Wonder, Sleek Streek, Thermic Trio, AMA Cub, etc., are so important. They may not be glamorous or a `display of wealth,' but they give a beginner a successful first-taste of modeling for a very small investment."

FORMULA FOR FUN?

Vern McIntosh, who specializes in building vintage models, wrote in to say: "I must comment on your March `Hannan's Hangar.' One look at the Lockheed Vega models and I shouted (mentally anyhow), `Whoopee!' They made a minimum of structure capture the form, features, and the spirit of the originals. As for Sam Welch's Fokker Triplane cowling (complete with handmade rivets), it should be exhibited on velvet, under glass. I stand in awe. But I could never do it. The model Clement Bayard, with all the ribs of the original, would stretch both my patience and my ability. So...I like models that are instantly recognizable, will fly at least a little, and are easy to build. There should be a contest where the points formula reads:

$$\text{Points} = \frac{\text{Satisfaction with flight and appearance}}{\text{Labor involved in building}}$$

"Maybe time should have been a denominator, too. Either way, the old time models might have scored rather well."

TIME VS. SATISFACTION

On a similar note, Georges Chaulet, of France, wonders about the hyper-light indoor models, saying that things have gotten to the point that the glue holding the parts together weighs more than the components! And that the time involved in making such models is inversely proportional to the weight.

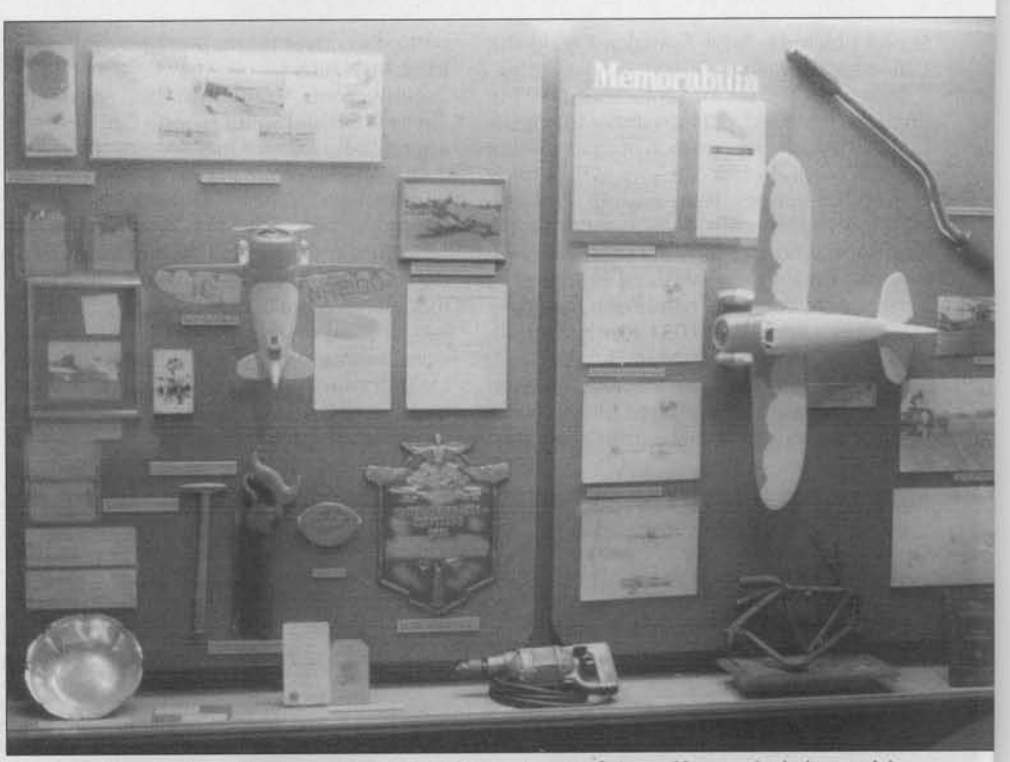
WAY TO GO!

Paul Boyanowski, of the Detroit Cloudbusters club, says that he has been working lots of overtime, however, he has not allowed work to interfere with his hobby: "It just means that some of my nights are a little longer. I've managed to complete a Marcoux-Bromberg racer, a Roland D VIb and have a Piper J3 about 90% finished." Perhaps time is where you find it?

JULIAN WOLKOVITCH

Dr. Julian Wolkovitch, model and full-size aircraft designer, passed away during early 1991. Born in England during 1932, Julian maintained a lifelong interest in aeromodeling, and considered it an important testing tool for his advanced concepts. Among firms with whom he was associated were Folland Aircraft, Ltd., Convair, Systems Technology, Inc., Ling-Temco-Vought, and his own company, ACA Industries. His patented joined-wing principles were applied to free flight and RC models, a hang-glider, an ultralight, and a remotely-controlled reconnaissance vehicle.

Among awards he received were the SAE Wright Brothers Medal and the AIAA Aircraft Design Certificate of Merit. Julian is survived by his wife Judith and daughters Debra and Linda. We join with Bruce Carmichael and Eugene Larrabee in feeling privileged to have shared at least a small portion of Julian's life.



Granville brothers memorabilia in the Springfield, Massachusetts Science Museum includes models, photos, trophies and tools employed in building the Gee Bees. Photo by Henry Haffke.

Midshipman Ed Toner with his Earl Stahl designed Curtiss Seagull, circa 1952. Now a retired airline captain, Ed remains an enthusiastic model builder.

NETA SNOOK SOUTHERN

The lady who taught Amelia Earhart to fly, Neta Snook Southern, recently passed away at age 95. She operated her own Canadian Jenny for a time, also flew various Kinner aircraft during her earlier years, and was a passenger in Earhart's Kinner Canary when Amelia force-landed it. Southern gave up flying in 1922 after starting her family, according to her son Curtiss.

Mark Fineman and Ed Whitten provided us with this notice, for which we are appreciative, as we are for this timely reminder from Uruguayan master modeler Ulises Alvarez, who wrote: "The reality is that it is unavoidable to notice the comparison between the fragility of our lives and our creations."

So appreciate each other!

INTERNATIONAL EVENTS

F.L. Van Hauwaert, Contest Director for the Flemalle, Belgium International Indoor Contest, scheduled for August 22-25, has announced the addition of two additional events, one for CO_2 and the other for electric-powered indoor models. As in previous years, Peanut and Pistachio proxy entries are invited, and complete rules are available from: F.L. Van Hauwaert, Grand Place 1, Bte. 52, 4110 Flemalle, Belgium.

There's still time to enter the Shonai proxy Peanut contest, August 13-15, featuring six different categories plus the BD-4 Homebuilt class, which encourages original color schemes! Full details may be obtained from:

Shoichi Uchida, 3-24 Asanaka, Ogaki-shi, Gifu-Ken, 503 Japan.

Interscale '91, set for September 21-22 in England, intended as a forerunner to hoped-for F.A.I. official recognition of indoor flying scale as a world-class category, will employ accredited judges representing Finland, Holland and Czechoslovakia, according to Reg Boor, who can furnish comprehensive information for those wishing to attend in person, or to compete in the Pistachio Proxy class. Reg's address is: 103 Crow Hill South, Middleton, Manchester, M24 1LA, England.

When writing to any of the above-named sources, please include three International Reply Coupons (available from most post offices) to cover return postage.

BELL MODELS

Nope, not Airacobras, but Mustangs, Taylorcrafts and Spitfires! John Bell has been a scratch-builder for many years, as well as a draftsman, professional golfer and golf club maker. He has also been involved in the production of RC kits, however, he has recently directed his talents and attention to manufacturing rubber-powered flying scale models. We have examined two of these kits, and found them to be first-rate productions, with top quality materials, sparkling clear construction plans, complete instructions, decals and lightweight tissue.

While the parts are on printwood, difficult-to-do items are pre-cut and pre-drilled, and the stripwood is hand-cut to relieve stress. The drawings reflect great care, a tremendous investment in research and drafting time, and are truly labors of love. Currently offered are the North American P-51-1A at $21.95 and Duane Cole's Clipped Wing Taylorcraft at $24.95, plus shipping. Future kits will include the Supermarine MK XIVE, Fairchild 24 and Rearwin Speedster.

John also offers plans and three-view scale drawings in great variety, and we suggest ordering his catalog at $1.50 to see the complete selection; Bell Model Aircraft Company, 650 Pine Crest Drive, Largo,

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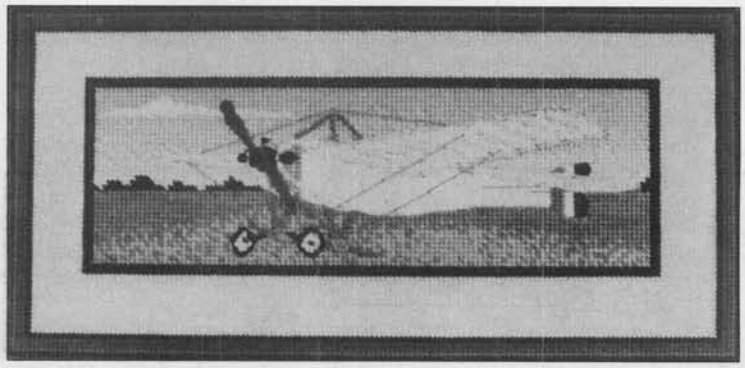


(Left) Joe Clements with his indoor helicopter powered by a Brown Junior CO_2 engine. Although duration is brief, the potential has been established for exciting scale free flight rotorcraft models. Fritz Mueller photo. (Right) Nieuport monoplane stitchery portrait by Gordon Quimby, of Rockford, Illinois, is executed entirely in colored yarn, including the frame!

The Mirage 550.™

The only thing that's ordinary about *this* electric sport-trainer is its price tag.

MIRAGE 550

WINGSPAN:	54 INCHES
WING AREA:	464 SQUARE INCHES
LENGTH:	39 INCHES
WEIGHT, READY-TO-FLY:	40-46 OUNCES
RADIO:	ACFT., 2-3 CH. RQD.

Kit includes motor with switch harness, prop, spinner, wheels, formed cowling and wheel fairings.

Among 550-class electrics, nothing tops the Mirage's combination of sparkling performance, deluxe features and easy-to-build simplicity.

When our boss suggested that we should develop a sport-trainer for our Turbo 550™ motor, we hadn't told him we were already testing a little gem that out-flew anything we'd seen.

Boy, was he delighted.

And we've got a feeling you're going to like the Mirage 550 even more than the boss did.

CUSTOM-ELECTRIC PERFORMANCE IN A BASIC-ELECTRIC PACKAGE.

Besides delivering the kind of superb stability and long, slow glide that make it an outstanding trainer, the Mirage's advanced aerodynamics and state-of-the-art Selig airfoil come through with the kind of performance that even an expert can appreciate.

You'll take off from hard surfaces in about sixty feet, climb to a thousand feet on a charge, loop and roll from near-level entry and make touch-and-go landings that are a thing of beauty.

And speaking of beauty, you've probably noticed that the Mirage's dramatic cowling, Posi-Lok wheel pants and rakish lines lend it a touch of class that's sure to score big at the club show-and-tell.

A standard 6 or 7 cell pack powers the shock-mounted Turbo 550 motor.

The Mirage may be basic, but it certainly isn't boring.

THE DETAILS THAT MAKE THE DIFFERENCE.

Special featherweight wheels, ultralight formed components and precision-cut parts from carefully selected balsa bring you better performance and they also help make building the Mirage a breeze—even if you've never built before.

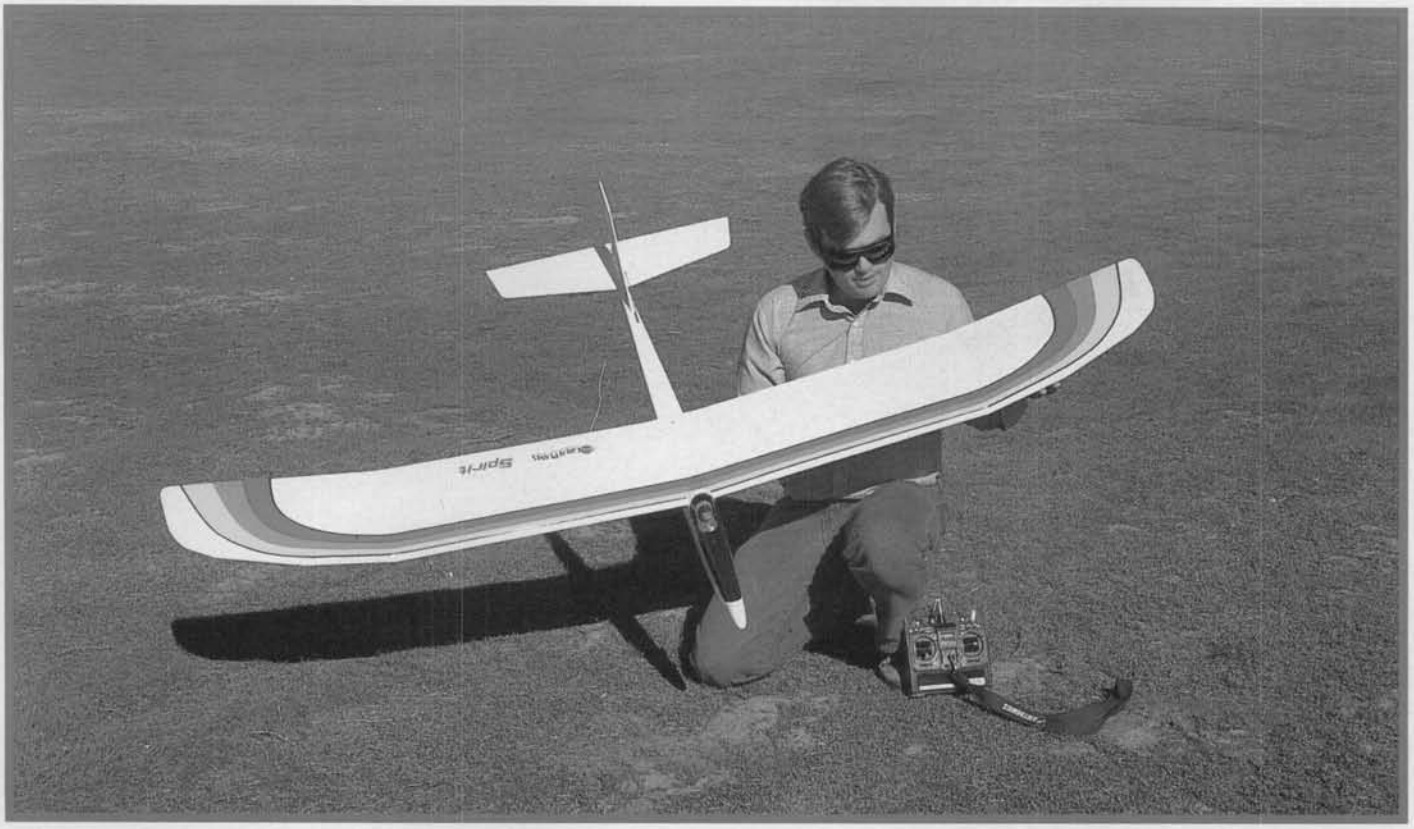
You'll work from clearly illustrated step-by-step plans and instructions that leave no detail to chance. Options like on-off "throttle" and speed controllers are explained, covering technique is described and there's even a section on trimming and flying your model.

THE VALUE'S HARD TO TOP, TOO.

The kit includes the Turbo 550 motor and switch harness, a high-efficiency propeller, a C.G. spinner and all the hardware you'll need. Except for covering material and glue, there's hardly anything extra to shop for.

CARL GOLDBERG MODELS INC.

The Mirage 550 is at your local dealer's now, so don't delay. Find out how exciting electric-powered RC can really be!



GREAT PLANES' SPIRIT

Submitted for Judging as an International Model of the Year, and Eventual Winner in the Glider Category!

BY BILL FORREY

The Spirit was submitted by its manufacturer, Great Planes Model Manufacturing Co., to judgement for the 1991 RC Model of the Year Award in the Glider/Motorglider Category. Because models are submitted by manufacturers on a voluntary basis, those who participate in this program are confident enough in their product to risk international scrutiny and comparison. For this reason, only the BEST models are reviewed and judged. You can rightly say the competition is a beauty pageant in this regard.

In a normal year, an average of six models are submitted in every model category. Winners are announced each year at the Nuremberg Toy Fair in Germany in early February. I received only two models for review in 1990, the Great Planes Spirit sailplane and a motorglider from another company. One could say that it was a slow year for new models.

Scoring is done as follows, with each judged in four general areas: Quality of the

design, quality of the kit, suitability of the model for its intended purpose, and innovation. Zero to five points are awarded in each area; therefore, the best possible score would be a perfect 20. However, jury members have been cautioned by Guy Revel, the RCMYA's founder and coordinator, "Keep in mind that no model is perfect," and, "Any model must be judged in relation to similar models already on the world market." Similarly, it is doubtful that a model submitted to the RCMYA could receive a zero score.

The RCMYA awards are tough to win! Kit or design shortcomings must be noted and weighed, not glossed over. New ideas, new techniques, and new solutions to old problems must also be noted and rewarded. My goal as a jury member is to be impartial, honest, and as objective as possible, giving credit where it is due, and calling a spade a spade.

Going into this review, please understand that I believe the Spirit is an EXCELLENT MODEL that a beginner can successfully build and fly. An experienced sailplane flyer can also enjoy very good performance from the Spirit, considering that it is basically a very stable trainer. Personally, I like my Spirit and will continue to flying it though the review process is over.

QUALITY OF THE DESIGN: 3.0 points

Aerodynamically, the Spirit designers have attempted to wed modern drag reducing design with traditional building techniques and materials in a trainer format. However, the combination of these technologies involves compromises which may nullify many of the benefits of these modern design ideas.

The trend among designers in the past two or three years is to apply the Wil Schuemann inspired multi-taper, multi-sweep planform to everything from high performance aileron ships to rudder/elevator/dihedral or polyhedral sailplanes, many of which are lightly loaded "floaters." These applications are sometimes unnecessary (producing no noticeable benefit), and sometimes detrimental to performance (producing bad habits, such as tip stalls).

For a little background, the Schuemann planform was originally applied to a full-size, 15-meter sailplane to solve a performance problem. This sailplane had a flat, relatively stiff wing with slightly tapered main panels and slightly more tapered tip panels with no sweep (It had been cut down from a 17-meter wing).

The problem was a large increase in drag at high angles of attack, most notably during high speed zooms and tight thermal turns. This was caused by a boundary layer flow separation along the entire trailing edge (TE) of the wing.

It was discovered that the flow separation would start at the wing tips and travel down the wing TE to the root (near the fuselage) causing the severe drag penalty and loss of performance.

Schuemann concluded from his observations and his research that the flexible-wing Standard Class and Unlimited Class compe-

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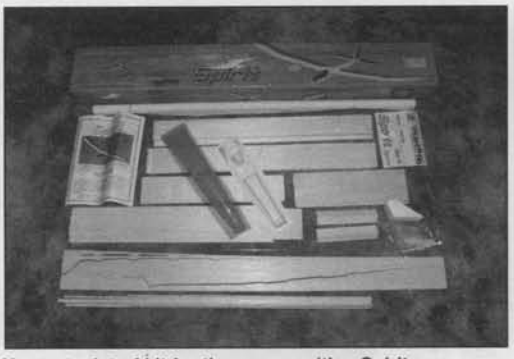
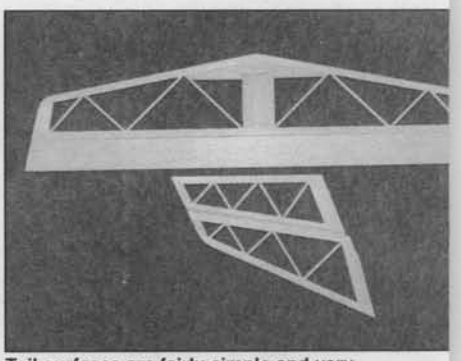
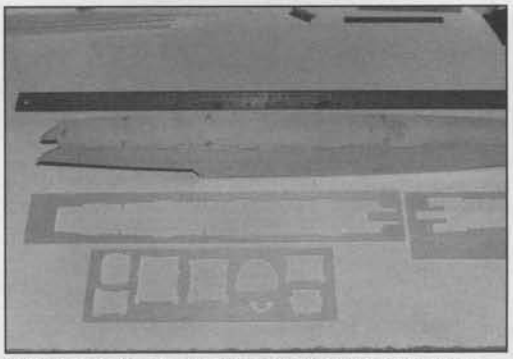


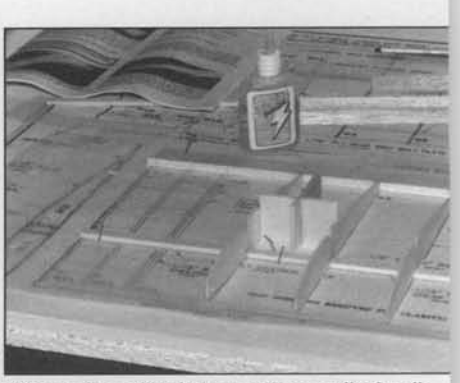
You get a lot of kit for the money with a Spirit.



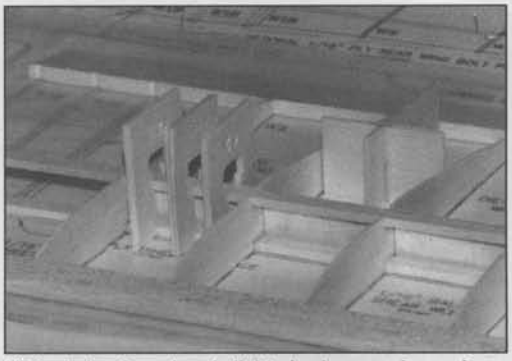
Tail surfaces are fairly simple and very lightweight.



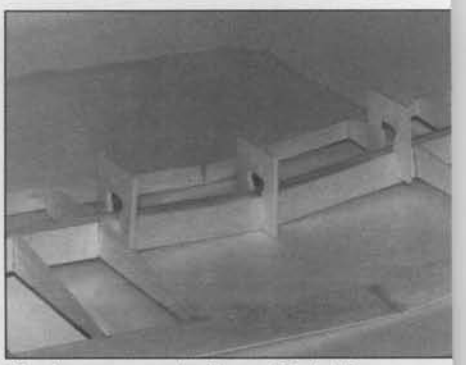
Fuselage under construction; photo shows the many "tab and slot" parts which interlock with surprising accuracy. Only one tab was off, and that not by much.



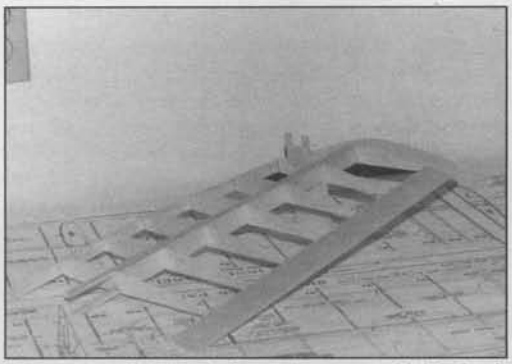
Kit includes a dihedral gauge/perpendicular rib gauge that helps keep those ribs angled the right way. Just fits the rib spacing. TE stock is pre-notched for proper rib spacing.



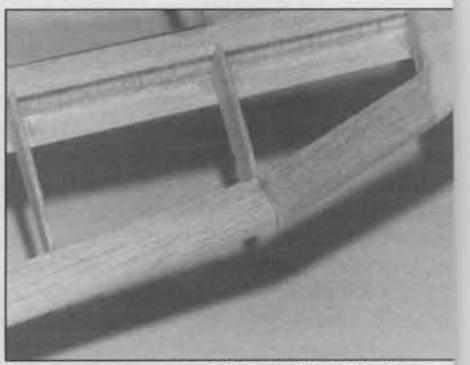
Kit includes these handy light ply clamps, when using aliphatic glues, it might be necessary. CA glues work so fast, they aren't needed at all!



Ply clamps were actually used in holding plywood joiners in place while epoxy hardened.



Kit includes nifty dihedral support gauge, which helped get the angles right when joining tip panels and center panels. Still too "wobbly" to be used all by itself. Masking tape was used to hold gauge to ribs.



Forget trying to cut and "bend" this LE joint (per instructions), grain will snap and break. Just cut, sand and fit.

NUREMBERG FAIR 1991 PART II

BY GUY REVEL

As said earlier, this year was no exception: engine-powered models are definitely outnumbered by sailplanes of all sizes and shapes and most of them are offered by smaller specialist manufacturers. Very few large models were to be seen, a couple of scale WW II fighters (a 1/5 scale Me-109 G for 1.20 cu. in. engine by Rodel and a smaller one at 1/6 by Wega), an all-fiberglass 1/4-scale Super Star acrobatic scale for 2 to 3 cu.in. by WiK and an 86-inch sailplane tow-plane for a similar powerplant, also by WiK, and a very nice scale Klemm 35 for 2 to 3 cu.in. power, a German lightplane from the thirties, with scale metal fuselage structure, produced by Prazise. This small German company specializes in producing all-metal scale models. On closer inspection, I could find a big scale swing-wing Panavia "Tornado" jet fighter offered by Master Fly, an Italian manufacturer, and designed for twin .90 D/F power. Impressive, no doubt, but well-hidden as I cannot imagine many European flying fields where such a model could be flown.

Flight demos of electric helicopters were conducted at the Kyosho stand. Ewald Heim (behind) studies the Convert EX in flight.

Vario, a manufacturer of high-quality aftermarket parts and Heim-system competition helicopters, displayed a new machine specially designed for four-cycle engines.

Hisashi Suzuki of Kyosho (with Guy Revel) was proudly displaying his new "Concept 60" helicopter, one of the most interesting new models of the Fair and with a few novel features.

Large twin-D/F scale "Tornado" by Italian manufacturer Master Fly has a working swept-wing mechanism.

HELICOPTERS

Although the helicopter market seemed to be as usual, I noticed that Robbe refurbished its entire line of Robbe-Heim and Robbe-Schluter models, including several improved models and a complete line of pre-assembled helis, even with engine already mounted. The gap between Heim and Schluter mechanics is bridged by the new reverse-rotation version of the Schluter "Magic" heli. A neat idea by a manufacturer already producing both types of choppers.

An improved "Magic Pro," competition version of the already established Magic, fully ball-raced and with epoxy molded main and rear rotor blades, is now available. With the Heim "Pro" mechanics, the new Pro-kopter is meant as a high-quality trainer with underslung tail boom. All these machines are designed with straight rotor linkages, a feature now almost universal on European helicopters; the "virtual rotation" of the Tx rotor functions take care of the logical chore with three or four servos used for the cyclical pitch functions. Presentation in the Robbe booth was enhanced with a couple of nice bodies, Hughes 500 for Schluter 50 and 60-size mechanics and Sikorsky S-76 for the Heim Pro mechanics.

At the Graupner booth, Ewald Heim himself was presenting his new "Voll-Mechanik" for 45-size engines, his first venture into reduced-size mechanics under the Graupner banner. A very compact mechanics designed for the recoil-starter OS 46 SF-H engine. This is, to my knowledge, the first 45-size heli designed for an integral starter. A Star Ranger (the Heim-modified Jet Ranger with integral pipe exhaust) body is available for the new mechanics as well as a trainer body.

The Kyosho booth was constantly full, so big was the interest for the various choppers presented; the electric-powered Convert EX and EP Concept, but even more for the brand new Taya-designed Concept 60. Believe me, this machine will print its mark in the model heli world as much as the Concept 30. The design is superb in its simplicity and cleanliness, with a few novel features which will certainly be taken by others. This machine is undoubtedly one of the highlights of the modeling year and I can't wait for my own review model, which will be completed in high priority. Flight demos were conducted in the Kyosho booth with the electric helis and every time they attracted a flock of interested retailers. Excellent public relations system indeed!

After being relegated to the waiting list and obtaining a remote booth last year, Hirobo had its own regular booth this year in the sought-after "L" hall, the one where most of the model industry companies are grouped. While Hirobo is currently working on its own electric-powered chopper, they displayed a number of improved parts as well as the "Gold" Shuttle of all-metal structure.

I guess that the time is ripe when there will be a separate competition class for 30-size machines and not only a few privately-sponsored events. These relatively low-cost models really deserve separate competitions for all the modelers who do not want to spend the time and expense necessitated by the larger-size helis.

Kalt helicopters were exhibited in its German distributor booth. I cannot really understand why the range is not better known in Germany, nor in the neighboring countries, except that two very strong manufacturers already hold the European market. However, the electric powered Kalt "Whisper" has been very well received in Europe and could well change this in the near future. Hiroyuki Oki was kept busy meeting all exhibitors and distributors and doing his own advertising in the most appropriate way.

I could not find any trace of the American helicopter manufacturers, although GMP and X-Cell models have been exhibited these past years *(The author was apparently not aware of GMP's closing. wcn)*. In fact, the European market (where the first practical heli had been flown and marketed by Dieter Schluter) is almost a closed field for the Schluter and Heim machines and most modelers have not even heard of any other manufacturer, although Kyosho and Hirobo are slowly getting their share, thanks to their 30-size models which have no equivalent in Europe (except for British models which are not, or very scarcely, distributed on the continent.

In all booths I could see an overwhelming range of molded fiberglas rotor blades of all shapes and sizes. Tip shapes exhibit many different varieties in search of a better efficiency and a lower noise level. Smaller after-market manufacturers also offer a number of metal replacement parts for most helicopters; some of them, like Huner and Vario, even offer complete machines for competition use. These parts are usually modeled after the Heim mechanics.

With the European electric flight trend being so strong, it is no

The Wik "Caddy" shows how popular big sailplanes and aero-towing are in Europe. This DeHavilland Beaverish-looking 88-inch span model for 2.0 to 3.0 cu. in. engines is specifically designed for aero-towing.

Wolfgang Matt is showing the ready-built "Saphir" produced by Modeltech in Hongkong. Outstanding quality for competition use; Robbe is supplying the necessary specialist's accessories like carbon-fiber tuned pipe, etc.

Czech products are finding their way to the West. The "Mentor" is one in a series of ARF models which will be distributed in many countries including Germany and the US. Oracover sold in US by Hobby Lobby.

Spain is coming into the ARF market with well-made models like this "Proto 25," having painted fuselage and tail surfaces.

surprise that helicopters are electric powered too. But unlike the Japanese models, this is being done on "normal" size machines. One of the most successful conversions is the Hirobo Shuttle flown by German specialist Dieter Meier. This model is now made available by Hirobo's Swiss distributor, complete with Geist motor and Sommerauer special speed controller. This limited-quantity, high-priced version is not meant to sweep out the present heli market, but such a pioneer will show the way and I am quite confident that electric-powered helicopters will become more common within the next years.

POWER AIRPLANES

It may seem astonishing that so few power models are to be seen, but it is in accordance with the situation on the engine market. As I mentioned earlier, most new engines are of Italian origin and aimed at the American market, the remaining being chiefly helicopter variations. While this does not mean that European modelers stand away from power models, there is no doubt that the present offering is in accordance with the demand in most countries. Do not forget, however, that this is perceived through the offering at the Nuremberg Fair and that the power modeling activity is greater in some other countries, like England, Italy, or Spain. But British model production is almost nonexistent outside of its boundaries. Spanish model activity, while steadily growing, is still limited (but the model industry is getting stronger and of excellent quality) and many Italian products are extremely specific, Aviomodelli being the only model aircraft manufacturer exporting in any sizeable quantity. In short, I guess that the German model industry covers at least 2/3 of the whole European market, so that the German trends are, even if only by necessity, quickly followed in the other countries.

