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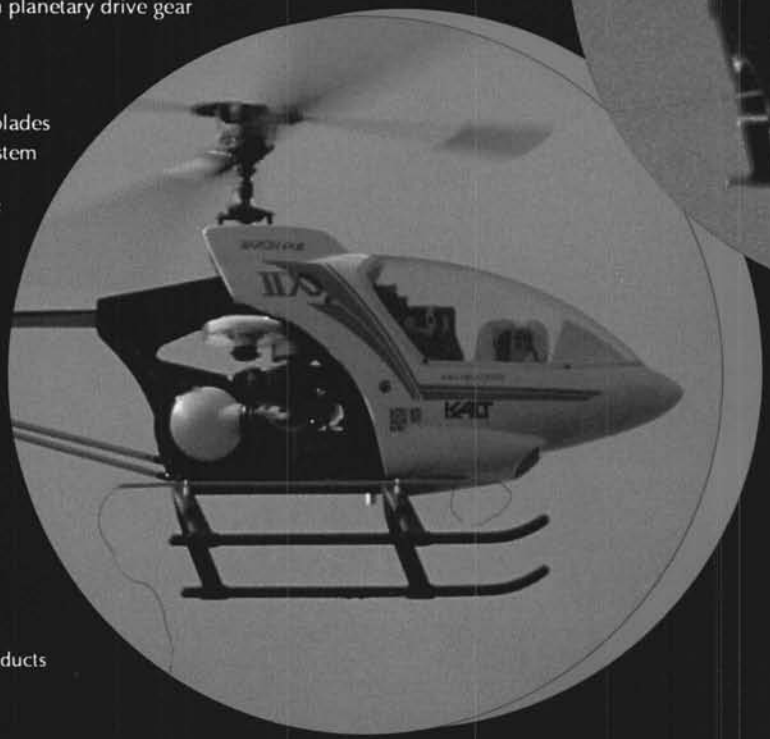

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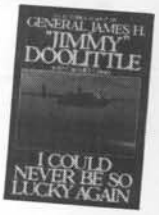

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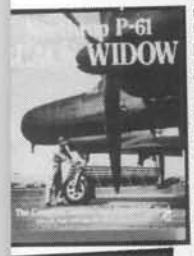

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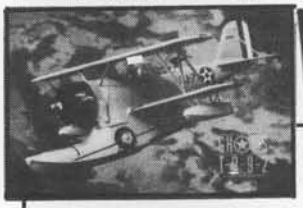

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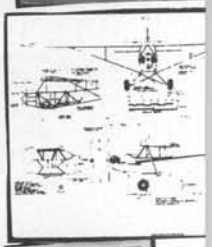

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CONTENTS

APRIL 1992 • VOLUME 22 • NUMBER 241

COLUMNS

FEATURES

PRODUCTS IN USE

ON THE COVER

The P-50+1 strikes a pose against the backdrop of Hawaii, where designer-builder Al Wheeler developed construction plans for this WWII fighter. Article begins on page 22. Top insert: Sam Stauffer with Chuck Rosen's P-51, related story in *Big Birds*, page 26. Bottom insert: From this month's *Electric Power*, Dr. John Mountjoy's Canadian colored fleet biplane, an Aerodrome kit with some subtle changes. see page 68.

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BILL NORTHROP'S WORKBENCH

The first model hobby trade/consumer show for 1992 (IMS Pasadena, California) took place the second weekend in January.

Many large hobby industry companies take a jaundiced look at trade shows that allow selling, but like the Puyallup, WA, White Plains, NY, Toledo, OH, and Baltimore, MD shows, IMS (in Pasadena, and coming up in Orlando, FL, May 1, 2, and 3) feels that optional selling privileges for exhibitors is not only a benefit to the exhibitor and the buyer, but also to the hobby shops in the show areas. Direct contact with shop owners in these show areas bear out that conclusion.

Large volume manufacturers obviously have to rely on distributors to absorb their production of many hobby items, and the ability of the distributors to pass them on to the hobby shops. But what they (the manufacturers) sometimes overlook is that although they may "sell" certain quantities of their products to the distributors, and the distributors, in turn, "sell" the products to their networks of hobby shops, the whole lovely process of *really* selling products comes to a screeching halt if the lowly consumer, the final dumping place for all these products, doesn't, for whatever reason, buy the product from the dealer!

Let's face it . . . no one has ever, or will ever, figure out exactly what John Q. Consumer really wants or how much money he is willing to take out of his earnings to enjoy the change of pace of indulgence in a hobby. But there is no quicker or more accurate way to find out what the consumer likes or dislikes than direct, face-to-face contact with thousands of them in a few days. It's the money that's really the proof of the pudding. If they back up their talk with a cash sale here and there, then you know you're on the right track. And when that cash customer shows up at the flying field, or pond, or track, and your new product performs and sells itself, you have created a "dumping place" and room for more of your products to go through the distributor/hobby shop selling pattern.

Anyway, should manufacturers be concerned about the current economic situation when it comes to spending money on hobbies, it would appear, if the 1992 IMS Pasadena show was any indication, that the trend is definitely upward. Quite a few IMS exhibitors who have been to Pasadena in past years, and brought items to sell, were, by Saturday afternoon, down to taking orders at show prices for sold-out items, to be shipped when they returned to their places of business. This trend applied to both high and low-ticket items.

IMS Pasadena, in its three show days, entertained both a record number of hobby dealers and modeling public. As of this writing, accurate figures are not available, but the twenty thousand total figure estimated by KNBC Channel 4 and KTLA Channel 5 television, both of which covered the show, are not far off.

By the way, the public was treated to the opportunity of selecting their choice of the best model on display in the Static Model Competition. Ballots were placed in a box that was opened Sunday afternoon, and the winner was Jerry Kitchin's large scale F4U Corsair, "Lady'n Red." Jerry won a beautiful 15-inch silver tray, plus a small silver Revere bowl for Third Place in Sport Scale Non-Military. Jerry's from Vista, California. The 40 plus people who selected what turned out to be the winner by majority vote will all receive a free ticket to the 1993 Pasadena show. The "Best of Show," as selected by the judges, was the large scale Spitfire Mk. XIV, built by the team of Ron Doucette and Scot Doucette, of San Gabriel, California, from a Yellow Aircraft kit.

While we're talking about shows, *Model Builder* readers in Florida should note that IMS is bringing its show to Orlando on the 1st, 2nd, and 3rd of May, at the Orange County Convention/Civic Center, 9800 International

The three smiling faces belong to (l to r); David Katz, George Dix, and Steve Smith. Steve, from Diamond Bar, is smiling because his call to Los Angeles pure rock radio station KNAC won him not only a free ticket to the 1992 IMS Pasadena show, but also won him a Traxxas "Sledgehammer" ready-to-run RC Monster Truck, complete with radio system. George is smiling because, as Director of Public Relations for KNAC, he was happy to present the truck, valued at $400.00, to Steve. And David . . . well, as Vice-President of the Dallas, Texas based Traxxas Corp., David always smiles, especially when one of his fine RC cars or trucks makes someone else . . . smile. There'll be more smiles in Florida, as Traxxas will be on hand at IMS Orlando in May!

Drive. This will be the premiere of an annual show. Stay tuned for more developments.

THUMBING OR PINCHING

In the January '92 issue, we brought up a question that has really stirred up a controversy . . . a pleasant controversy, not the type that brings out anger and frustration. We simply asked for your comments on the various methods of moving the control stick(s) on your transmitter, and basically it came down to using thumbs on the ends of sticks or holding the top end of the sticks between thumb and forefinger. The possibility that the transmitter mode (Mode I, also called "split sticks," where the primary controls for pitch and yaw or roll are separated, or Mode II, in which the two primary controls are on the same stick) might affect the choice of "thumb" or "pinch," was also included in the discussion. The following letter, from prominent RC scale competitor, Dennis Crooks, adds yet another important consideration in this matter, and one that is very prominent in many countries outside of the United States, and used by many leading competition fliers from those countries: the transmitter tray.

"Having just read your Workbench article on thumbing or pinching, I thought I would offer some of my observations on flying styles. The transmitter I was using in the Byron fuel ad was so large that a tray was almost mandatory. Therefore, pinching becomes the preferable style. However, since Futaba is my radio of choice, how I fly depends on the circumstances.

"For normal sport flying, it is much easier and convenient to simply grab the transmitter and thumb it. This is probably the least precise method of controlling an aircraft, but when flying for fun, so what.

"The next method seen occasionally is to hold the transmitter and pinch the sticks. This method requires a rather long

continued on page 77

A "Duster" (seven-eighths-size version of Bill Northrop's "Big John") built by Dave Eby back in 1966. Dave sent this photo along with an interesting dissertation on the "Thumbing vs. Pinching" controversy (see text for an interesting letter on this subject) which we'll use another time. The Quadraplex radio unfortunately terminated the aircraft on its first flight.

DEAR JAKE

Advice for the Propworn

DEAR JAKE:

Hi, it's me, Tommy Smith.

Me and my friend Randy teamed up on a project for the Science Fair at school this year. We decided to do a scientific experiment on adhesives and the relative strengths of the bonds they formed.

We glued together three different kinds of materials: porous, semi-porous, and non-porous. For these we used sponges, wood, and glass. We glued them with five different kinds of glue: flour and water paste, rubber cement, aliphatic resin, epoxy, and cyanoacrylate (super glue).

We decided for the actual Science Fair at school it would be more impressive to mix the glues on the spot and make the bonds real time instead of just having the final products laying there on the table.

We didn't win, but we had some pretty interesting results:

1. Super glue dissolves sponges.
2. Flour and water paste tastes good.
3. Broken glass is dangerous.
4. Skin is semi-porous.
5. Super glue worked best on the judge's notebook.

Next year we're going to add hot glue and Elmer's. Wish us luck.

Your friend, Tommy Smith

Dear Tommy:

It's nice to see young people plan a project and then stick to it.

Jake

DEAR JAKE:

When reassembling delicate servo gear train parts that I have disassembled for cleaning or repair, I sometimes encounter difficulty with a miniature shaft or bearing that just doesn't seem to want to seat or fit in the location it originally occupied. When this happens, I try a little additional lubricant or a product such as Never-Seez to coax the recalcitrant part into cooperation. It doesn't always work, however.

What do you use in a situation such as this?

Tinkerer at Tinker AFB

Dear Tinkerer:

A bigger hammer.

Jake

DEAR JAKE:

The guy at the hobby shop says I should buy a new RC set with an exponential feature. What's that mean?

Dwayne in Detroit

Dear Dwayne:

It means the cost is a power of ten higher than a radio set without that feature.

Jake

DEAR JAKE:

Your Aunt Eugenia is back in the hospital. I'm sure you remember her. She's the one who moved to Florida and had all that plastic surgery. The surgeons really lifted her spirits (and just about everything else, too).

Well, it seems she was at the airport and paused for some reason in the metal detector. The microwaves, or whatever they use, set off a chain reaction in her silicone molecules. The explosion blew out her Maidenform, and several passersby suffered spandex contusions.

Eugenia is resting comfortably, the hot patch and reinflation procedure apparently having gone well.

Sorry to disturb you at your magazine column, but family news should be important.

All My Love, Your Mother

Dear Mom:

Poor Eugenia! Bad luck just seems to follow her around. I remember when she first had all that surgery. Wasn't it only her second day home from the hospital when a butt suture broke? And then didn't she have to walk around for a couple of days with one cheek down behind her knee before the doctors could schedule a repair?

Your Son, Jake **MB**

Why should *you* join the Sport Flyers Association?

For the MOST R/C Liability Coverage in the industry at Just $25 a Year

$1,000,000 per member coverage. PLUS, SFA clubs and sites are covered *even if a non-SFA flier causes a claim.*

- Underwritten by General Agents Insurance Company *(not self-insured)*, an "A" Excellent A.M. Best rated insurer with over $70 million in liquid assets.
- Primary coverage when no other is applicable, including member-to-member, flight instructors, and non-members while buddy box training.

We Make It Easy To Join— No Politics, No Hassles and *Instant Membership.*

Instant membership via fax 214-522-0868, through your local hobby dealer or using your computer on CompuServe #76702, 1747.

Accepted Everywhere, and at the Best Flying Sites Throughout the U.S., Like Santa Clara County Model Aircraft Skypark (SCCMAS).

Santa Clara County Model Aircraft Skypark, with membership totaling almost 400, has joined the Sport Flyers Association. Founded six years ago by Brian Nelson and 25 charter members, the SSCMAS flying site is located on a 42 acre park area leased from the county. Charter members invested $30,000 of their own money for a 519 ft. paved runway, a 185 ft. safety zone with paved taxiways, and shaded pit areas. SCCMAS repaid this investment within two years and now has a concession stand and clubhouse facilities. Scheduled for '92: R/C helipads and R/C car track areas.

People You Know . . .

JOHN WORTH.

Elder statesman of model aviation and retired executive director of the AMA (1961-1991), John is now both an SFA member and director.

DOUG PRATT.

Modeling expert on everything from peanut scale to engines, author of McGraw Hill Guide Books, and 10 year AMA veteran, Doug is now applying his talents as an SFA Vice President.

BRIAN NELSON.

A model builder since grade school, full scale pilot at age 14, and Navy P-3 pilot, Brian is also founder of Santa Clara County Model Aircraft Skypark, the largest flying club in the U.S., and an SFA member.

We Save Our Members Zillions. (O.K., maybe not *zillions*, but a lot. So join anyway).

SFA TRAVEL CLUB. Up to 70% off quoted fares, a members only 800 reservation line, and a percentage of every airline ticket purchased goes to your SFA chartered club.

RECENT SAVINGS OF OUR MEMBERS		
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Dallas/FtW to Pasadena (IMS Show) Coach Roundtrip	$1,092	$ 168.00
(4) Roundtrip Coach Tickets Dallas/FtW - Orlando	$2,260	$ 954.00

SFA PHONECARD. Saves our members up to 40% off AT&T, MCI, Sprint and other long distance calls away from home.

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In a special offer only for SFA members, you can order 12 issues of MODEL BUILDER for just $10 — SAVE 60% off the normal subscription price of $25.00!

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SPORT FLYERS ASSOCIATION

REMOVE BEFORE FLIGHT

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1992 SPORT FLYERS ASSOCIATION SAFETY CODE

1. I will not fly my model aircraft over spectators.
2. I will not fly my models in the presence of spectators until I have learned to fly safely.
3. I will not use metal propellers.
4. I will not buzz, tail, or harass any aircraft, car, animal, or any object in the air or on the ground.
5. I will test fly any new or repaired aircraft before flying in the presence of others.
6. I will abide by all safety rules established at any field where I fly and any state or local regulations governing model flying. I will always obtain prior permission from property owners before flying. I will not fly any models in a careless, reckless or dangerous manner.
7. I will not use hazardous fuels nor fuels containing tetranitromethane or hydrazine.
8. I will not use any explosives in conjunction with model flying whether on the model, in the air, or on the ground. Rockets will be flown in accordance with the Safety Code(s) of the National Association of Rocketry. A fire extinguisher must be present when using pyrotechnic smoke candles. Authorization may be secured from the SFA for special events.
9. I will not power my models with turbojet engines.
10. I will not fly my model higher than 400 feet unless it is flown in uncontrolled airspace, or unless it is a sport rocket flown in accordance with the Safety Code(s) of the National Association of Rocketry.
11. I will not fly model aircraft within three miles of any airport unless I have received permission from the FAA or I am flying at an authorized radio control flight field.
12. I will always perform a ground check of my model before flight.
13. I will use only those radio control frequencies currently allowed by the Federal Communication Commission.
14. I will extinguish any fuses on my Free Flight model upon completion of function.
15. I will only launch Free Flight models at least 100 feet downwind of spectators, cars, or anyone not directly involved with the flight.
16. I understand that SFA insurance does not cover activities related to the flying of Control Line models.
17. I will retrieve any lost model with great caution, considering all circumstances thoroughly before proceeding, and will never attempt to recover a model from a power line.

Sport Flyers Association
4145 Travis, Suite 202, Dallas, TX 75204

NAME: _____

ADDRESS: _____

CITY/STATE/ZIP: _____

CHECK ENC. ☐ $25 Adult ☐ $15 Youth or Non-Powered Free Flight

☐ VISA ☐ MASTERCARD Exp. Date: _____

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

SIGNATURE: _____

SAFETY CODE COMPLIANCE AND WAIVER STATEMENT

I will comply with the 1992 SFA Safety Code and my Flying Site Safety Code for all model aircraft operations and the NAR Safety Code(s) for all sport rocket operations including any changes or additions which may occur during my membership period. I understand that my failure to comply with the codes will result in loss of liability coverage for any damages or claim. I understand that written notice must be provided immediately upon the occurrence of any incident of bodily injury and/or property damage. I also understand that no claim will be accepted sixty (60) days after the expiration of my policy. I hold harmless the Sport Flyers Association, Incorporated trade membership organization for any personal injury, property damage or wrongful death which may occur.

_____

Applicant or Parent or Guardian of Applicant under sixteen years of age.
MUST BE SIGNED FOR ACCEPTANCE

MOVE BEFORE FLIGHT

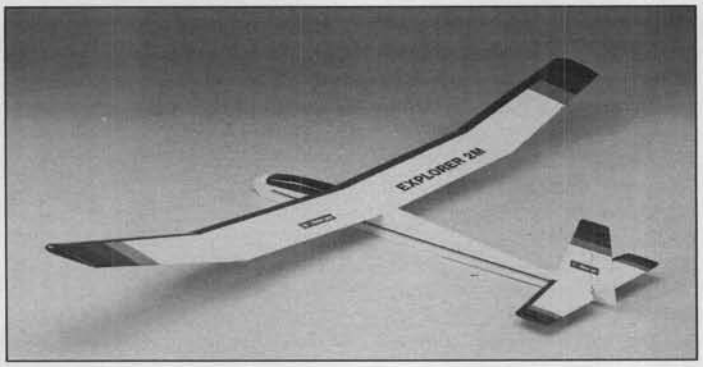
REMOVE BEFORE FLIGHT

REMOVE BEFORE FLIGH

over the counter

NOVICE ARF SAILPLANE

This month we have a number of new glider kits to tell you about, each of which is quite different from the others because each is designed for a different type of flying. First is the Thunder Tiger "Explorer 2M" ARF sailplane from Global Hobby Distributors, billed as a completely factory built, 95% ready-to-fly model that requires only a couple of hours' work to make airworthy. With a long tail moment, forgiving Clark-Y airfoil and 77-1/4 inch polyhedral wing, the Explorer 2M should provide the kind of hands-off stability needed by beginning RC pilots. Sounds like just the ticket for club contest fliers as well. Construction is mainly balsa with a hardwood I-beam wing spar, and the model comes complete with all required hardware, including towhook. Suggested retail price is $124.95. The Explorer 2M is distributed in the U.S. by Global Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728-8610; (714) 963-0133.



RADICAL AEROBATICS

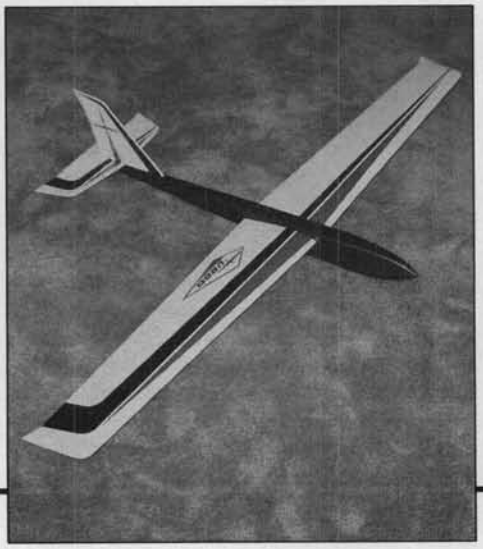
The Turbo S and Turbo ST from C.R. Aircraft Models are clean, fairly straight-forward gliders designed for aggressive slope aerobatics. What really sets them apart from most others in their class is their use of wingeron roll control, which means both wing panels rotate opposite each other on a common support rod to provide an aileron effect. From what we saw on C.R.'s video at the recent IMS Pasadena trade show, these ships are capable of some really radical maneuvers!

The basic differences between the S and ST Turbos is that the ST is a bit larger all around (60-inch vs. 52-inch span) and uses a Selig S3021 airfoil, as compared to the S3016 on the S model. Otherwise, they're pretty similar models, with similar construction—balsa and plywood with foam core wings. Kits include machine-cut parts, hardware, instructions, and full-size plans. The Turbo S and Turbo ST sell for $60 and $70 respectively and are produced by C.R. Aircraft Models, 205 Camille Way, Vista, CA 92083; (619) 630-8775. When contacting the company, tell Charlie Richardson you read about his kits in *Model Builder*!

SLOPE RACER

Slope fliers who get their biggest adrenaline rush from raw, all-out *speed* will want to take a real hard look at the "Nova" unlimited class slope racer being offered by RnR Products, 1120 Wrigley Way, Milpitas, CA 95035; (408) 946-4751. It's claimed to be one of the fastest commercial sailplanes available today and managed to rack up a *very* impressive contest record last year.