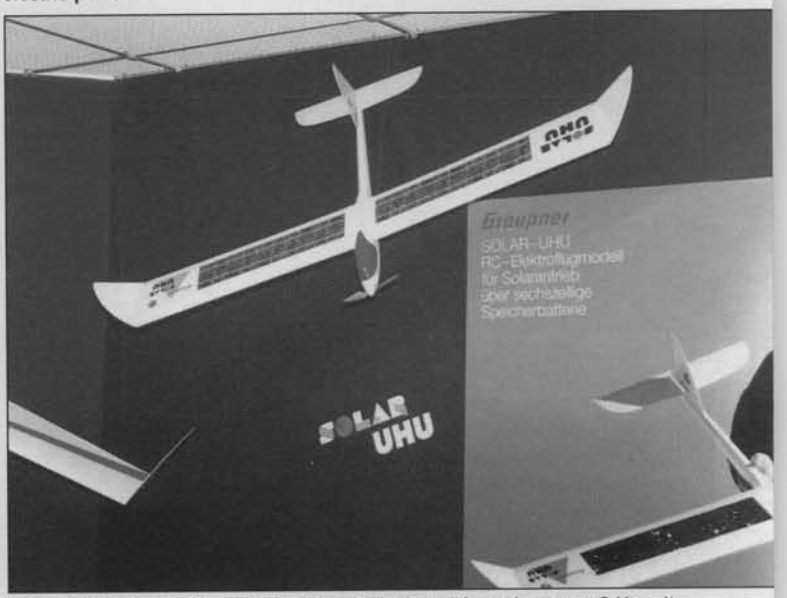
So what is new? Graupner, with the "Tipsy," offers merely a revamped version of a 25-year old classic small trainer, now for Cox .074 power in place of the former .061 diesel. Robbe's "Puma 40" is the fourth version of one of the most popular aileron models of all times. I flew one on reeds, just before my first proportional radio, around 1967. The very elegant new version has a "Plura" blow-molded plastic fuselage and a sheeted foam wing, in accordance with normal European practice. Remaining new models are a small and light trainer by Simprop for .10 power, in fact only very slightly modified from the earlier version, and Wolfgang Matt's Saphir pattern model, the Hongkong Modeltech kit which has been around for some time now.

You have to go to smaller manufacturers to find anything more.

Nice twin electric-powered P-68 on the Graupner stand.

First production scale electric-powered WW II fighter is this Spitfire by Bauer, aerobatic with 20 cells. Note the folding propeller. Size would be enough for 40 to 60 power. A companion model is an Me-109, also for electric power.

One of the nicest of the few new scale sailplanes this year, this 130-inch span ASK-23 by Robbe.



Can you imagine a kit model specifically designed for solar power? Here it is: the "Solar Uhu" by Graupner, designed by famous Werner Dettweiler.

Modelhob, a Spanish manufacturer, offers an ARF trainer where all wooden surfaces (fuselage and tail) are painted instead of being film-covered as with the Far East imports. Such a model offers good value with a moderate price and a much better quality than most of the Asian products. Another competitor on this market could well be the Czech Modela firm. I heard that their models will be available on the American market, they are already available in Germany. With the strong modeling tradition of the Czech, I am sure that their only problem will be producing in sufficient quantity for the demand.

Other new airplanes are simply engine-power versions of new electric-powered models, instead of the other way round. This shows to what extent the manufacturers are going the electric way. I must add that German manufacturers are deeply concerned with all the restrictions that may be imposed on model flying for noise pollution or space availability reasons, and they are leading the way to prevent any degradation of the situation rather than just following blindly the demand at the risk of losing both flying fields and market in a predictable future.

SAILPLANES

Model sailplanes have been, more or less, an European tradition. However, a change is coming, not about the popularity of these models, but in the way they are used.

The average European sailplane, by Japanese or American standard, is rather on the large side. A span of 120 inches is a conservative average size, two-meter being considered very small and usually restricted to beginner's models. Contrary to what is generally believed, slope soaring is almost never done on wind lift as you could find at many British sites or at Torrey Pines. European slope soaring is just that, soaring, above hills or even in the mountains as in Switzerland, Austria, or France. This is really flying in thermal lift with the very same sailplanes which are used from the flat. Only the launching method is different and, because of that, the average size is also greater. Most commercially-available sailplanes used for slope soaring span around 150 inches and smaller specialized manufacturers offer models up to 25 ft. span, although in actuality the practical limit is set at 12 ft. or, for scale sailplanes, about 1/4-scale.

There is no real difference between soaring sailplanes and slope sailplanes, neither size, nor weight. Most available models have molded fuselages, blow-molded plastic or epoxy, and just about every kit of a model sailplane above 100-inch span features wood-covered foam wings, ailerons and provision for wing-set servos.

Rudi Freudenthaler was showing his "Surprise 2" World Champion model, which will be produced by Aeronaut like all his other electric-power models.

Simprop is now taking the electric-power train in a big way with three new models, including several innovations and a very low price for such kits supplied with epoxy-glass fuselage.

From the flat, models are usually launched with a bungee line or an electric winch. The change I mentioned earlier is that electric motors are now used as a replacement for these launching methods and not for electric power as such. The advantage of electric-powered sailplanes is that there is no need anymore for a large launch area, in fact it is possible to fly almost anywhere without any helper or cumbersome equipment. A small fast charger and a spare battery is all what is needed to fly all day long if one wishes.

The future of model sailplanes is electric power, I have no doubt about it. And this year's Nuremberg Fair shows very well this evolution. Most of the electric sailplanes manufactured these last years have been small models because the motive power was derived from the RC car products, enabling the use of relatively low-cost motors, chargers and batteries. Now this really covers only the newcomer market and the need is always stronger for larger electric-powered sailplanes of the same size as the readily available pure sailplane kits. Such a way was already shown by Graupner with models like their ASW-22, several years ago.

The time has come. Large electric sailplanes could be seen in every booth. Graupner and Robbe are still leading the way, but Multiplex, the other pioneer, is coming back into this market after having neglected it for years. As I said earlier, it would have meant producing at a loss, waiting for the market to materialize. Now the two big companies that kept faith (and had enough money to afford it) are collecting the crop, so to speak.

And electric sailplanes are only the visible part of the iceberg. With such sailplanes are coming strong rare-earth motors, refined speed controllers, and automatic chargers for up to 24-cell batteries in ever-increasing numbers. The demand is such for Keller and Graupner cobalt-samarium and neodymium magnets motors that independent manufacturers, Hecktoplett and Geist, find it hard to survive the competition and are forced to sell through regular distributors as it is easy for even the most competition-minded modeler to find the proper Keller motor in almost every shop.

On a different path, one of the major news items of this year's Fair was the first-ever sailplane kit specifically designed for solar power. This "Solar-Uhu" is, again, a design by Werner Dettweiler, a famous electric flight specialist and chief designer for Graupner. The model is adapted from the one used by Werner during the solar-flight competition last summer in Italy. It uses a buffer battery regulating the power and charged by the 20 two-by-four-inch polycrystalline solar cells laid on the wing. On such a small model (71-inch span) there is no possibility to get enough power from the solar cells to keep altitude, but more simply the solar cells are there to charge the power battery during the gliding phases of the flight. The original prototype was noted for its ability to use the lightest thermal, hence recharging the power battery enough to significantly increase the total flight duration.

When I spoke about this model with Johannes Graupner, he made it clear that he did not expect such a model to be seen on every field, but that he simply wanted his company not to neglect even the smallest area. I know that the original model has been extremely successful and that many European modelers are just waiting for such a model to be available to try solar power.

ELECTRIC AIRPLANES

More models are to be seen; small aerobatic models, a nice Partenavia twin scale at the Graupner booth, large scale fighters by Bauer among others. Actually everybody is trying to make electric powered airplanes a possible alternative to gas power. We are, however, far from success, such models are only scarcely seen on flying fields and we are still years ahead of a common use of electric power for ordinary model airplanes.

Multiplex is again entering the electric sailplane market with three new large models and Astro cobalt power (Multiplex is distributing the Astro motors in Germany).

Summary

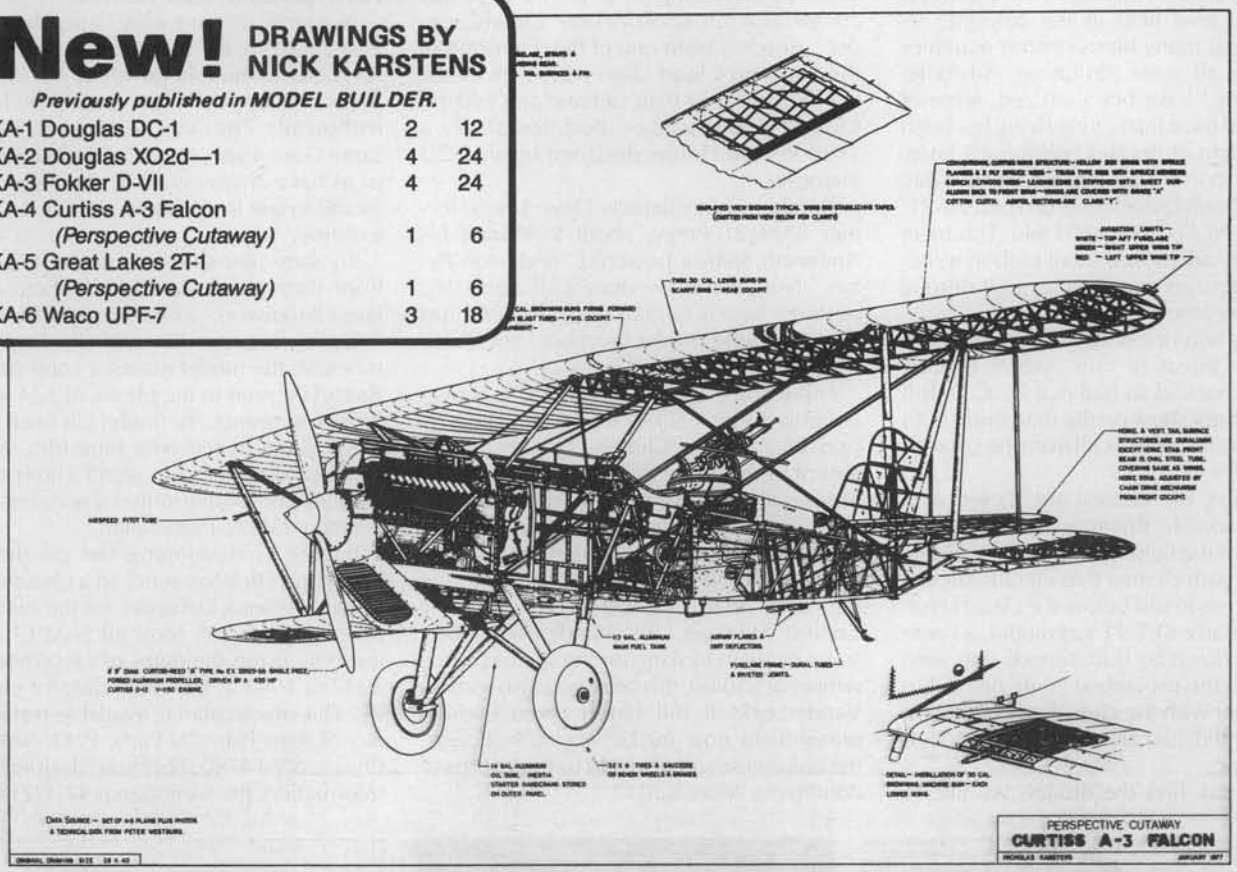
Generalized use of microprocessors for RC equipment with new developments to come chiefly from software design, appearance of the East-European countries on the model market with a potential threat for the Far East model industry, more helicopters providing an answer to the model field problem, growth of the electric flight industry tending to the actual replacement of the present sailplanes with electric power as a new launching method, naturally driving to an increase of the average size of such sailplanes, such are the main features of this year's Nuremberg Fair. All this with a general increase in trade business. Even with flying field restrictions to come if the present ecological trend goes on, modelers and the industry keep finding the answer. **MB**

Peter Westburg's
SCALE VIEWS

New! DRAWINGS BY NICK KARSTENS

Previously published in MODEL BUILDER.

KA-1 Douglas DC-1	2	12
KA-2 Douglas XO2d—1	4	24
KA-3 Fokker D-VII	4	24
KA-4 Curtiss A-3 Falcon *(Perspective Cutaway)*	1	6
KA-5 Great Lakes 2T-1 *(Perspective Cutaway)*	1	6
KA-6 Waco UPF-7	3	18



SUPER-ACCURATE AIRCRAFT DRAWINGS. USE FOR SCALE DOCUMENTATION AND/OR FOR DEVELOPING MODEL CONSTRUCTION PLANS. ALL DRAWINGS ARE 28 x 40 INCHES BORDER- TO-BORDER, AND ARE SCALED AS LISTED BELOW.

1/24 scale: ½" = 1 ft.	No. of Shts.	$
WE-18 Douglas O-35/B-71	1	6
WE-23 Douglas XO-36/XB-7	1	6
1/12th scale: 1" = 1 ft.		
WE-2 Boeing F4B-4/-3	4	24
WE-3 Boeing P-12E	3	18
WE-4 Curtiss A-8 Shrike	3	18
WE-7 Curtiss Gulfhawk 1A	2	12
WE-8 Curtiss N2C-2 Fledgling	4	24
WE-9 Curtiss O-1B/A-3 Falcon	3	18
WE-10 Curtiss P-1B Hawk	3	18
WE-12 Curtiss XP/YP-23	3	18
WE-13 Curtiss SBC-4 Helldiver	4	24
WE-14 Czech Avia B-534	2	12
WE-15 Davis D-1K	2	12
WE-16 Douglas O-25C	3	18
WE-17 Douglas O-31A/O-31B	3	18
WE-19 Douglas O-38/O-38B	2	12
WE-20 Douglas O-43A	3	18
WE-21 Douglas O-31C/Y10-43	3	18
WE-22 Douglas O-46A	3	18
WE-25 Fokker D-17	3	18
WE-26 General Western Meteor	1	6
WE-28 Grumman F2F-1	3	18
WE-29 Grumman F3F-2	3	18
WE-34 Stearman 4E Mailplane	2	12
WE-36 Travel Air 2000	2	12
WE-37 Waco ATO Taperwing	2	12
1/10 scale: 1.2" = 1 ft.	**Shts.**	**$**
WE-1 Berliner/Joyce P-16	4	24
WE-5 Curtiss BFC-2 Goshawk	4	24
WE-6 Curtiss F9C-2 Sparrowhawk	4	24
WE-11 Curtiss P-6E Hawk	4	24
WE-24 Fiat CR-32	3	18
WE-27 Great Lakes Trainer	4	24
WE-30 Hawker Fury Mk I	4	24
WE-31 Hawker High Speed Fury	3	18
WE-32 Hawker Persian Fury	3	18
WE-33 Monocoupe 90A	2	12
WE-35 Swedish Sparmann P-1	2	12

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PLUG SPARKS

BY JOHN POND

Every so often, this columnist is at a loss for a lead item in the column. Although many times contest activities from all over (including Australia, England, etc.) have been utilized, some of the best and most interesting flying has been going on right under this columnist's nose.

Case in point was the recent two-day Oakland Cloud Duster meet on April 20-21, held at the NCFFC Waegell Field. This meet was heavily advertised in all club newsletters and drew an excellent turnout despite the "iffy" weather.

Saturday was one of those cold days with a constant threat of rain. Matter of fact, conditions looked so bad that RC C.D. Bill Bowen did not show on the field until 9:30. This was in answer to a call from the contestants!

Regardless, the contest got started with some remarkable flights seen on the free flight side of the field. The overcast was like a huge vacuum cleaner that literally sucked up the models to just below the cloud layer. One impressive O.T. FF gas model, a Foote Westerner flown by Bud Romak, was seen to get up to the proverbial "mile high." Put that together with the glide the Foote Westerner is noted for, and you have a tough competitor.

Bud Romak flies the models we like to see; i.e., something other than the normal competition run, a Bob Meuser "Cloud Chopper." Bob has been one of the mainstays of the Oakland Cloud Duster Club for years. What better way than to have an Oakland Cloud Duster member (Bud Romak) fly a 1939 Record Holder designed by an OCD member?

Another photo depicts Dave Lewis, former SAM 21 Prexy, about to launch his Anderson Spitfire powered "Anderson Pylon." Note that Dave does it all alone. Big problem here is to grab the transmitter just about the time you let the model go. Quick reflexes!

Following that up, Don Bekins is shown holding his pink silk-covered reduced version of a Comet Clipper. Don has been absent from the last two or three meets. No one is really complaining, as it does give the rest of us a better shot at winning a prize!

The three foregoing photos were taken by Fred Terzian. As a humorous sidelight, the big raffle prize of $100.00 was won by Contest Manager, Bill Vanderbeek. After some delay in looking for the second place winner of $50.00, this prize was also won by Vanderbeek! If Bill hasn't taken enough punishment now for buying raffle tickets, the columnist will also add to the chorus of comments. More fun!

FLYING SCALE 1/2A TEXACO

As mentioned in earlier issues, here is an event that is really catching on. Normally 1/2A Texaco models powered by the Cox Black Widow 049 flew quite slowly and realistically. The flying scale event, with the same Cox engine, is a natural follow-on. All of us have always wanted a realistic flying model to use in duration. Here is the event to enjoy.

To show the spread of interest, a letter from Danny Lutz encloses a photo of his latest handiwork, a Rearwin Sportster.

Danny reports that with its long nose moment, the model makes a good subject. As can be seen in the photo, at 324 square inches wing area, the model has been beautifully done in red with blue trim. Model weighs 20 ounces, so won't climb out of sight too fast. Danny further reports he scaled it from a rubber model plan.

Interest is developing fast on the East Coast and Dick Say sends in a photo showing an Aeronca Defender for the new proposed 1/2A Event. Most all SAM Chapters are now using the dates of December 31, 1942 or 1944 as the cutoff date for eligibility. This model plan is available from Dick Say of Aero Plans 'N Parts, P. O. Box 939, Olean, NY 14760. For those desiring more information, the wingspan is 47-1/2 inches,

Good flying Little Dynamite powered Cloud Chopper is launched by Bud Romak at Oakland Cloud Duster meet.

Danny Lutz produced this gorgeous red Rearwin Sportster for the 1/2A Texaco Flying Scale event.

Dave Lewis shows how to start, launch, and handle RC transmitter all in one move. Fast reactions with an Anderson Spitfire.

Don Bekins shows he has been busy during his contest absence. A scaled Comet Clipper for the Ohlsson 23 Event.

wing area is 300 square inches, and required weight of 18 ounces. This includes an Airtronics four-channel micro receiver, two "microlite" servos and the SR 150 battery pack. Preliminary flights have been perfect. How could you ask for more!

ENGINE OF THE MONTH

This month's subject could be classified as a modern engine, having been produced by REMCO in the late seventies. Named after its founder, **R**alph **E. M**roch, the REMCO Company owes its start to the Forster Bros. This firm's output was purchased by Mroch, with the Forster 99 being produced first.

A development of the Forster 29, and looking very much like a Torpedo 29, it was manufactured by REMCO of Denver, Colorado. Basic materials were the same as found in the K&B Torpedo engine. Timer housing and points appear to be the same as the Forster 29 arrangement.

One of the biggest problems facing the REMCO firm was the quality control in manufacturing the engines. In an effort to speed up production, rough honing stones were used in fitting up the piston and cylinder. This resulted in low spots in the cylinder, and simply not a good enough fit. To make the engine run properly, extensive "break-in" and running of the engine was required.

Eventually, due to marital problems and a tiring of interest in engines, the "Forster project," which included the REMCO 29, was sold to Randy Linsalato of RJL Industries, P. O. Box 5, Sierra Madre, CA 91024-0005.

Linsalato has purchased other engine lines, such as the Bavarian HB (Herman Bernhardt) 61 engine, earlier known as the German "Veco," and the Kraft 61 tool and die setup.

As a sidelight, the REMCO 29 engine was approved as an Old Time engine by the SAM Engine Committee. Along with this was the front rotor 1946 Forster 29/35 glow combination that was converted to ignition and marketed as an O.T. ignition engine. These have proven to be acceptable performers.

FIFTY YEARS AGO, I WAS . . .

This is going to be a short but sweet section this time with a photo showing Peggy and Chet Lanzo in the Spring of 1939 with Chet's rubber design called the "Classic." This pic was sent in by Bucky Walters, of SAM 39. I have also been advised that all of Chet's rubber plans were sent to SAM Headquarters in hopes that a museum could be started.

SAM President Jim Adams advises me that the plans have been drawn and are now available. (Everyone wants to get into the plan business!) There are several others, but to date, this writer has not received any list of available Lanzo plans.

NOSTALGIA CORNER

This section is slowly gaining popularity from the RC Nostalgia Event viewpoint. We dearly like to run the unused photos by Dick Everett taken during this magnificent age.

Some of the boys are discovering what we already knew; i.e., take the eight-ounce dummy out of the Payload models and you have a very good performing model.

Such is the case in the photo showing a large size Sandy Hogan converted to PAA load event. A smaller version called the PAAGAN by Denny Davis was developed for the 1/2A PAA event. Once you had the model adjusted for the load carrying event, and the dummy man was removed, a spectacular performance was obtained.

To that event, this writer has embarked on creating a Civy Hearse 66 based on the Civy Boy 66 design. This idea is nothing new, as Gene Wallock had such a model at the 1964 Nationals. Matter of fact, it was in the lead photo in the Nats results page. Wallock says it performed like a scalded cat on a Torpedo 29/32 combination!

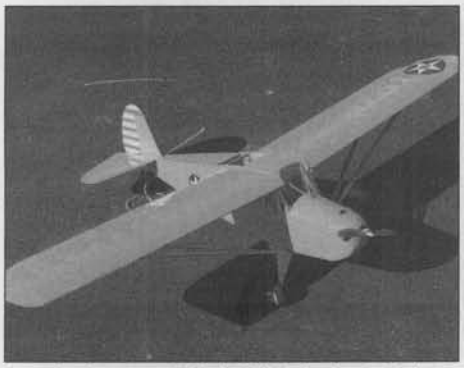
OIL ADDITIVE

Trust the competition boys to come up with something new. Present SAM rules say no additives shall be mixed with the gasoline, but what about the oil? At the recent SAM 49 meet at Taft, Ken Myers was displaying two types of oil additives, one for ignition and the other for glow engines using mentholated fuels.

While disulfide fuels are nothing new, it has taken some time for a firm like Olmstar Products (126 Marine Avenue, Wilmington, CA 90744) to market oil conditioners suitable for all fuels. For those desiring information, write to Diversified Enterprises, Ltd., (Ken Myers), 12151 Calle Medero West, Tucson, AZ 85743-9758.

While Ken was displaying the oil additives, he also handed out some impressive figures showing cooler running temperatures, and better economy. Sounds like you can have your cake and eat it too! The prices are a little high for a product like this, but only 4 to 6cc of oil additive are required for a gallon of fuel. A bottle of this oil additive should last a long time!

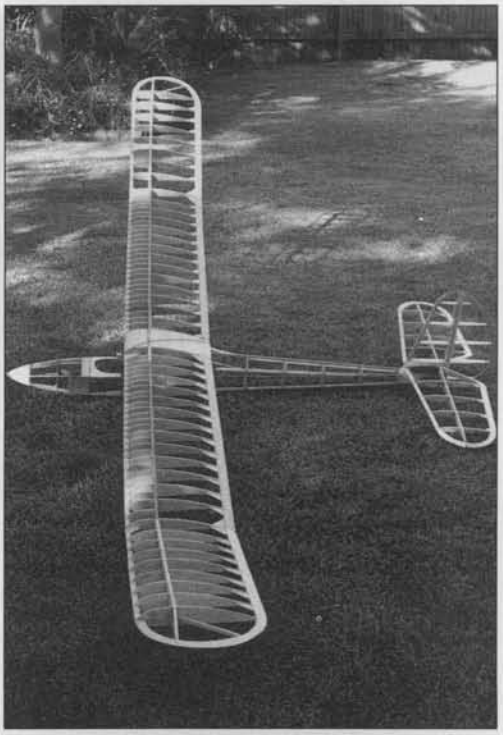
To summarize, Olmstar oil conditioner is probably the most advanced lubrication technology. This high friction free substance is a dark gray oily liquid that neutralizes acids, dissolves and prevents the build-up of gum, varnish, lacquer, and sludge. Further testimonials state this oil additive adheres tenaciously to the metallic pores, filling them to



An Aeronca 65TA (L-3B) Defender by Bob Aberle. Plans by Dick Say of Olean, New York.

Back in the fifties, the PAA Event was popular as indicated by this Sandy Hogan converted to payload.

Peggy and Chet Lanzo prepare to fly Chet's "Classic" design, in the spring of 1939.



An Italian 10-foot glider, known as the DG 47, was built by John Quigley of New South Wales, Australia.

produce a film shield that protects the bearings, cylinder walls, pistons, rings, and other related engine parts. Of particular interest to those owners of old and noisy engines is the removal of clatter and noise, producing smoother running engines. Sounds great, huh?

READERS WRITE

This is probably the most popular section of Plug Sparks as we are constantly receiving photos from everywhere. Let's look at a few.

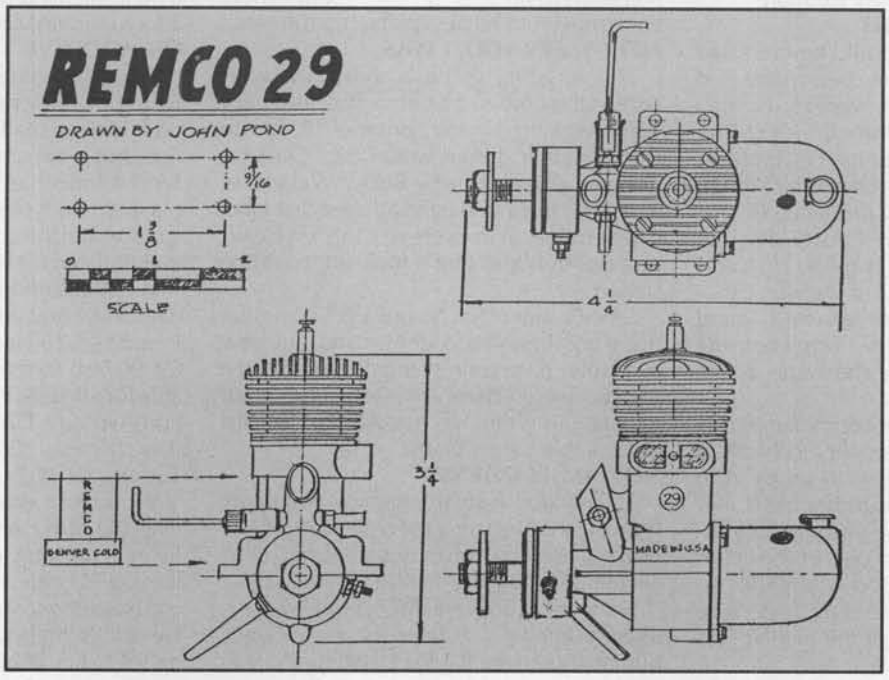
AUSTRALIA

From far-off "Oz" comes a photo showing an Italian glider known as the DG47. This ten-foot glider is the product of John Quigley who states he took only three weeks to build the model. The model was built primarily for competition at the Canowindra Australian SAM Champs in 1991/92 as the Nationals will follow in April of 1992 at Wakerie, South Australia. This is the site of the South Australia Gliding Society and it is only natural several O.T. glider events (FF and RC) should be held during that competition. The columnist hopes to attend, and bring a glider with him for the O.T. RC Event (subject to help from John Quigley).

ITALY

Paolo Rossi of Stezzano, Italy sends in a photo showing a well-built "Wasp" as designed by Bob Milligan. This design was kitted by Modelcraft, Ontario, Canada. Recently revived, the kit is again available.

Paolo states the Wasp flies excellently. Looking at the photo, it appears the model construction and finish fall in the same category . . . excellent.



SWEDEN

This time we must acknowledge a group of excellent photos from Sten Persson of Halmstad, Sweden. Just to show you that modelers have "hi-jinks" everywhere, a presentation was made to Bertil Dahlguist (l) by Kurt Sandberg (r); a Bertil design called the "Phu Ling" (fake Chinese, which when pronounced in Swedish means "The Ugly One"). This glider is one of the first to feature a truly modern airfoil based on the German aerodynamist Schmitz theories. The model flew well but disappeared without a trace.

Just about the time of Bertil's 70th birthday, we found a small plan of the model in an old magazine. In less time than it takes to tell, Kurt Sandberg built a replica which you see in the photo being presented to a very surprised and happy Bertil.

SAN DIEGO SAM 41

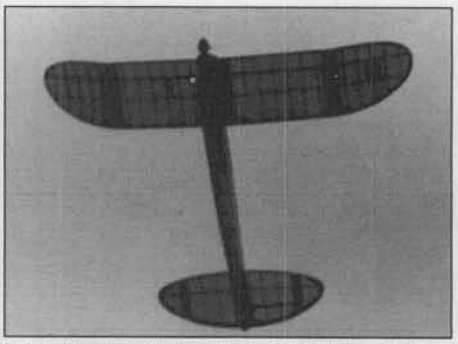
While not from a foreign country (only a few miles from Mexico), Jim Alaback continues to send in excellent photos of the activities in that area. What really struck this columnist's eyes was the well-built German Taube (probably Rumpler design) by Ken MacLean of the San Diego Aeroneers. This shot was taken at the Old Timer Scale Contest at the SAM 41 field located near Alpine.

This photo reminds this columnist of the interest being generated in the 1/2A Texaco Flying Scale Event. There are several variations of the original Jack Brown (SAM 46

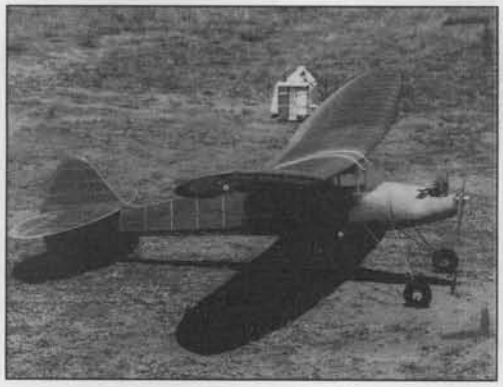
continued on page 101

Paolo Rossi of Italy built this "Wasp," which is again being kitted by Modelcraft of Canada.

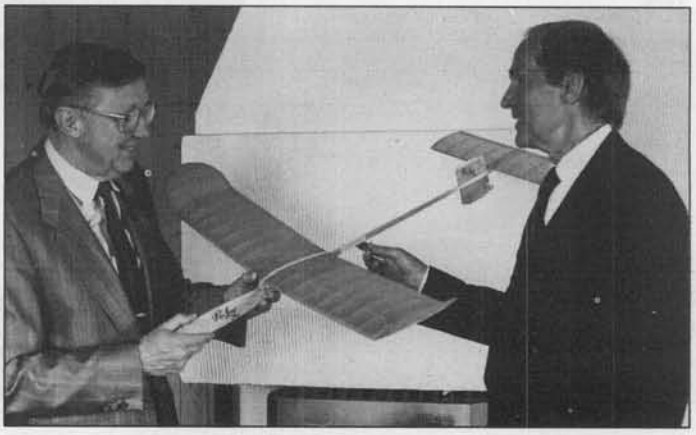
A dandy German Taube by Ken McLean of SAM 41, the San Diego Aeroneers, built for the 1/2A Texaco Flying Scale Event.



Larry Jenno's 2X Kerswap in full flight . . . good climb angle!



An excellent Flamingo by Walt Geary, who is now a charter member of the "Switch Off" club. Sadly, the model is still missing.



At a recent Swedish banquet, a surprised Bert Dahlquist received a copy of his long lost glider, "Phu Ling," from builder Kurt Sandberg.

SOARING *Continued from page 26*

popular covering material for over a decade has been Top Flite Monokote. More recently Hobby Lobby Oracover and Carl Goldberg Ultracote have come along and provided alternatives. Even more alternatives will begin to pop up in the early 1990s as the patent for Monokote has recently expired and there are sure to be imitators.

Choose from any of these three coverings and you cannot go wrong. They are more torsionally rigid than others on the market, and they are pretty darn durable. Oracover and Ultracote are the more puncture-resistant of the three, with less tendency to bubble and sag.

To apply these heat-shrink coverings, buy a heat-sealing iron and a heat gun. The iron is used to seal the edges, the gun then shrinks down the material in between the edges without scratching the glossy finish. If you can't afford both, buy the iron. If you can't afford either, use your clothing iron. It is not as good a tool as a hobby iron because of its bulky size and lack of Teflon coating, but it can do the job. I used a small family travel iron for two years quite successfully.

Recommended colors? Stay away from colors like gray and light blue because they blend too easily with the sky or the clouds. Personally, I like white for the top surfaces with a second, contrasting, darker color band or thick stripe added. When banked and turning, this combination gives the brightest white reflection of sunlight on clear days and a splotch of dark color to contrast with light gray clouds on overcast days. The bottom surface can be any dark color. I like dark reds, dark blues, or black on the bottom because they contrast well with all kinds of atmospheric background.

A good tip for beginners would be to give the right (or left) wing a broad, easily seen band or large spot of contrasting color. This can help prevent disorientation during flight. At long distances, it can be tricky to determine if a model is coming toward you or going away.

WHAT GLUE SHOULD YOU BUY?

For your first model, I would recommend using an aliphatic resin glue like Franklin Titebond Wilhold Carpenter's Glue. It's cheap, it works very well with the balsa and hardwoods you find in kits, and it gives you plenty of working time to position the parts to be joined.

You will also need same kind of epoxy glue. Devcon Five-Minute or 30-Minute cure epoxies will be good enough for this kind of trainer. Epoxies are used for joining wing halves, where the air curing of the water-base aliphatic glues is not practical.

When you gain model building experience, the instant glues work very well. The obvious advantage of these CA type glues is the rapidity with which you can assemble a kit. They are notoriously unforgiving, however, of inexperienced modelers who may not make tight glue joints or position parts accurately. Plus, they can become very messy . . . in a hurry!

Personally, I use cyanoacrylate (CA) glues because they are fast and the bonds they make are good.

CONCLUSIONS FOR TYROS

Visit your local hobby dealer and see what he has in stock. If it is one of the kits I mentioned, buy it. If you see one in this article you like better, order it. Once you buy the kit, follow the directions! If you have trouble, go back to your dealer and ask questions or call a fellow sailplane modeler. Better to ask a "dumb question" than make a "dumb mistake." Right?

If you want to ask me questions about beginning modeling, I am available. I prefer phone calls to letter writing; Bill Forrey, 610 Amberwood Ct., Lake Elsinore, CA 92330; telephone (714) 245-1702.

Most of the suggested products listed are from manufacturers advertising in *Model Builder*. For your convenience, we include the addresses of others you may wish to contact.

Dynaflite: P. O. Box 1011, San Marcos, CA 92069.

BK Products: 2495 W. Hampden, Englewood, CO 80110.

Bob Martin RC Models, 1520-B Corona Drive, Lake Havasu City, AZ 86403.

Thermals! **MB**

BY FRANCIS REYNOLDS

BOEING IS 75 YEARS OLD

William E. Boeing, a Seattle engineer, took his first airplane ride in a Curtiss Hydroaeroplane from Lake Washington at Seattle in 1914. He signed incorporation papers, founding a company to build aeroplanes, on July 25, 1916.

Boeing built many famous early airplanes, including the P-12, the P-26, the 247 (first low-wing all-metal multi-engine retracting-gear airliner), the Boeing Clipper, and the Stratoliner.

The Boeing name really became prominent in the headlines at the start of WW II. Thousands of B-17 Flying Fortresses were built, and perhaps did more to win the war for the Allies than any other airplane. The Boeing B-29 Super Fortress also played a major role in that war. Later came the B-47 Stratojet, followed by the B-52 Stratofortress, which was still active in the Iraqi war.

After initiating multi-engine low-wing air travel with the 247, Boeing lost the major share of the commercial business to Douglas for some years, but came back with a vengeance in the jet age. The 707 was the first really successful jet airliner. It is still the only large commercial airplane to have done a roll. That little stunt wasn't in the flight plan, and test pilot Tex Johnston nearly got fired over it.

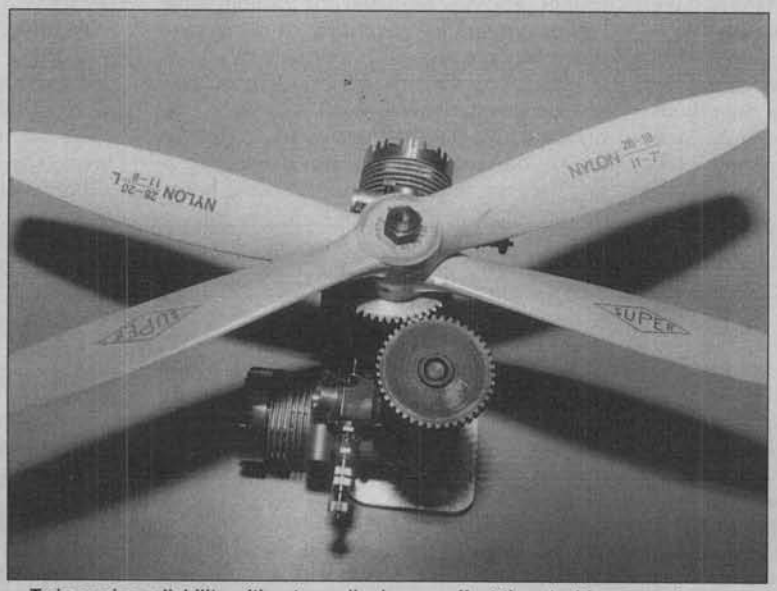
In case you hadn't noticed, the Boeing Company is a biggie. They accepted 47.7 billion dollars in orders last year. They have facilities in a dozen plus cities. Boeing employment is over 100,000 in Washington state alone. Boeing commercial airplane foreign sales have been the largest single factor in the United States' balance of trade for years.

Happy diamond anniversary, Boeing, and a personal thanks from this writer for my rewarding forty-year career.

FRANCIS ATTENDS INDOOR MEET

The last time I built and flew a rubber-powered indoor model airplane was in 1930 or 31. Although I graduated (I use that term just to get a rise out of the indoor crowd) to other forms of modeling, I've retained great admiration for those modelers who can squeeze many minutes duration out of gossamer gumband models by technical savvy, craftsmanship, careful adjustment, and lots of patience.

This morning, March 9, I went to a Seattle indoor contest hosted by the Boeing Hawks, and maybe by the Strato Bats. It was a little hard to tell. In fact it was hard to tell whether it was really a contest or not. I did see the static judging of some fine-looking Peanut Scale models going on, and occasionally somebody with an authoritative voice made an announcement of some kind, but mostly it was just relaxed individual modelers flying and chatting with each other. The majority of them weren't even bothering to time the duration of their flights.



Twin-engine reliability without nacelle drag or offset thrust with one engine out. See text.

Let me try to share my updated impressions of this remarkable branch of our hobby. Of course you can read about Indoor in Bill Hannan's and Ken Johnson's columns, but if you are an RC type you may not. Further, Indoor modelers Bill and Ken take for granted, and therefore seldom mention, some basics that I found very interesting this morning.

The world record for indoor rubber-powered model airplane duration is held by Jim Richmond at 53 minutes. Yes, the energy stored in a twisted rubber band has kept a model airborne for nearly an hour! Without any thermals, yet. Some of them fly at less than walking speed, with Reynolds numbers in the range of 2,000 to 5,000.

Of course, these models aren't exactly heavyweights. Models in the Pennyplane class, as one might guess, weigh the same as a U.S. cent. I just gave my gram scale a penny and asked for the weight. It said 2.5 grams. That is 0.088 ounce, or about a thousand times lighter than the average .40-size RC model. Some indoor models are lighter than that, and certainly the microfilm-covered 36-inch F1D models have a much lower wing loading than that.

"Microfilm" is the lightest covering material. It is made by pouring a thin dope-like mixture on top of a basin of water, letting it dry, then very carefully lifting it off the water with a big wire hoop. It can't be touched by hand. A fingertip will immediately put a hole through it. Microfilm is so thin that its thickness is measured by the color it reflects. In other words, its thickness is comparable to the wavelength of light.

"Ultrafilm" transparent plastic film for indoor model covering is a lot heavier. The thinnest Ultrafilm is a huge 0.000225 inch thick, around ten times as thick as microfilm; but you can touch it without damaging it, if you are careful. By comparison, MonoKote and its ilk is about .002 inch thick, nine times as thick as the Ultrafilm, and 90 times microfilm.

The structures to support these thin films on indoor models is of course balsa, but sparingly used. On some parts they seem to start with 1/64 square balsa and sand it down to reduce the weight. Of course we are talking "contest balsa" which weighs only four to five pounds per cubic foot.

I think it was Bruce Kimbal who was showing me one of his homemade Pennyplane props. The blades were cambered sheet balsa which he had sanded down to seven thousandths of an inch thick. The prop was twenty-eight inches in pitch and

fourteen inches in diameter but weighed only a quarter of a gram, and that included the prop shaft/rubber hook. The props as well as the surfaces on the big F1D models have an almost nonexistent balsa framework and are covered with microfilm.

Indoor modelers use all kinds of clever stability and automatic control concepts. The changing rubber torque is permitted to twist the motor stick (fuselage) in order to control the turning of the model. Many of the props have automatic variable pitch, and some have automatic variable diameter, to convert the varying torque from the rubber motor into more constant thrust.

I observed that indoor flying sometimes becomes quite romantic. We saw an obviously male model (an "Easy B", I think he was) sneak up behind a lady model of his kind and land on her back in a very suggestive manner. They flew around coupled like that for a long time, right out in front of God and everybody. I don't think amorous RC models could get away with an airborne tryst without danger. These two suffered no injuries... and are expecting.

Another comparison struck me. Actually an indoor Easy B model struck me in the back, and I didn't even know it. Its owner had to warn me not to step back onto it. I have never been struck in the back by an RC plane, but I'm not looking forward to it. I'm sure I will know if it happens.

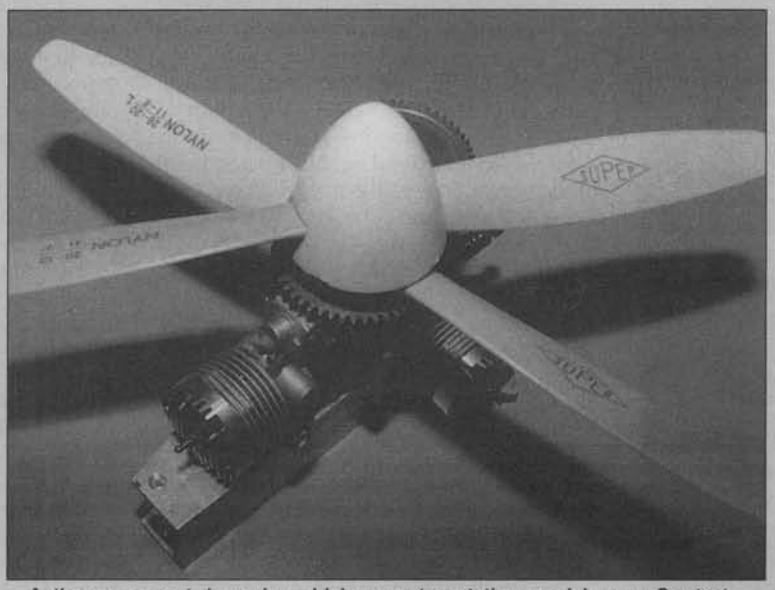
Dave Aronstein, who just left Boeing engineering to get his PhD in aeronautical engineering at the University of Washington, was the most prolific and innovative designer at the meet. He repeatedly flew a rubber-powered ducted fan indoor model of his own design that has gotten a flight of a minute and four seconds.Its silent slow propeller-less flight reminded me more of a blimp than it did a jet airplane. Today it was flying with one of the six fan blades missing. No visible vibration. Things that don't weigh anything can't cause unbalance.

Needless to say, the rpm of the fan in Dave's model was a few orders of magnitude lower than RC fans. The rubber-powered props on some indoor models turn very slowly indeed. I was told the big microfilm-covered props turn 40 to 50 rpm. Someone also mentioned 6,000 to 8,000 turns in the rubber. If these two figures happen to apply to the same airplane, arithmetic says the motor run would be two hours or more!

At one rev per second, these modelers don't need tachometers, they can visually count the rpm. They also have no use for voltmeters, starters and other power-model accoutrements. They do have their own instruments and support equipment, however. I saw many torque meters to measure the torque of the wound rubber.Winders of all types, of course, and roller shears to accurately split rubber strip into any desired width. They can tailor a new rubber motor to just the desired torque and install it in the model in a minute or two.

Gene Stubbs was flying a cute little flying wing of ten-inch span. In one flight today it got a minute and fifty-five seconds. Gene then took off the rubber and prop, re-balanced the model, and gave me a demonstration of portable slope soaring with it. The slope was my eight-and-a-half by eleven-inch clip board. Gene held the clip board in front of him as he walked, creating an updraft, and "pushed" the flying-wing glider ahead of him, above and forward of the clip board, steering the model wherever he wanted to. Dr. Paul MacCready's sons are credited with inventing this portable slope-soaring concept. Clever.

And I saw ornithopter performance I never thought possible. Gil Coughlin was flying a flapping wing indoor model that climbed up to the high ceiling of the Seattle Naval Reserve Armory and flew and flew and flew. The design was a biplane and it looked very much like a dragonfly in flight. It used a simple but clever mechanism with balsa conrods that appeared to be one sixteenth square. The record for indoor model ornithopter duration is over seventeen minutes!



Author proposes twin engines driving counter-rotating coaxial props. See text.

Some of the other knowledgeable guys at that indoor meet who kindly answered my questions were Ed Lamb, Bob Rovick, and Carl Stokes. Indoor modelers are the ones who most need to live by the motto, "Simplicate and add lightness." Thanks for the education and entertainment, fellows.

COAXIAL CONTRAROTATING PROPS AND TWIN ENGINES

I've built only a few twin-engine model airplanes to date. The first was a rubber-powered A-frame twin pusher in 1930 or 31. It flew fine until the wet grass softened the LePages animal glue I built it with.

I have avoided building RC scale models of conventional twin-engine planes because the challenge of flying them safely after one engine cuts out doesn't appeal to me. The redundancy of dual engines is appealing however, if the configuration is such that the thrust from both engines is on or near the center line. We are familiar with a few full-scale airplanes with tractor/pusher twin engines, but these require twin booms, a very low aft fuselage to duck under the pusher prop, or a pusher prop aft of the empennage. I prefer conventional tractor configurations and conventional fuselages.

There have been a few tractor airplanes with coaxial contrarotating propellers. The Boeing XF8B1 experimental navy fighter, for one, but that had a single engine. I can't name any off hand, but I'm sure there have been some airplanes with twin engines independently driving contrarotating props coaxially mounted. Nice. Twin-engine safety with no offset thrust to try to yaw the plane out of the sky if an engine cuts out. Also, with both engines on, there is no net torque. Double also, the wing isn't cluttered up with heavy, draggie nacelles.

The other day, for no reason at all that I can remember, I wondered why we couldn't do that on a model. Conclusion: we could. I like to actually try ideas and work out a few details before I present something new in MD&TS, but I'm making an exception in this case. I intend to build an RC model with this twin-engine setup some day, but my current project list precludes this happening soon. You try it and let me know how it works. I would love to publish your drawings and photos of the engines installation and the coaxial-prop drive system.

The photos here show what I have in mind. Both engines would be at the front of the fuselage. One engine drives its propeller directly, but the other is coupled to its prop through a pair of spur gears. Since a gear mesh reverses the direction of rotation, both engines can rotate in the normal direction, but the geared prop will rotate opposite to the direct-drive prop, and will therefore need to be a left-hand propeller. These are called "pusher props," since that is their normal use, but we would be using them on a tractor airplane. (Is that legal?)

If the engines are the same size, the props the same size, and the two gears the same size, the engines could be roughly synchronized and the props would turn at the same rpm. Different size engines could be used, but then we would probably use different size gears so the engines could turn at the same speed, but the smaller engine would be driving a larger prop for its size, with a greater pitch than usual, at a lower rpm. In other words, one engine would be geared down, which has advantages with regard to

efficiency.

The photos show both engines at roughly the same fore-and-aft location, therefore the gears need to be large enough so the crankcases of the engines clear each other. Alternately, the geared engine could be located partially behind the direct-drive one, then the gears could be somewhat smaller.

If the engines are roughly side by side, the motor mounts can be shorter, and the gear assembly may be simpler. If the engines are staggered fore and aft, the frontal area could probably be reduced for lower drag and a cleaner look, but the installation would probably be heavier and there could be a cooling problem on the rear engine.

If the engines are side by side, the direct one could be upright and the geared one inverted, or vice versa, but I'm allergic to inverted engines. They look nice, and the higher thrust line and/or lower CG is good, but for starting and idling, give me upright or side-mounted engines.

Both engines could be horizontal, like a horizontally-opposed twin, but the geared one would stick out to the side farther than its mate. I think I prefer the arrangement shown, with the direct drive engine upright and the geared one horizontal and located below the upright one. Note that the crankcase and gear of the lower engine would be offset from the center line, but the engine as a whole would extend equally on each side of the center line, so the frontal area would be symmetrical and could be cowled neatly if desired.

In case you haven't noticed, these photos are not of complete working units. I simply arranged two engines, two gears, and two propellers on the workbench and took photos of them. I only wish the job was all done. Designing it in detail and building it is not going to be easy. For one thing, I see no way this could be built without some minor engine modifications and without using a metalworking lathe. That will probably discourage many of you who might otherwise like to build one.

Starting this unique twin-engine unit is also going to be an interesting challenge. The direct-drive engine and its (front) prop can be started by hand flipping or by an electric starter as usual; but how about the geared engine? There is no place to plug a conventional electric starter into it.

Conceivably the geared engine could be started first, by hand from behind, then the front prop started with a starter. Nope, that won't work at all well. I just tried to flip a prop from behind on one of my planes. The engine, fuselage, wing, and landing gear were all in the way. No thanks.

Several other starting methods for the geared engine occur to me. A spring starter could be installed on the geared engine shaft. You know, the kind they put on some Cox engines, that have to be wound up by turning the prop backward.

Another thought is to install a one-way clutch on the coaxial shaft, so that when the direct prop is turned backward, it turns the geared prop in the same (the geared prop's proper) direction. The starting procedure would then be: Light the glow plug on the geared engine and apply an electric starter to the prop spinner with the leads switched so it runs in reverse. After the geared engine is running and tuned, switch the leads on the starter back to forward, light the direct-engine glow plug, and start the direct engine. This seems like far the best starting method, but the addition of the one-way clutch between the two props is a further complication to an already difficult mechanical assembly.

The whole coaxial contrarotating unit will be difficult to design and build because the direct-drive engine must either have a shaft extension or a large bearing assembly built around the engine front bearing, or both.

Bearings will be required to support the driven gear and the thrust load of the geared prop. The bore of the driven gear and the hole in the geared prop will obviously have to be quite large. The dual motor mount assembly must be rigid and accurately built in order that the spacing between the gears be properly held.

Lubrication and/or material selection for "dry" gears would have to be addressed for adequate life. Enclosing the gears to keep them clean and to retain lubricant would be one answer, but open gears have been successfully used on both glow engines and on electrics.

A major goal in powered modeling these days is, and should be, noise reduction. I'm sorry to observe that these coaxial contrarotating props are not going to reduce noise. Quite the contrary, I expect there will be a loud prop noise at four times engine frequency. The contrarotating blades passing each other will chop the airstream and generate a sound wave similar to that generated by sirens, and like the noise of a pusher prop passing close to a wing trailing edge. This is a sound most modelers would like.

This source of prop noise could be reduced somewhat by separating the two props farther. Curved-bladed props, like the antique-style Graupners, would further reduce it because the front prop blade edges would pass the rear blade edges progressively instead of all at once on a straight radial line.

So, with the difficult construction and the noise problem, I don't expect these twin-engine coaxial-prop units to become very popular, but they look like an interesting challenge to develop. Remember to keep me posted when you build one.

PARTING WORDS

Speaking of engines and noise, I have an idea. Most of the noise comes from the exhaust; right? OK, all we have to do is seal up the exhaust port. This would also greatly reduce fuel consumption. I don't think it would do much for the performance though. Oh well, I guess we can't have everything. We could all go to rubber-powered models. They are quiet — except when wound rubber breaks loose inside of a fuselage.

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

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Products I·N U·S·E

PECK-POLYMERS GENESIS SAILPLANE

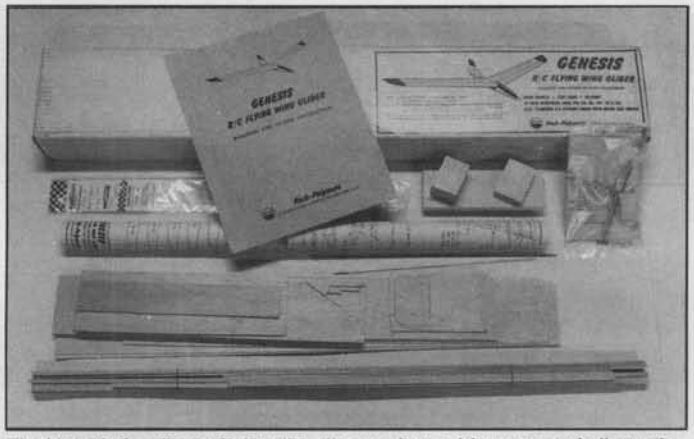
BY DAVID GARWOOD

Keith Schwemmer, the Genesis designer, has a clear idea of what sailplanes should be and what RC sailplane fliers should do: launch by hand. To him, a hand launched glider (HLG) is the purest form of RC flight. "Just walk to the schoolyard or an open field and throw the airplane," Keith says.

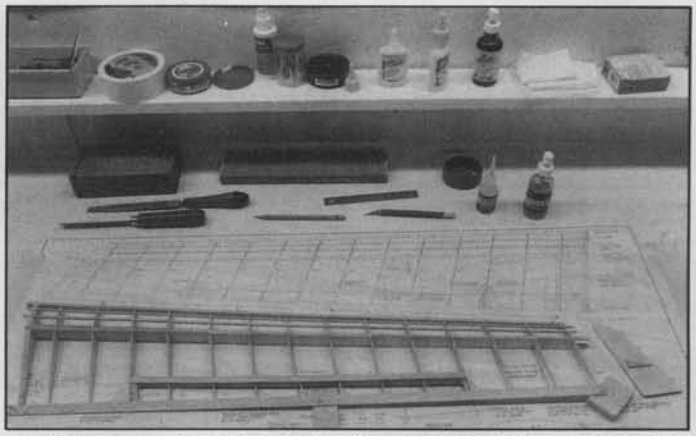
The uninitiated are now grumbling about short flights and sore arms. HLG is where brains, experience, and ability to observe weather conditions pays off. Hand launches have started two-hour LSF thermal qualification flights. In the last year I've seen three flights lasting over half an hour from a hand launch. The soreness in your arm goes away in a month or so, anyway.

The Genesis is a 60-inch RC flying wing sailplane kit manufactured by Peck-Polymers. This unique hand launch glider is designed for thermal duration. It can be hand tossed for fun, used to compete in the AMA 441 hand launch class, launched from

Completed aircraft, ready to fly. The wings are covered with Micafilm. The fuselage and tip markings and canopy are spray painted. Wing markings are from Vinylwrite Custom Lettering.



The kit includes die-cut balsa ribs, die-cut plywood formers, and all wood and hardware needed to build the model except the optional V-tail mixer. Plans are rolled and the instruction manual is illustrated with drawings.



Wings are built up from die-cut ribs, balsa and spruce sticks over the plans using traditional methods. Washout is built in with a 1/4-inch spacer at the mid-point and a 1/2-inch spacer at the tip.

a light high-start, or flown in slope lift.

KIT CONTENTS

The kit contains the following: Machine-cut balsa for fuselage sides, fin and rudder; die-cut balsa ribs, gussets, and small parts; spruce spars and balsa sticks; all essential hardware; clear, detailed, full-size black line printed plans; and a brief instruction manual containing eight diagrams.

The only additional materials needed to build the kit are CA glue, epoxy, and covering material. While the quality of the die-cut parts in my kit was average, the wood selection was excellent.

The plan drawings are above average, but the manual is not always complete. For example, the wing instructions start with the lower spar, go through ribs and shear webs, but neglect to mention installing the top spar. Modelers who have built a few gliders will have no problem, but beginners may have trouble.

The design itself is impressive. It makes good use of materials, minimizes use of tricky construction techniques, and results in a light and strong airframe. Three control system options are given, so the builder can choose to mix aileron and elevator function by building a sliding servo, using an advanced transmitter, or installing a mechanical mixer. Two options also couple the rudder to the ailerons.

In summary, the design is well thought out, parts quality is adequate, the drawings are excellent, and the instruction manual is a bit brief for inexperienced builders.

CONSTRUCTION

The fuselage is a ladder type design with balsa sheet sides, birch plywood formers, and 1/16-inch sheet balsa top and bottom. The canopy and nose are carved from balsa blocks. The canopy is held in place by the wing front attaching dowel, so neither hardware nor tools are needed to secure or open it.

The fin and rudder are pre-cut from 3/32-inch balsa sheet and little building is needed, although hinge installation is a bit tedious with wood this thin.

The wings are built in a conventional

continued on page 94

Bob Powers launches the Genesis for a flight test in slope lift. Bob flew the airplane during the photo flights.

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JRSJ4MC2

4th Servo Order Part JRSS507 $16.96

JRS4FC2	MAX 4CH FM SYSTEM W/3-507	149.96
JRS6FC2	MAX 6CH FM SYSTEM W/4-507	189.96
JRS5FH2	MAX 5CH FM HELI W/5-507	299.96
JRSJ10C	PCM 10 PATTERN SYSTEM	699.96
JRSJ10H	PCM 10 HELICOPTER SYSTEM	759.96

JR RADIOS

X-347 7 CH

SALE $439.96

JRSXPC

Sub-trim, Dual rates, Exponential, Servo reversing, End point adj. (ATV), Programmable mixing, Fail safe, Programmable function trainer (PFT), Stop watch, Model select, Model name input, Type selection (helicopter, air-plane, glider), Modulation selectable (PCM/PPM), Copy function.

JRSXPC	X-347 PCM PATTERN SYSTEM	439.96
JRSXPH	X-347 PCM HELICOPTER SYSTEM	459.96
JRSXPG	X-347 PCM SAILPLANE SYSTEM	439.96
JRSXP770	X-347 FM AIRCRAFT SYSTEM	349.96
JRSXP790	X-347 FM HELICOPTER SYSTEM	374.96

JR PCM 10

SALE $699.96

JRSJ10C

10 Channels, touch screen input, servo reversing, dual rate, EXP and VTR on aileron, elevator and rudder, end point adjustment on all channels, group mixing (5), servo test, name input, integrated timer, stop watch, plug in Tx battery pack, snap roll, 4 JR 4031 servos, 700 mah battery.

ENGINES

COX

TEE DEE .049 $27.96 **COX170**

A **high performance** 1/2A engine for those smaller R/C projects needing **extra power.**

COX1001	R/C PEE WEE .020	17.96
COX150	BLACK WIDOW .049 ENGINE	19.96
COX160	TEE DEE .020 ENGINE	27.96
COX170	TEE DEE .049 ENGINE	27.96
COX200	TEE DEE .051 ENGINE	27.96
COX210	TEE DEE 09 ENGINE	31.96
COX2901	MEDALLION 09 R/C W/MUFFLER	33.96
COX350	BABE BEE .049 ENGINE	15.96
COX3701	QUEEN BEE .074 R/C W/MUFFLER	36.96
COX4501	QRC .049 ENGINE W/MUFFLER	19.96
COX4505	DRAGONFLY .049 ENGINE	21.96
COX4506	TEXACO .049 BLACK WIDOW	19.96

WEBRA

WEB280	28 SPEED ABC W/MUFFLER	94.96
WEB281	28 SPEED ABC - HELICOPTER	124.96
WEB282	28 SPEED ABC - SHUTTLE	99.96
WEB320	32 SPEED HELI ENFORCER- CONCEPT	134.96
WEB400	40 SILVERLINE W/MUFFLER	69.96
WEB401	40 SPEED W/SILENCER TN-CARB	119.96
WEB402	40 SPEED ABC TN-CARB	134.96
WEB403	QUICKEE 500 40 SPEED W/MUFFLER	219.96
WEB404	40 SPEED ABC HELI	149.96
WEB500	50 SPEED RING W/TN CARB	174.96
WEB501	50 SPEED ABC W/TN CARB	179.96
WEB503	50 SPEED ABC HELI	154.96
WEB600	61 SILVERLINE W/MUFFLER	134.96
WEB611	61 SPEED W/TN CARB	169.96
WEB612	61 SPEED ABC TN-CARB	184.96
WEB613	61 SPEED W/MUFFLER & TN CARB	199.96
WEB616	61 SPEED LONGSTROKE TN-CARB	239.96
WEB617	61 SPEED ABC LONGSTROKE TN-CARB	189.96
WEB619	61 SPEED ABC HELI	199.96
WEB800	80 SPEED ABC W/TN CARB	209.96
WEB910	91 SPEED W/TN CARB & MUFFLER	239.96
WEB911	91 SPEED ABC W/DYNAMIX CARB	209.96

ENYA

SS 40 R/C w/muffler $69.96 **EMP403**

The Super Sport Series of engines from Enya are designed to be **reliable,** easy to start and **powerful** at an **economical** price. Ball bearing versions are noted by "BB" after the size notation.

EMP090	09 TV W/MUFFLER	42.96
EMP150	15 R/C W/MUFFLER	49.96
EMP190	19 R/C W/MUFFLER	54.96
EMP251	SS 25 TV W/MUFFLER	64.96
EMP252	SS 25-BBTV W/MUFFLER	89.96
EMP300	SS 30 R/C W/MUFFLER	69.96
EMP301	SS 30BB R/C W/MUFFLER	89.96
EMP351	SS 35H HELO R/C W/O MUFFLER	119.96
EMP403	SS 40 R/C W/MUFFLER	69.96
EMP404	SS 40BB R/C W/MUFFLER	94.96
EMP405	SS 45 R/C W/MUFFLER	106.96
EMP500	SS 50-H R/C HELICOPTER	139.96
EMP110	11CX R/C W/MUFFLER	72.96
EMP402	40CX R/C W/MUFFLER	119.96
EMP451	45CX R/C W/MUFFLER	129.96
EMP452	45CX W/PUMP W/O MUFFLER	189.96
EMP801	80X R/C W/O MUFFLER	179.96
EMP600	60 R/C G-8 CARB W/MUFFLER	129.96
EMP602	60XF S.E. RING W/MUFFLER	159.96
EMP604	60XL R.E. CHROME W/O MUFFLER	184.96
EMP606	60XF R/C CHROME W/MUFFLER	189.96
EMP608	60XF S.E. PUMP-CHROME W/O MUFF	219.96
EMP609	60 R.E. PUMP-CHROME W/O MUFF	209.96
EMP610	60 S.E. PUMP-HELO W/O MUFFLER	224.96
EMP530	53 4-CYCLE W/MUFFLER	199.96
EMP800	80 4-C W/O MUFFLER	249.96
EMP905	90 4-C W/MUFFLER	298.96
EMP906	1.20 4-C W/MUFFLER	319.96
EMP907	R120 4-C W/MUFFLER	359.96
EMP908	R120 4-CYCLE W/PUMP-MUFFLER	389.96

FOX

40 R/C BB w/muffler $71.96 **FOX24096**

An **American made ball bearing** engine that offers excellent **power, long life** and **easy starting.** Comes complete with muffler.