The Nova is priced at $295 and is supplied almost completely prefabricated, only about 20 hours being needed to complete assembly and install your radio. The wings and stabilator come pre-molded and pre-colored (we believe they are vacuum bagged foam/fiberglass surfaces, but interested buyers should verify this for themselves), and the fuselage is molded epoxyglass. Span is 94 inches, wing area 900 square inches. Wing airfoil is the HQ 1.0/8. The ship flies at between 90 and 170 ounces, depending on how much ballast you load aboard. Flaps are standard equipment. If a modern computer radio is used, the flaps and ailerons can be mixed for full-span camber changing, giving a very wide speed envelope for varying slope conditions. Contact RnR Products at the address above for more information.



KW 100 TAILLESS

Future Flight's Rol Klingberg has introduced an interesting follow-on to his pretty Klingberg Wing tailless glider. The new KW 100 flying wing is designed to be a competitive standard class thermal duration sailplane, claimed to be capable of performance right up there with any of the currently popular thermal soarers on the market. Quoting from the company's *Future News* newsletter: "In recent flight testing

against the Airtronics Legend the KW 100 has shown a better float without giving up any of the high speed end. I think that in the contest season of 1992 we will see a new glider configuration in the winners circle." We shall see!

Basically the model is a fully balsa sheeted foam core with winglets and elevons. A minimum of two channels are required (for the elevons), or four if you want to go all the way and add the optional flaps and in-flight adjustable CG. This latter feature allows fast upwind runs with minimum down elevon deflection for low drag. The wing disassembles into three sections about 35 inches long for easy transport. Span is 100 inches, wing area is 1100 square inches, and the nominal flying weight is something under four pounds.

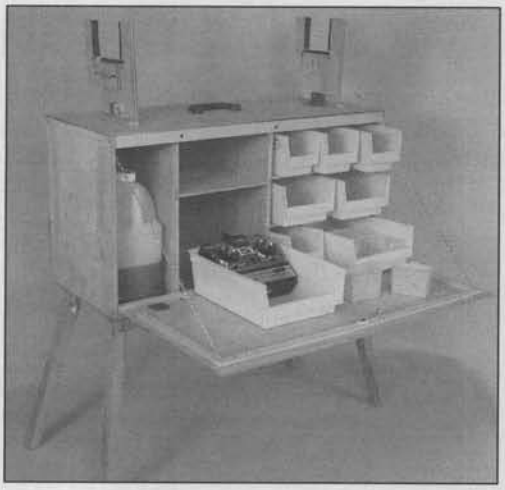
There is a lot more we could tell you about this intriguing new model, but instead, we'll finish up by saying the kit lists for $219.95 and that you can get more info on it by contacting Future Flight, 1256 Prescott Ave., Sunnyvale, CA 94089; (408) 735-8260.

MAKE YOUR OWN FOAM CORES

What with all the balsa sheeted and composite bagged foam core wings and tails being scratch built these days, mostly by the RC glider fraternity, what's needed now is an affordable and truly professional quality foam core cutter. A couple of companies are offering such cutters, one of which is the "Feather Cut" hot-wire cutter from an outfit whose full name is Tekoa: The Center of Design. The Feather Cut machine operates hands-off, will produce both straight and tapered wing cores, and is really not as complicated to use as it might appear in the photo. It does, however, have far too many features to list in this limited space, so we will simply refer interested modelers to the manufacturer for more information. Tekoa: The Center of Design, 3219 Canyon Lake Dr., Hollywood, CA 90068; (213) 469-5584. Ask also about the "Thermal Generator" power supply offered as an optional accessory.

DELUXE FIELD BOX

Jennings Products, P.O. Box 1121, Hendersonville, TN 37077-1121; (615) 824-0475, is introducing a large field box that sounds like quite a buy at only $89.95 plus UPS shipping. The box itself is built of birch plywood and solid basswood, measures 30 inches long by 16 inches high by 12 inches wide, has folding legs, and comes complete with padded, adjustable fuselage cradles on top and a fold-down door that doubles as a work surface. Seven polyurethane drawers in three sizes, plus twelve drawer inserts, completes the list of features. The only thing that you, the buyer, need do is apply a finish—ordinary clear polyurethane would be a quick, inexpensive way to go and would leave a pretty woodgrain appearance. The Jennings Products field box is available factory direct only.



QUARTER SCALE AERONCA

It would be hard to find a modeler who isn't familiar with the immortal 1932 Aeronca C-3 Collegian and 1935 C-3 Master, but the 1937 Aeronca K is perhaps not quite so well known. Be that as it may, Ikon N'wst is now producing a balsa/spruce/plywood kit of the Aeronca K in 1/4 scale, priced at $190 plus $9.50 S&H. The model spans a big nine feet and is a perfect match for the O.S. Gemini 120 four-stroke twin, which was the engine used on Ikon's prototype. Some of the niceties you'll come across in the kit include hand-cut parts, pre-bent landing gear, inked plans showing both wing panels, and shaped wing struts, to list only a few.

A complete catalog describing all of Ikon's kits is available by sending $4.00 to Ikon N'wst, P.O. Box 306, Post Falls, ID 83854. Be sure to mention *Model Builder* in your letter!

NEW PATTERN ENGINE

The selection of high-performance powerplants from YS Futaba continues to grow at a steady pace; the latest addition is the YS Futaba 61AR long stroke engine designed with pattern competition in mind.

The engine incorporates some unique and interesting design features, including a crankshaft with two steel rings that keep residual fuel out of the rear bearing for better rust protection (the fuel regulator circulates fresh fuel directly to the bearing for lubrication); a new chromed aluminum liner for reduced weight and better heat dissipation; and a bar stock aluminum head, also for better heat dissipation and a nicer anodized finish. The new 61AR is intended to be a direct replacement

The AWARF advantage: More flying time with your friends.

Your friendship was like a secret club. Every day after school, you and your best buddies crammed into the back seat of the bus, throwing aside Mrs. Grundy's homework to plot some devilish scheme against sissy girls.

Today you're older and probably wiser, but free time still means the same thing: time together. Now there's less of it to go around, so finding the best way to spend that time is a must.

Introducing the **Hobbico AWARF** family. Quality all-wood ARFs that are as strong, beautiful, and exciting to fly as the hand-built models you discovered R/C flight together with years ago.

Hobbico AWARFs feature all-wood construction and pre-built parts already covered with tough, brilliantly colored polyester film. They require no painting, and include extensive hardware packages. Out of the box, they're already 80% assembled.

Which means you can unwind for a few evenings after work by putting the finishing touches to a top-notch kit...spend the rest of the week getting to know your kids...and still make the field Saturday morning. Just you and the guys.

At the flight line, all three Hobbico AWARFs shine. With its broad, 64" wing span and flat-bottom airfoil, the **Flightstar 40** is a dependable trainer with rock-solid stability.

Intermediate fliers can send the 60" span **Avistar 40** through aerobatic maneuvers courtesy of its semi-symmetrical airfoil.

A high-wing design, semi-symmetrical airfoil, huge wing area, and trainer-like wing loading make the 71" span **Hobbistar 60** an easy-flying step up to .60-sized dimensions.

The world's changed a lot since you and your friends first met. So have ARF airplanes. See the Hobbico AWARF family of high-quality models at your hobby dealer today. Mrs. Grundy would be so proud — you've all finally learned to straighten up and fly right.

AWARFs set a high standard for ARF quality. Construction is all-wood and parts are already handsomely pre-covered.

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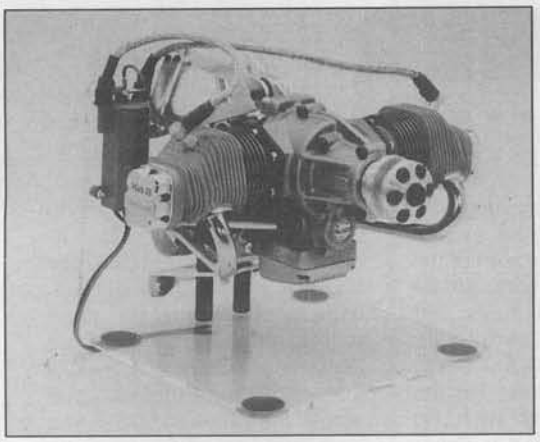
HOBBICO®
AWARF™ SERIES
All Wood — Almost Ready To Fly



for the YS 61FR and uses the same mounting bolt pattern for a drop-in fit.

For more info on this brand new YS Futaba powerplant, contact Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

50cc KAVAN TWIN

Latest word from Hobby Lobby is that they are now distributing the big German-made Kavan "Continental" 50cc (3 cu. in.) four-stroke twin in the U.S. This engine is indeed a big one, both in displacement and sheer physical size: it's 10-1/2 inches wide and 7-3/8 inches long from the firewall mount to the back of the prop. Hobby Lobby is handling both the glow and spark ignition versions of the Continental, priced at (gulp) $2195 and $2790 respectively.

Hobby Lobby's new catalog #19 contains a complete description of the Continental engine as well as all of the other neat and interesting items the company imports. Best part of all is that the catalog is free for the asking—the best possible price! You can get your copy by calling or writing Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444.

DAVIS IMPORTING MOKI ENGINES

Bob Davis (the man in charge at Davis Diesel Development) sends word that he is now importing the Hungarian-made .51FSR and .61FSR engines into the U.S. Both are baby brothers of the big Moki 1.8s that pulled Bill Hempel's big A-26 Invader to a solid first place victory at the RC Unlimited Races at Madera this past October.

We've seen Moki engines up close and can vouch for the fact that they are beautiful pieces of workmanship. No gaskets are used or needed. The cylinder/piston construction is RCS (a ringed piston running in a hard chrome plated liner) for the longest possible TBO. The .51 and .61 are supplied with Soundmaster mufflers and a set of Iso-Mounts, are designed to run on no-nitro glow fuel—an important feature, what with the shortage of nitro these days—and are said to meet the AMA's guidelines of 90 dba at nine feet, turning an 11x8 prop at 12,500 rpm.

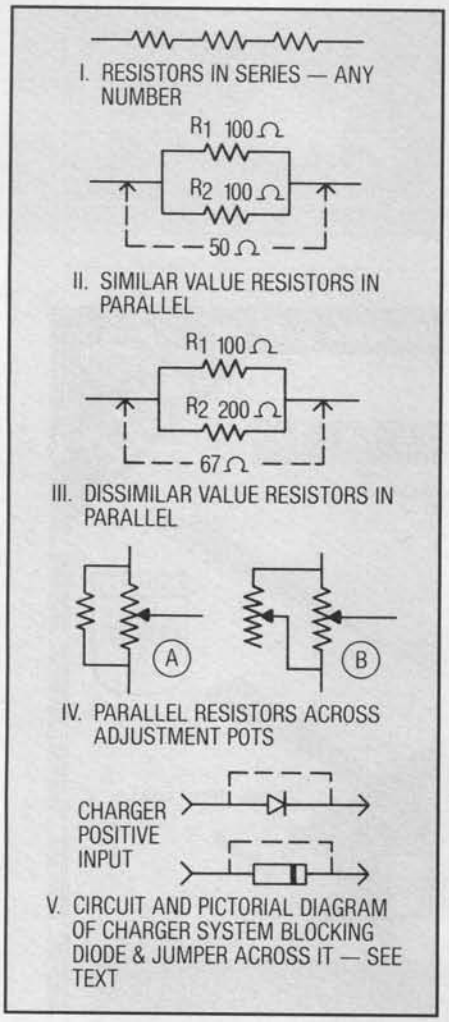
Wouldn't you know, Bob has also developed diesel conversion heads for these motors, for those who may want to do away with glow plugs and methanol fuel altogether. More information on the Moki engines and diesel heads can be had by contacting Davis Diesel Development, P.O. Box 141, Milford, CT 06460; or call (203) 877-1670. ***MB***

ELECTRONICS CORNER

BY ELOY MAREZ

The How-To of Parallel Resistors

Resistors in parallel are quite common in electronic circuits, often used simply to obtain an odd resistance value not otherwise available. We used one, of a sort and for another reason, in the glow plug circuit presented here last month, and upon some reflection I decided to pursue the subject, as you might find a similar application in your tinkering, or sometimes to improve the action of some device already on hand. Then too, there is always the time, like on Sunday afternoon when the electronics store is closed, when you need a certain value resistor that is not in your goody box, but which can be made up from those that are.



I. RESISTORS IN SERIES — ANY NUMBER

II. SIMILAR VALUE RESISTORS IN PARALLEL

III. DISSIMILAR VALUE RESISTORS IN PARALLEL

IV. PARALLEL RESISTORS ACROSS ADJUSTMENT POTS

V. CIRCUIT AND PICTORIAL DIAGRAM OF CHARGER SYSTEM BLOCKING DIODE & JUMPER ACROSS IT — SEE TEXT

First, let us touch lightly upon resistors in series—you often find them used that way also, for the same reasons already stated. They are simple to use; the total value of resistors is series is obtained simply by adding up the individual values. See Figure I, which is simple and completely self-explanatory.

Resistors in parallel (see Figure II) are another story, and can be done in your head in some cases, while others will require the use of that handy-dandy calculator. But fear not, the math is never really difficult. The simple calculations are those involving two resistors of the same value; in all cases, the total circuit resistance is exactly one-half the value of the individual resistors. You doubting Thomases can confirm this using the formula to follow.

See now Figure III, two resistors of unequal value connected in parallel. The formula used to obtain the total resistance is:

$$R_t = \frac{R_1 \times R_2}{R_1 + R_2}$$

In simpler terms, the total resistance of two (or more) resistors in parallel is determined by first multiplying the values, and then dividing by the sum of the two. Let's work out our example in Figure III: 100 times 200 equals 20,000, which then divided by 100 plus 200 (300), gives us 66.67 ohms. Try the formula now for the two 100 ohm units connected together in Figure II; you will confirm that the total is in fact the same as stated, 50 ohms.

As in all electronic formulas, it is important to use all the same multiples or sub-multiples of the values being used. In other words, use all ohms, all kilohms, or even all megohms, as mixing them will result in completely inaccurate values, stated in who knows what!

There is another interesting application for parallel resistors, as used in the glow plug supply previously mentioned. In that case, we use a fixed resistor in parallel with a variable one, a "pot," if you will. The purpose of the fixed resistor is to tame down the affect of the pot, to make it less sensitive and easier to set at at the proper point. Electronically, its effect is to reduce the total circuit resistance yet to provide the correct resistance for the circuit to operate as desired. The circuit is as shown in Figure IV, the fixed resistor being connected across the two outside terminals of the pot.

The value of the resistor to be added can only be determined by trial and error, because each circuit that you may want to add it to will be different, and the effect you are after will depend entirely on your preference. In most cases, the fixed resistor will turn out to be of a value less than that of the pot.

If you have a supply of resistors on hand, temporarily connect one of the same value as the pot, and check its affect. Then try subsequently smaller values, until you reach the point that works best for you. Another way is to temporarily connect another pot of the same value, using only one side and the center connector, across the main one (Figure IVb). Start with the added pot at maximum resistance, and slowly reduce its resistance until you reach the balance between the two. Then, without disturbing the shaft setting, disconnect it, measure its active resistance and install a fixed unit of the closest value across the original pot. If you have an electrical device of any type that is difficult to use because it is too sensitive to adjust, try this simple cure, it really works!

CHARGING CIRCUIT BLOCKING DIODES

A blocking diode is that little component that prevents you from testing the batteries in your transmitter with an Expanded Scale Voltmeter (ESV) or checking their charged capacity with a discharger. Now, I for one do not agree that the ESV should be used to measure the remaining charge and thus the operating time of the battery, but it does have a definite value in determining the condition of the battery, and certainly, checking the latter's capacity periodically is one of the best methods I know of to keep from losing an airplane.

First, the "Why" of this diode. Frankly, I don't know! And as far as I know, none of the major manufacturers have ever graced us with an explanation for its use. It even appears that some of them don't know themselves, or that their engineers don't agree with its use, as in more than one case, a given transmitter will include a blocking diode, while another one of the same brand will not. Said diode allows charging current in, but prevents voltage (and thus current) being available at the same connector.

True, the slight possibility of a problem does exist, with some damage resulting. If, while you are connecting any external instruments to the transmitter's charging jack, you inadvertently cause a short circuit, it will most definitely incinerate all wiring between the battery and the short, unless you are extremely fast and disconnect things immediately. Even then, you will have created enough heat in the

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Tools

TAO001A	Taig Lathe	269.00
HLAE801	Solingen Balsa Planer	7.40
HLH625	Balsa Stripper	12.60
HLMO0002	Modelers pins, 50	3.40
HLPS111	Permanent sanders set	33.40

Building Boards

GR503	Laminated balsa 50 x 13"	43.50
GR645	Unitized balsa 39 x 10"	26.60

2x4 Connectors to make workbench, shelf

HLKE300	Workbench set	22.90
HLKE200	Storage unit set	39.90

RC airplanes, glow powered

HLA121	1:4 Scale Cub	228.00
HLA128	DH82A Tiger Moth	209.00
HLA3731	Golden Eagle Biplane	226.00
HLRM1480	Romeo	139.00
HLSC232	Taurus Plus	309.00

Telemasters, Funster

HLA105	Telemaster 70 ARF	174.00
HLA107	Senior Telemaster	135.00
HLA111	Telemaster 40	79.50
HLA112	12'6" Telemaster	339.00
HLA108	RCM Funster	79.80

RC electric sailplanes

HLA130	Freshman	39.00
HLA131	Graduate	59.00
HLSI0204	Excel WS 10	148.00
GR4207	Elektro-UHU (1.9M)	88.00
GR4208	Pink	105.00
GR4264	ASW 22 B270	279.00
GR4266	ET 200 RTF	127.00
GR4270	Elektro Junior ARF	179.00
GR4271	Cherry ARF	238.00
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HLAN1324	Sinus	284.00
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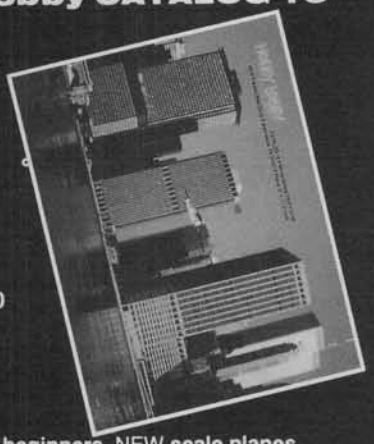

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wiring to melt some insulation, requiring replacement anyway.

However, with some care, and I do believe that the RCer advanced enough to want to care for his batteries can manage to do so without cooking them, the possibility of such a short is about the same as that of you or I hitting the lottery. I have never done it, and I don't know or have ever heard of anyone who has. (Now, I know that I'll hear from twenty of you to tell me that it happened to your friend Joe, but let's face it, he's not too sharp anyway, right?)

Anyway, properly done, without any makeshift wiring and/or connectors, we should be able to plug in one polarized connector without causing any damage. After all, we are trusted to connect the charger in the same manner, and it too could cause damage if incorrectly used.

Circuit-wise, the diode is generally installed in series with the positive input lead just after its connection to the charge jack. Depending on the equipment, it might be floating with some of the related wiring, or it might be installed on a small circuit board to which the jack itself is attached. In any event, it will be located close to the jack, and is a small glass device about 3/8 of an inch long by 3/32 inch or so diameter, with a single black band on one end. The band, as in all diodes, denotes the positive end.

It is necessary only to remove the diode and replace it with a short piece of wire, or simply to jumper across it with the same wire, in the event that you want to restore the transmitter to its normal configuration sometime in the future.

Another possibility for testing the transmitter battery exists with those transmitters that have a drop-in battery, though it is not quite as convenient as plugging in to the charge connector. That is to simply remove the battery and make the proper connections directly to it. In that case, we are faced with generally two possibilities: those batteries that rely on two spring contacts pressing against terminals of the type found on the common nine-volt "transistor" battery, and those that depend on more secure polarized electrical fittings for making these important connections.

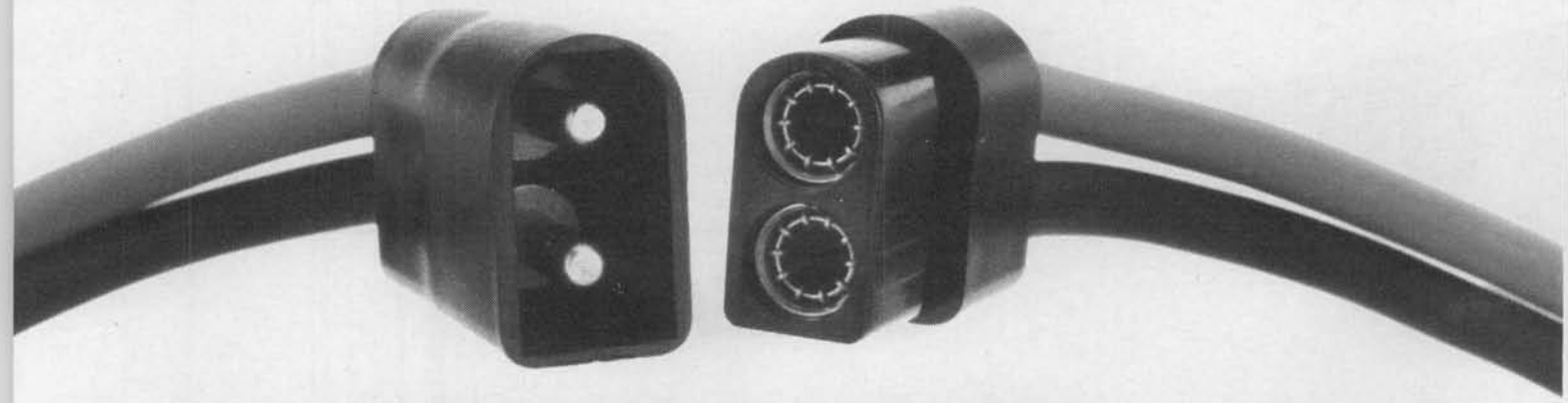
Depending on your transmitter and its battery contact arrangement, it is readily possible to wire the necessary harness to connect the battery to your test instruments. Again, secure and permanent connections throughout are strongly recommended, as temporary wiring or clips always include the possibility of reversed installation or short circuits. And if you have never shorted across a charged NiCd battery, you have a real surprise coming—they pack a tremendous amount of power and are quick to let you know they don't like to be abused.