FOX22000	19 BB SCHN R/C W/MUFF	59.96
FOX22500	25 BUSHING R/C W/MUFF	53.96
FOX24095	40 BUSHING R/C W/MUFF	59.96
FOX24096	40 B.B. R/C W/MUFF	71.96
FOX24097	Q-500 40 R/C SPECIAL	119.96
FOX24098	40 BB DELUXE W/SPIN & MUFF	79.96
FOX24197	QUICKEE .40 SPORT W/MUFF	84.96
FOX24600	45 BB SCHN R/C W/MUFF	89.96
FOX25000	50 BB SCHN R/C W/MUFF	98.96
FOX26600	EAGLE IV.61 R/C RING W/MUFF	113.96
FOX27400	EAGLE 74 R/C W/MUFF	124.96

K&B MFG

65 R/C SPORTSTER $69.96 **K&B5800**

New member of K&B's highly successful Sportster Series. Features include **excellent idle, moderate power and easy starting.** American made and complete with a super quiet muffler.

K&B5600	20 R/C SPORT W/MUFF	41.96
K&B5680	28 R/C SPORT W/MUFF	49.96
K&B5800	65 R/C SPORTSTER W/MUF	69.96
K&B5900	45 R/C SPORT W/MUFF	64.96
K&B4011	40 R/C W/MUFF	69.96
K&B6550	61 R/C W/MUFF	84.96
K&B8906	3.5CC-21 OUTBOARD ENGINE	109.96
K&B8701	7.5CC-45 OUTBOARD MARINE	144.96

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RADIOS

FUTABA 1991

7UAFS SUPER SEVEN

SALE $319.96
FUT074

FUT052	5UAP PCM W/R129DP - 4 SERVOS	279.96
FUT074	7UAFS SUPER SEVEN FM SYSTEM	319.96
FUT075	7UAFP SUPER SEVEN PCM SYSTEM	379.96

Dual conversion 1991 receiver, all nicads and charge, servo reversing, trainer system, control panel with ATV-4 standard servos, programmable mixing on 7ch systems. PCM models have a 10 bit microprocessor for high resolution.

9 CH PCM 1024 SYSTEM

SALE $669.96
FUT090

Dual Conversion 1991 receiver. 3 dual rates, 3 Snap roll functions, LCD Screen, programmable mixing function, precision gimbals, timer and tachometer, programmable memory for up to six different models, (4)S5101 competition servos.

FUTABA 1991

4NBL ATTACK SYSTEMS

SALE $109.96
FUT043

1991 Micro receiver. All NICADS and charger. Aircraft version with 3 standard servos. Glider version with 2 micro servos and 250MAH battery. Electric version with electronic speed control and two (2) micro servos. Servo reversing.

FUT043	4NBL AM SYSTEM W/3-148	109.96
FUT045	4NBL AM SYSTEM W/2-133	154.96
FUT046	4NBL ELECTRIC SYSTEM W/2-133	174.96

CONQUEST SYSTEMS 1991

6 CH FM

SALE $189.96
FUT061

The new 1991 series of Conquest systems from Futaba all feature dual conversion receivers, standard S148 servos, trainer system, servo reversing and full nicads.

FUT041	4NBF FM DC SYSTEM W/3-148	139.96
FUT042	4NBP PCM DC STYSTEM W/3-148	209.96
FUT061	6NKF FM DC SYSTEM W/4-148	189.96
FUT062	6NKP PCM DC SYSTEM W/4-148	239.96

SERVO SALE

AIRTRONICS		
AIR4102	STANDARD SMT H.D. SERVO	17.96
AIR4141	MICRO SERVO W/METAL GEARS	44.96
AIR4732	HI TORQUE CORELESSB.B. SERVO	49.96
AIR4737	HI SPEED CORELESSB.B. SERVO	49.96
AIR4741	H.D. CONTEST B.B. STD. SERVO	34.96
AIR4831	MINI B.B. SERVO	29.96
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FUTS30	H.D. B.B. SERVO G	29.96
FUTS33	B.B. MICRO SERVO G	29.96
FUTS48	LOW PROFILE STD SERVO G	16.96
FUTS133	B.B. MICRO SERVO J	29.96
FUTS134	1/4 SCALE H.D. SERVO J	39.96
FUTS136G	COMPACT 108° RETRACT SERVO	49.96
FUTS148	LOW PROFILE STD SERVO J	16.96
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FUTS9201	SMT HT B.B. AIRCRAFT SERVO	44.96
FUTS9301	SMT HT CORELESS SERVO	44.96
FUTS9601	SMT MINI B.B. CORELESS SERVO	44.96
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ROY0101	TITAN SERVO JR	13.96
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ROY0062	TITAN SERVO FUTABA J	13.96
ROY0063	TITAN SERVO AIRTRONICS	13.96
ROY0064	TITAN SERVO WORLD MOLEX	13.96
ROY0065	TITAN SERVO WORLD/ARISTO "S"	13.96
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ROY0067	MINI TITAN II FUTABA J	17.96
ROY0068	MINI TITAN II AIRTRONICS	17.96
ROY0069	MINI TITAN II EXPERT MOLEX	17.96
ROY0070	MINI TITAN II EXPERT/ARI "S"	17.96
ROY0091	MICRO TITAN FUTABA G	23.96
ROY0092	MICRO TITAN FUTABA J	23.96
ROY0093	MICRO TITAN AIRTRONICS	23.96
ROY0094	MICRO TITAN EXPERT MOLEX	23.96
ROY0095	MICRO TITAN WORLD/ARISTO "S"	23.96
ROY0096	MAXI TITAN FUTABA G	23.96
ROY0097	MAXI TITAN FUTABA J	23.96
ROY0098	MAXI TITAN AIRTRONICS	23.96
ROY0099	MAXI TITAN WORLD/ARISTO "S"	23.96

ENGINES

MAGNUM

40 FSR

Inflation Fighters. The Magnum Series of engines are all **Schnuerle** for **great top end** and **low reliable idle.** The Pro Series features **twin ball bearings.** All engines include a **muffler.**

$74.96
MAG401

MAG110	MAGNUM GP 10FSR R/C W/MUFF	42.96
MAG210	MAGNUM GP 21FSR R/C W/MUFF	40.96
MAG250	MAGNUM GP 25FSR R/C W/MUFF	49.96
MAG400	MAGNUM GP 40FSR R/C W/MUFF	54.96
MAG211	MAGNUM PRO 21FSR CAR	87.96
MAG251	MAGNUM PRO 25FSR-BB W/MUFF	69.96
MAG401	MAGNUM PRO 40FSR-BB W/MUFF	74.96
MAG451	MAGNUM PRO 45FSR-BB W/MUFF	79.96

ROYAL .45

$74.96
ROY0450

The perfect engine for the **advanced** trainer or sport airplane. **Schnuerle ported, twin ball bearing and muffler.** Easy to adjust carb for **maximum top end and low reliable idle.**

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ROY0450	45 R/C ABC W/MUFFLER	74.96

RJL

61 R/C

Schnuerle scavenged side exhaust, front rotary valve, **double ball bearing**, 18 oz. Comes complete with muffler.

$98.96
RJL610

SAITO

FA-65G GOLDEN KNIGHT

Smooth running, excellent idle and plenty of **power** to replace "40" size two stroke engines. An excellent choice for scale airplanes up to 8 lbs. or aerobatic midsize aircrafts.

$214.96
SAT650G

SAT450S	FA-45S ABC 4-CYCLE	159.96
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SAT650	FA-65 4-CYC. R/C W/MUFF	189.96
SAT800	FA-80 4-CYCLE R/C W/MUFF	219.96
SAT900	FA-120 4-CYCLE R/C W/MUFF	289.96
SAT901	FA-120S GOLD SPECIAL 4-CYCLE	309.96
SAT500G	FA-50G GOLD 4-CYCLE	189.96
SAT650G	FA-65G GOLD 4-CYCLE	214.96
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SAT993	FA-130T TWIN ENGINE 4-CYCLE	449.96
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SAT995	FA-270T TWIN 4-CYCLE	669.96
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ISC INTERNATIONAL

ASP 40

The perfect engine where **high power** and a **reliable idle** are required. To insure **long life** the cylinder has been chrome plated and the crankshaft is supported with two ball bearings.

$73.96
ISC540

ISC540	ASP 40RC W/MUFF	73.96
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ISC543	ASP 61 FSR RING W/MUFF	89.96
ISC544	ASP 61 FSR ABC W/MUFF	94.96
ISC545	ASP 91 FSR ABC W/MUFF	124.96
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YS ENGINES

.61 FS

$249.96
YSE610

Unique pressure system, **ABC piston-sleeve, ball bearings,** excellent workmanship all add up to a **high performance long lasting** contest/sport engine.

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YSE451	.45 REAR EXHAUST ABC W/O MUFF	129.96
YSE120F	1.20-4C W/PUMP & SUPERCHARGER	369.96
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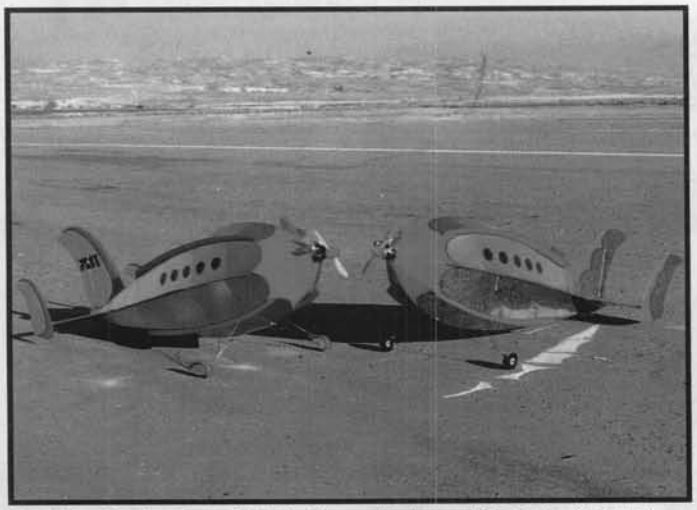
Part I • Roy Clough's 1954 "Anti-Grav" Martian Spaceship

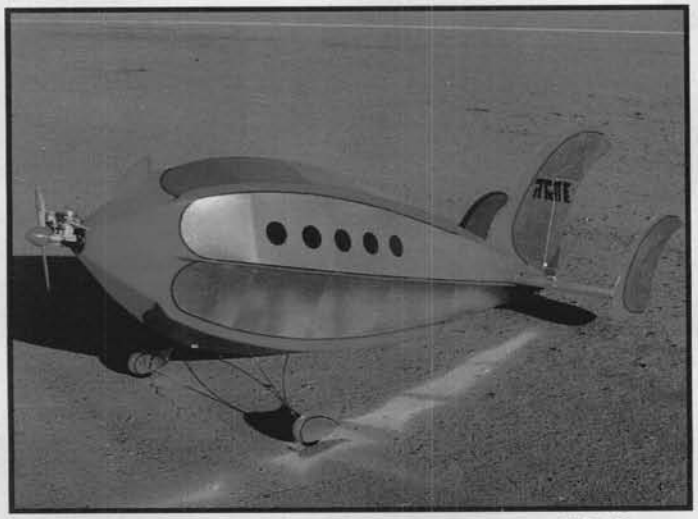
Redesigned for Radio Control

BY SKIP RUFF

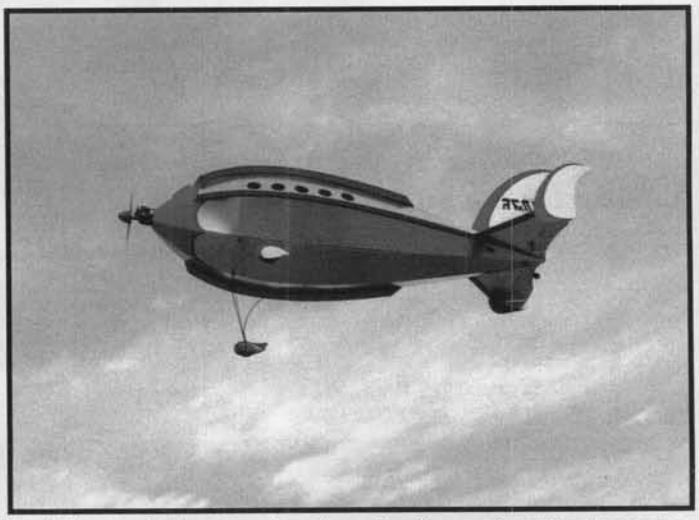


Mr. & Mrs. Martian Space Ship (he's wearing the pants). Earlier (heavier) model on right was covered with chrome MonoKote. Newest (lighter) model covered with silver Micafilm.

Designer Skip, with dad, Gordon (right), portray actual size of model. The two white "Cubs" are styrofoam test models. One is mounted on "Piggy Back" rig on Sig Kadet, used for higher altitude "glide" tests.



Like the Bumble Bee, just so it doesn't know it "can't fly," it will fly! You won't need a drag chute or dethermalizer to bring it down, however!

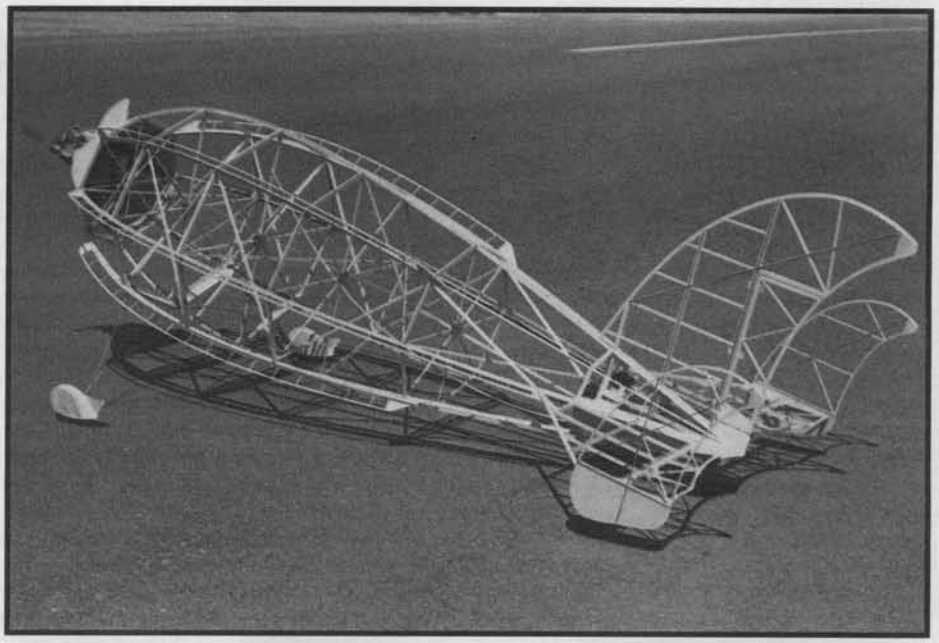


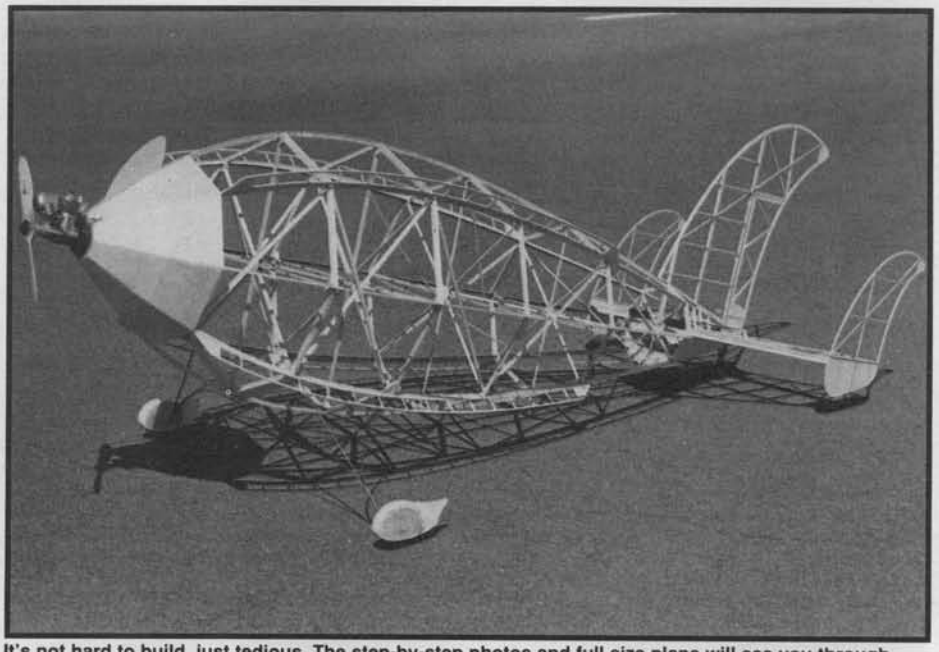
Yes, it flies, and will even perform loops. Don't worry about how it manages to do it, just enjoy! It's a show stopper.

Those of you who have been involved in the sport of model aviation for 20 or more years may remember the name of Roy L. Clough Jr. Between the years 1945-1968, Roy published no fewer than 70 articles on various types of models, including, but not limited to, helicopters, autogyros, flying saucers, lifting bodies, hovercraft, ducted fans, pressure jets, jetex turboprops, flying wings, slat wings, ring wings, radial wings, custer wings, tandem wings, and just about anything else you can imagine. His articles appeared in magazines such as *Model Airplane News, Flying Models, Air Trails, American Modeler, Popular Science, Popular Mechanics, Science & Mechanics, and Astounding Science Fiction.* A true genius, his designs were both innovative and highly unique, and to this day, you can still see the results of his pioneering work in the field of ducted fans and F/F helicopters, such as those marketed by Cox.

Since childhood, I've admired and been fascinated by the wild and wacky models he has designed, especially the rotary-winged stuff and the ones with a science-fiction theme such as the "Venusian Scout," "Moon Scout," "Saturnian Space Skimmer," and the subject of this article, the "Martian Spaceship," which was originally published in the April 1954 issue of *Air Trails* magazine as a 30-inch long, 1/2A powered free flight. As is sometimes the case with an unorthodox design such as this, Roy did not initially set out to build a "Flash Gordon" type spaceship, but was actually trying to perfect a flying blimp that used no helium. After the many modifications necessary to get the thing to fly, it resembled a 1930's type spacecraft more than a blimp and Roy went ahead and published it as such.

I'm quite certain I'm not the first person to attempt an RC version of this er, uh, "aircraft" and, if memory serves me right, I remember seeing, in a later issue of *Air Trails*, a 1-1/2 size version with a single-channel escapement radio for control. It was a static photo and flight test results were not available. I also have it on very good authority, if you can believe this, that someone actually built a man-carrying version powered by a 65 hp. Continental. Again, test results are unavailable, although I have a pretty good idea of what happened if someone actually strapped himself in and tried to fly it!





It's not hard to build, just tedious. The step-by-step photos and full size plans will see you through. No helium required!

Not to change the subject, but you might be interested to know that another of Roy's designs was very successfully adapted to RC by Fran McElwee and was featured in a construction article entitled "Super Saucer #5" in the April 1973 issue of *Model Airplane News.*

Anyway, in regard to my version of the Spaceship, I was finally motivated into action (after having it for years in the back of my mind as a future project) by a sketch of it as the "Mystery Model" in the April 1988 "Free Flight" column of this magazine, and by the statement a certain Editor/Publisher (who shall remain anonymous to spare him further embarrassment!) that this model could NOT be adapted to RC! *(Whoopee! The trick worked!-"A certain Editor/Publisher")*

Being somewhat skeptical of the lifting ability of such a configuration, I decided that to fly properly as an RC ship, the model would have to be larger, built light and use a lightweight radio system. I constructed a double-size version following the original shape as closely as possible and made modifications only to allow the use of a landing gear (the 1/2A original had none) and the control system utilizing throttle, rudder and elevator.

To say the first flight was exciting is an understatement! As soon as the wheels left the ground the ship rolled violently to the left. For a split second I thought torque was the culprit and that my brand new creation was going to roll inverted and auger in! After reaching about 90 degrees of left bank, the roll suddenly reversed to the right until the model was at 90 degrees on its right side, then went to the left again and so forth, left, right, left, etc., swinging rapidly through a 180-degree arc while gradually climbing. I was able to make (I still can't quite remember exactly how!) a slow circuit of the field and get the thing pointed into the light breeze at about 100 feet of altitude. A reduction in power produced a gentle, near vertical, descent with the oscillation continuing until touchdown, whew!!

Obviously something was not quite right! Although much more rapidly, the model appeared to be doing a classic dutch-roll. After some experiments with a couple of small foam spaceship gliders, vertical stabilizer area was added in the form of tip fins glued onto the ends of the horizontal stabilizer. The next flight was much better, with only a slight oscillation. Next, the forward fin on the nose (which gave dihedral effect on the F/F) was cut down to a stub and

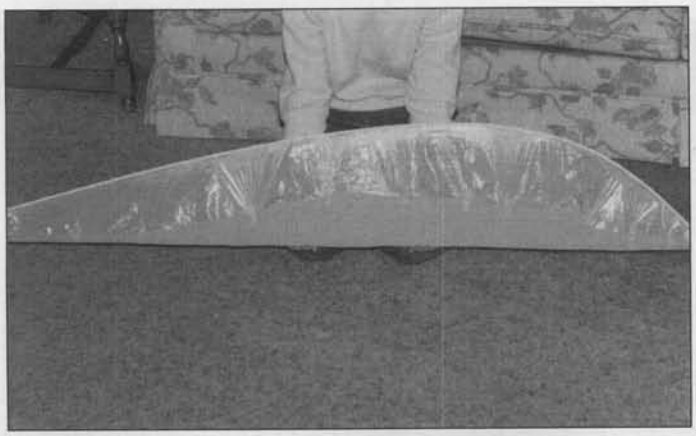


Photo #1.

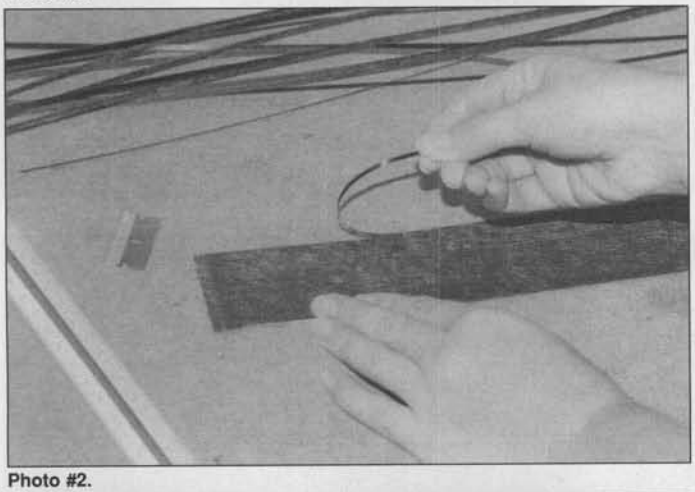


Photo #2.

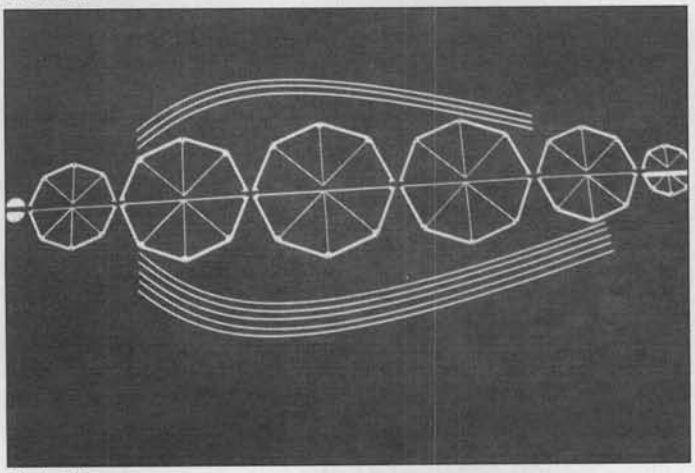


Photo #3.

Photo #4.

this further improved the stability to the point where the model would only rock slightly in turbulence or by quick movement of the rudder. Evidently, the lowering of the center of gravity by the addition of a landing gear, made these modifications necessary. The small forward fin now serves only as a handle for use during starting procedures.

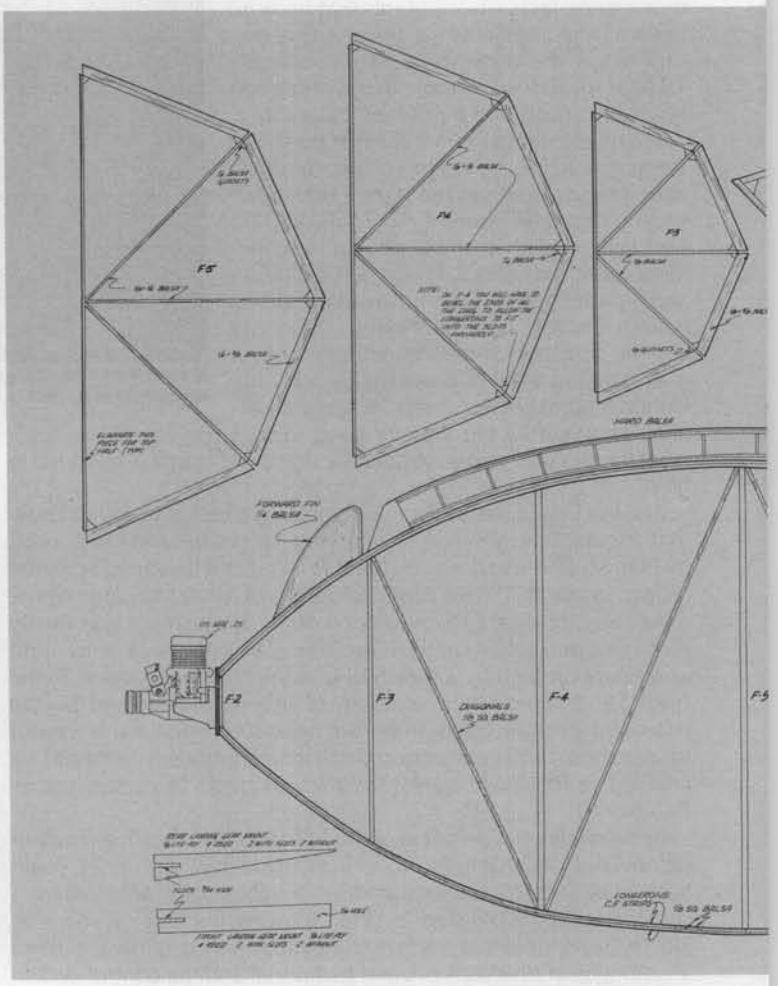
What makes it fly? Well, if you look at it from the side, you'll see that the fuselage is actually a symmetrically shaped wing with a very short span. With the addition of a tail for control and stability and strakes for efficiency (they reduce "spanwise" airflow) the model flies as either a flying wing with a tail, or as a lifting-body, depending on how you view things. Within certain limitations, the model is easy to fly and is definitely a show-stopper at the field.

CONSTRUCTION

Although not difficult to build, I would be less than honest if I didn't say that construction is somewhat tedious. Very light wood must be used to avoid excess weight and some of the structure is rather fragile, especially before covering, making care necessary when handling parts, such as the strakes. For maximum strength with minimum weight, carbon fiber is used in certain areas. Although this material could probably be eliminated by increasing some of the wood sizes or the addition of more structural members, such as bulkheads, you're on your own if you decide to do so. If you do decide to deviate from the instructions, make sure you keep it light and follow the basic outline.

You will notice that the plans (as is the model) are a bit different in detail and perspective than the norm. Because of the unique shape of the design and the construction method, I chose to provide a basic set of drawings from which to build, and tried to cover the details that would be hard to draw on paper with many photos and these instructions.

Construction begins with the making of a jig, cut to the curved shape of a main longeron, out of 1/8-inch corrugated cardboard and capped on the edge with 1/16x1/8-inch balsa for smoothness **(photo #1)**. This is covered with Saran Wrap, or equivalent, to keep the



FULL SIZE PLANS AVAILABLE, SEE PAGE 106.

longerons from sticking to it during lamination.

The carbon fiber I used came in a sheet of .007-inch thickness, 4x72-inch, which provides more than enough for one model. It can be purchased from Aerospace Composites (P.O. Box 16621, Irvine, CA 92741; telephone (714) 250-1107). The needed strips can be ripped from the sheet by notching one end with a razor blade to the width needed (1/8-inch for the longerons) and pulling back along its length **(photo #2)**. Be careful of slivers when handling this stuff. If you wind up with a strip slightly undersize, that's fine. Lay the first carbon fiber strip over the jig and secure it with masking tape at its ends. Using slow CA (cyanoacrylate)+ accelerator, glue a 1/8-inch square balsa strip over the carbon fiber (a butt joint is okay on the 36-inch long balsa) followed by another 1/8-inch square piece (butt joined at a different location) over the first and then a top cap of carbon fiber. A 1/16x1/8-inch balsa cap strip will eventually be glued on the outer portion of each longeron, for the covering to adhere to, during a later stage of construction. Make eight longerons, noting that three of them, which go on the top of the fuselage, are shorter than the other five **(note photo #3)**. Make each longeron a little longer than needed to insure adequate length. They can be trimmed later. Now is a good time to mark the position of each bulkhead on the longerons with a pen or pencil, to aid later assembly.

The bulkheads F-2 through F-8 are constructed in two halves, a top and bottom. The differences between the halves are noted on the plans and should be apparent in **photo #3**. Where appropriate, the bulkheads' outer crosspieces are slightly oversize so that they can be beveled down later to conform to the curve of the fuselage. There is only one half to F-9, the bottom.

Assembly of the fuselage, which is constructed in the "half shell" method, starts with the bottom half. Begin by pinning down two of the long longerons to the plans on a flat building surface **(photo #4)**. Next, the bottom halves of bulkheads F-2 through F-9 are glued to the longerons, taking care to insure they are perpendicular to the building surface **(photo #5)**. The 1/8-inch square balsawood diago-

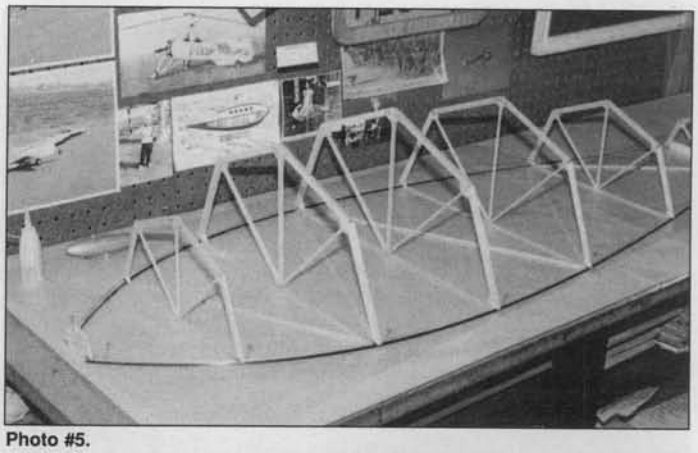
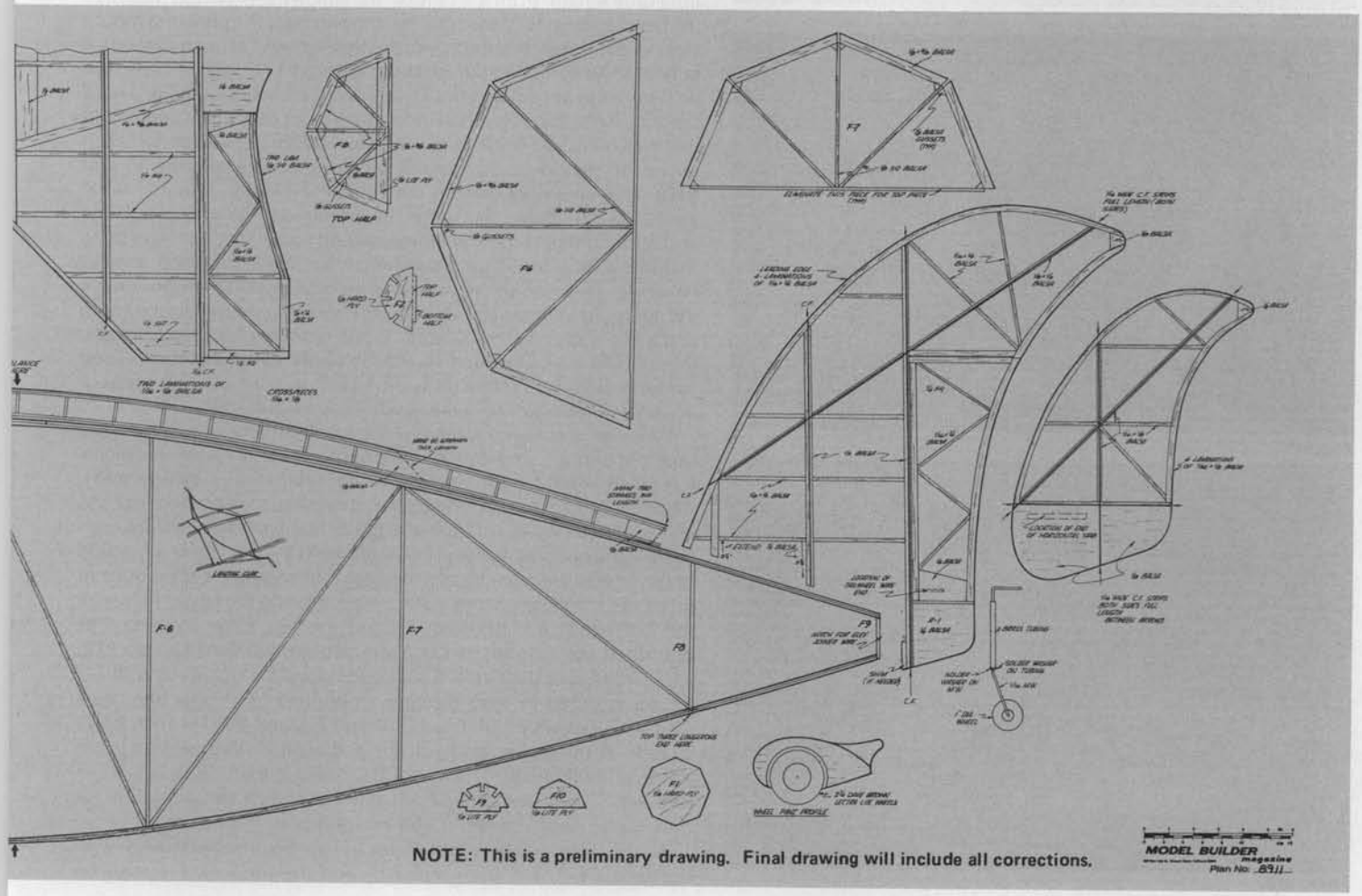


Photo #5.

Photo #6.



NOTE: This is a preliminary drawing. Final drawing will include all corrections.

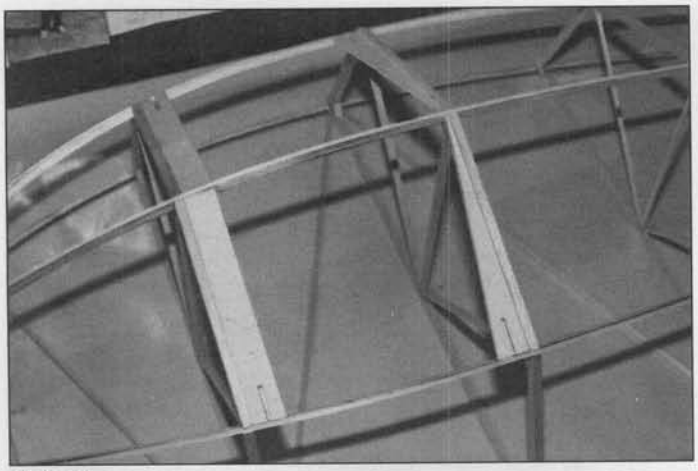


Photo #7.

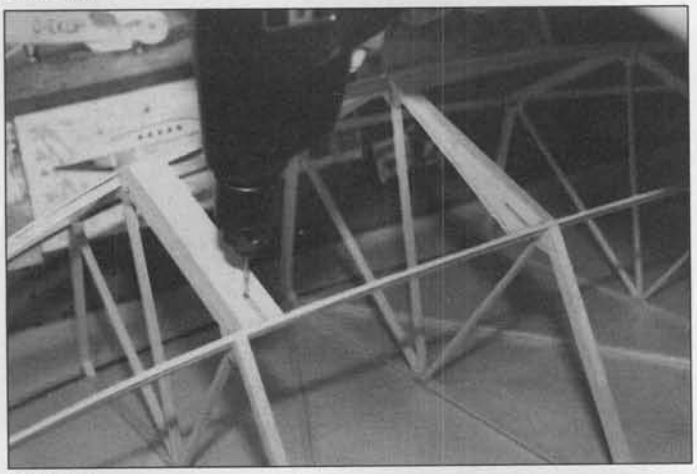


Photo #8.

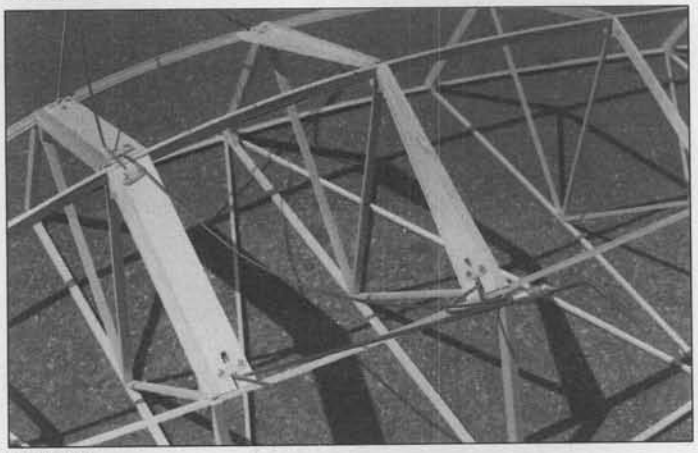


Photo #9.

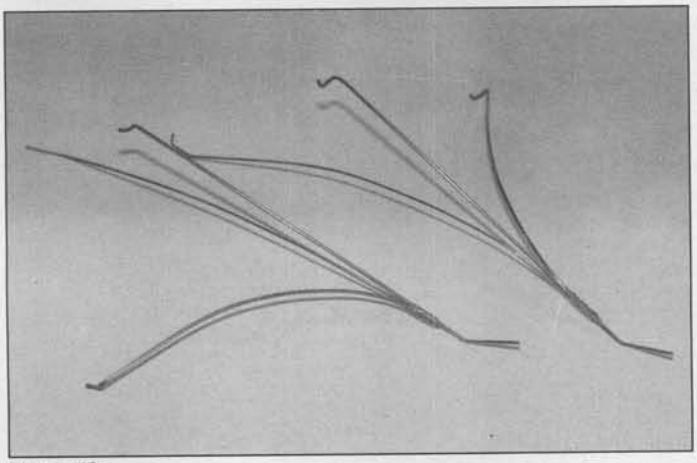


Photo #10.

nals are added next from bulkheads F-3 to F-8 **(photo #5)**, followed by the other three long longerons, which are being fitted into the slots in the bulkheads and glued in place **(photo #6)**. With everything still secured to the building board, carefully sand and bevel bulkheads F-3 and F-8, around the area of the three bottom longerons, so that they are flush with the carbon fiber outer surface of the longerons. Next, cap the three bottom longerons with 1/16x1/8-inch balsa from bulkheads F-3 to F-8. The cap strips should extend up to, but not over, F-3 and F-8, as 1/16-inch balsa sheeting will later overlap these bulkheads.

Next, the landing gear mounts are made out of 1/8-inch Lite-Ply. You will need four pieces of each one shown on the plans, two of each with slots and two without. Laminate the pieces together with CA or epoxy, a slotted piece with a solid one, which will give you four pieces (two front and two rear) 1/4-inch thick. Make sure you've made a left and right of each. Bevel the edges of these pieces as necessary until they fit into their respective places, slot side out, against bulkheads F-4 and F-5 and flush with the capstrips on the bottom longerons **(photo #7)**. Glue these in place securely and then drill a 3/32-inch hole in the inside end of each slot **(photo #8)** and a 1/16-inch hole on the two front mounts, as indicated on the plans. These holes help secure the ends of each gear wire leg.

Now is the best time to construct the landing gear. Again because of the unusual shape and many odd angles involved, I haven't shown the gear legs full size on the plans. Instead, you'll find a sketch and dimensions on the plans along with the photos and instructions to guide you. The fuselage should remain secured to a flat surface, as each leg is built "on the model" and measurements are taken from the building surface to assure correct and equal spacing of the gear legs. Each leg consists of a tripod formed from three pieces of music wire which are held to the fuselage with nylon straps and wood screws, and are wrapped with fine copper wire and soldered together at the wheel end.

The straight piece of 3/32-inch wire, which forms the axle and extends from the forward outside corner of the fuselage is ten inches long (true length) from the bend at the slot in the plywood mount to the bend at the axle. When making the bends for the plywood mount slots in the outer 3/32-inch wires, allow about 1/4-inch clearance between the wires and the longeron **(photo #11)**. This will keep the gear from flexing out far enough to strike the lower strakes on a hard landing. Note that 1/16-inch inner wires cross over at the center and that the rear 3/32-inch wire and inner 1/16-inch wires are both curved to provide a measure of shock absorbing **(photos #9 and #10)**. The amount of curve is not critical; if it looks about like what you see in the photo, that's fine. Be prepared to do a bit of twisting and re-bending to finally get things where you want them, and try to include a little toe-in and camber in the axles for good ground handling. The ends of the wires can be held together temporarily at the solder location with masking tape until everything looks good, and then wrapped and soldered. When removed from the fuselage, they should look like what you see in **photo #10**. The wheels used are Dave Brown 2-1/4 inch LECTRA-LITE units which, to the best of my knowledge, are the lightest wheels on the market.

With the gear legs off, remove the fuselage bottom half from the building surface and mount it upright on eight or more objects (cans?) of equal height and, again, on a **flat** surface **(photo #11)**. Apply weights to the side longerons, if needed, to keep them flat and level. It needs to be just high enough to allow the bottom longeron to clear the building surface. (Note **photo #11** shows the rear section of the lower fuselage already sheeted. This should NOT be done at this time. It will be covered later.) Now glue on the upper halves of the bulkheads F-2 through F-8 and the top three longerons as described earlier **(photo #12)**. You will also note that in **photo #12**, 3/16-inch balsa diagonals have been added for rigidity and this is further clarified in the side view in **photo #13**. Notice the cross diagonals between bulkheads F-4 and F-5 and the 1/4-inch balsa gussets at the lower ends of the X diagonals that reinforce the longeron/bulkhead/L.G. mount for landing stresses. Bulkheads F-3 through F-8 can be capped front and rear at their center section, or hub, with 1-inch diameter 1/64-inch ply plates, for strength.

At this point, the longeron ends can be trimmed flush with bulkheads F-2, F-8 (top) and F-9, and the firewall, F-1, can be

epoxied onto the face of F-2. Sand and bevel the rest of the outer edges of F-1, F-2, F-3, F-9, and the bottom of F-8, until they're flush with the carbon fiber surface of the longerons. Apply the rest of the 1/16x1/8-inch balsa cap strips over the appropriate areas on the remaining longerons as described before, except that the top three go all the way to the rear end of the longerons, where the ends are trimmed flush with bulkhead F-8. The rest of the bulkheads can now be sanded down flush with the cap strips.

The motor mount of your choice (although a glass mount is shown, I recommend aluminum for vibration resistance and nose weight, which you'll probably need) can now be affixed to the firewall with either bolts and blind nuts or large sheet metal screws, which seem to work fine for me. This is shown in **photo #14** along with the fuel tank installation. The four-ounce Sullivan slant-style tank sits on a 1/8-inch balsa plate which is glued to the bottom of the side longerons and is surrounded by 1/4-inch foam and a 1/16-inch balsa box. The very front of the tank, around the stopper, is siliconed to the top longeron. Make sure the tank doesn't leak, as it is inaccessible once the forward 1/16-inch balsa sheeting is added later.

Install the throttle linkage at this time. As the throttle servo, along with the rest of the radio, is in the tail section, this requires a very long piece of the .032 cable size Sullivan Golden Rod that I used. The longest length available to me was 36 inches, so the difference was made up with a 3/16-inch balsa pushrod that connects the aft end of the cable to the servo **(photo #15)**. As the thin cable is very flexible, secure the nylon outer sheath to every bulkhead it crosses with silicon RTV or CA to prevent unwanted flexing and erratic throttle control. **Photo #15** also shows the curved piece of nyrod in which the receiver antenna is housed.

Sheet the front of the fuselage from F-3 forward with 1/16-inch balsa, the grain running vertically. Depending on the engine you use, you may have to provide a recess in the sheeting for muffler clearance. As far as engines go, I found the O.S. .25 FP to give excellent results. It is light (non-ball bearing) and with 25% nitro fuel and a 9x4 wooden prop, provides near vertical performance, albeit at a slow rate of speed! I would guess that the new K&B .28 Sportster would also be an excellent choice. A good .20 would fly it fine, with limited performance for climb and loops, but I do not recommend anything over a .28 or a 4-stroke. The lightweight airframe (especially the tail section) may not take the vibration or extra speed in a dive.

To be concluded next month. ***MB***

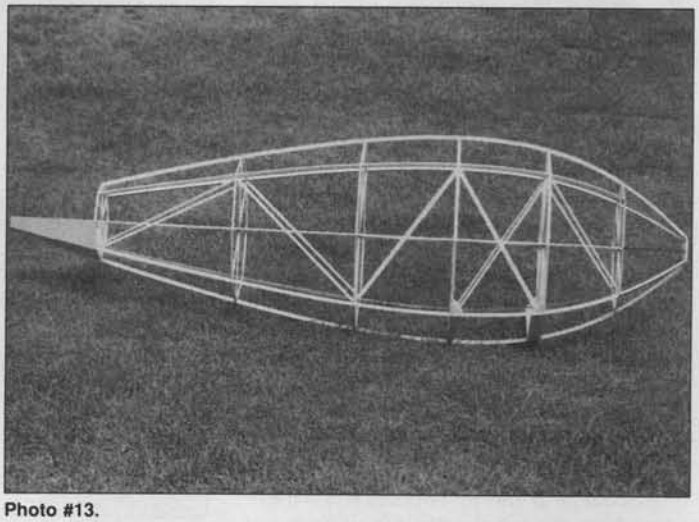


Photo #13.

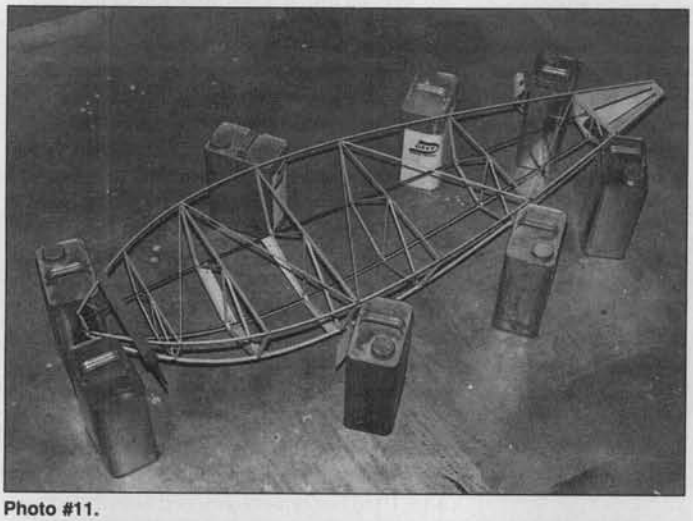


Photo #11.

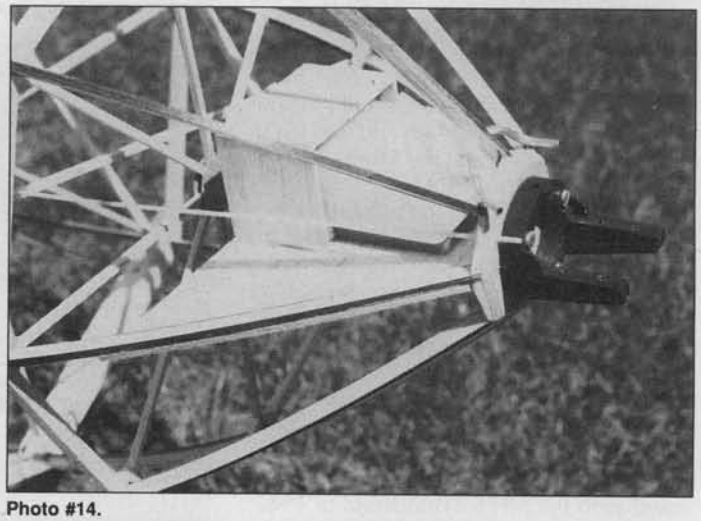


Photo #14.

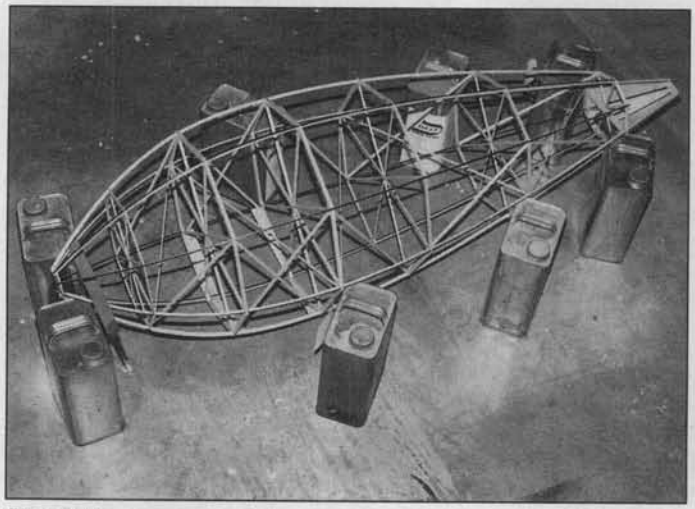


Photo #12.

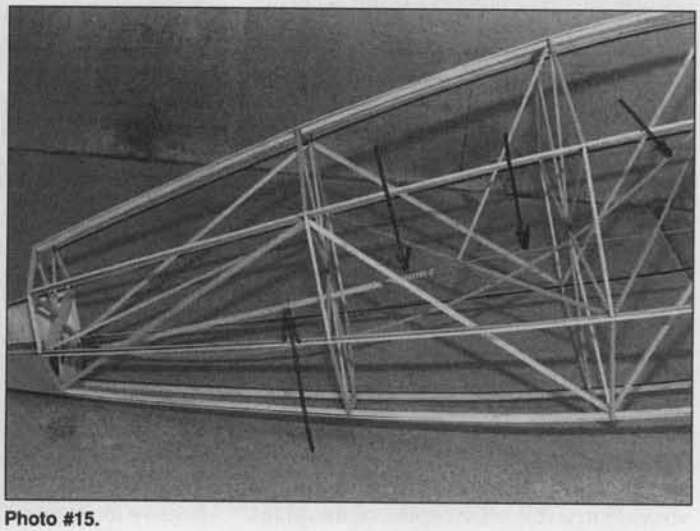


Photo #15.

FREE FLIGHT

BY BOB STALICK

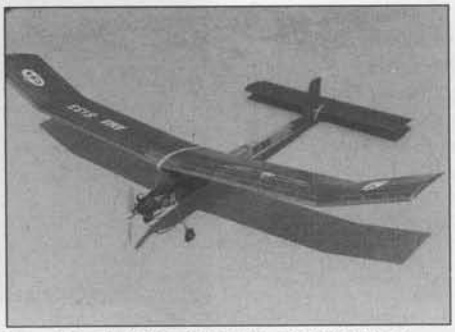
PAYLOAD MAKES A COMEBACK

Payload is making a comeback. Here in the Pacific Northwest, the boys in the Strat-O-Bats (S.O.B.) have renewed the competition in this interesting event. For those of you who are used to screaming gassies, soaring gliders, or flailing rubber models, you might want to take a look at a payload. For one thing, the models are easy to make, easy to transport and relatively easy to fly. I built my first one just two months ago, and had a ball flying one of them at the recent S.O.B.'s Misery Meet. Even though the conditions were not ideal, as noted in the June "Free Flight" column, the flying was great fun. So, as a primer to you who might find yourself interested in this event, I have selected for our three-view the most popular and successful payload model flown at the Misery Meet—Harry Murphy's Pay-Triot.

After my introduction to Payload competition, I contacted Harry Murphy about his design, the Pay-Triot. Harry was very open with his design and its successes. Harry noted that the ship was nearly released as a kit. An ink drawing was completed and a kit box produced, but the kit itself never saw the light of a hobby shop. It was to be produced by the late Casey Hornbeck, who died prior to the completion of the project. Harry also noted that the three-view in this issue originated with the NFFS Symposium of 1982, but was missing a number of critical details, such as the airfoils. The airfoils for this model have been superimposed on the three-view so you can build the model with the information provided. By the way, the reason this ship was in the Symposium is that it was the small gas "model of the year" in 1982—another good reason to consider building one.

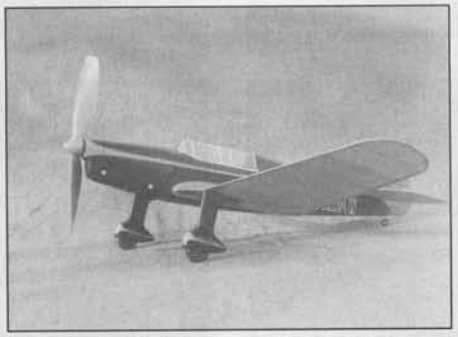
The ship is a great performer both in the R.O.G. mode and in the air. Flight pattern is right-right and with the landing gear mounted just slightly in front of the dummy, its ground handling characteristics are excellent. So, if you have a spare Cox .020 gathering dust in one of your drawers, put it to use and take it to the next Payload event. You will have a ball with the ship.

If you don't want to enlarge the three-view, Harry still sells copies of the plans.



Harry Murphy's Pay-Triot, the August 3-View.

Close-up of the Pay-Triot, showing the location of the landing gear, engine mount and other front end details.



Al Lidberg's latest design, the Miles Mohawk. A 35-inch scale free flight. Plans available. See article for details.

You can get them for $5.00 by sending a check or money order to Harry Murphy, 3824 Oakwood Blvd., Anderson, IN 46011.

DARNED GOOD AIRFOIL—NACA-M13

Once again, I reached into the *Comprehensive Reference Guide to Airfoil Sections for Light Aircraft* for this example. This section was tested at the NACA laboratories at Langley Field. It has the kind of look that the high speed free flighters, such as F1C, would find attractive. It has a low top camber and modest undercamber. The high point is at 35%, and the nose entry is slim and modestly sloped. It also has a slight Phillips entry and a rounded leading edge. So, it will lend itself to high speed climb with only a modest glide if the ship is heavy; however, with VIT, it would be a more than adequate performer. To me, it is reminiscent of the Goldberg 9071 airfoil, which was the section used on the FAI Viking of about two decades ago.

So, if you are contemplating building an F1C or other VIT equipped model, give this section a try. In fact, if you are working on an F1G model, this might be just the one for you. It will take a little bit of work to get enough strength into a wing with such a thin profile, but try some carbon fiber spars or 1/20-inch or 1/32-inch sheet for the top and bottom. It should be a real performer for you.

AUGUST MYSTERY MODEL

One of the most beautiful Wakefields that I can recall from my earlier free flight days was designed by an expert craftsman who at one time lived in the Northwest. It was only after I had become enamored with the model that I actually met the man who was responsible for it. This ship and its designer-flier were members of the U.S. Wakefield team once upon a time. The model was featured in one of the national model magazines as well as an older Zaic Yearbook. I am sure that anyone who has been around free flight competition for any length of time will recognize the ship. If you know the name of the model, jot it down on a sheet of paper and forward it to Bill Northrop, c/o *Model Builder* as soon as possible. The winner receives a free subscription, and that may be the best prize there is.

BILL GIFFEN: 1937-1991

One of my best flying friends, Bill Giffen, died on March 22, 1991. Bill was a longtime member of the Vancouver (B.C.) Gas Model Club and a frequent contributor of ideas and designs to this column. Perhaps, those who

regularly attend the AMA Nats will remember his spectacular four-engine scale model Handley-Page Hannibal free flight at the Reno get-together. Bill had labored hard and long to get this difficult subject ready for the Nats and was rewarded with a well-deserved second place.

Those of us who knew Bill better were aware of his keen interest in many forms of free flight modeling, from indoor duration to Nostalgia and AMA gas. Bill also flew P-30 and outdoor rubber and gas scale. One of his outdoor rubber models that always got some comment was a Pietenpol Air-Camper rubber-powered ship complete with a removable dipstick that had a small bit of oil on it.

Many people did not know that Bill was a recovering alcoholic who had been out of work for a number of years. His models and his association with free flighters were most of the pleasure that filled his life during the last several years. Many of us who knew Bill enjoyed his risque manner and willing assistance for tasks that needed to be done. And I think each of us has a Bill Giffen story to tell to liven up a dull get-together. I know I have several. Bill was just that kind of guy. He will be missed at the contest fields and the other free flight gatherings here in the northwest. All of us lost a good buddy in March.

So, to Bill Giffen: Good luck, friend, and may your last flight be without limit.

STILL MORE TIMERS

It seems such a short time ago that many of us were lamenting the lack of engine timers on the marketplace. Then, a near explosion of products has become available. I recently reported on the Starline timers that Sal Fruciano is marketing, and then Ed Dolby comes through with several thousand KSB timers available from FAI Model Supply. Well, here are some more for your use:

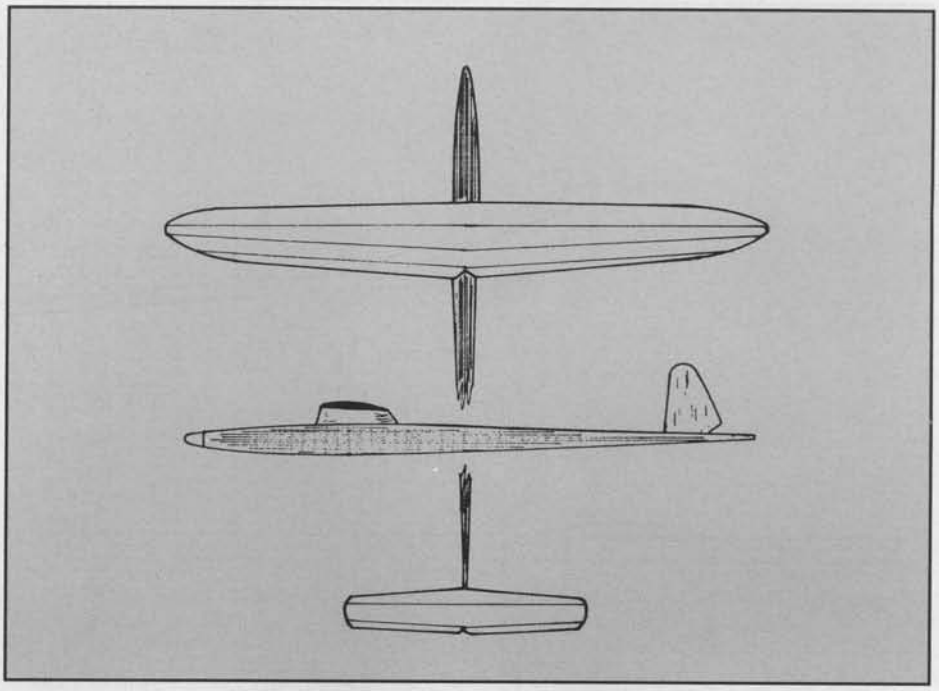
1. Jorge Triana called to let me know that he had purchased 200 "True K-Mart Timers" for model use. These are the same timers that many of us bought even when the Tatones and KSBs were on the hobby shop shelves. We bought them because we thought the springs were stronger and the timers were better. Well, Jorge is selling them for $15.00 each plus $1.00 for postage for the first five that you buy and each five thereafter. In addition, Jorge has also produced a sheet of instructions on how to convert these timers to pinch-off use. So, if you want to be a do-it-yourself timer builder, contact Jorge at 3713 73rd St. East, Inver Grove Hts., MN 55076. If you'd rather call to speed things up, the number is (612) 552-0057.

2. Jose Tellez dropped me a line to let me know the following: "Go to McDonald's and order a Happy Meal. If you are embarrassed to do it for yourself, take along your kid or borrow one. Make sure you make the deal with the kid that **you** get the toy.

"The current toys are miniature 4x4 trucks. When you take off the two screws which separate the body from the chassis, out pops the best little Tomy timer-type motor I have seen yet. The spring has considerably more beef than the Tomy and should be a lot more reliable. The escapement is readily accessible to enable putting a small weight on to slow the motor down to the desired speed.

"So, go get a Happy Meal: you get a hamburger, french fries, drink and a neat little timer to boot."

3. Finally, I received one of Starline's new Polish pinch-off timers, tested in prototype three months ago. According to Sal Fruciano, the production model is now available. The timer is much more nicely finished and has a bright yellow faceplate with super graphics. The cost is still $19.95 and Sal has fifty of them in stock as this is being written. If you are interested in this unit, drop a line to Starline International, 6146 East Cactus Wren Road, Scottsdale, AZ 85253.



AUGUST MYSTERY MODEL

AL LIDBERG'S LATEST

Al Lidberg is a proficient and prolific designer of neat scale model free flights, and I have frequently reported on his latest releases in this column. Well, Al is at it again. This time the design is the Miles Mohawk, a nifty low-wing rubber-powered ship in 1"=1' scale. This produces a model of 35-inch wingspan. Included with the full-sized blackline plans are a 3000+ word step-by-step text, plus a three-view, drawings and photos for scale reference. All of this for only $6.00 plus postage.

If you are interested in this design or any of the others that Al has designed, send an SASE for the complete listing. He has over fifty plans and numerous documentation sets for the discriminating scale free flighter. Address: 614 E. Fordham, Tempe, AZ 85283.

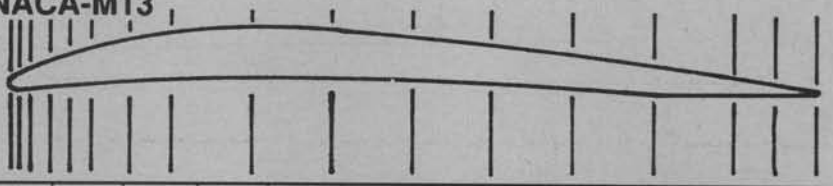
C.G. OR NOT TO C.G.

This article appeared in a recent issue of the *Satellite* newsletter from the San Valeers MAC. Author Bill Moore acknowledged apologies to another Bill (Shakespeare).

"We've all done it: completed our latest superbomb and then, disaster.