Another transmitter feature which I am not too comfortable with is the fuse with which some of them are equipped. I'll bet you don't even know if yours is one of those that has an internal fuse, do you? Well, there is a good reason for that, as most of them that are fused make no mention of it in the instructions.

The fuse worries me in that I know the only reason that it will go west is if a current in excess of its amperage rating flows through it. Should the original fuse blow but the replacement fuse holds normally, the big question is why did the original fuse blow, and is it going to do so again during the next takeoff? I would not trust such a transmitter—in fact I once had one that did just that, and I was never able to locate a logical reason for it. I mistrusted it so much I finally gave it away, with specific mention of the possible problem and strong recommendations that it never be used to fly important or expensive airplanes.

As in the case of the diodes, I jumper the fuse in any transmitter so equipped that I fly. Should a major fault develop that renders the transmitter inoperative during use, I'd rather have the smoke; the problem can be corrected. On the other hand, such a component failure would have blown the fuse anyway, and the transmitter—and my airplane—would be just as dead.

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



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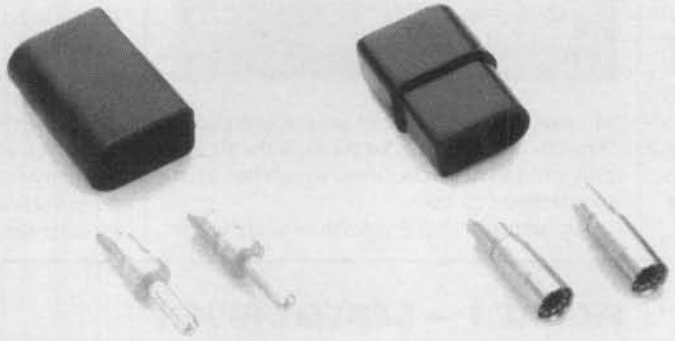

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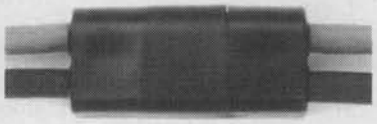

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CONTROL LINE

BY JOHN THOMPSON

GET REAL!

No matter what control line flying activity a "serious modeler" ends up in, what attracts them to the hobby at first is often the beauty of certain kinds of airplanes—the graceful magnificence of precision aerobatics planes is an example.

No type of model airplane is more eye-catching—at least while on static display—than a scale model.

A flier may eventually become interested in the thrill of racing, the finesse of stunt, the exhilaration of speed, the technology of carrier or the excitement of combat, but what all of us have in common at the start is an interest in aviation. That's what attracts us to what look like "real airplanes," though we learn eventually to consider our models of any kind to be real, the ones people ride in are "full-scale."

As control line activity continues a sustained upsurge in interest, the attraction of scale building and flying appears to be on the leading edge. In addition to the precision scale competition for the master builders, there is the AMA sport scale category for less serious modelers. Beyond that, there are various local and regional profile and sport scale events. As a result, there is a comfortable level of scale building and flying competition for modelers of all skill and experience levels.

As has been mentioned in this column many times before, these competitive activities are of benefit not only to those interested in competing, but to the casual or beginning modeler as well. Each contest provides a seminar in how to build and fly models—and sometimes, how *not* to do it. Model builders are a social bunch, virtually always willing to share their knowledge with beginners.

Scale model contests are listed, along with all of the other control line model competition events, in the contest calendar published by the Academy of Model Aeronautics. In addition, flyers for local contests can be found in hobby shops and club newsletters, etc. Many of these newsletters have been listed in this column's "newsletter of the month" feature over the past couple of years. Local clubs can be tracked down through hobby shops or through the Academy of Model Aeronautics, which has a list of chartered clubs.

No type of model airplane is more eye-catching—at least while on static display—than a scale model.

An indicator of the growth of scale in the past few years has been the Northwest Regional Control Line Championships in Eugene, Oregon. The 1991 contest featured a virtual explosion of scale entries, primarily in the sport and profile classes. Word from the modelers who came from far and wide last year is that the 1992 Regionals (on Memorial Day weekend in late May) will also see a stronger entry in the precision scale category.

Prominent among the modelers who contributed to the stunning lineup of scale models at the 1991 Regionals were three fliers from Southern California who brought several top notch models with them and promise to bring more this year. Part of what attracted attention to the work of Fred Cronenwett, Grant Helstand and Merle Mohring was their use of electronic systems for operating various features of their scale airplanes. They are able to activate multiple features on their planes through the use of only two lines, rather than the three or more used in traditional mechanical control systems.

In the interest of sharing their wealth of research into the use of electronic controls, Fred, Grant and Merle have written a two-part series of articles for the Control Line column that should take the mystery out of electronic control systems for control line scale airplanes.

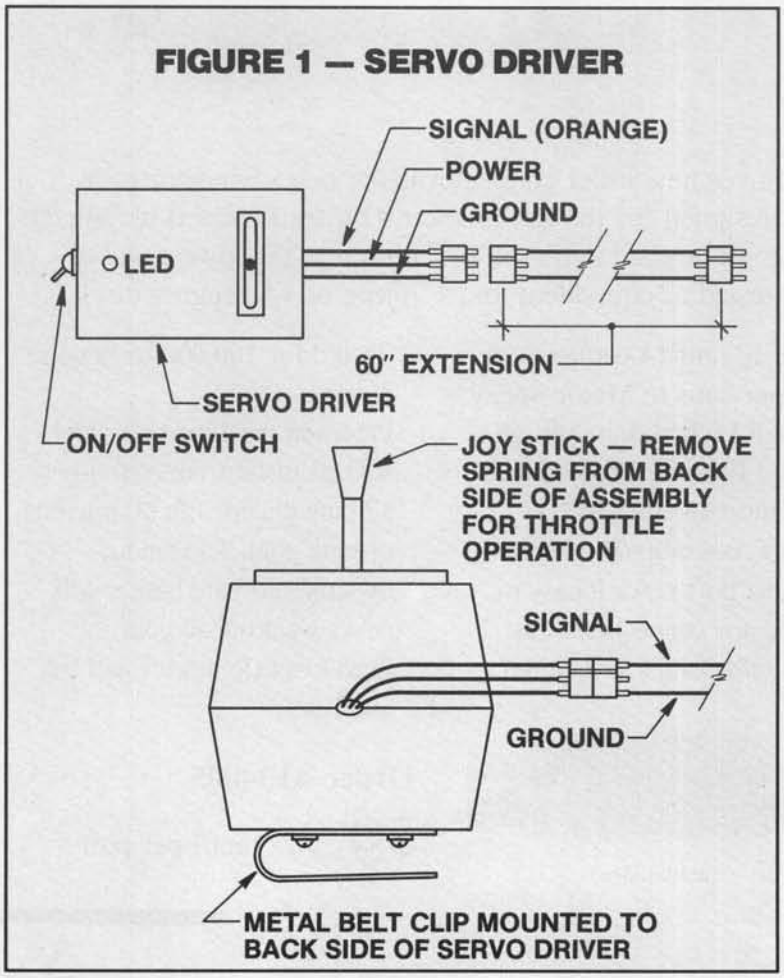
Our thanks to Fred for packaging the material and providing it to us. Here we go with the first installment:

SINGLE-CHANNEL ELECTRONIC CONTROL

This single-channel electronic control system replaces the three-line bellcrank normally used to operate the throttle on carrier and scale CL model airplanes. The electronic control system for throttle will result in a smoother and more precise control. It will safely control the engine even in cases where line tension is lost.

There are three major components required for this

FIGURE 1 — SERVO DRIVER

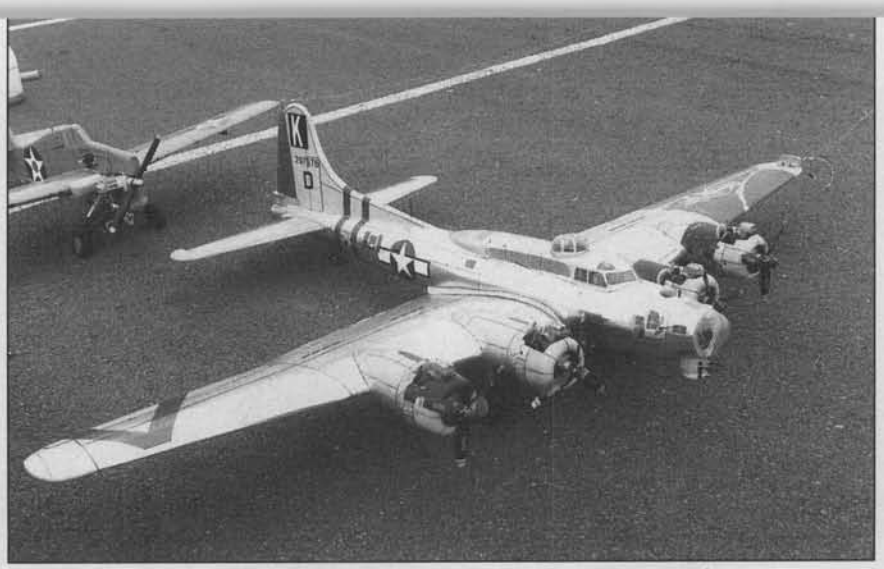


system. The servo driver is a purchased unit that does not need any modification. The flying lines and the flight pack make up the rest of the hardware. The initial cost is about $75, depending on what type of servo and batteries are used. One servo driver will support more than one airplane, so each additional airplane will only require a set of flying lines and a flight pack.

Custom Electronics in California sells two different servo drivers that can be used for this purpose. We have tried both types and recommend the servo driver with the joystick. The other servo driver has a twist knob that works almost as well. The servo driver needs a metal clip so that the unit can be clipped to your belt during flight. An extension is also required so that the unit does not unplug from the lines when your arm reaches full extension. Refer to Figure 1 for details of the clip and the extension.

The flying lines serve two purposes: first, to fly the model airplane and pass all pull tests; and second, to transmit the electronic signal to the model airplane. We presently are using nylon coated fishing leader that is made from stainless steel. The nylon coating prevents the system from shorting out and the braided stainless steel is still structurally strong enough to pass pull tests. The stainless steel is an acceptable conductor for the signal and ground, but power cannot be transmitted down the lines due to the high resistance (ohms). Refer to the table accompanying this article to determine what size line you will need for your model airplane; we have made some recommendations based on flight tests with different aircraft. The assembly of the lines is shown in Figure 2.

The flight pack is scratch-built from wires, Deans connectors and a switch. You will need a good soldering gun, heat-shrink tubing, and wire (red, black and white). Use the white for signal, red for power and black for ground. Follow the schematic shown in Figure 3. The first Deans connector will be used for ground check of the system, while the second Deans connector is only used when the lines are hooked up (see Figure 3).



Merle Mohring's B-17 uses only two lines, but has many operating features, including rotating turrets, separately throttled engines, etc., all controlled electronically. This one happens to use a multi-channel system, which will be the subject of next month's column.

There is one very important consideration: *The ground between the servo driver and the battery in the airplane must have a common ground.* If the grounds are not common the system will not work. If a model is converted over from three-line to two-line electronic operation, there is no need to replace the three-line bellcrank. The third line should be removed and the servo system installed in the model.

POWER: DRY CELLS VS. NICDS

The servo is powered by a battery that is carried in the model airplane, so weight is a key factor in selection of the correct battery.

Large models can easily carry four AA dry cells, while the little airplanes can use the px-28 dry cell available from electronic stores.

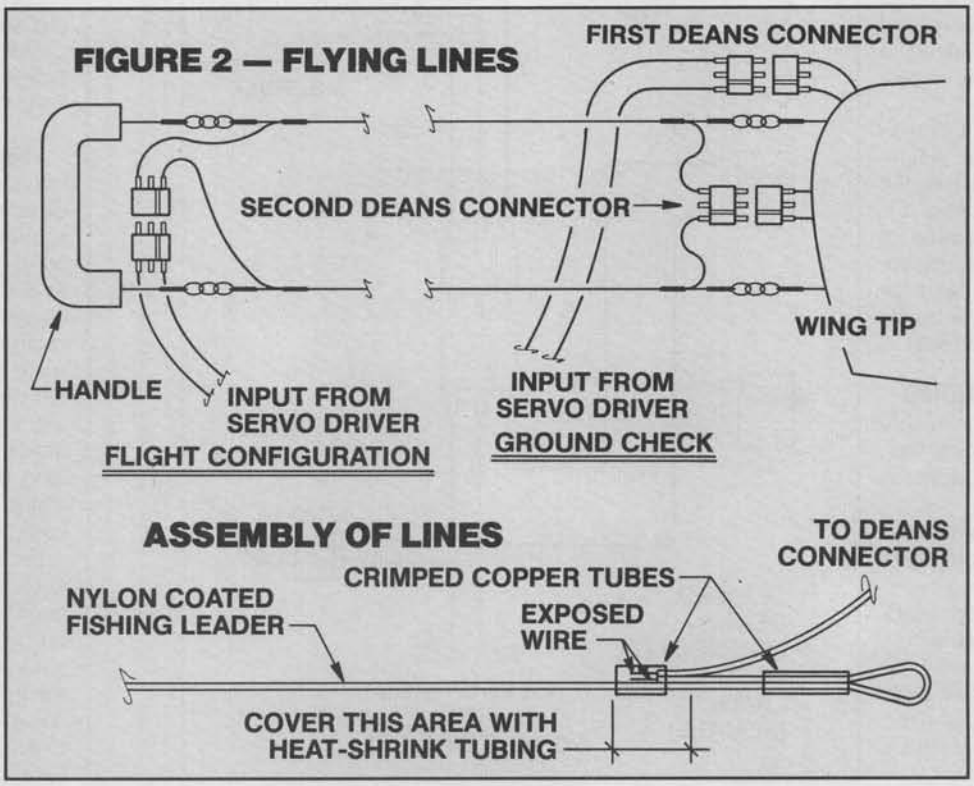
A NiCd battery also will work, but since only one servo is used, a full 550 mAH 4.8-volt NiCd is a bit much. If you choose to use a NiCd battery, consider making your own battery pack using 120 mAH cells from your local electronic store. We tested this type of battery on a twin-engine model airplane driving two servos with great success. One word of caution: The px-28 six-volt dry cell battery only has enough amps to drive one servo. They are on the expensive side ($5) and are micro light and micro small. We have gotten as many as 50 to 60 flights out of one px-28 battery driving one servo.

OPERATION OF SYSTEM

We usually ground check our engines before the lines are hooked up by plugging the servo driver into the first Deans connector. The lines are plugged into the second Deans connector for actual flight operation. When the airplane is ready to be flown the engine is started with the servo driver plugged into the first Deans connector; this way the throttle can be adjusted without walking out to the handle.

When a reliable idle is set, the pilot unplugs the servo driver from the first Deans connector (the lines are plugged into the second Deans connector) and walks out the handle. The servo driver is then plugged into the Deans connector at the handle, the servo driver is clipped onto the belt, and the pilot is ready to fly

We tested the single-channel servo system with a profile scale Martin B-26 twin-engine bomber (twin O.S. .20FPs, 50-inch span) on the local carrier deck and found the electronic system to be much more precise than the three-line system. With the single-channel system we were able to obtain a more consistent slow speed that was not dependent on line tension. If the model started



A couple of sport scale models that are prime candidates for the single-channel electronic control system described in this month's text. Both use a conventional mechanical control system—note the four leadout holes in the Hurricane's wing tip.

to sink, the throttle could be "bumped" ever so slightly to maintain level flight.

Multi-engine models can be set up two different ways: a torque tube arrangement or individual servos for each engine. The B-26 was tested with both systems, and both were acceptable. The multi-servo operation will require a "y" connector so that both servos receive the same signal.

CONCLUSION

After the more than 300 flights we have logged with several models, we are very much impressed with the electronic control system described here. Each one of us can recall an incident in which the three-line system would have been a handicap because it is based on line tension.

The first incident that is fairly common is ground looping inside the circle when all tension is lost and the airplane is out of control; in this case we calmly reduced the engine speed to an idle and shut the motor down safely.

The point we are trying to make here is that the single-channel system is safer than the three-line system because it is not based on line tension. If battery power is lost during the flight, the worst that can happen is that you have to fly the tank dry and land dead-stick.

MATERIALS REQUIRED

- One servo driver, available from Custom Electronics, Inc., P.O. Box 1332, Alto Loma, CA 91701.
- Six or more three-pin Deans connectors, available from hobby shops.
- One roll each of red, black and white wire, available from electronic stores.
- One or more feet of heat-shrink tubing in various sizes, available from electronic stores.
- One battery, 4.8-volt NiCd or 6-volt dry cell, available from hobby shops or electronic stores.
- One on-off switch, available from electronic stores.
- One servo, micro or standard, available from hobby shops.
- Fishing leader, available from sporting goods stores, or Netcraft, Inc., 2800 Tremainsville Road, Toledo, OH 43613 (call 800-638-2723 for a catalog).

INSULATED FLYING LINES

Netcraft's insulated wire is available in 300-foot or 30-foot spools. Stock number for the 300-foot spool is 1C2R5; for the 30-foot spool it is 1C2R3. You need to specify the pound test desired. Below are the available pound tests along with the corresponding outside diameter and wire diameter:

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80#,	.038,	.025.
60#,	.032,	.021.
45#,	.027,	.018.
30#,	.025,	.017.
20#,	.026,	.012
15#,	.020,	.016.
10#,	.019,	.010.

For a 2- to 4-pound model, the 30-pound test line is recommended. For a 5- to 8-pound plane, use 60-pound test. For a model heavier than eight pounds, use the 80-pound test line.

Next month's column will look at multi-channel electronic control systems.

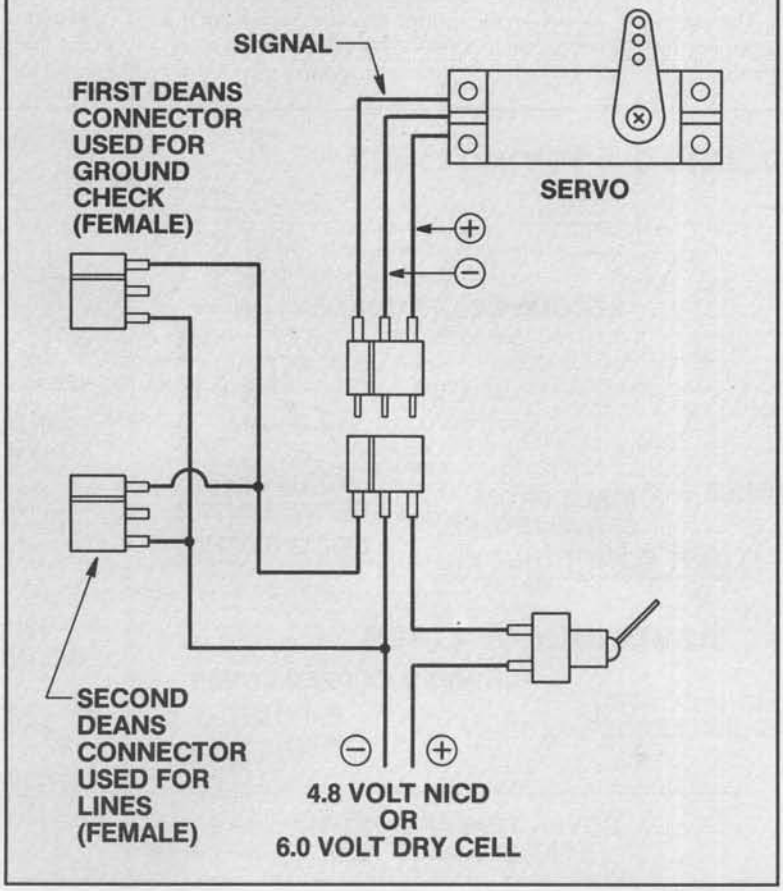
For more information about the single-channel systems, contact Fred Cronenwett, 7352 Independence #201, Canoga Park, CA 91303.

• • •

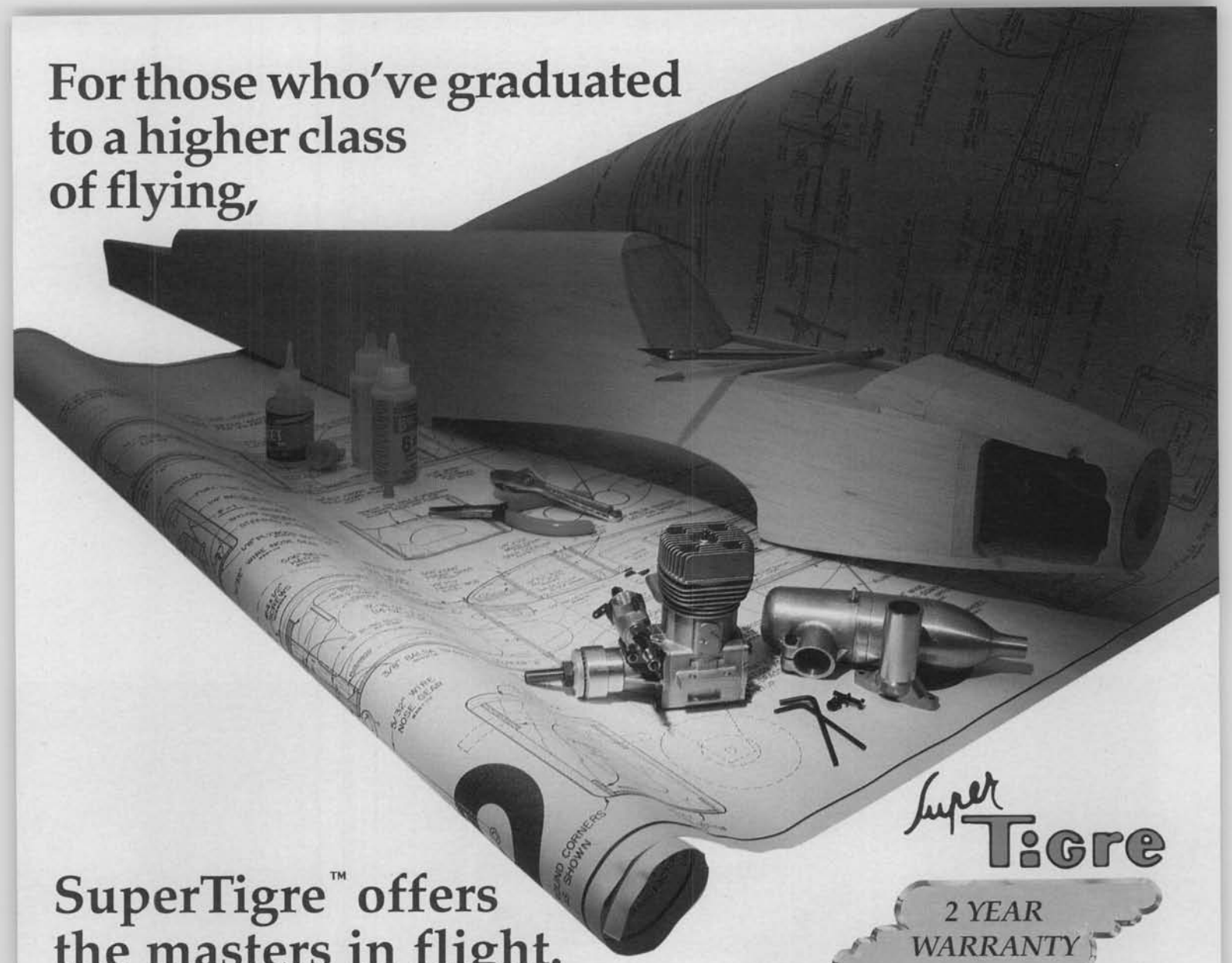
Fliers in the northwest interested in seeing some of the electronic control systems described above in action will want to attend the 1992 Regionals at Eugene Airport, Oregon. In addition to the profile, sport and precision scale competition, there is a full two-day schedule of racing, combat, precision aerobatics, carrier, speed and balloon bust competition. It's a "must" contest for West Coast control line flying enthusiasts.

For information, write to me. Technical information, club news, contest reports and news of upcoming events, questions, photos and other control line modeling news is always welcome. Write John Thompson, 1145 Birch Ave., Cottage Grove, OR 97424. ***MB***

FIGURE 3 — FLIGHT PACK



For those who've graduated to a higher class of flying,



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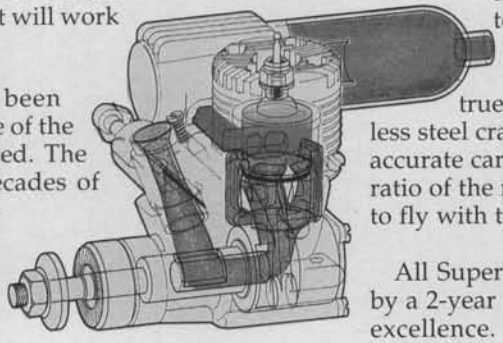

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EEE-Z-FLI P-50+1

BY AL WHEELER

At one time or another, many modelers just have to have a P-51. Many choose to model one of the various military versions, while others elect to be represented in the fast-paced world of air racing. The same basic airplane fits either application, so the choice is yours—the nostalgic days of invasion stripes or the flash and glamour of a Reno pylon polisher.

The version of the classic North American fighter presented here follows the basic concept of the previous EEE-Z-FLI efforts published in *Model Builder*. Ease of construction, use of familiar materials, and "polite" flight characteristics were prime considerations. The basic appearance, although not truly scale, is pleasing and leaves little doubt as to what aircraft is being modeled. Like previous EEE-Z-FLI designs, repairs, should the ground rise up and bash your creation, are easy and straightforward.

The initial flight of the P-50+1 demonstrated pleasing performance. Ground handling was crisp and precise; even with the scale tail wheel location, takeoff tracking was straight. With neutral elevator trim, the tail came up and the airplane lifted off into a gentle climb. A trim flight in the pattern required only one click of left aileron correction. The P-50+1 is stable in both pitch and roll and the rudder has a good handle on any yaw requirements. Slow flight and stall exercises demonstrated no adverse characteristics. With closed throttle, the glide is slightly nose down and the flare and landing fall into the "ho-hum" category, followed by a straight roll-out, easily corrected with a touch of rudder. Later flights have indicated that the model is delighted with wheel landings.

With a little power left on, she rolls straight and the tail stays up for what seems like forever, just like the big boys! With the O.S. .25 FP running a bit on the rich side, loops, rolls and their usual combinations are very pleasing.

Even though the outline has been greatly simplified, there's no mistaking this model's full-scale ancestry. Ship lends itself well to both military and civilian color schemes. Wing tips could be clipped and a tiny canopy used for a Reno racer look. All sorts of possibilities exist here, so be creative!

The model flies smoothly, going where you tell it to with satisfying precision. With scale ailerons instead of the often used full-span type, the roll rate is more scale. Those desiring a faster rate can increase the aileron length inboard when building the wing.

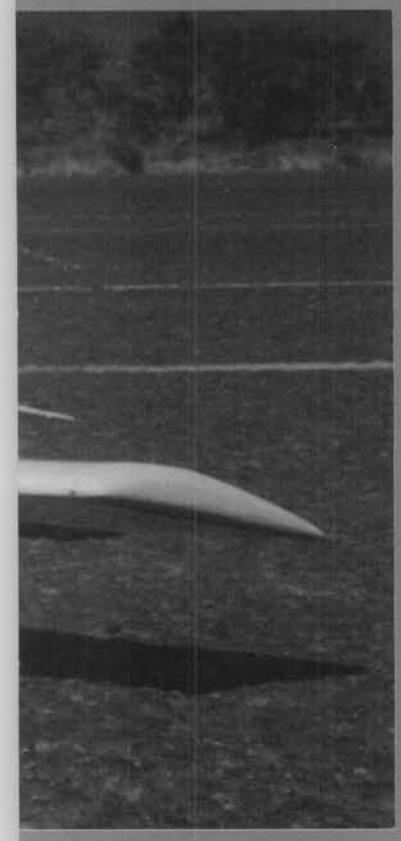
So, if tighter tactics or pylon polishing are your bag, break out the balsa and start cuttin'!

GENERAL NOTES

1. It is a good idea to cut out and number all parts prior to starting construction. If you can find a good looking box, you can roll up the plans, pack the pieces and you have a kit!

2. The EEE-Z-FLI wing contruction is quite rigid and resists any corrective warping, so *build it flat*!

3. Component choices such as engine brand, covering material, fuel tank make and general hardware selection are left up to the builder. Specific items used on the prototype will be noted in the appropriate section of the building instructions.



TAIL SURFACES

All surfaces are medium hard 3/16-inch balsa. The elevators are joined with a dowel as shown. Join them on a flat surface and assure that the leading edge is straight. Cut hinge slots in both the stabilizer and elevator, but cement hinges into the stabilizer only. Join the fin and dorsal, then slot the fin and rudder and install hinges in the fin only. Sand all edges round and put the tail surfaces aside for later fitting and covering.

The P-50+1 follows the author's basic EEE-Z-FLI design philosophy: flat bottom wing with fully sheeted undersides and partially sheeted top, and sheet balsa fuselage and tail surfaces. Cowl top, wing root fairings and landing gear fairings are bent from soft sheet aluminum. O.S. .25FP used on original.

FUSELAGE

Select two matched sheets of 1/8-inch medium balsa and cut out FS1. Cut FD1 through FD5 from 1/8-inch medium balsa. Cut FB1, 2 and 2a from 1/8-inch balsa and cement the three together. Assemble FB3 with epoxy, using 1/8 balsa and 1/8 plywood back to back. Fabricate FB4, 6 and 7.

Add fuselage doublers FD1 through FD5 to the fuselage sides as shown; be sure to make a left and a right! Now attach FB4, 6 and 7 in the slots between the doublers in one of the fuselage sides, assuring they are square. Fit and install FB5 and the instrument panel. FB3 may now be set in place but not cemented. When dry, assemble the fuselage by laying the remaining side on a flat surface and inserting the bulkheads from the assembled side into the appropriate slots and cementing. Again, do not cement FB3.

Install both FD5s and allow the entire assembly to dry. The rear of the fuselage may now be drawn together and cemented. Be sure it is square; sight down the top and bottom for centerline alignment. This is the point at which a lot of good models go crooked and once a crook, always a crook!

Install the aft fuselage vertical members and cross pieces. The rear wedge may now be fitted and installed. Now, with FB2 and FB3 in place but not cemented, align the tops with a straightedge from FB5 forward. Soak the fuselage sides with ammonia and water—and let it really soak in. When wet through, use as many rubber bands as are required to bend the fuselage sides to fit the bulkheads. This may require a bit of patience—and could require repeated soakings.

When satisfied, recheck the alignment with a straightedge on the top, then cement the nose piece (FB2) and firewall (FB3) in place. When dry, install the top stringer from the rear slot in the nose piece to the instrument panel. The bottom of the nose from FB4 forward is now planked with 3/16-inch soft balsa and contoured to shape. Cover the bottom of the fuselage from FB6 aft with 1/8-inch light balsa, cross grain. The two scoop sides may now be installed, the front block and the bottom skinned with 1/8 light balsa. Install the tail wheel support block added inside the fuselage and fit the tail wheel assembly. The prototype used a DuBro #375 unit. Attach the steering arm and run the control wire forward to the approximate rudder servo location to be attached to the servo later.

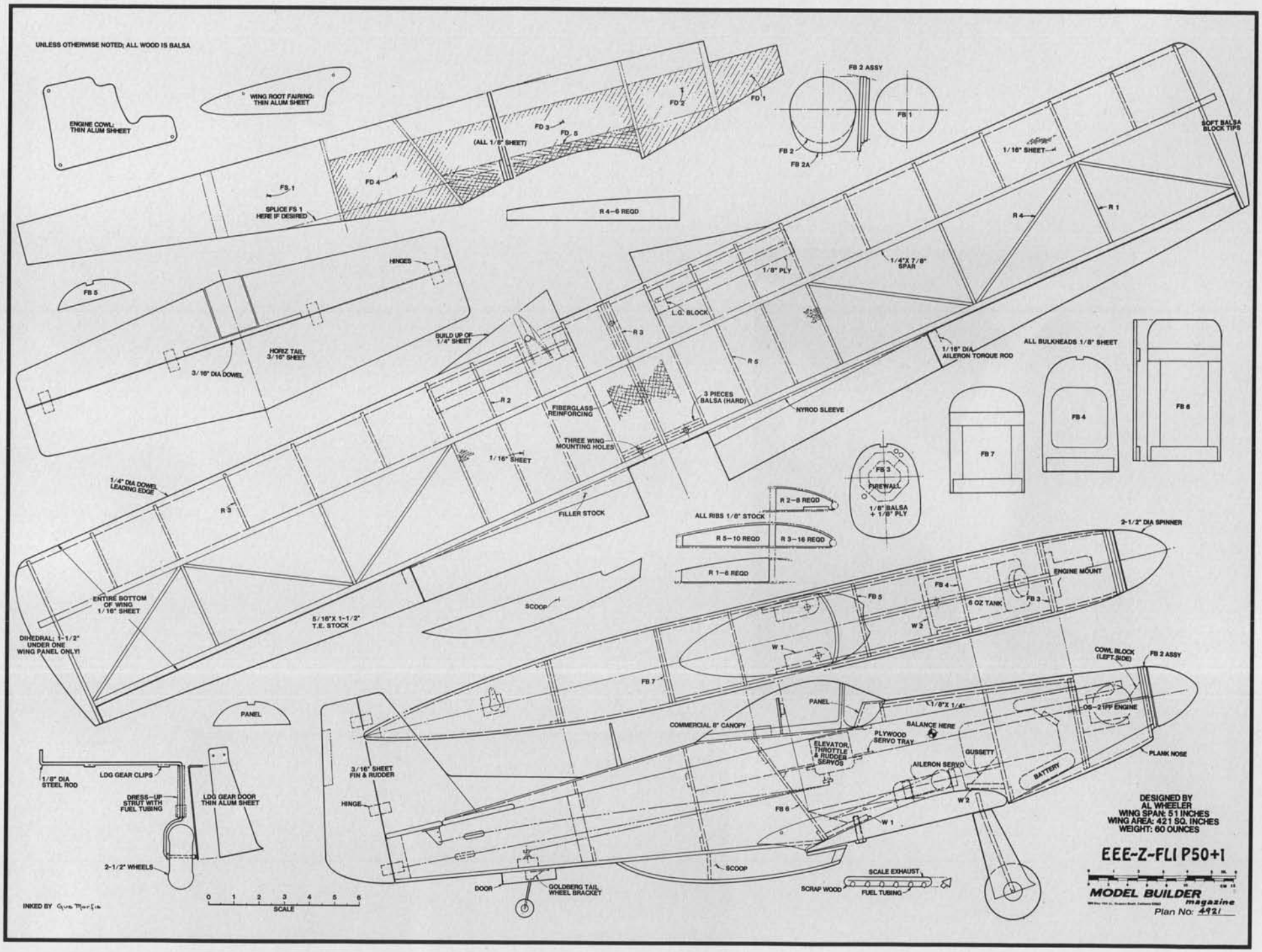
Install the 3/16-inch plywood W1 and W2 wing supports and the W3 and W4 1/8 balsa gussets. Use epoxy throughout. Install the servo mounts on the top edge of FD3, spaced to accommodate the servos to be used. The top of the fuselage is next covered with 1/16 sheet balsa from FB3 back to FB7. On the prototype the entire area was covered and the cockpit opening cut out later as the canopy was fitted—this prevents cutting the opening too large.

The canopy deck may be fitted and installed once the cockpit opening is complete. No pattern for this, as the canopy used will determine the final shape. The top of the fuselage from FB7 aft may now be sheeted with 1/16 balsa. Note that the sheet stops at the aft edge of the stab and that slots for the stab and fin are required. Trial fit the stab and fine trim the bottom of the dorsal to fit the top of the fuselage with the fin seated on the top of the stab. Cut the openings for the rudder and elevator pushrods.

The engine mount may now be fitted. To drill the required holes and provide access for mounting screws, etc., cut a hole through the FB2 assembly slightly smaller than the spinner (about 1-3/4 inches). The side of the fuselage ahead of FB3 will have to be cut to accommodate the muffler exit; also, the rear side of FB2 will have to be routed out for carburetor clearance.

Insert two extra long pieces of fuel hose through the firewall and attach them to the tank outlets before the tank is installed; then push on the tank and pull on the hoses and in she goes—slick as can be. There is adequate room below the tank for a flat pack battery.

Sand all fuselage edges round, and shape the nose and bottom scoop to round contours. With the fin and rudder held in place, mark the rudder and back of fuselage for the lower rudder hinge, cut the hinge slots and install the hinge in the fuselage only. On the left side of the nose provide a triangular block for mounting the top cowl. Check the entire fuselage for areas needing more sanding or filling


UNLESS OTHERWISE NOTED; ALL WOOD IS BALSA
ENGINE COWL: THIN ALUM SHHEET
WING ROOT FAIRING: THIN ALUM SHEET
(ALL 1/8" SHEET)
FD 1
FD 2
FD 3
FD 4
FD 5
FS 1
SPLICE FS 1 HERE IF DESIRED
R 4–6 REQD
FB 2 ASSY
FB 1
FB 2
FB 2A
SOFT BALSA BLOCK TIPS
1/16" SHEET
R 4
R 1
HINGES
FB 5
HORIZ TAIL 3/16" SHEET
3/16" DIA DOWEL
BUILD UP OF 1/4" SHEET
R 3
L.G. BLOCK
1/8" PLY
1/4"X 7/8" SPAR
R 5
1/16" DIA AILERON TORQUE ROD
ALL BULKHEADS 1/8" SHEET
FB 4
FB 6
R 2
FIBERGLASS REINFORCING
3 PIECES BALSA (HARD)
NYROD SLEEVE
THREE WING MOUNTING HOLES
1/16" SHEET
FB 7
FB 3
FIREWALL
1/8" BALSA + 1/8" PLY
1/4" DIA DOWEL LEADING EDGE
R 3
FILLER STOCK
ALL RIBS 1/8" STOCK
R 2–8 REQD
R 5–10 REQD
R 3–16 REQD
R 1–6 REQD
2-1/2" DIA SPINNER
ENGINE MOUNT
ENTIRE BOTTOM OF WING 1/16" SHEET
SCOOP
5/16"X 1-1/2" T.E. STOCK
FB 5
FB 4
6 OZ TANK
FB 3
W 2
W 1
DIHEDRAL: 1-1/2" UNDER ONE WING PANEL ONLY!
COWL BLOCK (LEFT SIDE)
FB 2 ASSY
FB 7
PANEL
1/8"X 1/4"
COMMERCIAL 8" CANOPY
BALANCE HERE
PLYWOOD SERVO TRAY
ELEVATOR, THROTTLE & RUDDER SERVOS
GUSSETT
AILERON SERVO
BATTERY
PLANK NOSE
3/16" SHEET FIN & RUDDER
HINGE
FB 6
W 2
W 1
SCOOP
SCALE EXHAUST
SCRAP WOOD
FUEL TUBING
DOOR
GOLDBERG TAIL WHEEL BRACKET
1/8" DIA STEEL ROD
LDG GEAR CLIPS
DRESS-UP STRUT WITH FUEL TUBING
LDG GEAR DOOR THIN ALUM SHEET
2-1/2" WHEELS
0 1 2 3 4 5 6
SCALE
INKED BY Gus Martin
DESIGNED BY AL WHEELER
WING SPAN: 51 INCHES
WING AREA: 421 SQ. INCHES
WEIGHT: 60 OUNCES
EEE-Z-FLI P50+1
MODEL BUILDER magazine
Plan No: 4421

(DAP vinyl spackling). Finish as required and lay aside for covering.

WING

Cut and edge glue the bottom two sheets. With the sheets on the building surface, mark the spar location and all rib positions. Cut the spar to the right length and glue it to the bottom sheet. Install the rear spar. Install the R3 ribs; note that the ones marked R2 on the drawing are notched for the landing gear support and that the ribs at the wing center line are double. The landing gear support may be slid into place from the outboard R2 rib.

Install the R1 and R5 ribs. Note that the R5s are flush with the top of the front spar and 1/16-inch below the top of the rear spar. The R1 ribs are 1/16-inch above the top of the front spar and flush with the top of the rear spar.

Install all R4 ribs; trim ends to fit as needed. Install the inboard vertical landing gear block and the 1/8 ply landing gear support strip. Using a 1/4-inch round file, true up and align the openings for the leading edge dowel in the nose ribs. Assure that the dowel seats on the bottom sheet and cement it in place, being sure of a good joint along the bottom sheet and at all ribs.

Install the three vertical 1/8-inch hard balsa compression strips between the inboard R1 ribs forward of the rear spar. Sand the ribs as required and install the aft center section 1/16-inch balsa skin. It should fit against the front of the rear spar and extend to the center of the front spar. Assure a good cement bond to all ribs.

Check the leading edge ribs for contour and for being flush with the top of the spar. Sand as required and fit the leading edge skin, cutting a jog to clear the center section skin and make it fit even with the rear face of the front spar. Wet the top surface and install; assure a good bond to the top of all ribs and the leading edge dowel. Use tape to hold it in position until dry.