"The CG is off badly. It should be at 72

DARNED GOOD AIRFOIL — NACA-M13



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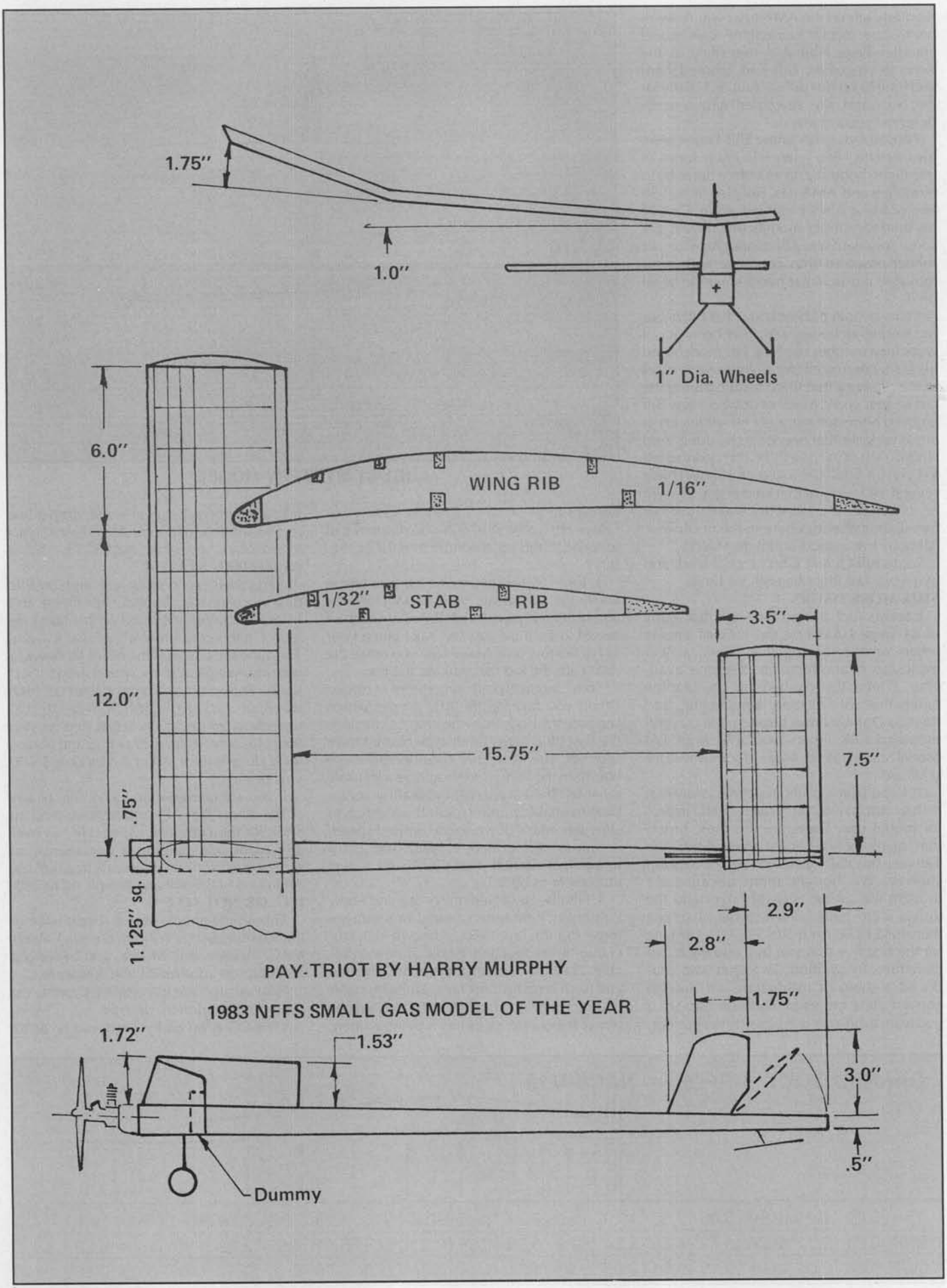
UPR	0.84	2.11	2.76	3.77	4.58	5.24	6.28	6.98	7.65	7.51	6.86	5.81	4.55	3.22	1.87	1.23	0.60
LWR	0.84	0.02	0.01	0.15	0.35	0.55	0.93	1.21	1.44	1.34	1.05	0.66	0.30	0.07	0.00	0.05	0.16


1.75"
1.0"
1" Dia. Wheels
6.0"
WING RIB
1/16"
1/32"
STAB
RIB
3.5"
12.0"
15.75"
7.5"
.75"
1.125" sq.
2.9"
2.8"
1.75"
PAY-TRIOT BY HARRY MURPHY
1983 NFFS SMALL GAS MODEL OF THE YEAR
1.72"
1.53"
3.0"
.5"
Dummy

percent, but it is really too far back at 90%. What can be done to correct this? There isn't enough lead in Chile to add to the nose; besides, who wants to add all that weight to the ultralight airframe you've slaved to achieve?

"Despite our best endeavors, sometimes gremlins strike. Obviously, it couldn't have happened without outside intervention. We're all too careful to have dumb things like this occur. But, there it is. The plane is grossly out of balance.

"You can extend the nose, adding auxiliary firewalls, not lead, until you finally bring it into balance. This takes time, but it is infinitely preferable to all that lead.

"But there is another way. It adds no weight, requires little work, and often allows you to safely fly your bomb.

"What you have been stymied by is trying to achieve a balance at the CG, or what has been identified as the Center of Gravity. A word is always omitted from that title. It should read `Static Center of Gravity.'

"For purposes of general stability, airframes of whatever kind must demonstrate some semblance of balance. This is referred to simply as Center of Gravity . . . or the physical balance point. But there's another equation at work here, and that is the Aerodynamic Center of Force, or center of gravity *where aeronautical forces are applied.*

"What does that mean to us? It means that we often overlook the effect of wing angle of attack, decalage . . . or even the efficiency of the wing. At this point, the skeptics all say, bunk! CG is CG, and there's no way to come up with some artificial CG. The plane either balances properly or it doesn't. And if it doesn't, it crashes!

"Not always.

"Take the Top Banana. Its CG is at about 95%. Take a look at the extreme pylon, and the incidence at which the wing is set. Then study the decalage. Consider the Satellite, one of the most stable models ever to be designed. It flies at essentially zero-zero decalage and zero incidence. For that reason, tiny changes of 1/64-inch may make dramatic changes in power pattern and glide. But the Satellite has a CG range of 72-78 percent, a fairly safe margin of error and range of balance. What that means is there is almost a ten percent variation in where the balance point can be located, and maneuvered.

"Given these data, let's take another look at your `out of balance' new superbomb. Is your angle of attack exactly right? A sixteenth of an inch too much incidence and you have a serious problem . . . but a sixteenth of an inch too little may help you achieve a perfect aerodynamic CG.

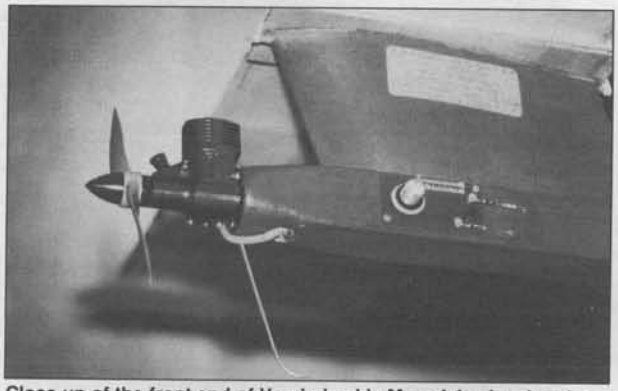
"Look at your stabilizer. Does it have the required negative incidence? No? A tweaking of the incidence here may compensate for as much as a ten percent error in static CG, but you must exercise extreme caution.

"These are admittedly desperate measures, to be sure, but as Doug Galbreath once remarked to me when my Mini-V was gliding decidedly left, when I preferred a right glide, `We can't always get what we want. The plane knows how it wants to glide. Take what you get!'

"Another remedy is to move the pylon, or at least a portion of it, to obtain a longer nose moment. Remove the wing platform, carefully cut an inch or two from the front of the pylon, then add the same amount to the rear. Tack glue the platform back onto the pylon, strap the wing back on and check the balance again. Sometimes, if everything goes well, the repair goes well, and it's hard to tell anything had gone wrong. This is the surest way to solve your problem. Simply finish installing the platform and the wing tiedowns, do your cleanup sanding, re-dope and then clear epoxy the pylon . . . then go fly the new critter.

"Normally, I tend to build so that I end up being a tiny bit nose-heavy, which is much easier to correct. But now and then, extra coats of dope or epoxy at the end of a long tail moment arm can add up to a very rearward static CG. This just happened to me on my latest project, a rear-rudder Satellite 1000 with a venerable old ST .65 as the motive source. This came about because in the initial building, it turned out much too nose-heavy. I got a bit overcautious and sawed away the firewall, shortened the nose moment to get perfect balance, and goofed. I took off about a half-inch too much, resulting in a CG at about 85%. I added two Bakelite spacers of 1/4-inch each and that solved the problem. I think. I haven't had a chance to test glide it yet."

Bill Vanderbeek holds his latest 1/2A powered bomb—a stock Maverick powered by an .05 Shuriken. Bill says it really moves out.


Close-up of the front end of Vanderbeek's Maverick, showing the Shuriken installation and a fancy Starline timer. Ship is covered in Micafilm and sports an APC prop.

HOW I GOT STARTED IN FREE FLIGHT

I have asked readers to tell me how they got started in free flight, and many responded with some great stories. This month, I feature Ted Ballin's, of Seattle, Washington.

"This is how I got started in modeling . . . again. In 1980, Elisabet and I found ourselves in Edmonton, where I was teaching at the University of Alberta. We had rented a furnished house from John MacDonald, Dean of the Science Faculty, while he and his family were off on sabbatical leave at the University of California, Berkeley. When we first met him, John had mentioned in passing that he was a `model builder' and told me to feel free to make use of his basement workshop once we had moved into his house. It wasn't until much later that I found out that John was not just a `model builder,' but an expert scale modeler and trophy taker at Canadian contests. I especially remember a magnificently crafted Mills diesel DeHavilland Moth hanging from his workshop ceiling.

"I started to look around his basement: well, what do we have here? Lining one wall is John's collection of model magazines, including *Model Builder* going back to the earliest issues. I started to leaf through *Model Builder* just to see what has happened to free flight since that day in 1944 when I decided to take a breather from model building and flying, and got sidetracked into the War, into college, into other things. Hmmm, carbon fibers, Coupe d'Hiver, F1B, bunt and Benedek, cyanoacryl-something. What in heaven's name does all this mean? A few more issues and I began to see the light; I began to learn the new jargon, the new materials, the design and construction.

"Later, back in Seattle, Elisabet and I attended the N.W. Model Expo and learned the existence of the Strat-O-Bats MAC from Ernie Linn, who was manning their booth. I joined and got to know great modelers like the late Don Zipoy, Tom `Gumbandito' Cashman, Kevin Collins, Steve `O'Bat' Helmick, and too numerous to mention, all the other wonderful people of the Pacific Northwest free flight scene.

"Once in your blood, the free flight virus never quite leaves you; after an interval of nearly forty years, it had flared up in me again! Thanks *Model Builder*. Thanks John."

And thanks to you, Ted, for sharing your story. So, *Model Builder* attracts another back to the fold. It must be a good thing.

Well, that wraps and ties it again for another month. Time to go out and fly while the weather gods are acting nice. See you all next month. **MB**

CONTROL LINE

BY JOHN THOMPSON

BACK TO SCHOOL

In a general way, control line fliers can be divided into two camps: casual fliers and competition fliers. Many casual fliers are happy to devote their energies to the vast variety of projects available to the model aviation enthusiast. There's everything from casual stunt flying on Sunday afternoons to the production of a plethora of unusual and oddball aircraft from autogyros to triplanes. Some simply enjoy the thrill of building planes and collecting engines, and are happy to find space in their homes for every plane they've ever built. To these fliers, the loss of a plane through a crash is almost like losing a family member. But some fliers are honing their skills with an element of sporting competition to their modeling hobby.

Here we run into that peculiar anomaly of the model aviation vernacular: Commonly, "sport" flying refers to non-competition flying, and "competition" is the word used when a flying activity becomes a sporting event. Thus the reference above to "casual" and "competition" flying, to avoid the obvious confusion! Similarly confusing is the reference to casual flying as "fun" flying—as if competition wasn't fun for those involved . . . our language is a funny thing!

Making the jump from sport—whoops, casual!—flying to competition often can appear to be a bigger leap than it really should be. Most clubs probably include a few of each type of fliers, who sometimes have difficulty getting together.

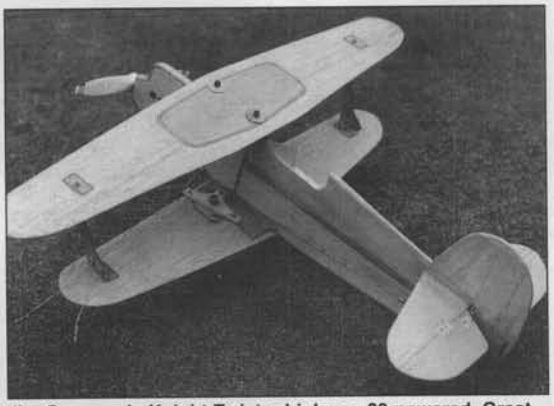
At the club meetings, the competition fliers are often, perhaps unintentionally, talking about things on a level above the casual or beginning fliers. While the novices are trying to figure out the mysteries of such basic topics as "bellcrank" and "balance" and "inverted," the competition hot dogs are tossing about such esoteric terms as "Nats" and "carbon fiber" and "pressure regulator." The novices are trying to grapple with their first Fox .35 stunt while the experts are all "Nelson" and "Shuriken."

At the flying field, while the novices are helping each other get Ringmasters into the air at one end of the field, the hot dogs are at the other end effortlessly practicing with high-tech, high-rpm, high-dollar equipment.

It's not hard to see why the twain don't always meet.

It's not that competition fliers aren't interested in bringing more fliers into their end of the hobby—quite the contrary—but the fact that the two groups are living in such different worlds, modeling-wise, can make communication difficult.

The competitors are for good reason busy developing, testing and practicing, an effort which can consume all of a person's modeling time, particularly during the contest season. For the beginners, what the competitors are doing can look so advanced and so difficult and so foreign that they (novices) simply are intimidated at the prospect of trying to discuss it with the experts. It might seem a little like a city league softball player approaching Jose Canseco for some tips on batting.



Jim Cameron's Knight Twister biplane, .09-powered. Great for laugh-filled flying sessions.

Tom Dixon's Thunderbird II is powered by a Fox .40 ABC reworked for stunt.

How do we break this cycle? How can we distract the experts from their worries about the next contest long enough to pass on some skills to the novices, and how can we make the novices feel comfortable as they merge into modeling's fast lane?

There are probably any number of approaches, but what they have in common is that there is a deliberate, planned strategy to bring the two together. Here is where a strong club leadership comes in—to develop this strategy and then carry it off.

One such approach is being tried in the Eugene Prop Spinners, the home club of your "Control Line" columnist. The Prop Spinners has for decades been a club of both casual and competition fliers. In the past decade or so, there have been periods where the activities of the two groups were largely separate, as described above. This year, the two groups are getting together as they never have before.

The strategy being tried by the Prop Spinners, which could be adapted by any club, involves a regular schedule of club meeting seminars, followed up by on-field demonstrations, and interspersed with general "fun-fly" days.

The seminars cover the kind of competition categories through which casual fliers might enter competition. The flying demonstration follows a couple of months after the meeting seminar, to give fliers time to build airplanes. It's hoped the third stage of the program will be the novices' first entries into actual contests. The general fun-fly events are designed simply to make sure that people keep coming to the field. Actually, scheduling fun fly events and putting someone in charge of organizing them assures that interest will be kept up, particularly when weather is "iffy."

The program follows a firm schedule distributed to all club members at the beginning of the year. Here's a look at the schedule the Prop Spinners followed in the first half of 1991:

JANUARY: Club meeting—Seminar on Northwest Sport Race. Club activity—Annual pot luck.

FEBRUARY: Club meeting—Seminar on Northwest Goodyear Race. Field activity—General fun fly at field.

MARCH: Club meeting—Seminar on precision aerobatics. Field activity—Demonstration of Northwest Sport Race.

APRIL: Club meeting—Seminar on combat. Field activity—Demonstration of North-

west Goodyear.

MAY: Club meeting—Seminar on Navy Carrier. Field activity—Demonstration on precision aerobatics. Contest—Club hosts annual Regional Championships, opportunity for first competition by the "students" on their home field.

JUNE: Club meeting—A fun-fly at the field. Field activity—Demonstration on combat.

This method of interspersing seminars with on-field demonstrations gives the two groups of fliers a chance that they might otherwise not have, to mix and share ideas and concerns. The experts will be able to impart their knowledge and to get back in touch with the basic problems of the hobby, and the students will advance much faster than they otherwise would and will be able to avoid discouragement that comes from trying to solve problems without expert help.

Doing this kind of outreach for each competition category has the potential benefit not only of assisting eager novices but of attracting other club members who may become interested after getting a close look at some activities they hadn't studied in detail previously.

At the time of this writing, the Northwest Sport Race seminar/demonstration had been completed successfully.

At the January meeting, the club's most experienced NWSR team, Mike Hazel and John Thompson (known on the contest circuit as the Nitroholics Racing Team), brought their competition airplane to the meeting. They pointed out the features of the plane that make it different from a standard sport airplane, gave building tips, pointed out the do's and don'ts of getting ready for the competition, and imparted some information about racing in general and the other classes available to those interested in progressing through the ranks. They also went through the basic rules.

At the March field activity, the Nitroholics extended the instruction to the techniques of pitting and piloting, the equipment used in the pits, pit-pilot communication, etc. Then they went through the standard preflight and race routine, running a simulated racing heat while narrating the events to the students and explaining each thing that was being done. Finally, they participated in an actual race with another club member with racing experience, again narrating the activity so that the students could get a feel for the real-life situation—including the excitement and suspense of the competition and the euphoria of victory.

Several club members left the field with pledges that they would return another day with their own racing programs under way. It was a good moment for all involved.

It also was a confirmation of the idea hatched by club members last year that a regular schedule of meeting/flying field activities would be a boost to club activity and an advancement of the area's control line flying quality in general.

It would be interesting to examine similar programs run by other clubs. If club officers or members would send in a report on their successful activity-building programs, we'll report on them in a future issue.

The reference above to those casual fliers who like to find unusual airplanes to fill up those sunny Sunday afternoon flying sessions is illustrated by one of this month's photographs. Jim Cameron provides a shot of his .09-powered Knight Twister biplane.

This 1945 Stanzel Baby V Shark was built by Wayne Spears of Portland, Oregon.

Wayne Spears' 1/2A team racer, powered by Holland Hornet.

This is the second one that Jim has built, and it makes for hilarious flying sessions. The plane will hang on the prop, tumble and do other impossible stunts, as well as being nearly indestructible.

• • •

Our mention some time ago of the PDQ company and its Flying Clown started a trip down memory lane for correspondent Frank Paskovich of Weikert, Pennsylvania, who has been keeping us informed on the progress of constructing a Stiletto, which was nearing completion at last report.

Frank sent an advertisement that was included in a PDQ kit of many years past, which listed some airplanes that might spark some old flying tales when mentioned to a longtime modeler. We don't have the date of the ad, but the prices provide a hint. The ad lists the Flying Clown at $1.95. You also could buy the 42-inch span Lion Tamer, with full fuselage, for $3.95. There was also the Super Clown for $2.95, the PDQ Trainer for $2.45, the very zippy-looking Circus King for $2.95, the Baby Clown for $1.50 and the Circus Prince for $1.95. The ad promises 100 percent Grade AAA balsa, hardwood motor mounts, and, most important, a "sprightly decal."

It's great to be flying in an era when many of the old kits are being reissued by new manufacturers along with some new, excellent designs. But it's also fun to recall the "old days" when the big manufacturers produced dozens of kits. As I recall, the Sterling kit boxes used to contain a list of an incredible number of control line kits, including about a dozen versions of the Ringmaster!

And speaking of classic control line airplanes, there never was a more visually pleasing craft, new or old, than the Thunderbird. Tom Dixon sent along a photo of his Thunderbird II, built from one of his kits. The one shown in the photo is a bolt-together version for long-distance travel, powered by a Fox .40 ABC reworked for stunt. It weighs in at 49 ounces. Tom is an active flier who also sells a wide range of modeling kits and accessories; you can get a catalog by writing him at P.O. Box 671166, Marietta, GA 30066.

While we're on memory lane, we'll take a look at some ancient classics built by Wayne Spears of Portland, Oregon. They include a 1945 Stanzel Baby V Shark, used for speed competition. It was powered by a K&B-Allyn twin .15 engine, had an 18-inch span and was 20 inches long. There's also a 1/2A team racer powered by a Holland Hornet. Wayne's planes were photographed by Jim Cameron when they were displayed in an area modeler's booth at the Troutdale Air Show last year.

• • •

We've spent quite a bit of discussion in the past on the topic of what keeps an airplane out on the end of the lines while producing optimum performance. Just to prove that there are always several ways of approaching any problem, we have a different view provided by Steven Bard of Endwell, New York. Steven referred to an April 1990 article in which we discussed leadout position as the main ingredient for optimum line tension. He writes:

"Maybe I can augment some of your

points: I've been doing some experimenting with stunters.

"Engine offset was my mainstay since the early 50s (Flying Clown, All American, Ringmaster). Only lately have I realized that the essence of the effect is in the distance between the thrust line and the CG (center of gravity).

"Now, I don't know where the CG is, because I don't know how much of the lines to count. Never check this with the lines attached. But the thrust line should pass inside the CG (as seen from above). This will turn the plane out. Note that a long nose helps here. Also notice that tip weight moves the CG in the correct direction *(Aha! Could this be the true explanation of what tip weight really accomplishes?-jt).*

"My recent experiments have been to solve a problem, as I see it, of what happens when the CG is too far out. Namely the airplane tending to roll during tight turns. They tend to show me their underside during inside turns and show me the upperside during outside turns *(Sounds like too much of that tip weight!-jt).*

"I've taken to putting the CG in the center of the wing (centered from tip to tip, not leading edge to trailing edge) but moving the engine inside. The effect is to make the outboard wing longer than the inboard wing.

"It is working. The roll is less and lines hold as well as before.

"Now, because of your article, the leadout location is getting moved back; no test flights yet, but I expect success.

"A lot of tip weight is needed to get the CG on the outboard side from the fuselage, but only a little more than normal. The perpendicular distance on the present test bed, a Tutor, is three inches *(That's three inches outboard of the fuselage-jt).* It doesn't seem too much yet. But then leadout position adjustments have not been made.

"My Beautiful Stunter is starting to look funny and I have had to play with paint to try to make it look symmetrical, but performance is good right now. And the plane wants to fall over on its right wing sitting on the ground. Ground handling is good with the engine running.

"Here's more on the plane: .19 diesel for power (little engine equals light plane), low pitch props for slow flying and pull out all the stops for tension. See November 1989 *Model Builder* Reynolds article for the airfoil I'm shooting for."

Steve has some other radical ideas that had not been tried as of this writing. It will be interesting to see how Steve's experiments turn out. We'll be looking for pictures of the planes and a report on their performance.

• • •

Our continuing "Newsletter of the Month" feature focuses this time on *The Pits*, the newsletter of the Metrolina Control Line Society, in North Carolina. The club's members are spread out over several cities. *The Pits* is edited by James Duckworth of Stanley. The club leadership includes president Dale Campbell of Newton, vice president Charles Lineberger of Gastonia, secretary-treasurer John Hagan of Mooresville, safety director William Davis of Gastonia, and event director Pat Robinson of Gastonia.

The March 1991 issue announces plans for a unique Points Night Auction and Cookout. During the year, president Campbell writes, club members will be awarded points for participation in club activities. At the end of the year, Campbell will host a cookout and auction, with earned points being used to make purchases. Dale says the idea came from the Mid Hudson Modelmasters.

Also in the issue are notes from the February club meeting, a report on a city parks advisory board meeting in regard to the Holbrooks Park flying site, a report on the deaths of two model aviation greats (Duke Fox and Bob Peck), an article on vibration in profile models, a useful form for use in measuring various engine specifications, and other tips, hints and gossip.

North Carolina area fliers interested in joining the MCLS can do so by sending in the dues of $15 ($20 for family, $7.50 for juniors). People elsewhere interested in subscribing to *The Pits* can do so by sending $10 for 12 monthly issues. The editor's address is James Duckworth, 629 Mariposa Road, Stanley, NC 28164.

As mentioned above, most fliers are aware of the tremendous loss suffered by all of control line model aviation with the passing of Duke Fox. His contributions to the hobby were unsurpassed; his memory will long remain with all of us who own multiple copies of the various outstanding Combat Specials and venerable all-purpose Fox .35 stunt engines. It is hoped that Fox Manufacturing Co. will continue the tradition Duke started and so long maintained, of providing quality, affordable engines for control line fliers.

As always, club news, contest reports, hints, tips, photos and questions are welcomed. Write John Thompson, 1145 Birch Ave., Cottage Grove, OR 97424. **MB**

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STRICTLY SCALE

BY AL TUTTLE

SKY FURY, WORLD'S GREATEST PROPELLER DRIVEN FIGHTER

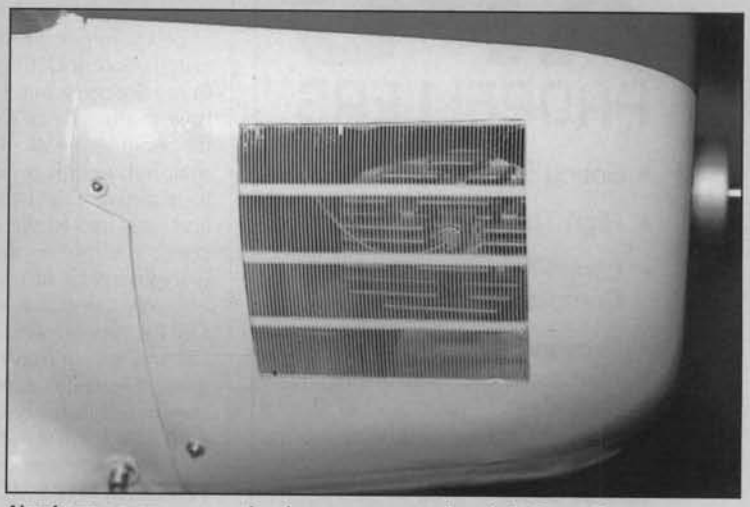
One of the prettiest prop driven fighters, in my estimation, is the Hawker Sea Fury. Its proportions and moments appear to be ideal for an all-up scale warbird, and the models of it that I have seen fly proved this out as they flew exceptionally well. The main problem, in my mind, is that the five-bladed prop that the full-size aircraft utilizes would be very difficult to duplicate to fly the model. A two-bladed prop for flying takes away the scale flight appearance. However, for those of you who would like to build a truly **scale** flying replica, all is not lost.

(Below) George Baker's full-size Sky Fury. Note size of canopy and bottom of rudder being rounded off. (Right) The prop blades are blurred as the Sky Fury's engine is running; note pilot in cockpit, and smoke generators at wing tips.

A close-up look at the engine exhaust stacks and one of the oil coolers on George Baker's Sky Fury.

The wing tip smoke generator on the Sky Fury. The smaller unit is the air mixture control.

A side view of Roy Vallaincourt's model Sea Fury, which could also be built as a Sky Fury; see text. Note size of canopy and angle at bottom of rudder vs. the Sky Fury canopy and rudder.



Aluminum screen was used as louvers on our columnist's Byron Staggerwing.

There is a **Sky** Fury located in New Smyrna Beach, Florida. It originally started out as a Sea Fury and was a basket case when purchased by George Baker, owner of American Aero Services, who did the restoration. Ironically, the plane came from Iraq, where it had been flown in the Iraqi Air Force. The five-bladed prop and sleeve valve engine was replaced with a Curtiss-Wright 3350 engine and four-bladed prop from a Douglas Sky Raider. Hence the name change from Sea Fury to Sky Fury.

According to the data supplied by pilot/owner George Baker, out of this marriage evolved the Sky Fury, the world's greatest propeller driven fighter, developing approximately 3,000 horsepower with a speed of 485 mph at 18,500 ft. Initial climb is in excess of 5,000 feet per minute. Empty weight is 9,000 pounds; max landing weight is 14,000 pounds. The airframe is stressed 11 positive, 9 negative G's. Wing span is 38 feet, 8 inches. Length is 34 feet, 7 inches. As can be seen by the photos, it is decked out in Royal Australian Air Force markings.

What makes this plane particularly interesting is the fact that it has wing tip smoke generators for those who like smoke systems in their models. There is only one change in the plane in that the canopy has been lengthened as, according to George, the original canopy was too small and didn't look right. Lengthening the canopy results in the plane "looking right." Modeling this in 1/5 scale would allow the use of the Byron Originals four-bladed Purrrrpowr system, resulting in the ability to fly the plane with a scale prop.

Roy Vaillancourt, of Vailly Aviation, has the plans, cowling, etc., available for a 1/5-scale Hawker Sea Fury, that could easily be modified into a Sky Fury. According to Roy, the Hawker Sea Fury is scaled at 2.35 inches to the foot, resulting in a wingspan of 90 inches with a wing area of 1,800 square inches and an overall length of 81 inches. The ship is intended to weigh between 28 and 32 pounds, with a recommended engine size from 3.4 to 4.2 cubic inches. Engines such as a Quadra 65, Sachs 3.7, or a Zenoah G-62 provide very realistic performance.

Plans and parts are available separately or as a package. The plans show all structures drawn full size, including the installation of flaps and retracts. Full-size templates are also shown for all ribs and formers. The parts available are a fiberglass cowl, a clear plastic canopy (which is too small for the Sky Fury, but you can use it as a guide when making a plug for the larger canopy), and an aluminum spinner and backplate.

Primary construction is light plywood, balsa and spruce or pine using conventional tried-and-true building techniques. All structures are built-up and sheeted with 1/8-inch or 3/32-inch balsa. No foam is used whatsoever. You will have to lengthen the canopy slightly to conform to the Sky Fury canopy.

In the side view photo of Roy's model, you will note that the bottom of the rudder is angled to allow retraction of the tail hook, whereas the Sky Fury's rudder is rounded at the bottom as shown in the photos.

If interested, Roy can be reached at 18 Oakdale Ave., Farmingville, NY 11738; telephone (516) 732-4715 after 6:30 p.m. Roy's model is a fine flier and has been in the winner's circle many times. The last time I saw the model fly was at the '89-'90 Tangerine in Florida, where he placed first in Giant Scale. As a scale judge at that contest, I can tell you the competition was fierce. He had to compete against the likes of Bob Fiorenze, Art Johnson, and Frank Tiano, just to name a few. I have paint chips from the Sky Fury and for those of you who are interested, Lucas Paints will make these colors available. Now you can have a scale fighter flying with a scale prop, using a scale smoke system!

BYRON EXPO '91

One of the greatest model events of the year is coming up this month, the Byron Expo '91, to be held August 7-11. This is going to be one humdinger of an event, as it is the 10th anniversary of the fly-in and the

50th anniversary of Pearl Harbor. I hope to see you there. As this is being written in April, I have my carrier-launched Zero all spruced up and ready to go, and am in the process of building another Zero, complete with retracts, power prop system, etc., to fly as a demo model, and for use as a back-up in case of a problem with the carrier Zero. If you miss the event, try again next year as Expo '92 will be held August 12-16.

COWL LOUVERS

Have you ever spent hours fabricating louvers for your latest scale project? Thanks to my friend Stan Sibley of Visalia, California, I have a supply of the niftiest louver material ever made! Stan used this material on one of his Byron P-51s and sent me some to try.

Last summer, I found that I needed additional cooling for the side-mounted ST 3000 in my Staggerwing. I cut a four-inch square hole in the side of the cowl, centered over the engine head. The aluminum louver material, which is one-inch wide between the solid material centerlines, was cut to size and attached to the inside of the fiberglass cowl. The louvers are attached to the cowl with fiberglass strips. The photo, which is not very contrasty, shows the installation. The louvers are an aluminum screen material and may or may not be available in your area. It is quite expensive, and has to be purchased in fairly large quantities. Check with your local screen companies. They just may have some scrap pieces on hand.

THIS MONTH'S MODELER

Meet George Jordon. George lives in Sharpes, Florida, and has been modeling since 1934! Most everyone who has been in scale modeling for any length of time has met George, or competed against him at one time or another. He was one of the early pioneers in Giant Scale and is still very active in the IMAA. I believe George was the founder of an IMAA chapter in the Cocoa, Florida area.

I first met George in the fall of 1969 when I was transferred to Patrick Air Force Base. At that time, George had a hobby shop in Cocoa and was also involved in the design and partial kitting of three .60 size sport scale models: a Spitfire, ME-109, and FW-190. All three of these models were outstanding fliers, with a fiberglass fuselage and balsa sheeted foam wings. Unfortunately, these models were about twenty years ahead of their time and never did sell very well. I still have an FW-190 fuselage and wing cores rat-holed away, which I intend to build someday.