Fabricate the inboard trailing edge piece from from 1-1/2x5/16-inch aileron stock, using a filler piece between it and the rear spar. Sand to fit, but do not attach. Cut a slot in the front edge to accommodate the aileron torque wire tube. Cut the tube to length and cement in place. Groove the rear face of the rear spar as required and attach the trailing edge, being sure that the bottom is flat and parallel to the bottom surface of the wing.

Ailerons may now be cut and trimmed to fit. Cut hinge slots in the ailerons and rear spar, but cement hinges in spar only. Install a piece of Nyrod in the aileron as a bushing for the torque wire. The wing tips may now be shaped and installed. The inboard leading edge of the wing is formed from three pieces of 1/4-inch medium balsa, and don't be afraid to use a bit of DAP spackle. After all, this is not a Scale Masters entry. Shape the bottom and top leading edge skins to form a smooth contour into the leading edge dowel. Recheck the wing and sand as required. Remember, bumps in the structure are lumps in the covering.

Now build another wing half: opposite please!

When both wing halves are completed, sand the inboard ribs square and at an angle to obtain a good fit with one tip elevated 1-1/2 inches. When satisfied with the fit, puncture a series of holes in both butt ribs for better epoxy penetration. Using adequate epoxy, join the halves, being sure the bottom surfaces are flat on the work surface—there is no point in building in a right or left roll now! When dry, apply three-inch glass tape to the center section, top and bottom.

Carefully measure, mark and drill the three wing mounting bolt holes. Use a 5/32 drill, drilling from the bottom and keeping the drill at 90° to the surface. Check the fuselage wing saddles for fit to the wing and trim as required. Place the wing in the saddles with the leading edge up against the back face of FB4. Be sure the wing is square and centered on the fuselage at the center section. Secure the wing and drill the three holes through the fuselage pads, also with the 5/32 drill, keeping it perpendicular to the wing bottom surface.

Remove the wing, tap the fuselage holes 1/4-20 and drill out the holes in the wing to 1/4-inch. The aileron torque wires can now be installed. Bend the 90° aileron end and slide the wire through the tube from the aileron gap inboard. Slide the ailerons onto the hinges with the 90° bend inserted into the Nyrod bushings. Center the ailerons and bend the inboard 90° vertical about 1/2-inch from the wing center line. Leave about 1-1/2 inches vertical height. Before bending, check and make sure the bend is close enough to the centerline to clear W1. Check the entire wing assembly and finish-sand for covering.

LANDING GEAR

Using 1/8-inch wire, bend two opposite gear legs. The "strut" effect may be accomplished using fuel tubing secured with a drop of cement and painted silver. The wheels used on the prototype are DuBro 2.5-inch low bounce. These assure that your aircraft will not bounce higher than 10 feet. Standard wheel collars are used. Fit the individual struts into the holes in the wing to assure that they lay flat on the wing bottom surface and that the struts cant forward to place the wheel centers directly under the leading edge.

COVERING

The prototype was covered and trimmed in Super MonoKote. The choice of covering materials and colors are obviously the builder's. The basic prerequisite to a good cover job is lots of sandpaper and a good cleaning to remove any specks and dust. Cut the covering away from any joints to be

continued on page 82

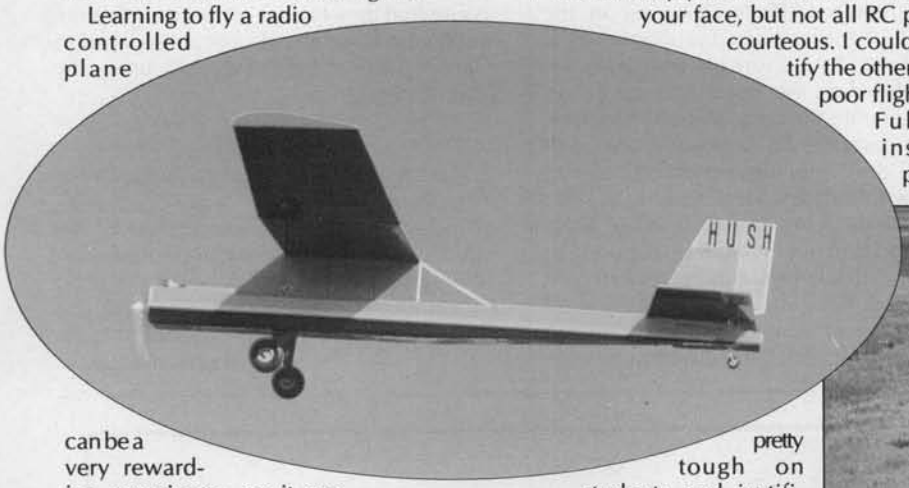
BIG BIRDS

BY BRUCE EDWARDS

TIPS FOR INSTRUCTORS

Two young men recently purchased my Humongous Sage Hen (a featured construction project in the May '89 *MB*) to learn how to fly RC. Flight instruction was included in the price, so I am back in the instructor mode again.

Learning to fly a radio controlled plane can be a very rewarding experience—or it can be the experience from hell, depending on the instructor. Instruction of a student RC pilot may result in the loss of a newcomer to our hobby or they may become lifelong RC modelers, if they enjoy the experience.



It is best to start your fledgling flier with a short course in aerodynamics so that he understands the function of the flight controls and flying surfaces, then instruct him in the functions of the radio so that he becomes familiar with all the controls in the system. It is a good idea to set the plane on the floor and let the student work the controls so that he is able to visually observe the flight controls moving on the plane as he operates the sticks on the transmitter.

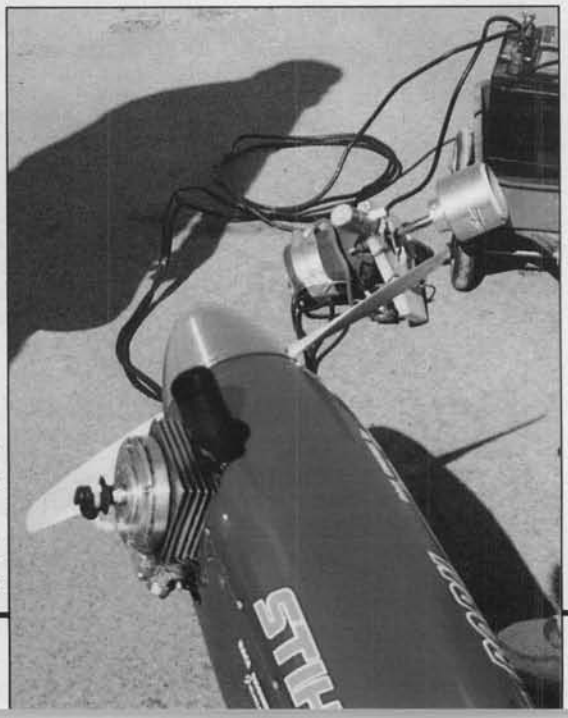
If the instructor holds the plane up and then moves it according to the controls used, the student will start to visualize the plane in three dimensions and will have a good start in preparing for actual flight.

Always impress the new RC student with the importance of following the A.M.A. safety code and any other rules you are trying to teach. It is essential to set a good example.

Young people are easily impressed, as I recently found out when instructing my two young friends. While cautioning to them to make low passes only on the far side of the runway, they indicated to me that they thought one of our local hotshots was trying to hit them. I explained that, while not a rule, common courtesy should keep your fellow fliers from flying in your face, but not all RC pilots are courteous. I could not justify the other fellow's poor flight habits. Full-scale instructor pilots are pretty tough on students and justifiably so, because lives depend on the student sharpening his or her skills. Our sport becomes life threatening only when a few basic safety rules are not followed, so there is really no reason to be a martinet! The instructor should be in control of the situation but at the same time should keep a fun atmosphere around the learning experience.

Some of the things I like to impress on my students are: Never fly alone, always have a good fire extinguisher available, and always use proper safety precautions with regard to fuel and batteries. These are in addition to the AMA safety code.

Novice RC pilots often have no knowledge of nickel cadmium battery use, so we have to explain trickle charging and expanded scale volt meter use to them. Eloy Marez has had some fine information on battery charging in past "Electronics Corner" columns, that should be very beneficial to someone new in the hobby.



(Above, left) Columnist Edwards recently bade farewell to his faithful Humongous Sage Hen, one of the finest RC trainers ever designed. He sold it to a couple of novice modelers and is currently teaching them to fly. (Above) Sam Stauffer poses with Chuck Rosen's P-51 at Madera. Sam helped several teams keep their big Unlimited racers in the air. (Left) Stinger Wallace's Stihl engine in his "Stihl-Born" P-51 was very powerful, and so was his starter. Stinger and his team worked hard at Madera and won a lot of heat money, however a nose-over on takeoff took him out of the Gold Trophy Race.

There is more to instructing the novice RC pilot than simply teaching him how to fly his plane. Take time to not only show your students how to fly, but help them develop good safety habits both at the flying field and at home. This will help them enjoy their new hobby/sport to the fullest.

It is not unheard of for the young person

you help today to go on to make aviation a career, and if you help an older person, it may enhance their retirement years.

• • •

Sullivan's new clevis with the safety clip is one of my favorite pieces of support equipment because it eliminates the need for fuel tubing sleeves or spring retainers to hold the clevis closed under flight loads. During a recent installation of one of these clevises it was apparent that my servo arm was too thick to allow the clevis to close down far enough to install the retaining clip. The servo arm was filed down carefully to a high-tolerance fit, so that there was no binding. The reason I mention this is that it is possible to make the clevis too tight on the arm and thus increase the current necessary to move the control surfaces. This would decrease the amount of time your flight pack would supply power to your control system.

Little details like this may cause you a lot of grief if there are enough of them. It is always a good idea to eliminate any friction or binding in a control system, because it reduces wear and tear on the servos and other components in the radio system.

• • •

W.G. Matheson of Colborne, Ontario, Canada, wrote and asked if I knew whether Len Bosman sells plans for his AVRO Lancaster Bomber. Unfortunately he does not, however, Lancaster plans in a few different sizes are available from Bob Holman Plans, P. O. Box 741, San Bernardino, CA 92401; telephone (714) 885-3959.

Matheson was a navigator on the Lancaster during WWII and flew the night shift while the U.S. B-17s and B-24s flew day shift bombing. He says that the Lancaster holds many special memories for him, and having viewed the R.A.F. Bomber Commands Memorial Window at St. Paul's Cathedral in London, I can well imagine the content of some of those memories. Should you ever tour St. Paul's, be sure to see that window and the American Memorial too. Our British friends have not forgotten our sacrifices.

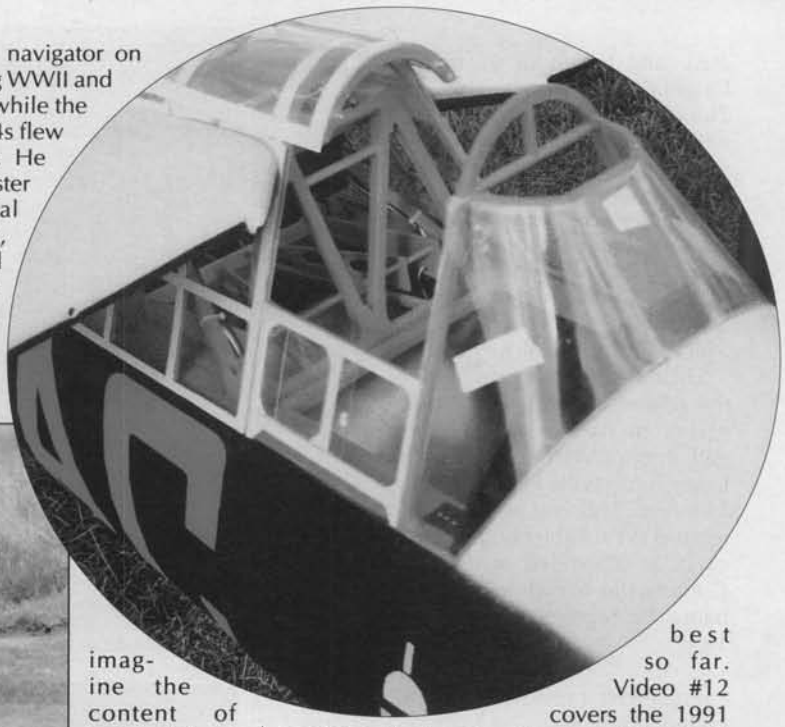
Matheson also tells me that the Canadian Warplane Heritage Museum, in Mount Hope, Ontario, has a wonderful array of full-size warbirds in flying condition, that include a Hurricane, Corsair, Mustang, Harvard (AT-6), B-25, A-26, D.H. Tigermoth, and an Avro Amson, to mention a few. Only the Confederate Air Force has more vintage aircraft flying. This sounds like a must visit to me!

• • •

I just received Dick Hansen's Scale Aviation Video #12 and have to say that it is a very enjoyable tape. Dick is improving as a video cameraman and his latest is his best so far. Video #12 covers the 1991 Q.S.A.A. Fly-In at Las Vegas and the 1991 U.S. Scalemasters, also at Las Vegas. Each event is covered with one hour of tape.

Most of us in the Northwest have seen Dick fly his Jenny at one time or another, because he has been flying it for 25 years. Now that Dick is retired he has had a chance to come up with a set of plans, with instructions, that he will be glad to sell anyone for $19.95.

Dick sent me a set of Jenny plans to review, and here is what I found. The plans come in eight sheets and are shipped rolled. The print is clear and dimensions are easy to read. The Hansen JN-4D Jenny has a 100-inch wingspan, with 1804 square inches of



(Above) Ed Hess's Westland Lysander has excellent interior detail. The whole plane is a tribute to Ed's craftsmanship. (Left) Dick Anderson gets a lot of flying pleasure out of his Ace 4-120 biplane. Saito 1.20 power and Futaba Radio. (Below) Chuck Willcox and author Bruce Edwards used to preflight 707s for their first flights at Boeing's Renton Flightline. They still fly Big Birds together. Chuck's giant "Sweet and Low" uses a Zenoah G-38 and Futaba radio.

area, and length of 62 inches. Original power was an Enya .60. The construction is not scale, but will give you a very nice standoff scale Jenny that will fly better than the real plane did.

A four-stroke .90 would be an excellent engine for this plane and would give an authentic sound for a WWI trainer. A set of vintage Williams Bros. wheels would give a nice finishing touch to the Jenny.

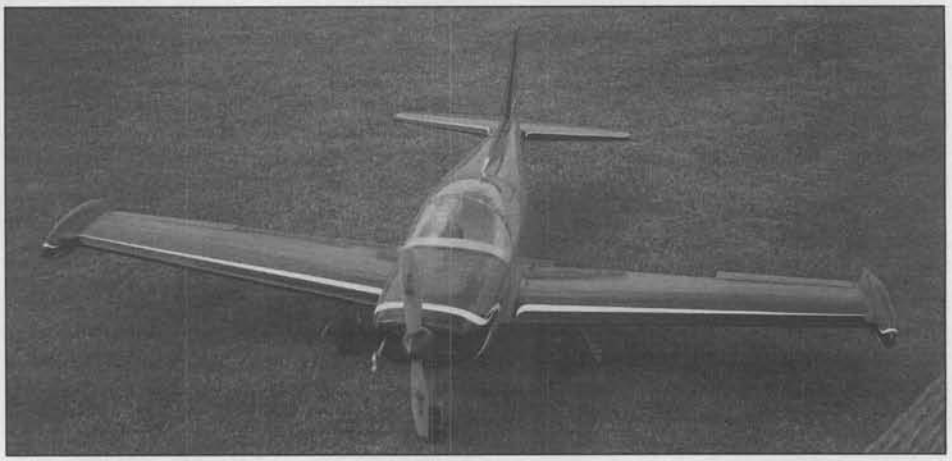
Dick also sent me a picture of the gentlemen who are the organizers of Aerodrome '92, the gathering of WWI fighters at the Lake Guntersville Fighter Replica Museum. This is a good time to remind WWI fighter buffs that the event is scheduled at the Lake Guntersville Aerodrome, in Alabama, for September 5, 6 and 7, 1992.

• • •

I received a review tape of the 1991 RC Unlimited Air Races, at Madera, California, and find that Pilot Communications did an excellent job of capturing the essence of the races. The crew that made the tape was a friendly group and I had a great time talking with them at the race. If you plan to attend or race at the next event, you should view the tape, because it will give you some idea of the intensity of the competition, and the areas you need to be most concerned with when building your racer.

Jerry Holcomb, from Vancouver, Washington, telephoned me to get some information about the rules for the plane that he will be racing in the 1992 event. I raced against Jerry in Quickie 500 a few years ago and found him to be an outstanding race pilot, always prepared to give a good accounting of himself. Jerry and his crew will be good competition, because not only is he a good pilot, but an excellent builder, too.

One area that really deserves attention is the weight of the plane. It is absolutely essential to build your big racer as light and as strong as possible. It is not possible to overemphasize this. Every avenue open to building light and strong should be explored to the fullest. Weight never helps strength and speed.



(Left) Bruce Gale is a mighty fine scale model builder and pilot. Bruce is seen here with his Hyperbipe. This fast biplane is Q-50 powered and uses a Futaba PCM for guidance. (Below) Karl Hibbs flew his new Siai Marchetti 260 at Keizer, Oregon, last fall. The quarter-scale plane has an 82-inch wingspan and is powered by a Super Tiger 3000. Karl uses an Airtronics Vision radio. (bottom) Norm Johnson (left) built this sorta-scale 43-pound Cessna 182 and Bob Kreuzinger (right) pilots the docile bird. Wingspan is 12 feet, power is supplied by a Kawasaki 3.15 c.i. engine. Radio is a Futaba.

If possible, build a model to practice closed-course pylon flying, while you build your competition machine. This will allow you to find any weaknesses in your plane and will give you the opportunity to practice flying a smooth, level, consistent course about 25 to 50 feet off the ground.

The pilots who won at Madera could hold a course that only varied a few feet each lap. Their turns were always at the same height as their straight flight altitudes. The race pilots at Madera also faced a quartering wind taking off and landing, which was fairly stiff at times. It probably contributed to some of the problems experienced by the pilots.

There are a lot of lights around an airport, along taxiways as well as runways, and several pilots came to grief when they landed long and the quartering crosswind weathervaned their planes off the landing strip. It would be a good idea to practice landing short so that your plane is practically stopped by the time it gets in front of you, especially if the event is flown at Madera again.

Great flying until next time! Bruce Edwards, 8304 53rd St. Ct. West, Tacoma, WA 98467; telephone (206) 564-4416. ***MB***

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RC SOARING

BY BILL FORREY

GREAT GREEN GOBS OF GRIMY CASTOR OIL!

Of course, we are referring to that dirt attracting, slippery, runny-nose-looking residue left behind from infernal combustion two-cycle model engines—that goo which you can never quite clean out of your transmitter or remove the smell from your clothes.

Willie Richards studies a very exciting sky crammed full of thermal clouds as he holds his Cox .049 powered Bridi Aircraft Designs "Kastaway." Obviously he's mentally preparing for a 15 minute Texaco-style flight a la RC Duration!

The very same stuff which gave many a brave WW-I fighter pilot regularity (frequency?) of lower GI movement—CASTOR OIL—appears to be making headway among those who love to work thermal currents in the proverbial "river of air."

What does castor oil have to do with gliders? Ordinarily, nothing at all. However, there are a few (whose numbers are growing) who have found a way to incorporate the fascination of model glow engines into the classic soaring framework. Call it motorgliding or powered soaring or whatever you will, it can be a lot of fun. I know, I've tried it!

Actually, powered takeoffs and gliding descents have been successfully combined since the beginning of the model aircraft movement. Replicas of these antique and classic models are found every month in the "Plug Sparks" column by John Pond. So, in effect, the modern RC Duration movement, as it is called, is no more than a radio controlled re-invention of the wheel.

Willie Richards, 980 S. 4th St., Beaumont, TX 77701, has become a fervent promoter of the two basic forms of engine powered soaring, namely: AMA RC Duration and AMA Climb and Glide. He submits his comments and photos this month for our enjoyment and enlightenment.

RC Duration (AMA event No. 702) is very much like 1/2A Texaco in the Old Timer movement. In fact, Old Timers are welcomed within the rules and can be very competitive too.

The RC Duration rules allow any design that is powered by a reed valve .049, regardless of its date of origin. There are some limits imposed on the design, such as a 60-inch wingspan, seven-inch maximum prop diameter, minimum eight-ounce wing loading, and no gas tank larger than 8cc (standard equipment on the Cox Black Widow, Cox Golden Bee, and Cox .049 Texaco engines).

At last summer's Baton Rouge RC Club's RC Duration meet, this Fox .15 powered original design motorglider was seen screaming up to 1,100 feet in under 60 seconds in the Climb and Glide event.

In this event, you simply fly out that 8cc tank of fuel then try to stay in the air for a total of exactly 15 minutes. If you fly past 15 minutes, the time over 15 is deducted from your score.

Climb and Glide (AMA event No. 703) is a limited engine run event. Here you run your engine for a maximum time of one minute, at the end of which you must be completely power off and gliding. At this point there are a couple of ways to run the event. You can follow the ratio scoring per the AMA Rulebook, or do like the Baton Rouge RC Club does by making it a 14-minute thermal flight.

The BRRC allows any model with a .25 cu. in. or smaller engine to compete in their Climb and Glide. According to BRRC, these

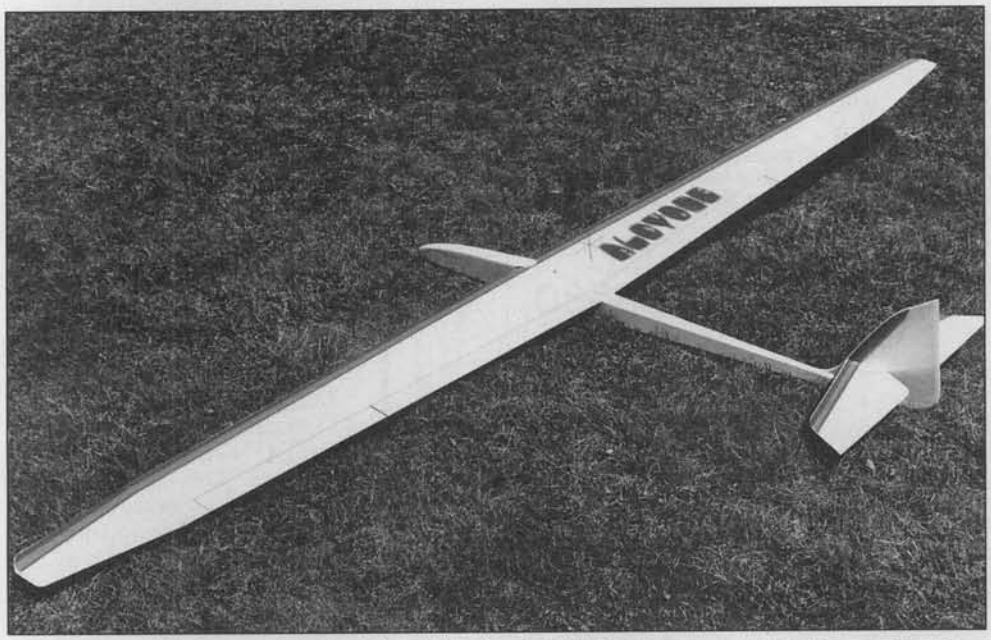
The father and son team of Bob and Chris Doreray prepare for liftoff in the Climb and Glide event with their .15-powered Bridi Windsurfer at the Baton Rouge RC Duration meet. No broken winch lines for this glider!

changes " . . . allow standard RC engines to be competitive by eliminating the need for very high horsepower. As the name implies, the way to win is climb as high as you can in one minute, shut down the engine, and glide for 14 minutes. Two-meter gliders with .15 engines should be very competitive."

Quoting from Richards' letter where he reports on the 3rd Annual BRRC Club RC Duration contest, "In the Climb and Glide event, it was heartwarming to watch some of the .15, .19 and even .25 powered planes climb to approximately 1,100 feet in a minute. Fifteen minute durations were easy to come by. Second place winner in this event flew a Society of Antique Modelers (SAM) legal Cleveland Playboy Sr. Cabin which climbed like a scalded dog."

Personally, I have flown .049 and .15 glow engine powered motorgliders before and have found them a fascinating change of pace. If you are interested in trying either of these formats, just remember to keep the noise down and fly away from populated areas. Don't jeopardize established soaring-only fields by breaking the rules with an engine. Have fun!

Thank you, Willie, for calling our attention to this interesting form of motorized soaring!



Northeast Sailplane Products now offers this cost effective, simple, high performance thermal duration model, the Culpepper Models "Alcyone." Skinny fuselage, high aspect ratio foam core wings, and modern airfoils team up for max L/D.

NORTHEAST SAILPLANE PRODUCTS

Sal DeFrancesco sends word of several very interesting new products which he alone sells under the Northeast Sailplane Products banner.

For anyone not familiar with this relatively new company, let me say that it is one of only two sailplane-only mail order houses in the United States and is the biggest of the two. Sal DeFrancesco is the president of the company and the chief "salesman," Stan Eames is the VP and computer operator, and Jay Kempf is the resident aerodynamicist and engineer.

For seven dollars sent to NSP at 16 Kirby Lane, Williston, VT 05495, a 100+-page catalog of everything NSP carries will be sent to you via first-class mail. This catalog is the most unusual I've seen in the hobby industry. It is loaded with information about each product (not so unusual), and there are also technical articles, how-to articles, and airfoil descriptions just like in a model magazine. The following are some of NSP's latest offerings:

ALCYONE SAILPLANE

NSP offers a new glider kit made by Culpepper Models called the Alcyone. It's a 121-inch span thermal competition model with a built-up wood fuselage and tail, a set of foam core wings, and extensive hardware. The wings are balsa sheeted, then covered in a heat-shrink film of the modeler's choice. The Alcyone's airfoil transitions from an SD7032 at the root to an SD7037 at the poly break. This combination of airfoils works very well at the Alcyone's 9.6 ounce wing loading.

The Alcyone is unique among thermal competition ships in that it is a reasonably priced ($149.95) high performance sailplane. Controls are simply rudder, elevator, flaps and ailerons. These surfaces are designed to be driven by only three servos, which further reduces the cost of total flightworthiness. In spite of this arrangement, NSP claims that 80 to 90% of the airfoils' (camber changing) speed range is available without going to a four-servo wing (a six servo model). Alcyone tows extremely well, giving high launches off of winches or hi-starts.

As an after-market upgrade, a new fiberglass and Kevlar replacement fuselage is now available for the Alcyone. Further simplifying and streamlining this design, the glass fuselage is fully retrofitable to existing wings and tails. The Kevlar gives incredible resistance to breakage on hard landings while the fiberglass gives more than adequate stiffness. The original lines of the Alcyone are kept, but a removable nose cone has been added for extra strength and accessibility to the interior.

For current wood-fuselage Alcyone owners, replacement glass fuselages cost $59.95. Alcyone kits with the new glass fuselage included will go for $199.95.

SPARROW AND SWALLOW SLOPE GLIDERS

According to NSP, the Sparrow is a very slick V-tail slope ship with simple construction, streamlined design, and outstanding performance. Its balsa sheeted blue foam core wings span 65 inches and sport the SD7080 airfoil. This combination gives the Sparrow a wide speed range and excellent slope handling. The controls are simply ailerons and elevator, driven by the required micro servos.

Sparrow's all-up flying weight is 23 ounces. At this light weight, it will fly in very light lift, but when ballasted and flown in heavy lift, satisfying high speed aerobatics are possible. Beauty, performance and versatility make the Sparrow a "must have" aircraft for slope enthusiasts.

The Sparrow kit features an epoxy fiberglass fuselage with removable canopy, all necessary woods, and complete hardware. The NSP price is $99.95.

The Swallow is very

Northeast Sailplane Products' Sparrow slope sailplane is a highly versatile, aerobatic, two-channel bird with balsa-sheeted foam core wings and glass fuselage. Its fully glassed wing brother is the Swallow; see text.

similar to the Sparrow, but it has a grey foam wing with vacuum bagged fiberglass and carbon fiber skins. Also, the Swallow uses the SD8000 airfoil, and the fuselage is slightly different allowing for the different airfoil and the ability to add more ballast. The wing design calls for two servos to be mounted inside the cores for camber changing flaperons. The NSP price for the Swallow is $169.95.

PINNACLE HI-START

NSP now offers model sailplane thermal hitchers a way to get their birds airborne! The Pinnacle hi-start features UV protected one-piece rubber tubing, specially made fluorescent orange towline (easy to find in any terrain!), top quality fittings, and a custom made, wear resistant parachute that won't tangle. The reel is easy to use and very durable, and features a snap to carry the included capped steel stake.

The Pinnacle is available in a variety of sizes to fit various launching needs. The "L" size is the most popular and is designed for two- to three- meter sailplanes (the majority flown in the U.S.). It sells for $69.95 directly from NSP.

AIRFOIL OF THE MONTH: SELIG-DONOVAN SD6080

This month's offering is yet another high performance airfoil created by the team of Michael Selig, John Donovan, and David Fraser about three or four years ago. Designed using a modern computer program and tested at Princeton University in one of the few *quality* low-speed wind tunnels in the world, this airfoil is a darned good one to try on your next thermal duration or light lift slope design.

Quoting from the book, *Soartech 8—Airfoils at Low Speeds*, where this airfoil was first officially published, "The SD6080 is an improvement over the S4061." (The S4061 was used, although slightly modified, in a couple of good sailplane designs by Paul Carlson, the two-meter Prodigy and the Unlimited Class ship known as the Quasoar, now kitted by Ace R/C.) Continuing from the book, "Although the high-lift characteristics of the two airfoils are much alike, the SD6080 offers improvements at the low-lift end of the flight envelope. The drag over most of the (lift vs. drag) polar is lower, particularly in those areas which are used by a typical RC sailplane."

As often as I can, I give first hand testimony regarding the performance of any airfoil mentioned in this column. This time, I have searched through my club newsletter archives and have found the February 1991 *Long Island Silent Flyer* (Gordon Stratton, editor). In this issue is an article entitled "Crossfire Experiments—SD6080 Airfoil" by Doug Barry. Barry relates how the club's "Wing Commander" recommended that he give this airfoil a try. The Crossfire, I believe, is a cross country sailplane, although nowhere in the article is that specifically mentioned.

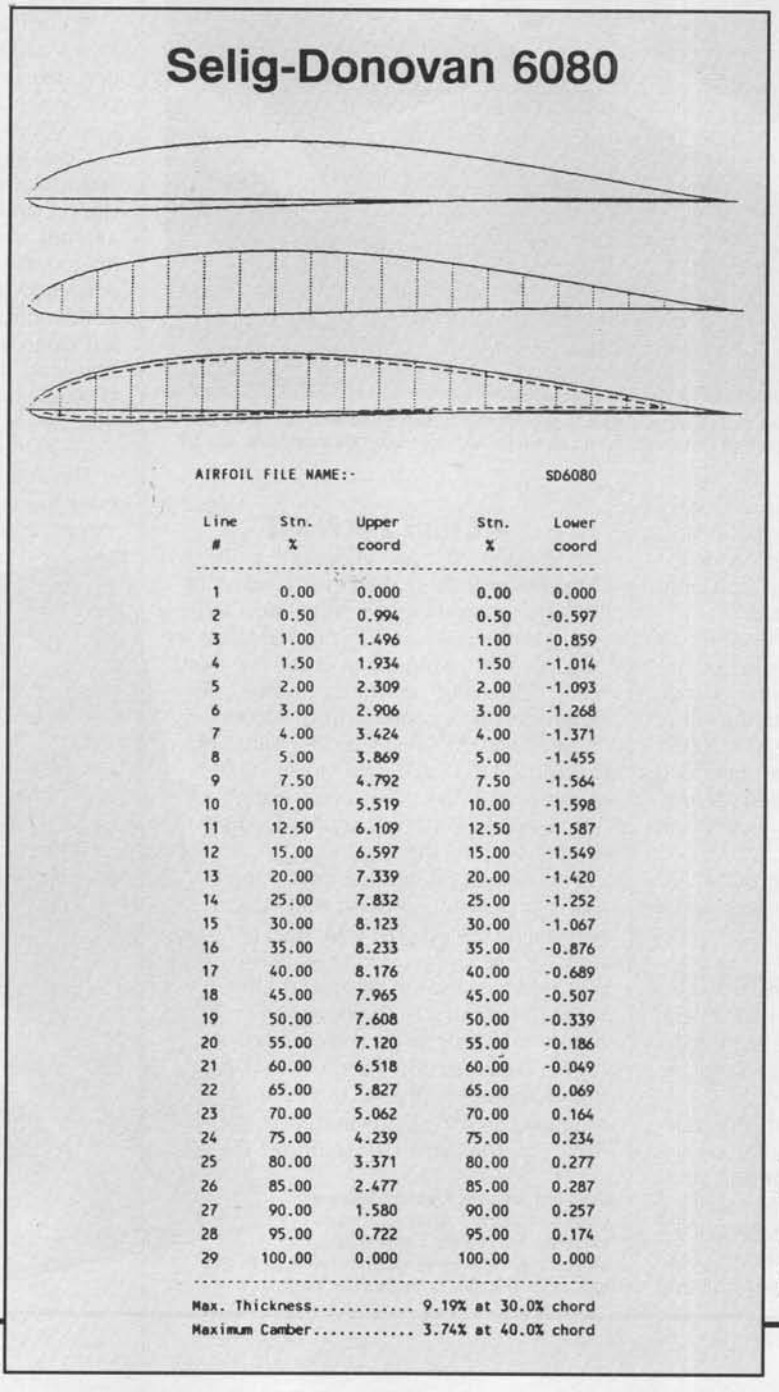
After running it through a performance predicting computer program and finding it not any better than the current batch of favored airfoils, and after trying several of these other airfoils on the Crossfire beforehand, Barry finally built an SD6080 wing. What he found was that the SD6080 didn't quite have the weight carry ability of the E-214, didn't have quite the maximum L/D (glide ratio) or "running" ability of the SD7037, didn't have any of the sudden stall of the SD7037, and that it was more versatile than the "one speed" FX60-100 with its very thin trailing edge. (He has also flown the likes of the popular S3021 and S4233 airfoils.)

Barry claims (in all capital letters) that the SD6080 airfoil is the "BEST THAT I HAVE FLOWN." Why? The answer was a difficult one for Barry, but he sums it up as follows. He admits there are other airfoils that will outperform the SD6080 in some aspect of flight, but for *overall* flight performance, the SD6080 is "absolutely smooth," consistent and predictable. Gradual changes in trim tab settings (up or down) produce gradual changes in forward speed. "This makes the airplane WONDERFUL TO FLY."

Barry concludes, "I am of the old school that has said that a higher L/D is the only real improvement. This airfoil has taught me a new lesson. A small loss of absolute performance can be more than made up by an improvement in the smoothness and broadness of the performance curve. I guess all the educated types out there are laughing because they always knew this. Am I going to change airfoils now? I already have, this is really a good one, and it has made the building program worth all the time and the money. It matches into my Crossfire design excellently and is a joy to fly."

Give the SD6080 airfoil a try. Then I'd like to hear what you think of this section. If you wish to pick up a copy of *Soartech 8—Airfoils at Low Speeds*, which is a one-inch thick volume, write to Herk Stokeley, publisher, 1504 No. Horseshoe Circle, Virginia Beach, VA 23451, with a check for $20.

The RC Soaring Airfoil of the Month is the SD6080 by Michael Selig and John Donovan: a good all-around airfoil for thermal duration under a variety of conditions. Artwork is provided by Cygnet Software and is one sample page among more than 50 found in the new "Airfoil Data Files for Foiled Again!!! Disk A." See text for details.



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7	4.00	3.424	4.00	-1.371
8	5.00	3.869	5.00	-1.455
9	7.50	4.792	7.50	-1.564
10	10.00	5.519	10.00	-1.598
11	12.50	6.109	12.50	-1.587
12	15.00	6.597	15.00	-1.549
13	20.00	7.339	20.00	-1.420
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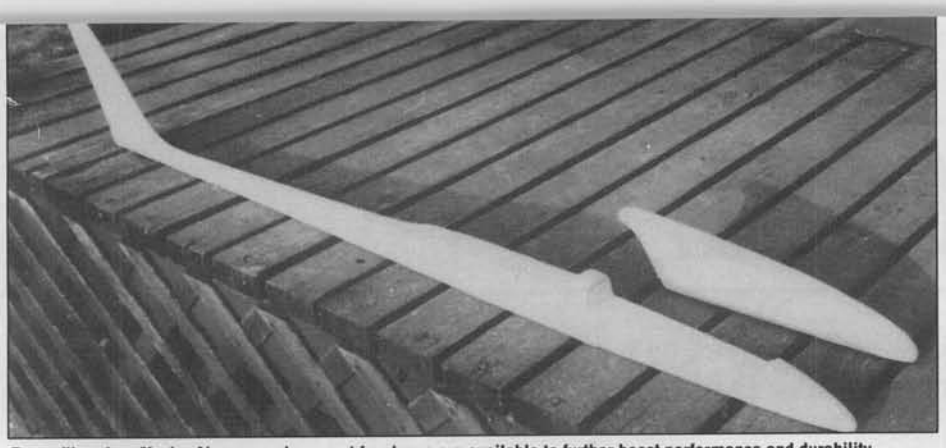
23	70.00	5.062	70.00	0.164
24	75.00	4.239	75.00	0.234
25	80.00	3.371	80.00	0.277
26	85.00	2.477	85.00	0.287
27	90.00	1.580	90.00	0.257
28	95.00	0.722	95.00	0.174
29	100.00	0.000	100.00	0.000

Max. Thickness..... 9.19% at 30.0% chord
Maximum Camber..... 3.74% at 40.0% chord

CYGNET SOFTWARE "FOILED AGAIN" AIRFOIL DATA FILES AVAILABLE

If you have the "Foiled Again!!!" computer program or are thinking of buying it, and/or if you just want to see what the most popular airfoils best suited to model sailplanes look like, you will want to pick up



Epoxy fiberglass/Kevlar Alcyone replacement fuselages are available to further boost performance and durability.

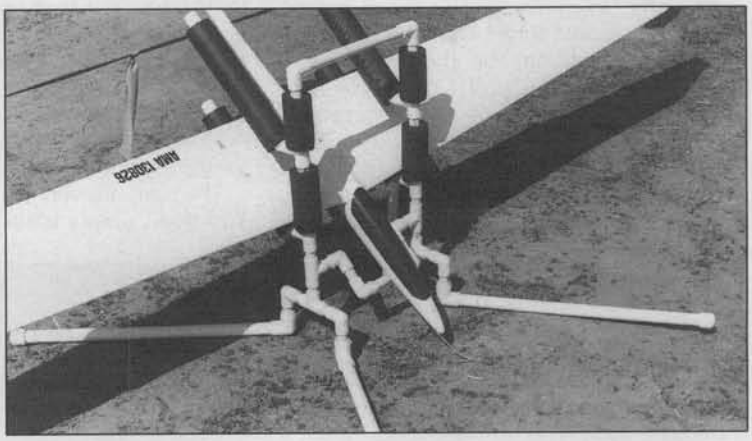
Cygnet's latest offering, "Airfoil Data Files for Foiled Again!!! Disk A." The manual and floppy contain 51 of the most commonly used profiles from the Clark-Y to those of Eppler, Selig, Selig-Donovan, NACA, Bame, Fraser, Renaud, Blanchard, Miley and more. In the manual, each airfoil is drawn three ways: 1) with centerline; 2) with station lines; and 3) with skin thickness, station lines and centerline. This way you can shop for a special airfoil visually without first having to call it up on Foiled Again!!!, then print it out on paper (a time consuming job). Disk A contains all the thousands of four-digit data points required to output all 51 airfoils in the manual. Considering that it would take you anywhere from 12 to 20 minutes to enter a single, typical 61-station Eppler airfoil, that's a heck of a lot of data entry already done for you!

The initial price has been $25, but you should contact Cygnet Software for the current price. Please inform Cygnet of your floppy disk drive size and format. Write to 3525 Del Mar Heights Road, #237, San Diego, CA 92130, phone (619) 792-8021. Please note the new address and phone.

Free flighters, scale enthusiasts, sport modelers, and old timers beware! More data disks and manuals are on their way from Cygnet! Stay tuned!

TIME TO SOAR!

I welcome your phone calls, editorial contributions, and your feedback. I much prefer phone calls over time consuming letter writing. My phone number is (714) 245-1702, and my address is 3610 Amberwood Ct., Lake Elsinore, CA 92530. Please call between 6 p.m. and 9:30 p.m. Pacific Time. ***MB***



Want to keep your bird off the ground and out of harm's way? One modeler chose to scratch build this stand from one-inch PVC pipe and insulation foam. Neat! Could you design one better?

STRICTLY SCALE

BY AL TUTTLE

SAE "AERO DESIGN" COMPETITION

This month I am going to deviate a bit from the scale scene and talk about an intriguing event that is held annually every spring. This event is the SAE International Radio Controlled Cargo Aircraft Competition. The first competition was held in the spring of 1986 at the the KCRC club field, Lake Jacomo, Missouri, and has been held in different parts of the country annually. The name of the event is a mouthful, so it is simply called "Aero Design," followed by the current year. This year it is Aero Design '92.

The first that I heard about this competition was December of 1986, when John Britt and has lovely wife, Carol, visited us on Maui over the holidays. John was involved in helping run the event at the KCRC club field and his description of it was very interesting. We both thought at the time that it would be a high profile event because of the wild and original designs that would come from the fertile imaginations of the students. Other than a small blurb in one of the model magazines that covered the '86 competition, this event has sunk into oblivion as far as the general RC modeling public is concerned. This is too bad; from the videotapes that I have viewed that were made by members of competing teams, it is a highly entertaining event. There is high drama (Will it get off the ground? If so, can we get it back in one piece?); highly original planforms, etc., as well as the enthusiasm of the competing teams.