George was also flying a 1/4 scale T-Craft powered with an O.S. .80 at that time. George scratch builds exclusively and utilizes a unique method of scaling his subject to size. When he does a scale subject, he takes photos from every conceivable angle of the full-scale subject. He then obtains three-views or draws his own three-views from factory specs, sketches, etc. He then decides the scale he wants to build and draws plans accordingly. He admits that his drawings are fairly simple. Here is the unique

George Jordon holds a P-51 wing; a beautiful Waco is to George's right.

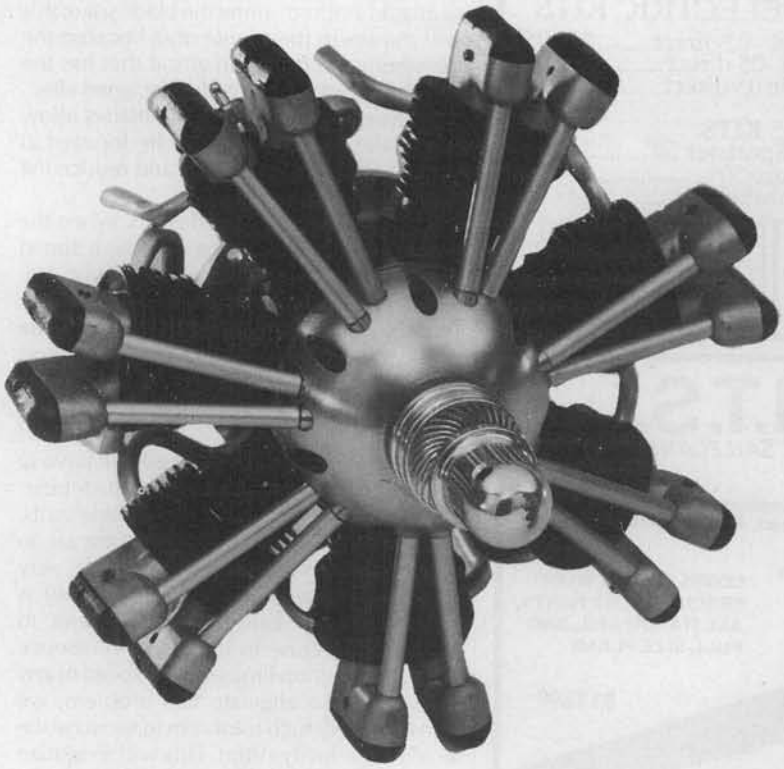
George paints over repaired P-51 fuselage.

part of his building: George is blessed with the ability to look at a picture or subject and accurately transfer it to paper **or form**. Once his simple drawings are completed, he uses the photos to complete the construction.

His favorite finishing method is the use of silkspan over solid balsa surfaces and Super Coverite, SIG Koverall, etc. over open structures. He uses an acrylic lacquer primer and then Randolph's butyrate dope for the final finish. One photo shows George with a couple of Dick Sarpolus designed P-51s which have proven to be quite popular in his area. The other photo shows George painting over the repaired fuselage of his P-51 which he broke in two the previous weekend. George is an excellent flier as well as a top builder. However, he does have one problem, and that is altitude. For him, anything over fifty feet in altitude is stratospheric, consequently if George makes an error, it is usually back to the hangar for major repairs.

He has a 1/4-scale Waco and Rose Parakeet that are real beauties and if you see either one of these planes doing aerobatics at fifty feet or lower and emitting the thickest, whitest smoke you have ever seen from his smoke system, keep an eye open, 'cause you are in for a real treat. After he lands, go over and say "Hi!" Even though he is not smiling in the photos, George is the most congenial person you would ever hope to meet. In fact, he willingly shares his experience and expertise with the newcomer to the hobby, as well as the old-timers. He always has time to help someone either with advice or actual hands-on. Thanks to George, who introduced so many people to modeling, scale modeling is alive and well in Brevard county. Keep up the good work, ol' buddy! ***MB***

WIN A RADIAL!



HERE'S YOUR CHANCE TO WIN A SEVEN-CYLINDER, FOUR-CYCLE, OVERHEAD VALVE, RADIAL ENGINE!

VALUED AT $1100

- 7 Cylinder
- 4 Cycle
- Overhead Valves
- Glow Ignition
- Displacement 1.35 cu. in.
- Red Line RPM 9000
- Flying RPM 8500
- 6" Diameter — 3.05" Deep
- Hard Chrome Bore
- Cast Iron Piston Rings
- 14/6 -16/8 Prop Range
- Extra Heavy Crank Shaft Supported By Ball Bearings Fore and Aft
- Phosphor Bronze Valve Guide
- Master Rod Runs on Needle Bearings
- Rocker Boxes Are Cast-Balance of Engine is Bar Stock
- Hardened and Ground Steel Cams
- Hardened and Centerless Ground Valves
- Weight 31 oz.

By Technopower

The Technopower radial, originally based on the Armstrong Siddely Genet Engine of the 1930's era, has taken over five years of design and development work. The result is a unique, aesthetic, highly practical scale flying engine of great engineering interest. These engines are fully operational, multi-cylinder, four-stroke, O.H.V. glow or spark, and contain over 300 component parts. Each engine is individually hand built, checked and test run before leaving the factory. This seven-cylinder engine is built to two-inch scale.

HERE'S ALL YOU DO

Just by subscribing or renewing your subscription to *Model Builder,* you become eligible to win this outstanding Radial engine or other valuable prizes for runner-ups.

We'll pick four names at random from the new and renewed subscriptions that have been received. The first-place winner will receive the Technopower Radial engine! Second place will win a complete Uber Skiver modeling knife set; and third and fourth place will receive a free additional six month's subscription to *Model Builder* magazine! What could be easier? There's nothing to do but subscribe or renew your subscription!

To be eligible, just subscribe to the finest all-around modeling magazine available, *Model Builder,* by sending your name and address, along with a check or money order for $25.00 for one year, or $47.00 for two years ($38.00 for one year [includes postage], outside U.S. including Mexico and Canada), to Model Builder, 898 W. 16th St., Newport Beach, CA 92663. *All payments must be in U.S. funds drawn on a U.S. bank.* Mastercard or Visa orders welcome. The easiest way to do this is to call our toll-free subscription hotline: (800) 243-9593 (in California: 714-645-8830) and place your order. If you've been thinking about subscribing or renewing your subscription, now's the time!

CHATTER *Continued from page 37*

induced velocity uniform along the blade span, thus minimizing the induced drag. The twist will now make the "effective angle of attack" uniform along the blade span; this will minimize the profile drag because the designer can choose an airfoil that has the minimum profile drag at this designed effective angle of attack. Low drag blades allow us to take off like a rocket, fly forward at Warp 5, lift more payloads, and reduce the burden on the engine.

Now, let talk about blade stall. When the pilot retrims the helicopter for high speed forward flight by feeding in some right cyclic stick, he is actually increasing the rotor blade's pitch angle on the retreating side and decreasing the blade's pitch angle on the advancing side. The purpose is to equalize the lift produced on the left and right side of the helicopter.

However, at very high speed, we have to increase the blade pitch angle on the retreating blade side so much that the blade stalls. When the retreating blade stalls, the air no longer flows smoothly over that blade, very little lift is produced, and lots of drag is produced. This causes the helicopter to vibrate and refuse to fly faster. In essence this phenomenon limits the top speed of any helicopter. To alleviate this problem, we can use a very high rotor rpm to increase the blade tip velocity (Vtip). This will minimize the difference in lift generated between the retreating and the advancing side. Thus less pitch needs to be added on the retreating blade side.

Increasing blade tip speed has its drawbacks. Increasing the rpm to solve the retreating blade stall problem will surely give us some problem on the advancing blade side. You do not expect something for nothing! High tip speed introduces a new problem called "advancing blade drag divergence." Let us use a simple example; if we double the rpm from 1400 to 2800, the new blade tip velocity will be 400 mph. If the model is flying forward at 100 mph, then the advancing blade tip total velocity is 500 mph. This is close to the speed of sound (a Mach number of 1.0), which means shock waves will develop on the top surface of the rotor blade tip. The consequence is a severe rise in drag.

This new drag is called "compressibility drag due to shock induced flow separation." It will seriously increase the engine power consumption. This is the same phenomenon that prevented the early jet airplanes from breaking the sound barrier in the 1950s. The problem was later solved by sweeping the wings. This fools the wings into believing the drag divergence should occur at a higher flight mach number.

Because of the smaller rotor radius, a model helicopter's blade tip speed is not as fast as full-size helicopters, therefore, compressibility is not a problem on models. However, model blades do suffer from retreating blade stall problems. In fact, because model blades have much smaller

blade chord than full-size helicopters, which means lower Reynolds number, and the airfoils stall at lower angle of attack. On a sharp turn, the retreating blade side may encounter blade stall. For example, the model is flying at full throttle and the collective is at 10 degrees. But in a turn, cyclic command is fed in which will increase the pitch of the blade on one side more than the other to tilt the rotor for turn. This means that on one side the total pitch may now go beyond 10 degrees. Almost all model airfoils stall around 11 to 15 degrees. When the blade stalls, drag increases tremendously. Consequently, the engine cannot supply enough torque, and we hear the engine get bogged down in high-G maneuvers. This is why your model may climb straight up at full power/collective without bogging the engine down, yet it will bog down in turns.

Traditionally, symmetrical airfoils, like on the Schluter helicopters, are used because they don't produce a twisting moment on the blade at any pitch angle. Any airfoil that is not symmetrical is called a cambered airfoil. In general, cambered airfoils produce more lift than a symmetrical airfoil at the same pitch angle. Aerodynamicists use "lift coefficient" to measure the lift generating capability of an airfoil. If there are many rotor blades all with the same blade area, at the same pitch angle and all of them moving forward at the same speed, the blade with the higher lift coefficient will be generating more lift.

However, there is a reason that the highly cambered airfoils like the Clark-Y are only used on fixed pitch helicopters such as the GMP Cricket and Rebel, and not on the collective pitch helicopters. It is because of the large twisting moment of a cambered airfoil. This will be explained next month. However, many model helicopters also use lightly cambered airfoils. Most Japanese wood and fiberglass blades employ cambered airfoils, and they are typically around 14 to 16 percent thick. Schluter uses symmetrical 16-percent thick airfoils. Cambered airfoils have a slightly higher (about 5 to 10 percent) maximum lift coefficient than the symmetrical airfoils. This means, when both blades are at the verge of stall, the rotor blade with the higher maximum lift coefficient will be creating more lift. When stall actually happens, the lift generating capability of a symmetrical airfoil falls much more abruptly than that of a cambered airfoil.

Okay, next month we will continue the discussion on camber and reflex airfoils, pitch moments, and where the blade bolt hole should be located. We will also discuss model blade flutter. Many readers have probably heard the fluttering noise in flight. What really happens is the blades are rapidly oscillating in pitch because the flight condition has triggered a dynamically unstable blade oscillatory mode. See ya' next month.

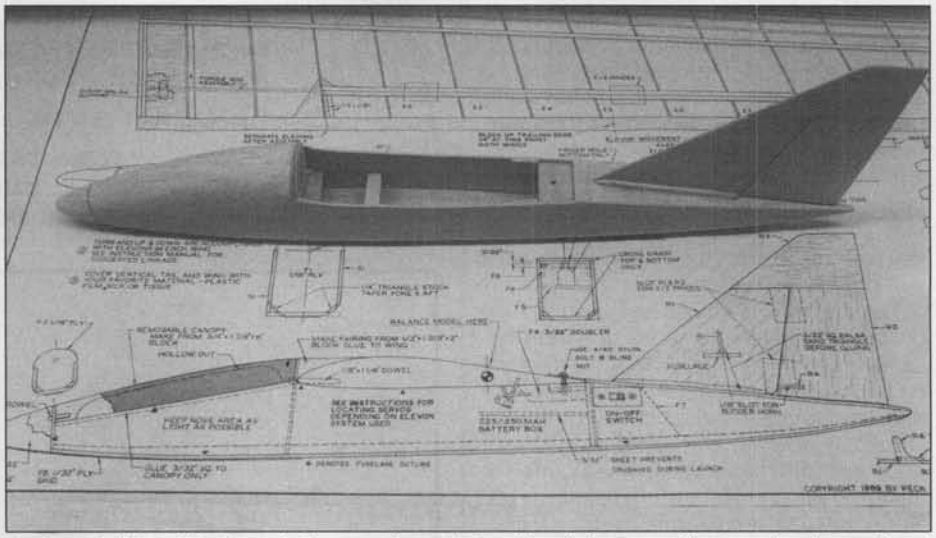
Any questions so far? Feel free to drop me a note at P.O.Box 692, N. College Park, MD 20740, or call (301) 454-8601. ***MB***

GENESIS *Continued from page 69*

manner from 1/16-inch balsa ribs, spruce spars, pre-shaped trailing edge, and sand-to-shape leading edge. Balsa shear webs are added for strength and stiffness. The airfoil is semi-symmetrical and a full half-inch of wingtip washout is built into the framework.

The wing lettering is from Vinylwrite Custom Lettering, and wingtip markings are spray painted.

The model needed an additional half-ounce of nose weight to balance at the recommended point, negating the weight saved from hollowing out the canopy. Control throws are clearly specified on the plans, but setting the controls to specs took much intensive fiddling. Construction, finishing, and setup took me 43-1/4 hours over 14 evenings. With the Micafilm covered wing, painted fuselage, micro receiver, micro servos, Peck-Polymers 270 mAH battery pack and half-ounce of nose weight, the ready-to-fly weight was 11-1/2 ounces, which yields a wing loading of 4.7 ounces per square foot. Wow! How light can you get?



Fuselage builds quickly from ply formers, die-cut balsa sides, balsa top and bottom sheeting, and carved canopy and nose block. Fin and rudder are machine-cut sheet balsa. Mylar hinges are provided for the moving surfaces.

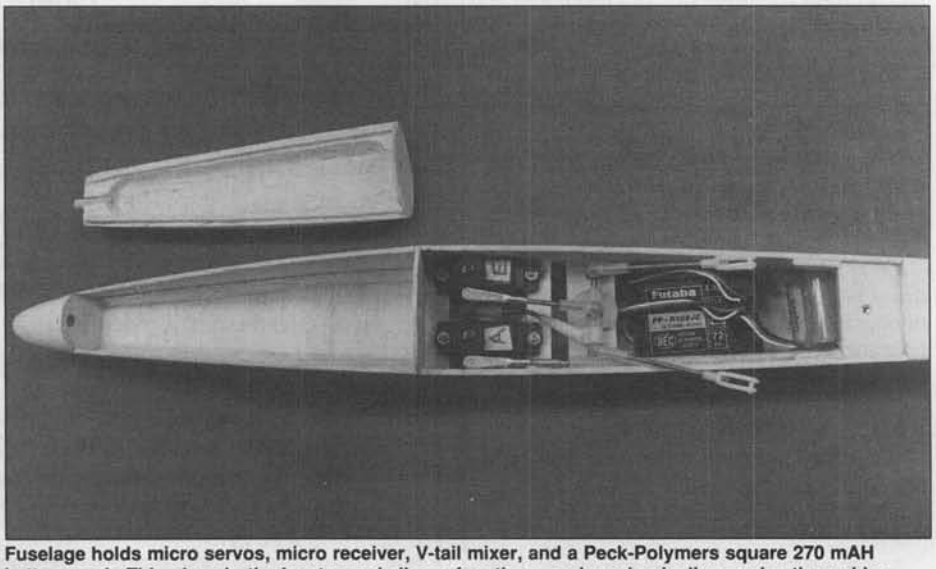
The instructions explain that sweeping the trailing edge upward at the tips provides essential stability in a flying wing design. The wing is joined with epoxy at the center with 2-1/2 inches of dihedral for each side.

COVERING AND FINISHING

Wanting a light and tough wrapping for this hand launcher, I covered the wing with Coverite Micafilm, which worked well, adding a mere half-ounce to the wing skeleton and strongly resisting landing punctures.

The fuselage was painted with two coats of spray primer and two coats of gloss enamel.

The cost to build this version of the Genesis is $50.90 including $34.95 for the kit, $9.95 for a roll of Micafilm, and $6.00 for an



Fuselage holds micro servos, micro receiver, V-tail mixer, and a Peck-Polymers square 270 mAH battery pack. This gives both elevator and aileron functions, and mechanically couples the rudder. Two servos driving three control functions using a simple transmitter is a light, efficient and inexpensive design.

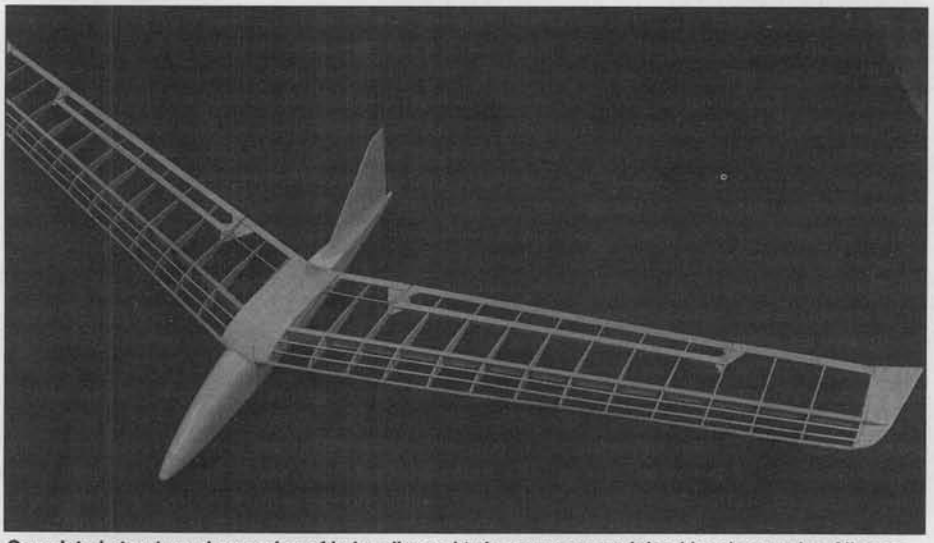
optional Du-Bro V-Tail mixer. Not included is the cost of adhesives, paint, wing lettering, and a radio with mini servos and mini receiver or smaller. I added a Sanyo 270 mAH square battery pack from Peck-Polymers for $24.95.

FLYING THE GENESIS

The first day was spent on hand launches.

I experimented with control surfaces by disconnecting the rudder and flying the Genesis with aileron and elevator only, which is one of the control system options given in the instructions. Turns were sloppy without the rudder, and I was glad I'd built the coupled rudder version.

Two more days of flight testing found us at slope soaring sites. The Genesis handles well on the slope, but needs light wind and plenty of lift to stay aloft. The forward penetration of my 11-1/2 ounce model is limited to wind less than 15 mph. The light construction is a boon, however, as it has survived several inverted landings to launch again.



Completed structure shows wing of balsa ribs and twin spruce spars joined by shear webs. Ailerons are actuated by torque rods. Rudder can be fixed or moving, depending on control system selected, but the latter is strongly recommended.

The Genesis flight path was speedy and stable, with appropriate control sensitivity. The model does have a rather sudden stall, dropping the nose quickly and using significant altitude to recover flying speed, but does not have a tendency to snap roll or spin when stalled. Stalls can be easily avoided by keeping the airspeed up.

Flying buddy Bob Powers and I launched the Genesis about 40 times, both of us getting to the point where we could throw it, fly a 100-foot circle, and fly it back to ourselves for a mid-air catch. This model is agile and responsive.

On the second day of test flying, we added high-start launches, and the Genesis exhibited an unusual launch flight path. The model left the launcher's hand normally, then pulled into a very steep climb and popped off the line headed just about straight up. At this point the model has gone ballistic and is hurtling more than flying. The model then either stalled and flopped over backward, or with strong rudder input performed a nice-looking hammerhead stall turn. Moving the towhooks forward had no discernible effect. Holding full forward stick resulted in aileron flutter, and failed to keep the model on the launch line.

On day three, we tried a weaker high-start of 1/2-inch flat rubber, and these launches were fine. The model was strong and stable in its climb and released the line cleanly. Loops were sloppy, with the Genesis entering the maneuver normally but running out of flying speed at the top, stalling and falling over into a dive. It recovers nicely but is too light to gather sufficient energy to complete a clean loop.

CONCLUSION

After 180 hand launches, 35 high-start launches and eight slope flights, I find that the Genesis is an attractive, responsive, unusual design suitable for experienced modelers. The Genesis has a limited speed range and some fliers will feel that it doesn't slow down enough to catch thermals easily, and that it doesn't fly fast enough to stay out in front of the ridge in brisk winds. The Genesis is rugged, and in proper lift it flies and handles well.

Both building and flying have some idiosyncrasies, and beginners may run into difficulties in both areas. If you're a bit of an experimenter, however, and if you're weary of traditional hand launch glider designs, you'll get your money's worth from the kit and have fun flying the Genesis.

Here are addresses for companies mentioned:

Coverite, 420 Babylon Road, Horsham, PA 19044, telephone (215) 672-9801.

Du-Bro Products, 480 Bonner Road, Wauconda, IL 60084, telephone (708) 526-2136.

Peck-Polymers, P.O. Box 710399, Santee, CA, (619) 448-1818.

Vinylwrite Custom Lettering, 16043 Tulsa Street, Granada Hills, CA 91344, telephone (818) 363-7131. ***MB***

JET TRAILS *Continued from page 39*

very well. The estimated rpm range for the fan is 23,000, producing 13.5 pounds of thrust. It should be available later this year. No price has been set at this time. To say the least, I was quite impressed with the new fan.

Another new development seen at JHH was the redesign of the now legendary K&B 7.5 DF engine. K&B did away with the pump in the back and put a new metal carburetor where the pump was, plus a remote needle valve. The new design is rated at 25,000 rpm, which suits the Turbax 1 just fine. The asking price is $130, and it should be available by the time you read this.

TAGS Dry Transfer Decals are available from JHH. See text for details.

Future JHH projects will include a 68-inch span T2J "Buckeye" for the new fan system, and an F100D for the K&B 7.5 Turbax 1 fan system. Larry says the new packages will combine lightweight construction and sterling performance with a new hard-hitting fan system, all at reasonable prices.

Also at the JHH booth was a new type of dry transfer decal, called TAGS (Total Aero Grafic Services). Dry transfer decals generally have trouble going around compound curves without cracking. I observed a very convincing demonstration of the flexibility of the TAGS decals. A sample decal was applied to a piece of tissue paper, which was then rolled up into a ball. When it was unrolled and flattened out, surprise! No cracks! That's flexible. They're available in a multitude of sizes, colors, and styles. Or if you need something special, they will be glad to custom make you what you need. For more information, contact Thomas Graham at (901) 386-7760.

JHH has been around for many years. It is one of the oldest DF companies still in business. Because of this, some people tend to overlook its products as out of date. However, just because a product has been on the market for a while, that doesn't mean it no longer works! Besides, with all the new JHH products I saw, I think the competition had better take a closer look. For further information, contact Larry at (213) 429-1244.

My next stop was Bob Violett's booth. The big story here was the new BVM 91 DF engine. I figured it was just a matter of time before Bob came out with a 91-size engine. It's manufactured to Bob's specifications by Nelson. Nelson is noted for its fine line of CL and pylon engines. Bob is a former pylon racer, so the connection with Nelson is obvious. The one I saw weighed two ounces more than the 82, and had a K&B carb on it. I'm not sure if that will be the production carb. Bob has been testing the new engine in his green camouflaged F-16 and has 33 flights on it so far. When he has 100 flights on it, with no trouble, Bob will okay the engine for production. No price has been set yet, but it will obviously be more than the 82. The question is how much? Typically, more speed costs more money. But if you're interested in pushing your Viper over 200 mph, this will be the engine to do it.

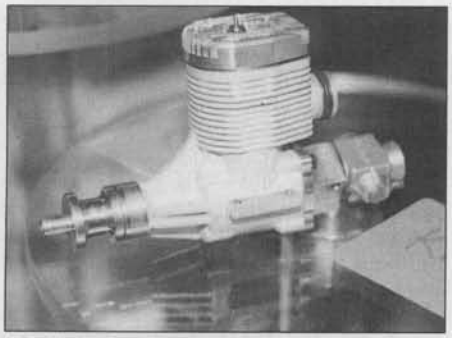
Just down the aisle was Tom Cook's Jet Model Products booth. The biggest news here was the price increase of the Dynamax fan to $125. Inflation catches up to all of us eventually.

A little farther down the aisle was Bob Parkinson's booth. I asked Bob what products were selling best this year. Bob said that because of the recent difficulty in obtaining the larger DF engines, he noticed a reduction in sales of the larger kits, but an increase in sales of the smaller jets, most noticeably the Saber kits. The Saber uses a conventional rear exhaust 61 pattern engine, which is easer to obtain.

After talking to Bob, I went to the Great Planes booth and talked to Mike Geiger, product manager. I asked him about the engine shortage. He informed me that all previous difficulties have been resolved and that the O.S. 91DF engines are now in stock, and should remain that way. Now if we could get Rossi to settle their differences, we may see an increase in jet sales. Last year's engine shortage seriously hurt jet sales, and forced some manufacturers to either produce their own engine (Bob Violett) or design kits to use other engines (like the Saber). I've spoken to many jet flyers who are upset with the engine manufacturers for the treatment they have received in the past. So my advice to the engine manufacturers is to, "Get with the program guys." Jets have the potential to be much more popular, if we have better access to more reliable equipment. Okay, okay, I'm coming down off my soap box.

Bob Parkinson's booth at the show. Note the Jet Pilots Organization box. Are you a member? You should be. Featured planes, from l to r, include: Saber, Baracuda, Blue Hornet, Regal Eagle Supreme, and A-4 Skyhawk.

There were a number of jets entered in the



Bob Violett's new BVM 91 ducted fan engine. This unique engine is being produced by Nelson, the CL speed and pylon engine manufacturer.

static competition this year, but only one placed. That was not from a lack of trying, however, as all the jets entered were of high quality. Jerry Caudle, of Metropolis, Illinois, won first place in Sport Monoplane and third place for Best Finish with his Violett F-86 Sport Saber. Jerry used a combination of automotive paints to produce this beautiful white and yellow paint scheme, with blue and green accent stripes. The plane also features matching drop tanks, panel lines, and rivet details. Nomenclature and graphics were by Aeroloft. You may remember Jerry from last year, with his black, copper-top Aggressor X. Sadly that plane is no longer with us. It was lost during a jet rally in Texas last year. But Jerry has more than made up for the loss with his fabulous Saber.

Don Tuttle, of Mentor, Ohio, scratch-built a very nice F-4E in Military Sport Scale. It features full armament, camouflage paint scheme, panel lines, full cockpit detail and goes by the name "Betty Lou." It uses a single inverted Byrofan and an O.S. 91 DF engine. The crewmen look as if they're ready to take off on another strategic mission. Also entered in Military Sport Scale was a Messerschmitt ME163 rocket-powered fighter/interceptor, scratch built by Craig Lovell of Madison, Wisconsin. Although not considered a ducted fan model, it was so unusual I thought it was worth mentioning. This small scale model accurately depicts one of Germany's more unusual designs of WW II. Instead of dangerous chemicals, the model uses standard model rocket motors for propulsion. A very unique model.

I saw so many interesting things that by the time the show was over, I felt like my brain was overloaded. I always gather as much literature and take as many notes as I can, because I usually forget half of what I heard and saw.

The Toledo Expo is the place to check out what's new and to see old friends. It draws people from around the world and around the country, to share a common interest, the joy of modeling. Next year, the show will be held in the Seagate Convention Center in downtown Toledo. This new, spacious facility will offer 60 additional booths for exhibitors, on-site parking, and luxurious accommodations, so next year should be bigger and better than ever. Hope to see you there. Till then, keep your gear up, your burners lit and watch your six. **MB**

HANNAN *Continued from page 50*

Florida 34640. Please tell John *Model Builder* sent you!

FULLNESS OF WINGS

Back in April of 1988, the longest-ever person-powered flight was made, covering some 72.4 miles from Crete to (almost) the island of Santorini. We say almost, because the flight ended a frustratingly few yards prior to reaching land, when the craft suffered over-stress and structural failure. But the achievement itself was anything but a failure; it was, in fact, a triumph of human creativity, patience, tenacity and stamina for the design team, builders and the pilots. A recently published book, *The Fullness of Wings, the Making of a New Daedalus*, by Gary Dorsey, presents the entire story in minute detail, including the backgrounds of the key participants, more than a few of whom were model builders!

The concept of recreating the mythical flight of Daedalus with a person-powered aircraft began in the hallowed halls of M.I.T. (Massachusetts Institute of Technology) populated by a cast of "Dweebs, Nerds, Tools, and Hackers." We are careful in saying "person-powered" rather than "man-powered," since one of the more important pilot/engines during the formative stages of the project was a young lady, Lois McCallin.

M.I.T. members had been previously involved in various human-powered aircraft designs, with varying results. Among their notable achievements was the propeller employed by the Gossamer Albatross during its crossing of the English Channel.

The Daedalus, however, was a much more monumental proposition, attracting historians, aerodynamicists, physiologists and electronics specialists, all attempting to impart their viewpoints to engineers. (According to Greek legends, Plato, Plutarch and Aristotle had been outspoken in their disregard for engineers!) With few exceptions, the builders were uninhibited free spirits sharing "a mutual yearning for creative freedom," resenting authority and despising bureaucratic thinking. Yet, they soon found themselves in direct conflict with ivory-tower academic nay-sayers and corporate bean-counters, a certain prescription for frustration all around.

A random sampling of the large cast of characters might include Project Director John Langford, a former model rocketeer; Mark Drela, "The Chopin of applied aerodynamics," (who contributed a Peanut Scale plan to *Model Builder* during 1977!); Juan Cruz, ". . . he loved building pieces of airplane frames with his hands, more than noodling over obscure theories"; and the pilot/engine for the ultimate flight test, Greek bicycle champion Kanellos Kanellopoules. In fact, so many personalities were involved in the Daedalus planning, construction and testing, it is quite a task keeping track of them all. Author Dorsey identifies many of the key players with nicknames, and features dozens of provocative quotations, such as these: "The impossible we do overnight, the paperwork takes forever" . . . "Simplify while you complicate, add as you take away" . . . "Whatever pleases the eye, pleases the air" . . . "A computer is really a stupid device—totally stupid" . . . "Anyone with an aesthetic sense could draw a passable airfoil freehand."

We think anyone who has ever been involved in the design of any sort of aircraft will be able to identify with the problems, personalities and solutions presented in *The Fullness of Wings*. Criticisms? Only two: we would like to have seen a three-view drawing of the Daedalus included, and a larger photo of Lois McCallin!

Fullness of Wings is published by Viking Penguin USA, 120 Woodbine Street, Bergenfield, NJ 07621, and is priced at $19.95. Our thanks to David W. Jones for telling us of this most unusual book. He, in turn, learned of it from Monogram Models vice president Bob Reder, who was formerly a member of Comet Model Airplane and Supply Company.

SIGN-OFF

These words of wisdom from J.R.R. Toynbee, were sent in by Herb Weiss: "It's the job that's never started that takes the longest to finish." So, get going on that new model! ***MB***

MODEL MARKETPLACE

MODEL MARKETPLACE

PLUG SPARKS *Cont. from page 61*

New York Chapter) rules used in the first event of this type. Most variations are rather small, as the basic 1/2A Texaco rules apply. It now appears that the design cutoff date will be for real aircraft first produced prior to December 1943. There are a tremendous number of designs available up to this date, and there should be no excuse for lack of variety, as witnessed by the win of a Focke-Wulf 56 at a Jersey contest.

In the matter of scale qualification, SAM 21, in its upcoming big meet (formerly called the West Coast Champs) has adopted a unique system. Any model design in question shall be judged by the contestants themselves, based on a simple **yes** or **no** vote. If the darn thing is a Powerhouse with struts then it is out!

PENNSY TURNPIKE

From Walt Geary comes a photo taken at the Valley Forge RC Club field in Pennsylvania; Larry Jenno's double-size Kerswap. Larry, who came all the way from Las Vegas to attend this meet, will be remembered as the Contest Manager for the Jean, Nevada SAM Champs of 1989. What better way to acknowledge Larry's efforts than to run the photo of his hot flying "Kerswap," in this normal climbing angle.