It ain't scale, but it sure is interesting! Seen here is the team from Embry-Riddle Aeronautical University with their entry in the SAE Radio Controlled Cargo Aircraft Competition, other known as "Aero Design." Models are designed to carry as much weight as possible, while remaining within specific design parameters. In foreground, l to r: Steve Royer, Todd Lee and Jeremy Chapman. Standing: Dan Abel, Hector Gonzales, Lee Riedel, Richard Orobetz, Steve Turner and Tom Albert.

The following is from the SAE competition rules:

OBJECTIVE AND SCOPE: The Aero Design competition gives the students of engineering disciplines an opportunity to apply the knowledge learned in the classroom on a practical problem. It was designed to provide a challenging and educational project to stimulate interest in both aircraft and design and the Society of Automotive Engineers. Contestants are to design and build an original scratch-built radio controlled aircraft based on a 0.61 cubic inch glow ignition engine and a maximum planform area limited to 1200 square inches. The competition tests each team's ability to predict the performance of their design as well as determine which entry will carry the most weight aloft from a 200-foot takeoff strip.

The rules are very stringent and explicit. You don't simply whip up an aircraft and then keep modifying it until it will lift a heavy load.

AIRCRAFT CONFIGURATION: Only fixed-wing, heavier-than-air aircraft are allowed to compete. Maximum planform area is limited to 1200 square inches with all flying surfaces (including flaps) positioned for maximum area. Planform area includes area of the fuselage, horizontal stabilizer and all flying surfaces positioned for maximum area projected vertically downward on a flat surface. Planform area also includes the area of the engine extension from the fuselage (excluding prop), landing gear struts and any slot overlap. Vertically overlapping surfaces are considered as separate when calculating planform area; area for each surface is included in the calculation. Point penalties are given for entries that do not agree with the pre-submitted plans and for every ten square inches over the 1200 square inch maximum.

The 0.61 cubic inch engine has to be stock. Tuned pipes or power augmenting devices are not allowed. Although the rules state that any 0.61 glow engine can be used, in practice only K&B .61 engines are used. This is the engine that has been used since the first competition and is specified in order to compare results from previous years. Tank size, Rx battery pack capacity and spinner or rounded spinner nuts are dictated. The flight safety rules appear to be the same as the AMA rules. The pilot of the aircraft does not have to be a member of the group entered in the competition as designers and builders, but does have to be a member of a nationally recognized model aircraft association such as the AMA. The pilot has to prove that he is a member of that organization via a current membership card, not an application form and check. In other words, you cannot join the AMA at the competition.

There are two sections or parts to the competition: Flight Competition and Design Competition. Thirty days prior to the flight competition, each team must submit detailed plans for the aircraft that is to be flown. Plans have to be full scale and fully detailed with all three-views, dimensions, planform areas, and the required bill of materials with stock sizes noted. Along with the plans, a report is required detailing the methodology and results of the design calculations performed to estimate the maximum payload of the aircraft. Additional points are given for innovation and originality of the design and construction of the aircraft. A panel of SAE engineers evaluates the plans and aircraft specs. Prior to the flight

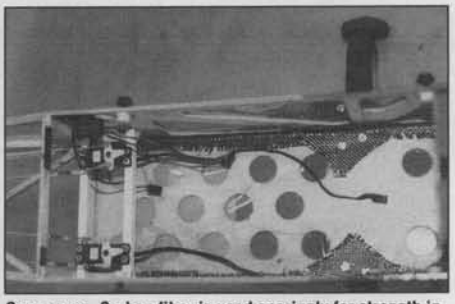
competition, each team is allowed ten minutes to give an oral presentation to "sell" their design to the panel of SAE engineers.

FLIGHT COMPETITION: As stated earlier, the plane has to lift the designed weight. A scoreboard is set up with each team's stated design lift weight. Each plane is required to carry a minimum weight of eight pounds on the first day of the flight competition to qualify. Test flights for trimming purposes without the qualifying weight may be allowed, but do not count as an official flight. Weight is added in 1/4 pound increments.

Time allocated for each round depends on the number of teams competing. Five minutes is allowed to start the engine and take off. The plane must be airborne within 200 feet, make a 360-degree turn and land back on the 200-foot runway. Penalties are assessed if the plane does not get off in 200 feet. On landing, the plane has to touch down on that 200-foot section. Rollout past the designated runway is allowed. The aircraft must take off and land with all the same parts attached to receive any points for the attempt. Fuel for the competition is supplied by the contest directors and is the only fuel used for the competition.

PROTESTS: The decision of the chief steward is final! Any argument with the chief steward or any Aero Design official after a decision has been rendered will result in the immediate expulsion of all team members from the Aero Design competition. You and your team will be immediately escorted from the grounds! An individual and his team will be accorded that same penalty for the following: Violation of any safety rule, argument or disobedience of any Aero Design official, and use of any alcohol or any other drug.

Side view of ERAV's Aero Design entry. Note composite landing gear with spreader, tiny wheels, and undercambered, inverted airfoil full-flying stab. Engines used in all Aero Design entries are K&B .61s.



Cargo area. Carbon fiber is used sparingly for strength in high-stress areas. Use of pull-pull cables to the tail surfaces keeps weight to a bare minimum.

Aero Design 1992 host is the SAE chapter at Embry-Riddle Aeronautical University, Daytona Beach, Florida. The DeLand Golden Hawks is the host RC club, with the flight competition taking place at the club field adjacent to the DeLand Municipal Airport.

Dan Abel is the driving force behind ERAU's two team entries and has competed in the '86 and '91 competitions. The ERAU team performed very well at the Aero Design '91 competition held at Wright-Patterson AFB, Dayton, Ohio, last April. They placed second overall and lifted within a pound of what their predicted cargo was going to be. Dan says they were pretty confident that they could lift the predicted weight. He showed me a sub-scale wing of last year's model that they used for wind tunnel testing.

It was interesting to note that the wind tunnel/computer figures compared very similar to the actual model flight characteristics. Dan stated that they were able to make these numbers mean something. With this data they were able to determine how much weight they could lift within a set of given parameters (e.g. headwind, temperature, etc.).

The ERAU team members stated that a very important part of being successful in the competition is to have a good background in modeling and RC. They stated that you can crunch numbers with the computers and come up with the figures that would satisfy the SAE panel, but experience gained as modelers tells them that although the numbers may be in the ballpark, considerable massaging is required to obtain a real world, flyable airplane.

Dan tells me that the maximum official weight lifted in the 1991 competition was 23.25 pounds. One team lifted 26 pounds, however, a wing folded on the turn to final which disqualified the flight.

The ERAU team students are from the Aircraft Engineering Technology Department and the Aviation Technology Department. The official faculty advisor is Bill Koselka. The teams depend heavily on sponsorship from the school, hobby shops or any individuals. In addition to the material cost, SAE charges $150.00 for each aircraft entry. When asked what the prizes were, I was told there ain't any—only a plaque and bragging rights until the next competition. As of this writing, over forty schools have entered Aero Design '92. If you are in the area Friday, Saturday and Sunday, May 1-3, come on up and watch this fascinating event. DeLand is about a 45 minute drive on the I-4 freeway from Orlando.

If any of you are approached by an Aero Design team for sponsorship or help in any way, be supportive, as this is where our next generation of aeronautical engineers, mechanics and technicians are coming from, as well as being a good image for our sport.

Al Tuttle, 4223 New Haven Court, Port Orange, FL 32127; telephone (904) 760-4246. ***MB***

RC PYLON

BY WAYNE YEAGER

THE FUTURE OF QUARTER MIDGETS?

There was a recent ruling by the Racing Contest Board related to radii on Quickie fuselage exteriors.

A kit manufacturer called to ask if he could put a large Formula I type wing fillet on a fiberglass fuselage for a proposed new Quickie kit, as there is already one on the market with this feature.

This writer was called because of my being on the racing board. I didn't think this was legal, because the rule clearly states that all outside corners cannot contain a radius larger than 1/4-inch. The wing-to-fuselage juncture is an inside corner, so our thinking was that this area is covered in the rules. However, we wanted the board to respond to this question, so a letter explaining the question and a ballot was sent to the entire Contest Board requesting an interpretation of the rule.

Needless to say, the return vote was 9 to 1 against allowing this feature. Several people on the Contest Board were involved with the original language for the rulebook, when Quickie became an official event, and they were adamant in declaring a fillet of this type as being absolutely contrary to the intent of the rules and not legal.

Therefore, if you purchase a kit with any built-in fillet larger than 1/4-inch radius, or install your own, you are flying an illegal airplane. It's that simple. Quickie was meant to be a simple box construction with no fancy stuff, but stuff of all kinds is starting to show up and it's going to ruin a good event.

Unfortunately, most of the bend-the-rules stuff I see is from the old-timers, the experts who need faster airplanes like I need another hole in the head. Most of them can beat the newer guys hands down, but they still persist in looking for that tiny edge that will help them beat the other experts. This is what's giving Quickie a headache.

On another subject, we must start thinking of the future of Quarter Midget rather than wait until it's too late.

Quarter Midget flying has been reduced to the same syndrome as Form I; the only people flying it are the diehards, the people who really like the event and won't let it die. Maybe "diehards" is a poor choice of words to describe these people, but they do hang on and there's no other fitting description.

There are a few people who come on board every year, but the new people are a very small number. Not like it was several years ago, when Q-M was a training area and a steppingstone to Form I. Quickie is now supposed to be that steppingstone, but things are not going that way.

There are people who fear Quarter Midget is in further trouble since Quickies have suddenly become faster on account of the Nelson Engines. Several have stated that as Quickies are easier to build and there are more Quickie contests around, that the number of Q-M contests may start to decline, which could be the beginning of the end.

So the future of this popular event must be considered. What can we do to keep it alive? The most obvious change is to make Quarter-Midgets faster than Quickies and maintain that edge. How to do that?

People fear Quarter Midget is in trouble since Quickies have suddenly become faster on account of the Nelson Engines.

There are several ways, starting with allowing tuned pipes or any muffler that greatly improves the performance of the engine. Quickies are capable of times in the 1:04 range and most Quarters are ten seconds back, so we are looking for a minimum of a second a lap.

A tuned pipe would be the most logical thing to try, because it would not obsolete any current equipment, and adding pipes is not a too-difficult task on most kits. Plus, it would help in the never-ending saga of noise reduction. However, this may not be enough.

Maybe we need a little more than what pipes could give us and if so, I suppose we could start using more nitro. We would be obligated to put up with the cost, availability and all the associated drawbacks. In any case, neither of these changes would require rebuilding your plane to incorporate them.

If none of this works, then the next step would be—and I'm not too sure that maybe this shouldn't be the first step—go to larger engines.

The Aussies run .21's in their Quarters and they go pretty darn good, considering they run no nitro. Their times are as good as our Quickies and they run stock .21's with pipes. There are a bunch of good .21's on the market, so we would have several options rather than having to buy the only game in town, as we now do.

So what say you? We need some thoughts from people out there, because I believe this summer should be the start of something new in Quarter Midget. If there is someone running a Q-M contest who would be willing to give one of these suggestions a try, or one of your own, maybe we will find the future of Quarter Midget so us "diehards" can continue with an event that we like—a fun event.

Anyone interested?

• • •

The Nats this year are in Chicopee, Massachusetts, a site we visited in '83 and '85—I think. It's a good site with miles of concrete and no grass. I recall pounding tent stakes into concrete expansion strips, which bent them all out of shape. There is no grass where the pylon pits will be, therefore, you guys with these nice flat top tents/canopies, bring yourself some weight to tie them down...sandbags, concrete blocks, your mother-in-law, whatever, because no tie-down means goodbye tent if a thermal comes through.

At last year's Nats, we were somewhat lax in checking airplanes for minimum dimensions and such, because we wanted everyone to fly. However, I find that the more lax we are, the more people attempt to take advantage of us and bend the rules farther than ever.

Therefore, look out this year! Some of the things we let slip by will not be tolerated in 1992, like Quickies without a removable hatch or a see-through window in the tank area. Read the rulebook and be right! Another item is identification, including AMA numbers and such on the wings or fuselages.

Another item is non-working RC carbs. This year, the barrels rotate for idle or shut-off or no fly! We took enough flak last year from trying to be mister nice guy, but no more! By the way, you prop modifiers (and you know who you are) may get a little surprise this year!

Read your rulebook, and if you're not sure of something, call the Racing Contest Board Chairman for an interpretation, or ask for an interpretation vote from the entire Board. You have this right if you disagree with the Board Chairman's opinion, so utilize and exercise your rights. Whatever you do, make yourself legal for the Nats. ***MB***

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HANNAN'S HANGAR

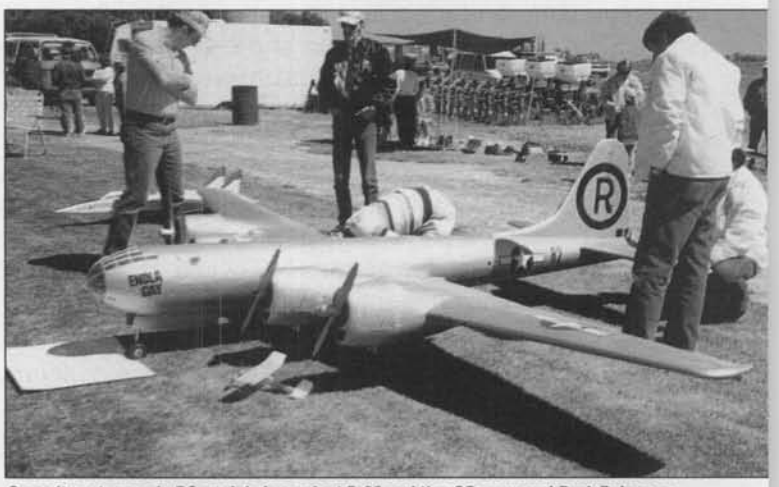
BY BILL HANNAN

"In every real man a child is hidden that wants to play."

Our quotation this month from German philosopher Friederich Nietzche (1844-1900) was brought to our attention by author/model builder Bill Warner. And isn't "play" what our hobby is all about? Why are so many people unwilling to admit that they *enjoy* playing? Certainly no apologies are heard from those who play golf, tennis or baseball! Why not release those lingering inhibitions and truly bask in the fun of "playing with toy aeroplanes!"

YEAR'S END

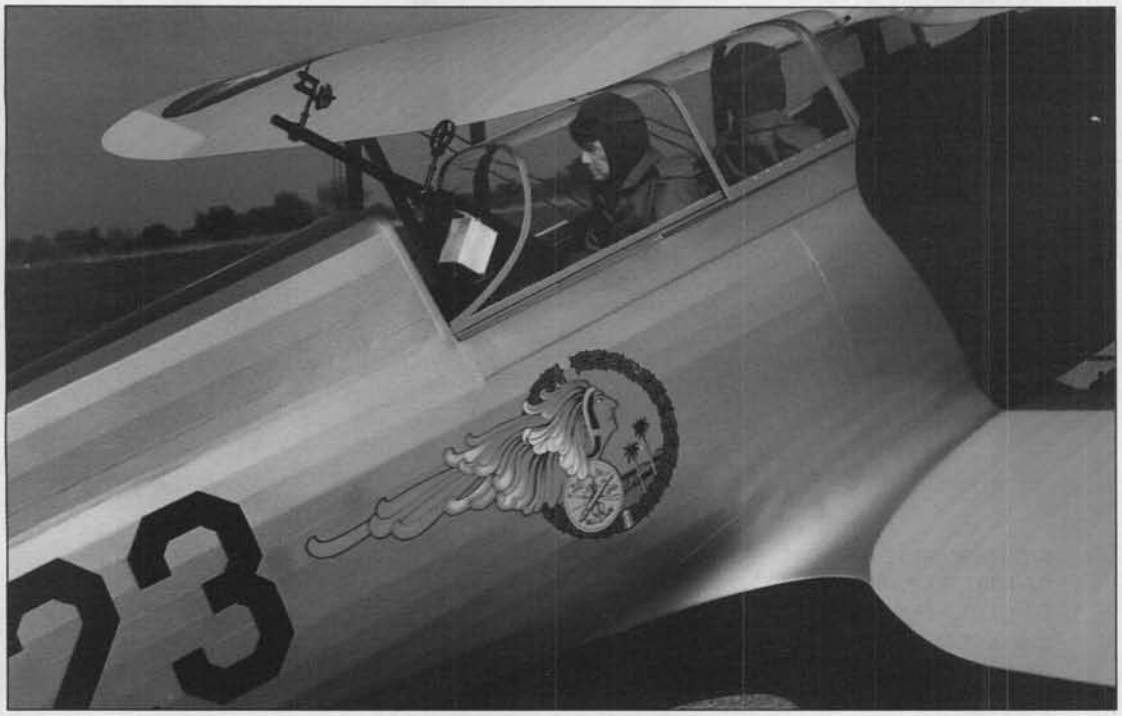
Though you may be reading this well into 1992, it is being composed during late 1991, traditionally a time to reflect. To paraphrase reader John Blagg, of England, "I have not finished with this year, but it makes no difference—here is the next one! Somehow the older I get, the more time I need, and the quicker time goes..."



Opposite extremes in RC model sizes: giant B-29 and tiny CO_2 powered Peck Polymers Prairie Bird, seen at a Georgia fly-in. Fritz Mueller photo.

In the inner sphere of our hobby, times continue to be fascinating, with exciting developments in every specialty. Giant scale models continue to increase in size and complexity, while mini-models grow smaller and quieter. Nostalgia persists as a powerful influence, with constantly expanding interest in "good olde days" modeling, perhaps harking back to memories of less turbulent times and fond memories of youth? Whatever the motives, modeling remains a most satisfying proposition.

We are grateful to the publisher, editor, entire staff and to our many faithful readers of *Model Builder* for your continuing support. We wish all of you a healthy and successful 1992.



This outstanding RC Waco S3HD-A exhibits the wonderful craftsmanship of master modeler Claude McCullough.

Certainly it was a year of worldwide changes, many with disquieting implications. Perhaps our model building activities represent an increasingly important counterbalance for our emotional stability?

COMET FOUNDER HONORED

According to the Detroit Cloudbusters newsletter, William Bishop, president of the original Comet Model Airplane & Supply Company, has been elected to the Academy of Model Aeronautics Hall of Fame. This is a fitting tribute to the guiding light behind the firm which produced so many model kits, including the universally remembered ten-centers.

During a recent telephone conversation, Bill Bishop expressed appreciation for the recognition, explaining that he was gratified to be honored for achievements of so long ago, and recalled his time at Comet among his most treasured memories.

LIFE ACHIEVEMENT AWARDS

Bill Bishop had been among those receiving the Detroit Cloudbusters Life Achievement awards during 1990, and the list of 1991 recipients has now been announced. These individuals were selected by virtue of their

Gorgeous free flight Waco SRE by Bob Schlosberg of Scottsdale, Arizona, spans 31 inches and flies beautifully.

contributions to flight, whether in model or full-size categories.

The awardees are:

Lin Reichel, long a sparkplug in the Flying Aces Club, as well as tireless editor of its newsletter. FAC is the largest flying scale model movement in the world, with many branches in widely-spread geographical locations. Lin deserves much of the credit for maintaining the organization's accent on the fun aspects of the hobby, rather than politics.

Herbert Kelley, aviation historian and model enthusiast extraordinaire. A total aviation person, Herb's interests span the entire spectrum of flying, from research to writing to model design to museum display consultation and construction.

Art Adamisin, a legend in control line circles, known not only for his dedication and talent, but for his willingness to help fellow modelers.

Burt Rutan, who started as a model builder and became one of the most innovative and accomplished aircraft designers of all time.

Jeanna Yeager and Dick Rutan, heroic aviators who successfully piloted their radical Voyager non-stop around the world.

IN REMEMBRANCE

Sadly, modeldom lost some staunch supporters during 1991. Among them was Salvatore Alu, a highly-respected builder of rubber-powered flying scale models, whose craftsmanship was truly inspirational. Sal passed away following a lengthy illness. His widow, Vicky, intends to continue operation of Sal's Skyblazer Models, in NY.

Also taken from us was Bernard Sexton, of England, who was renowned for his spectacular control line scale models, including Gee Bees and the Hall Bulldog racer.

Tony Immers, of Mount Clemens, Michigan, popular member of the Detroit Cloudbusters club, died during October. Ironically, the newsletter saluting Tony's excellent work reached his home one day after his passing.

Herb Clukey, owner of Flyline Models, passed away during November. He had served in the U.S. Navy during World War II, and had been a musician in well-known bands prior to entering the hobby industry. In addition to kits, Herb produced model construction drawings for various model magazines.

Our condolences to the families and friends of all these fine gentlemen. Shouldn't we all be appreciating each other more while there is still time?

Don Campbell and Bob Shalda, of the Detroit Cloudbusters club, with three examples of Don's Robin Red Sox Bostonian models.

NFFS CHAMPIONSHIPS

Chuck Slusarezyk has taken over from Tony Italiano, who is taking a well-earned rest, and has announced that the annual National Free Flight Society Indoor Championships will be conducted June 4-7 at the East Tennessee State University Mini-Dome, considered one of the world's best indoor sites. If you have even the slightest interest in any category of indoor models, by all means try to attend either as a competitor or a supporter. Other recreational activities in the area are available for other family members, and lodgings are readily available. A pre-addressed, stamped return envelope will bring complete information from: USIC, P.O. Box 470635, Broadview Hts., Ohio 44141.