While on this East Coast "kick" we should note the photo showing a very well constructed pink, silk-covered Flamingo as designed by Roger Hammer. Most fellows who attempt to track down the Zaic drawing of this model get a rude surprise when not finding it in the Yearbooks. Instead, one must look for the 1937/38 Jasco catalog to find it. Wild!

THE WRAP-UP: ELFIN 2.46 DIESEL

As most readers already know, there are two individuals producing the Elfin 2.46 diesel engine, Gordon Burford of Australia, and John Targos, of Palos Verdes, California.

As the old saying goes, "We have bad news, and we have good news." First, the bad news. Latest telcons and air mail letters to Gordon Burford reveal he is suffering from shingles, a severe-neuralgia type disorder. He has been unable to work in the machine shop, as he is in such pain.

Now the good news. Josie Burford, thoroughly fed up with the GP diagnosis of shingles, asked for a specialist to look "Burf" over. Net result was that the pain was discovered as coming from diabetes, which affected the tip nerves. According to "Burf," he is such a good boy now (no sweets, no alcohol, or for that matter, anything good) he is hopeful of turning out a few engines, probably the GB 250. If you have an order in, it is a matter of time and health recovery, so please try to understand.

Back to the bad news. John Targos (Argo) has been having such a bad time trying to get some machining done, he has actually tried his own hand at it. He has been rescued somewhat by Larry Jenno (Torpedo manufacturer), who turned out parts for 25 engines.

Now the good news. By the time this article reaches the reader, engines will be sent out. Hopefully, John will have more to assemble. Incidentally, for those who do not have the addresses, here they are: Argo USA, 3229 Dianora Ave., Palos Verdes Peninsula, CA 90274 (telephone (213) 377-6186); and, Gordon Burford, 86 Tierney Drive, Currumbin, Queensland 4223, Australia (telephone 00-61-7-988-435). Now, don't say we didn't give you the latest scoop! ***MB***

SPIRIT *Continued from page 53*

tition sailplanes did not suffer from this drag penalty in these same high-G maneuvers. This was believed (at least in part) to be due to the upward bending of the wings which created enough outward span-wise flow to prevent any possible separation bubbles at the tips from growing and traveling across the entire wing to the fuselage. He also noted that in nature, high performance birds and fish all have similar swept wings and fins.

After much research and experimentation, Schuemann discovered that by progressively increasing the taper and (more importantly) the sweep of the outward panels he could duplicate this span-wise flow with his much stiffer wing. There was a great increase in performance in the newly modified 15-meter wing.

According to Mr. Schuemann, dihedral and polyhedral model wing designs have this same affect. These bent-wing planforms create the same outward span-wise flow as the flexy-winged, full-size gliders. All of which leads me to conclude that applying this "state-of-the-art triple taper" planform to a polyhedral wing is unnecessary (and in some cases detrimental).

The Spirit wing tip does come nearer to a wide elliptical shape at the tips than most other designs. The elliptical wing shape has long been held superior to other shapes in reducing induced drag (tip losses) at subsonic speeds. The WW II Spitfire and P-47 Thunderbolt fighters are two of the best examples of the application of this shape to highly maneuverable full-size aircraft.

However, it is a widely held belief in limited-span, low aspect ratio model design that a medium taper in the tip panel closely approaches the drag reduction of the elliptical shape (which, along with production considerations, is why we see so few elliptically shaped wings in aviation). The Spirit's triple-taper tip panels may indeed be better than single taper wings, but the difference may not be noticeable. Actual proof would require carefully controlled measurement.

The airfoil chosen for the Spirit is a computer designed, wind-tunnel tested Selig 3010. According to Mr. Selig, this airfoil is a high lift section with low drag properties in the middle of the performance polar curves at low Reynolds numbers (A region of wing size and speed range into which the Spirit would fall). In this respect, the S3010 is a very good choice.

However, Mr. Selig has many times emphasized the importance of fully sheeting the wings to realize the full potential of his airfoils. Full sheeting prevents the between-rib covering sag (resulting in inaccurate and flexible wing sections) and post D-tube sheeting vortexes and/or flow separation bubbles (resulting in extra drag). To maximize performance, profile integrity must be maintained.

The Spirit wing has completely open-structured tip panels and only partially sheeted upper surface main panels. Also,

the spar in the tip panels can be seen as a span-wise "bump" in the airfoil. In this configuration, the Selig airfoil may not be working any better than any of a dozen or more popular airfoils.

Does this wing work? Yes, it works very well. However, I doubt that modified Schuemann planforms and compromised computer airfoils have very much to do with it. Rather, the Spirit does have at least two other very important things going for it: broad wing chords from root to tip (which helps Reynolds number-related performance gains); and a lightweight, seven-ounce per square foot wing loading (which helps minimum sink rate).

Structurally, the Spirit is an improvement over many other "trainer" type floaters. It has a spar system stronger and more sophisticated than a simple cantilever beam (a la Wanderer and Gentle Lady). There are two spar caps (upper and lower) of 1/8 by 5/16-inch basswood which is almost as strong as spruce, but less costly. These caps are held together by a system of shear webs.

The Spirit does have a stress riser in its spar design. The spar caps are held together by plywood or balsawood shear webs depending on where you are looking on the wing. Starting at the wing root there is a multi-laminated plywood wing joiner that is 5/16-inch wide, plus two 1/8-inch light plywood dihedral braces forming a receiver box for this joiner. For the one-piece wing option shown on the plans, this is a 9/16 x 13/16-inch H-shaped bar of plywood, ALL of which suddenly stops 4-1/4 inches out from the center of the wing! The very next rib bay has only two 1/16-inch vertical grain balsa shear webs on each side of the spar caps. This is too abrupt of a transition of stiffness and strength to be considered good engineering. Under severe stress, such as overly-hard (beginner's error) winch towing, this is the point where the wing is most likely to break.

In normal (sensible) flying, this stress riser will probably not pose a danger. However, I feel it shouldn't be there in the first place, and it is a simple matter for the modeler to correct by extending the ply shear webbing on the rear of the spar one or two additional rib bays.

In the two-piece wing configuration, the stress riser is still there and perhaps has an another potential problem. Side loads caused by hard (beginner) landings could possibly fracture the small (1/8 x 4-1/4) glue joints between the light ply joiner box and the basswood spar caps. Subsequent launchings may reveal the hidden structural damage in dramatic ways. An easy fix for this potential problem is to wrap the joiner box with dacron thread and coat all with epoxy (a step not mentioned in the instructions).

Structurally, these were the only flaws in the design that I could find. The rest of the model seems very well engineered.

Aesthetically, the Spirit's fuselage and empennage (tails) are very attractive. They are sleek, moderately swept, angular and racy, with classic aircraft lines. The Spirit even has a canopy and pilot figure which most models of this class do not. By contrast to the tail, the wing looks wide, somewhat round and stubby, like it was shaped by a different designer. In my opinion, the two do not harmonize well.

Summing up this section, Quality of the Design, I feel I should award a higher than average 3.0 score. The overall quality of the design is good, but it could easily be better.

QUALITY OF THE KIT: 4.5 points

The Spirit is unique in that its overall shape and its individual kit parts were designed on a computer using a CAD program. I know of only one other company in the U.S. that is designing kits this way, Midwest Products, and they have not yet designed a glider with it.

When the CAD design is final, the hundreds of parts which make up the Spirit are then output on drafting mylar (or some other stable material). The advantage of this technique is that the parts die drawings are exactly the same as the parts shown on the plans (the computer draws both). The drawings are then sent to the die-maker.

Provided no human error enters the equation, and the die-maker faithfully follows the patterns supplied, the parts will match the plan as closely as possible.

During the construction of our Spirit, the only inaccuracies noted were some of the wing rib spar notches that were not deep enough for the spar caps, and one of the fuselage side tabs was off by about 1/16 to its mating slot on the fuselage bottom. Other than these minor fitting problems, which were easily remedied, the Spirit kit went together beautifully.

The balsa and plywood cutting was generally superior to most kits this writer has seen. Some of the wing ribs (about a fourth of them) were cut from some very light, A-grain balsa. This wood was apparently dry-cut, as it became "crunched" around the edges in the process, requiring some very light sanding with 400-grit paper to smooth the rough edges. Better wood selection, or wet-cutting, would produce better, more accurate ribs.

The assembly of the kit went along very well. The accuracy of the parts, the completeness of the cutting, and the 30 pages of very detailed, photographically illustrated instructions helped tremendously. Interlocking tab-and-slot construction, as used on the fuselage, prevents the misplacing of formers, and helps prevent crooked fuselages.

Likewise there are rib slots cut in the front edge of the wing trailing edge pieces that assure solid glue joints and proper rib spacing. Even the leading edges and shear webs are pre-cut for you, making the Spirit one of the most completely cut kits available.

The instructions are likewise very complete, going beyond the building stages all the way through final hookups, pre-flight checks, trim flights, and the use of hi-starts. There are even sections on thermal flying, contest flying, contest practice log sheets, slope soaring, and a top and side-view drawing to help with the design of your color scheme. Even when considering the three separate addendum in the kit box, the 40-page instruction booklet is very good, complete, and easy to understand.

If the instructions have a weakness, the section on ballasting leaves a lot to be desired. Ballasting is necessary on windy days where the extra airspeed of higher wing loading helps in penetration. What to do is discussed, but not how to do it. If you choose the optional spoilers, the receiver ends up where the ballast should be, and with wooden pushrods interfering, any kind of ballast would be nearly impossible to add at the CG.

continued

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WHITE SILK: One-yard package, medium weight. $11.25 retail—$5.00 each, 6 for $25.00, 12 for $40.00. Old FF and UC kits, send for list. Stanton Hobby, 4734 North Milwaukee Ave., Chicago, IL 60630.

MINIATURE AIRCRAFT CORP. kits wanted. Alan Mironer, 269 Concord Road, Bedford, MA 01730. (617) 275-0962.

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GORGEOUS JUNIOR BIRDMEN T-SHIRTS! Were you one of 645,000 members in the 30's? Wear your Junior Birdmen T-shirt with pride and nostalgia. Price is $14.50 postpaid. Add $2.00 for XXL, XXXL. My book "Antique and Old Timer Model Aircraft," $10.00 postpaid. Danny Sheelds, 2318 Noonham Rd., Woodlawn, MD 21207.

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BERKELEY, CLEVELAND, etc., replica kits, duration rockets for jet models. Send three stamps to: WIL-LAIRCO, 2711 Piedmont Road, NE, Atlanta, GA 30305.

Summing up the Quality of the Kit, I will give the Spirit a near-perfect 4.5 points.

SUITABILITY OF MODEL FOR INTENDED PURPOSE: 3.5

As stated on the front of the kit box, the Spirit is, "A revolutionary design that combines easy construction for beginners with state-of-the-art aerodynamics to produce a high performance sailplane that anyone can build and fly. High performance soaring has never been this easy." These are strong words which reflect confidence in this sailplane by its manufacturer.

After building and flying a Spirit, the opinion of this writer is that these claims are basically true, but a little overstated. Considering that the box art doubles as a colorful ad for the Spirit, this is understandable and perhaps even expected. Great Planes uses this Madison Avenue approach to model marketing, and it has been very successful at doing so.

As for the claims, beginners **should** be able to construct and fly a Spirit without much trouble. There are simpler models on the market to build, but the tab-and-slot fuselage construction and the well-illustrated instructions probably make up for the added sophistication of the Spirit.

Personally, I find nothing "revolutionary" in the Spirit design. Tab-and-slot construction is not new, and the Spirit's version is not noticeably different than others which have gone before. Only the method of achieving the design is new, as it comes from a computer plotter, not a drafting table. Aerodynamically, the only "revolutionary" aspects of the Spirit are those which may have been compromised or misapplied.

Is the Spirit "a high performance sailplane that anyone can build and fly?" While I would agree that anyone might be able to build a Spirit, and with an instructor's help may even fly a Spirit, I would not consider it a high performance sailplane. It is a trainer; a lightly loaded (7oz./sq. ft.) floater that flies a little better than others of this lightweight class.

ADVERTISER'S INDEX

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True high performance sailplanes do not make good trainers any more than Pattern planes make good power trainers, or Formula race cars make good driver's education cars. Thankfully, the Spirit is not a true high performance sailplane.

The Spirit is truly an **excellent** trainer. It handles well, shows no bad habits and is remarkably stable (in spite of being short coupled due to its shorter-than-normal tail boom). The Spirit is so easy to fly that it is relaxing and confidence-inspiring. It is not as quick as some designs in rudder response, so aerobatics take some patience and control anticipation. However, a trainer shouldn't be too quick in this regard, and thermal ships don't need to be, so this is actually a good thing.

There is a lot of potential in the Spirit design for truly high performance soaring. An experienced modeler could beef up the spars, fix the stress riser, and convert it into an aileron ship with fully sheeted wings with little trouble. The full potential of both the modified Schuemann planform and Selig airfoil might then be realized, and the Spirit could become a top gun two-meter contest ship.

The Spirit has already shown its potential at the 1990 AMA Nats by taking first place in the Two-Meter Class in the hands of Paul Carlson, its co-designer (Paul also took first place with his two-meter Prodigy design a few years back). Paul is a very good pilot with a natural talent for soaring. His repeat win is indeed remarkable.

For the beginner wanting a good trainer, or the intermediate flier looking for a fun little two-meter with a little extra speed range, the Spirit is an excellent choice. For the advanced builder and contest flier or the slope rat looking for a truly "high performance" two-meter, the Spirit has potential. Summing up Suitability for Intended Purpose, I would give the Spirit a very good 3.5.

INNOVATION: 3.0

According to the New Webster's Dictionary, "to innovate" means to change or to alter by introducing something new; or to make changes in anything established. Furthermore, to quote the RCMYA rules, "Innovations which, in the Jury opinion and after thorough testing, do not bring any noticeable improvement in any field should not be awarded any point."

The general design of the Spirit is only modestly different and only a little better than existing trainer designs. I awarded the Spirit a good rating of 3.0 primarily on the basis of its superior CAD drawn plans and parts drawings which did in fact yield a very accurate kit that was a pleasure to build. Also, using a Selig 3010 airfoil (even if not to Selig's recommended construction techniques) was innovative in that I know of no other commercially available kit which uses this profile. In this 3.0 judgement, I feel quite generous.

SPECIFICATIONS LISTED BY GP:

Span: 78.5 inches.
Area: 676 sq. in.
Weight: 28-32 oz. (33.5 for author's).
Wing Loading: 6-7 oz./sq. ft.
(7.14 for author's).
Aspect Ratio: 9.1.
Length: 40 inches.

Equipment Used by Author: A third servo and spoiler option, Airtronics 401's for rudder and elev., Std. servo (102) for spoilers; PCM Airtronics receiver (eight channel); 275 mAH batteries with SW harness; Airtronics Vision PCM computer transmitter.

FINAL SUMMARY

I have given the Spirit a total combined score of 14.0. Subsequent to my judgement, the results were tabulated and announced in Nuremberg. The average score of all the international judges (total number unknown to me) according to RCMYA Coordinator, Guy Revel, was 14.7 points. In light of these results, I feel my judgement is fairly accurate. This year, 14.7 was the highest score achieved, therefore, the Spirit won top honors in 1991 as the RC Model of the Year.

Public reaction to the Spirit in this country has been enthusiastically positive, as evidenced by at least a couple of soaring club newsletter reviews which I have seen and read. These reviewers are heaping praise and superlatives upon the Spirit.

Congratulations Great Planes, you have a winner! ***MB***

WHISPER *Continued from page 36*

that which exists on the GMP Prohead and Elite head. And, there is no floating axle as on the X-Cell rotor head. And, there is no up and down flapping slop at the flap hinge, as on the Concept 30. In the last decade, full-size helicopters are all leaning more and more toward hingeless rotor head design. The German MBB B0-105, British Westland Lynx, and French Aerospatial A-Star and Dolphine all use hingeless main rotor design.

I should make it clear here about the picture of a five-bladed rigid rotor that we printed in the May issue. That five-bladed rotor is made and sold by RC Innovation, in Virginia. Even though the blades are attached rigidly to the feathering rotor hub, and there is no flapping hinge as on Schluter's multi-bladed rotor head, the blades can still flap up and down. This design is also called hingeless rotor, because there is no flapping hinge. Instead of having the hub made of a soft thin flexbeam for blade flapping, this five-bladed design uses wood blades that are very soft in the flapwise direction near the root. Therefore, the blades themselves elastically bend and allow flapping. As there is no flapping hinge, this five-bladed rotor is also called hingeless rotor. The full-size MBB BO-105 and MBB BK-117 passenger helicopters use this hingeless rotor design.

The advantage is that there is slop and the rotor is very rigid and thus gives tremendous control power. Hence, the BO-105 is the most aerobatic full-size helicopter. It can perform loops, rolls, stall turns, etc. But due to its stiff rotor flapping behavior, the controls are quick, and in very fast forward flight the helicopter pitches nose up more than helicopters with fully articulated rotor, and there is a lot more cross-coupling between all four controls. We will show pictures of the full-size BO-105 and BK-117 hingeless rotors in a future Hirobo MK-10/BK-117 review.

A hingeless rotor has many fewer parts than an articulated rotor such as the Concept 30. The Concept 30's feathering spindle requires a pivoting pin and the pin is mounted in two brass bushings in the hub. It also requires a black or red rubber O-ring to control the flapping stiffness. This adds up to more parts. On the contrary, the hingeless rotor, as on the Whisper or Kalt Enforcer, simply uses a single steel, or composite, flexbeam to control the blade flapping degree of freedom and stiffness. The Concept 30 uses a harder red O-ring to increase the flapping stiffness. The flapping stiffness on a hingeless rotor head can be increased very easily by employing a thicker flex plate. The biggest advantage, besides lower parts count and no flapping slop because there is no flapping hinge, is that hingeless rotors have the potential of being very aerobatic! This is because the flapping stiffness can be increased more easily than the GMP teetering, or X-Cell floating axle, or Concept 30 articulated designs. Unfortunately, Kalt does not sell a thicker flex plate for the Enforcer, or for the Whisper. The flexbeams on these two helicopters are so soft, that in the event of a hard landing the blades can easily flap down and strike the tail boom.

The reason a stiffer flexbeam is beneficial is that it allows the main rotor to transfer a pitching or rolling moment through the hub when the main rotor disk is tilted. This increases the cyclic response significantly, but at the same time, maintain the docile handling characteristics of individual flapping design, as on the Concept 30. The bottom line is, I recommend that Kalt keeps the stock thin flexbeam on the Whisper and Enforcer because they are fine for beginners. But, Kalt should make available optional thicker flexbeams for more experienced pilots. They would help avoid boom strike on autorotations and hard landings by beginners.

From the above paragraphs, you should have gathered that the flexbeam serves the same function as the O-rings or what we have commonly called rubber dampers. What exactly is the flexbeam doing? It acts like a leaf spring system for the blades, NOT LIKE A DAMPER. Blades get their flap damping from aerodynamic forces, they do not need or use any mechanical damping. Tightening the O-ring or rubber damper does **not** increase blade damping, it "stiffens" the blade flapping.

Collective control on the Whisper is obtained by sliding a collar up and down along the main rotor shaft; similar to the Baron 30, Cyclone, Excalibur, Enforcer, or Concept 30. Two mixing arms are mounted on the sliding collar. The main rotor head is identical to the Baron 30 and Cyclone I design. It offers about 70% Bell-Hiller mixing ratio. The design works very well. The Hiller paddles on mine are set to give about plus and minus 40 degrees of travel. This is a lot of throw! It is plenty for aerobatics, but unfortunately the electric motor can't provide the thrust for any of the high-G maneuvers. With the stock unweighted wooden blades, cyclic controls are very good when the swashplate is maxxed out, as on mine. I recommend setting the paddles at plus and minus 40 degrees for full rate, and for the dual rate low rate setting, use 75%. At low setting, even novice pilots can easily hover the Whisper.

Even though the Whisper is extremely easy to hover, we do not recommend it as a beginner's first ship because it is very fragile, and each flight only lasts three minutes. The other ingredients that make the Whisper so easy to fly are the thick and heavy Hiller paddles. These thick airfoiled paddles dampen the helicopter pitching and rolling response in the same manner as a good rate gyro dampens the yaw response. How a thick paddle does this was explained in great detail in August 1990 *Model Builder*.

The swashplate is quite a unique design. Unlike any other model, Whisper's swashplate uses two concentric rings instead of two solid spinning plates as on other helicopters. This unique design reduces the weight significantly, but with a strength penalty. As long as you don't crash, the rings will not break. However, if you have big fingers, do be careful when snapping on the ball links on the swashplate and mixing arms. Any excess pressure can break a part. Handle the flybar, tail rotor shaft and main rotor shaft delicately, as they are hollow and bend very easily. The swashplate does have more slop between the two rings than a conventional swashplate, which gives about 5 to 6 degrees of paddle slop. In flight, however, the slop is not that noticeable in

the cyclic commands.

The tail rotor response is amazingly good. Whisper does an excellent pirouette. Even with the tail highly damped by the gyro, tail rotor response is fast. There isn't that much slop in the tail rotor control. It is a belt-drive system. The sliding pitch control system is like that on the GMP Legend. In terms of flying characteristics, we have no complaints at all. Four people have flown it and we all love it. The fragileness is a fact that we have learned to accept. The only wish is for the flight time to be longer.

A reader from Canada called and told me that he replaced the stock pinion gear on the Whisper with one from an electric RC car that has one more tooth. The extra tooth reduced the main rotor-to-motor gear ratio. He says that this allowed him to use seven cells, and get almost the same performance as the eight-cell pack, and still get the same amount of flight time. He was using a 1700 mAH seven-cell battery pack. I have not tried any 1700 mAH packs because 1700 mAH packs are four ounces heavier than the 1100 mAH pack. My Whisper, at 2 pounds, 12 ounces, performs marginally at this weight. An extra 1/4-pound means the motor has to work harder and also lessens performance. But three minutes on an 1100 mAH pack is a very short period of enjoyment.

A definite advantage of the Whisper is that it's so quiet. I can fly it in my front yard without disturbing the neighbors at all. You can almost go fly it during TV commercial breaks and come back in the house and charge the battery again until the next commercial! It is as easy as, "switch on and fly." Just for this simplicity, it is worth the $200 for the kit. Furthermore, you don't need to buy a gas engine and fuel. But be very careful with electric helicopters. Always switch on the transmitter first before the receiver. Always check to see that the throttle stick is all the way down and the trim is also down, and the hi-idle and throttle hold switches are off before switching on the receiver.

The Kalt speed controller has an "arming button" that must be depressed before the motor will spin. This button is depressed just before takeoff. Again, make sure the throttle stick is all the way back! It is very dangerous if the throttle stick is not all the way back and the motor kicks into full power. There is no centrifugal clutch, so in a way the electric helicopters can be more dangerous than gas models. In the event something gets caught in the main rotor while the blades are turning, the battery or electric circuit may get hot and cause fire. Therefore, use caution. *(This hazard is not unique to electric helicopters. Experienced and safety conscious fixed wing electric model fliers use an arming switch between motor and flight battery to avoid inadvertent turn-ons. The switch is turned on only just before actual flight. wcn)*

The electronic speed controller is adjusted so that when the throttle stick is all the way back and the throttle trim is all the way up, the motor just stops running. At full stick, there should be full power. I always move the throttle trim all the way down before takeoff, or after I land, to ensure the motor will not engage. For aerobatics, idle-up is set just like gas model helicopters . . . pulling the throttle stick back increases the electric motor speed. When throttle hold is activated, it shuts the motor off completely. This allows autorotation practice. However, we don't think this helicopter is a good choice for practicing autos. Autos on the Whisper are more for showmanship. And, you do need weighted blades for autos on Whisper. The kit does not come with an autorotation bearing, but we think it is a good idea to get it even though you might not do autos. The reason is it allows the main rotor to freewheel, thus when you come in for a landing or during descent, the rotor speed will not drop as the motor slows down. Remember, there is no centrifugal clutch, therefore, when the motor slows down the rotor slows down, too. That's why we recommend the autorotation one-way bearing which makes the flight smoother.

The only other problem we have is that the blade tracking seems to vary between flights. No matter how carefully the tracking is set, it will change on the next flight. This was observed on several Whispers. My friend David Frann says he simply doesn't bother to readjust the tracking on every flight anymore, because by the time you track the blades on each flight, it's time to recharge.

The reason for the blades going out of track is probably because the parts are so fragile; they deform under aerodynamic loads. But, due to the very soft flapping flexbeam, even though the blades may be out of track slightly, very little vibration is transmitted down to the fuselage.

The two tail boom braces are simply standard pushrods with a snap-on clevis on each end. These braces are thin and are almost parallel to the tail boom, therefore they are quite bogus and useless. We simply removed them.

The main rotor pitch settings on mine are: 10 degrees at top, 6 degrees for hover and -3 degrees at the low end. On throttle hold, it has -4 degrees at the bottom and 12 degrees at the top. For idle-up it has -7 degrees at the bottom. The Whisper is not very sensitive to rotor rpm; it flies very well at any rotor rpm. Except at very low rpm, the model exhibits some ground and air resonance phenomenon. The control is quite good at any rotor rpm. I tached my Whisper in hover with an rpm of around 1400. The low rpm makes the model even quieter in hover, but it is too low for full speed forward flight. At such low rpm, the blades flap a lot in quick forward flight. There seems to be an optimal rpm to maximize the flight time. Too high or too low rotor rpm reduces the flight time.

The NiCd batteries come in a variety of styles. Some are designed for high current output; these are good for high rotor rpm and aerobatics. The SR cells that I have are for lower current output rate, but they give good flight time. There is quite a bit of experimentation that needs to be done to determine what is the best battery and charger for your Whisper and your particular style of flying. But we always recommend buying a peak detector charger that automatically fully charges the battery. Most RC car quick chargers are designed for six or seven cells only, so make sure that you buy one which can quick charge eight cells. Very few can. If you really want high tech, try some silver zinc rechargeable batteries like the ones used on solar race cars. These are very high density, and high current output cells, and high price, too. It's $120 per 1.2-volt cell, and has a life expectancy of one month max.

The bottom line is, the Whisper flies surprisingly well. It gets an A for its docile handling, and is the world's first practical production electric helicopter. The drawbacks are its fragileness (but this must be done to reduce weight) and relatively short flight time as compared to gas models. In the near future, we will examine the super compact Hirobo MH-10 helicopter. It is the same size as the Whisper, but is powered by an O.S. 15 engine. Then we will examine another successful electric helicopter, the Kyosho EP Concept. **MB**

COUNTER *Continued from page 10*

Runway, Box 210, Magalia, CA 95954, phone (916) 873-6421, is called "Model Plans & 3-Views International," and to support that title, it features eight construction plans and 11 aircraft three-view drawings. **Caution:** This book is not printed on waterproof paper, so you must read it at arm's length to avoid drooling on it and messing up the plans! In further support of the title, the plans showcase the work of model builders, technical artists, and photographers from Czechoslovakia, France, Germany, Japan, Sweden, and of course, the USA. We won't list here the names of the aircraft illustrated, partly to make sure you buy the book, but mostly because its more fun to open an exciting gift when you don't know its contents. Our favorite, drawn as three-views and as a full-size Peanut plan is the . . . Suffer or buy! The price is $9.95, and unless you stop by Bill and Joan's home in Magalia to pick it up, add $2.00 for postage and packing.

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R/C City, 96 Railroad Ave. #F, Suisun, CA 94585, phone (707) 428-3119, announces release of molded fiberglass cowls and wheel pants for the Carl Goldberg Models Ultimate 10-300. As with all of their fiberglass scale and pattern kits, the parts are made from epoxyglass, free from pinholes, and very lightweight. All of the R/C City products are available through selected dealers or by direct order.

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If there are youngsters in your family, and you have an air-brush for painting your models, Badger Air-Brush Co., 9128 West Belmont Ave., Franklin Park, IL 60131, phone (708) 678-3104, has something for you. Called New Kids Stencil Sets, these 8-1/2 x 11 stencils can be used with various paint application methods; sponge, paint brush, or air-brush. Use them on clothing, curtains, walls, bedspreads, pillows, etc. The photo gives you an idea of what the stencils are about. Each New Kids Stencil Set sells for $8.95.

• • •

Leading Edge Models is a new enterprise combining the efforts and expertise of Nick Ziroli, Jr. and Rich Uravitch to produce semi-kits and RC accessories not available through other sources. LEM also offers vacuum-forming services to volume OEM users, as well as short run, custom applications to individual designers.

LEM's first offering is a re-designed and re-engineered version of the previously available T-33 "T-Bird" ducted fan jet model from Sterner Engineering. Offered as a "Builder's Package," the kit includes pinhole free epoxyglass fuselage with separate hatch; minimum-loss, fiberglass inlet dye duct; vacuum-formrd canopy, cockpit interior parts and belly pan; full size plans; separate full size parts template sheet; and assembly instructions. A pre-cut parts package option will also be available. Price of the builder's package is $194.95, plus shipping. Span of the model is 64 inches, less tip tanks. It will now accept five-inch diameter fan units such as the JMP Dynamax and the JHH Turbax III.

Next offerings to come include the Lockheed F-80 "Shooting Star" and the LTV A-7 Corsair II (SLUF). For more information, contact Leading Edge Models at 170 Oval Drive, Central Islip, NY 11722, phone (516) 234-7264, FAX 9078.

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Rich Uravitch, 15 Newcomb Trail (MB), Ridge, NY 11961-2238, phone (516) 929-4132, is also doing his own thing with the offering of "Plans and Plastic" designs for the legendary Fokker D-VII and the R.A.F. SE-5A. Both models are giant scale, but easy to build and fly. Using standard "off the shelf" materials, the models can be framed up and ready to cover in just a few weeks of leisurely-paced work. Ideal for the newcomer to Sport Scale, the 75-inch span models can be powered with .90 to 1.08 two-stroke, or up to 2.2 cu. in. gas engines. Average weight is in the 15 to 19 pound range, making for wing loadings in the 19 to 21 ounces per sq. ft. category, nice for fliers with less experience. Plastic parts include ABS cowlings, louvered side panels for the D-VII, and headrest and engine rocker covers for the SE-5A. Either package is $36.95 UPS shipping in US included.

• • •

Two new RC glider kits are being offered by Minimax Enterprise, P.O. Box 2374, Chelan, WA 98816, phone (509) 683-1288. The Minimax 700 is a two-meter glider that come out at 19 ounces complete with radio and ready to launch. The Minimax 1000X is three-meter span (118 inches), and weighs 29 ounces at launch. The wing loadings of the two aircraft are 3.8 and 8.3 oz/sq. ft. respectively. Construction of the models is conventional, however, the parts are so precision cut that no sanding or trimming is required during the building process. For ease of transport, the Minimax 1000X wing is built in two pieces with a very strong but light joiner system. For more information, contact Ron Parcells, and tell him you read about Minimax in *Model Builder*.

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For those of you old enough to remember, and for those who would like find out how a real competition rubber model of the recent past can perform, pick up a kit for either the Jabberwock II or Gollywock II by Midwest Products Co., Inc., 400 S. Indiana St., Hobart IN 46342, phone (219) 942-1134. These updated classic Wally Simmers designs of the 50's are still as competitive as ever. Both kits feature Micro-Cut Quality (R) stripwood and printed balsa parts (yeah, *you* cut 'em out!). Kits also include full-size plans, two sheets of covering tissue, a pre-shaped balsa prop, and all parts required to make a folding prop. Both kits are available in limited quantities from your local hobby dealer. If not available in your area, call Denise Taylor at the above number, tell her we sent you, and find out how you can obtain the kits. **MB**

"ARF PLANE OF THE YEAR"
–Model Builder Magazine, 1989

Superb engineering and hand crafted quality are a tradition at *SKYWARD R+D*. The fact that our Model *40* and Model *60* were voted ARF trainers of the year proves it.

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