PEDAL POWER

Remember the Daedalus person-powered aircraft? Well, now a Massachusetts Institute of Technology team has applied the experience and imagination to a pedal-powered speed boat. Driven by a huge, 10-foot diameter air propeller, the twin-pontoon craft features hydrofoils enabling it to rise above the water at speed. During October, two records were claimed for it: 13.12 miles per hour was achieved by Ms. Dava Newman for the women's category, and 21.27 for the men's, as pedalled by Professor Mark Drela. Drela, who spearheaded the design effort, is also an accomplished model builder, who published three different Peanut Scale model plans in this magazine some years ago.

Our thanks to Ed Whitten and Mark Fineman for sharing this information.

NIFTY NEWSLETTERS

A steady procession of club newsletters cross the hangar desk, which are a testimony to the ingenuity and patience of their editors. Some arrive as regularly as clockwork, while others appear at somewhat irregular intervals, yet are usually well worth the wait.

One of the "meatiest" publications is *Topmac*, edited by Jack E. Koehlar. Subscriptions are $10 per year, from 3425 S.W. Arrowhead Road, Topeka, KS 66614-3845. A sample of the spirited writing may be tasted in lines extracted from this "Turf Farm Funtest" report: "A great day for flying!... We even had local RCers come to watch and visit. They still don't understand our `happiness of pursuit!' trip, but did enjoy watching our `pre-programmed models' fly. Some even admitted to being former free flight fliers, still intrigued by free flight, but didn't like (or weren't physically up for) `the chase.' Heck, that's why I like it. I need the exercise. However, there's such a thing as too much

HANNAN'S HANGAR

of a good thing, and a full day of model chasing in 90 degree temperatures, through brush and bramble, is one such thing...eh? (I suppose that's why most old guys are indoor fliers.)"

Compare that to this free flight fun-fly report by Richard Hawes, writing in *The Winding Stooge* newsletter: "...The neat thing was, almost everything flew well, to the applause and wonderment of many spectators on the adjacent baseball diamond. We all properly exclaimed over each others' nice flights. Which brings me to the proportionality concept. The air was still and a little heavy, the field a little cramped, the trees close and fairly tall. The moon was nearly full. The flights nearly all circled the perimeter of the available space, near tree-top level. They looked great! They looked real! At (the much larger Mead flying site) they would have just been so-so flights, lost in the vastness of the place.

"Conclusion: You've got to fly on a site that is proportional to the airplane for it to look like a good flight! I suspect there is more to this, like being close to the trees, to add a little element of fear, risk, machismo, or whatever, but I suspect the proportionality factor is the big thing. Any philosophers out there who want to take this study a little farther?"

R.M. (Dick) Johnson with the Goodyear Zeppelin hangar he restored. Model was originally on display during the 1933 Chicago World's Fair! Photo by Marvin Krieger.

Christine Redhead, of England, compares her Pistachio-size Delta Dart with the standard British version. The mini-model manages 40 seconds duration. Photo by Peter Redhead.

We find Richard's notions thought-provoking, and wonder if the proximity of the walls and ceiling might not add a note of excitement to indoor flying, as well?

The Winding Stooge, in which this appeared, is edited by Tom Winter, and subscription information may be obtained for the price of a pre-addressed, stamped return envelope sent to: 1010 Eastridge Dr., Lincoln, NE 68510.

LOW-COST OLDTIMER PLAN

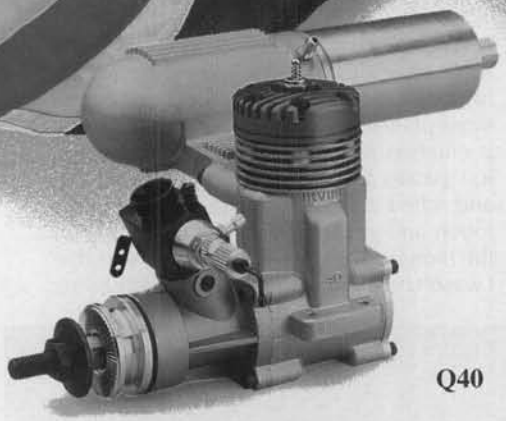
In these times of ever-rising costs, it is refreshing to encounter a bargain. How about plans for a genuine 1940 rubber-powered sport model for only $2.50 postpaid? Called the "Hawklet," the simple cabin design spans 16 inches, and is of traditional stick-and-tissue construction. Included with the plans are a pair of drilled hardwood wheels, and just in case you don't feel up to carving a balsa prop, a modern plastic one is furnished. A product of Best By Test Model Company, the Hawklet plans may be ordered from Edward Schlosser Associates, Inc., P.O. Box 4121, Ridgefield, New Jersey, 07657. When contacting any of our mentioned sources, please tell 'em *Model Builder* sent you. Thank you!

SILLY SIGN-OFFS

Carl Hedley, of Miami, Florida, assures us you can tell if your models are too heavy if: They fall through the bottom of the box in which you carry them. Or your Bostonian creates a sonic boom. Or you can't weigh your indoor model because your beam-balance scale is only calibrated up to 1000 grams. Or your Peanut Scale model hits a rafter and bends it!

Meanwhile, Jim Longstreth, of Portland, Oregon, says his latest rubber-powered model obviously meets the two prime criterias for such types, by 1) rising off ground easily, and 2) getting stuck in a tree! **MB**

IRVINE INTRODUCES THE POWER of silence.



Q40

For nearly 20 years, Irvine has been England's technological leader in the field of R/C model engines. Now Irvine Engines is once again leading the way with the development of the Q40, the first engine specially designed for quiet flight.

The new Irvine **Q40** (that's Q as in quiet) is deceptive with its silent purr. Designed specifically to reduce the noise level problems at R/C airfields, it reaches only 82 decibels at 9 feet—8 db. below the AMA recommended level. Yet it packs all the power you'd expect from a .40-size engine thanks to its specially tuned muffler. A muffler so unique in design it is being patented by Irvine.

Also new from Irvine

The highly competitive **.40 Pylon** gives you the best advantage yet for Quickie 500 competition. It includes a specially tuned silencer that actually enhances the performance of the engine.

Irvine also introduces diesel power in a .20- and .40-size—two diesel displacements not widely available from other manufacturers. The **.20 and .40 Diesels,** like all diesel engines, are known for their quiet flight as well as their fuel efficiency. They offer non-critical valve settings, low idle, a tremendous amount of torque and, since they don't require glow plugs, are less likely to overheat.

.40 Pylon

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With quality craftsmanship, advancements in quiet flight and now a 2-year warranty, there are more reasons than ever to choose Irvine.

.40 Diesel

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See your hobby dealer today for the complete Irvine line, or for more details, write for product packet no.349.

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BY ART STEINBERG

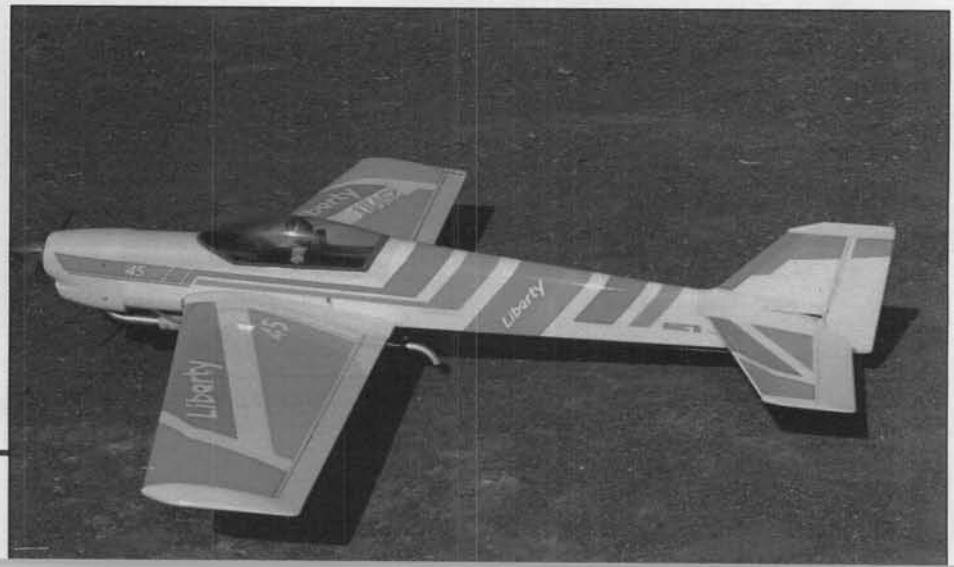
Liberty 45 from Hobby Dynamics

A few decades ago, back when I was learning to fly proportional RC, all I did was think about flying. My mind dwelled on this whether I was awake or asleep, and I was constantly flying my imaginary trainer through imaginary approaches, landings, and takeoffs. It got so bad that I would mentally wander off during conversations, and I began to almost live in a dream world. But the best make-believe flying I did was when I laid my head on my pillow and turned out the light, for then I became the hotshot stunt pilot I aspired to be, doing impossible maneuvers with my Goldberg Senior Falcon. These fantasies became such an integral part of my life, that even now I often close my eyes and imagine I'm working the controls on my latest airplane.

The other day I found myself back in my dream world, flying one of those perfectly responsive illusionary airplanes, rhapsodizing over my superb flying skill. It was one of those planes that makes any pilot look good. It climbed straight up, it zoomed through low passes at breakneck speeds, it snapped and rolled in the blink of an eye, and every touch-and-go was feather light and right on the money. The only strange thing was that I wasn't dreaming at all, I was actually flying

(Above) The clean lines of the Liberty 45 contribute to its outstanding aerobatic performance. (Below right) Notice the long tail moment, typical of a good pattern type model. This is one of the secrets of smooth flying and rock steady tracking in maneuvers.

Author Art Steinberg with the components of the Liberty 45 from Hobby Dynamics. From here on, it's just a few evening's work to a ready-to-fly sport competition airplane. Not necessarily for beginners, but experienced sport pilots will find it easy to assemble.



There's nothing like a wheels-up low pass to get the crowd's attention, and the Liberty 45 does it in great style.

the kind of airplane which only seems to show up in daydreams, and only rarely comes along to end up in the hands of an ordinary sport flier. What is the name of this wondrous airplane, you ask? It was Hobby Dynamics' Liberty 45, one of the sweetest sport/pattern airplanes ever to be offered to the model flying public.

The Liberty 45 is of Japanese manufacture, and is produced by the Yoshioka Model Airplane Factory. As a Yoshioka product, it was designed by that highly respected world class pattern flier, Mr. Yoshioka himself, and his expertise really shows in this model. As Japanese ARFs go, they are comparable to Japanese automobiles. They are slick, well thought out, and highly attractive. As for the Liberty 45, it is basically of the plastic finished foamboard over a wooden framework type, but it is without a doubt among the finest of this class model I have yet seen. Components fit together so well that they almost seem to build themselves. I enjoyed assembling this model so much that I can hardly remember going through some of the steps.

The slant mounted Rossi .40 nestles snugly in the ready-made motor mount. The nose section comes fuel-proofed and ready for engine installation.

Let's take a look at a few of the specifications of the Liberty 45: fuselage length 59.9 inches, wing span 57.1 inches, wing area 600 square inches, and projected weight is between 81 and 91 ounces. My model came out weighing 96 ounces, and I can only conclude that the factory specifications are a bit off in this respect, as I performed no modifications that would make the model come out on the heavy side. The engine was a comparatively light Rossi .40, using a MACS muffled tuned pipe, and the landing gear is the Hanno Prettner designed Supra mechanical retracts. Of course, it is perfectably acceptable to assemble the Liberty 45 with the fixed gear which comes supplied in the kit, plus an engine with a standard muffler. In that case, the ready-to-fly dry weight should run about 14 ounces less, resulting in a total of about 82 ounces, right at the lower limit of the factory estimate. Therefore, I would say that the Liberty 45 should weigh between 82 and 96 ounces, and possibly more if a larger four-stroke engine is installed. Incidentally, the wing loading on my version came out to be 23 oz./sq. ft.—about right for a high performance model in this class. As for the CG, it worked out just right, and no nose or tail weight was required.

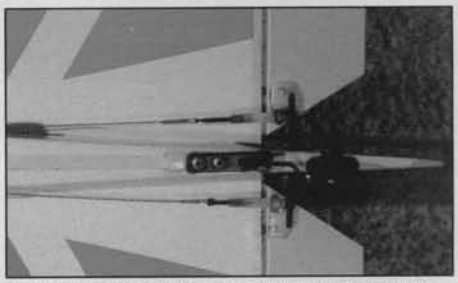
The Liberty 45 kit had quite a few nice touches, and a pilot just moving up into this class of model, with perhaps a view to getting started in pattern flying, will be pleasantly surprised with a number of things. For example, the beautifully formed canopy is lightly tinted, and it attaches to the fuselage with a precise fit. I used RC-56 glue to attach the canopy, then applied the trim tape supplied in the kit.

I must admit I was disappointed at first with the pilot figure supplied, as it was formed of what seemed to be flimsy plastic sheet, and was made of two sections which had to be cut out, glued together, and trimmed. My son, however, decided to have a go at it, so he rescued it from the trash can and put it together with one of the instant cements. The joint between the front and rear halves was filled in with epoxy filler, sanded smooth, then painted. The result was an acceptable looking pilot, and the weight was virtually nothing.

Another impressive part of the kit was the hardware, especially the dual control horns for the pull-pull setup on the rudder, and the

continued on page 86

A belly-up view of the Liberty 45 shows the MACS Products tuned muffled pipe which so greatly increases speed and performance. The Supra mechanical retracts work flawlessly.



Underside view shows the pull-pull wire control system for the rudder. Note the excellent hardware and the metal tailwheel bracket.

The cockpit canopy comes tinted, but the cockpit interior was painted flat black by the author. Add to this the painted pilot figure, and the overall effect is handsome and realistic.

25 Years of PATTERN EVOLUTION

BY WAYNE APOSTOLICO

The modern day modeling miracle has certainly got to be the radio controlled precision aerobatic aircraft. Today's 1.8-2.0 horsepower, piped .60s with eight- to nine-pound airframes traveling 100 to 130 miles per hour are a far cry from the 1960s, where 3/4-horsepower, unmuffled .45s pulling 5-1/2 to 6-1/2 pound airframes in the 80 mile per hour range were the norm.

While pattern pilots today argue the pros and cons of anhedral stabs, and discuss aerodynamic theories as to why their planes pitch to the canopy in the vertical lines or pitch to the belly in knife-edge flight, it is easy to forget it was just over 25 years ago that modelers struggled merely to keep their pride and joy in the air. Anhedral was the result of gluing your stab together crooked after the crash. The hot ships were the Taurus, Orion, Perogee, and Apogee, powered by unmuffled .40-.45 size engines.

Wayne Apostolico's Kwik Fli III and original Mariyha.

Engines with carburetors were marginally effective through mid-range and idle. Idle mixture adjustments on one popular carb were done by filing a notch in the barrel. Retractable landing gear was a term used to describe the condition of the gear after you tore it off the airplane from a bad landing. We had a hard enough time finding wheels, let alone retractable landing gear. As a matter of fact, we used to use pessories (a type of birth control device) as tires. They came in all different sizes and had great shock absorption ability. They had a few drawbacks though—you needed a prescription to get them and they were red in color. Real snappy looking! All those planes with red tires!

The hot "pattern" engines at the time were the K&B 45RC, Johnson 36RC and Veco .61. Mercos were also used by some, but Ed Kazmirski, World Champion in 1960, really popularized the K&B .45RC and Veco .61.

Several pattern pioneers of the era, including Hal "Pappy" Debolt with his Interceptor, Ed "Kaz" Kazmirski with his Orion/Taurus, and Tom Brett with his Perogee/Apogee, were at that time on the modeling cutting edge of performance technology.

Radio technology was changing fast, from the single-channel escapement rudder-only systems of the '50s to the reed radios of the late '50s and early '60s, to the proportional radios of the mid-late '60s with their improved reliability and precision factors which were quantum leaps ahead of their predecessors. Engine carburetion was refined through the early '60s, and the stage was set for the modern day precision aerobatic model. Modelers could finally concentrate on the precision part of the flight rather than on the reliability of the flight.

Americans led the world with such champions as Ed Kazmirski, Tom Brett, Doc Brooks, and Phil Kraft, each showing off the "latest" modeling miracles which American technology could produce.

On the local scene, Jim Kirkland's Beachcomber,

Jim Whitley's Daddy Rabbit, Phil Kraft's Kwik Fli III, Ron Chidgey's Tiger Tail, Don Coleman's Sweetator, Jim Martin's Banshee, Art Schroeder's Eyeball, Norm Page's Mach I, Jim Kimbro's Deception, Joe Bridi's Kaos, Dirty Birdy and Escape, Steve Helms' Bootlegger, Ted White's El Gringo, Rhett Miller's Compensator, Tony Bonetti's Troublemaker, Don Lowe's Phoenix series, Hanno Prettner's Curare, Dave Brown's Illusion, Dick Hanson's Tipo, Wayne Eulery's EU1-A, Bob Smith's T2A which has evolved into the T2AMKIII, and others, moved pattern flying as far forward in modeling history as the moon landing moved aviation history forward. The fire breathing pattern aircraft had gone through its adolescence and matured into a finely tuned miniature marvel capable of duplicating any flight maneuver of its full-scale counterpart with the utmost precision and grace.

It is interesting to note the changes in the flight envelope and model parameters that have taken place over the past 25 years.

In the early 1960s, the typical pattern airframe, ready to fly, weighed 5-1/2 to 6-1/2 pounds, had a .45 engine (3/4 hp), about 600 square inches of wing, was constructed of balsa and finished with silk and dope, had fixed gear and flew about 85 miles per hour. Today's pattern machine weighs eight to nine pounds (46% heavier), has a .60 engine with tuned pipe generating about 1.8 hp (140% increase), has 800-900 square inches of wing area (33%+ increase), sports a fiberglass fuselage, and foam core wings with balsa skins, has retractable landing gear, is finished with high-tech epoxy, enamels or MonoKote, and flies 100 to 130 miles per hour (53% increase).

Pilot proficiency has also increased by quantum leaps. There are many pilots today who would have been nationally and internationally competitive years ago, but because of the intense competition today, it is much tougher to place at large events. There are a lot of "top guns" out there!

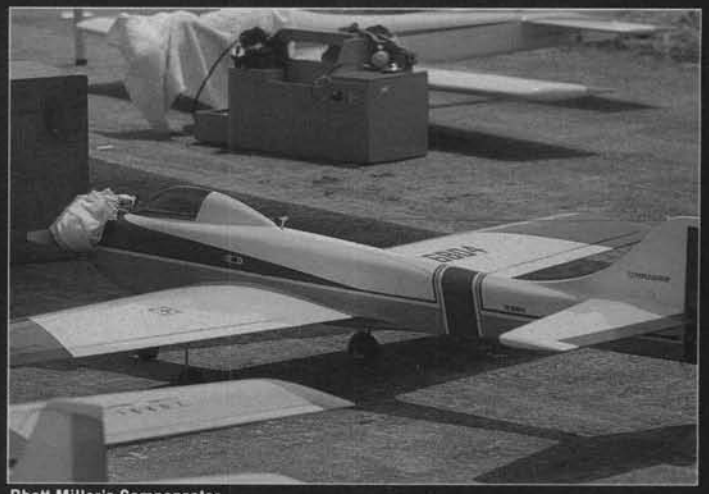
To be competitive today, it is virtually mandatory that pilots use all three primary controls. Using the rudder separates the men from the boys. Years ago rudder was occasionally blipped in some maneuvers, while today many top pilots use rudder in almost all of their maneuvers. Today, proper rudder use, especially in the lower classes, gives the pilot a tremendous edge in competition. In the upper classes, if you don't use it properly you certainly won't be competitive with the top guns.

The pattern flight envelopes have gone through some interesting changes over the years. Years ago most of the emphasis was on horizontal maneuvers whereas today there is a tremendous emphasis on tall vertical maneuvers.

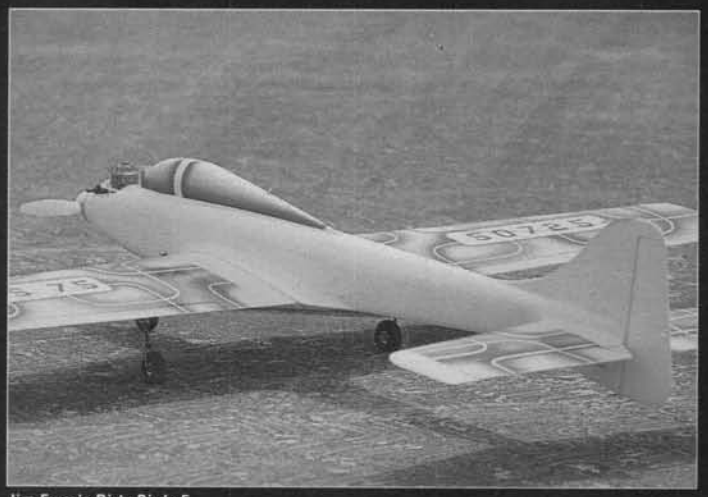
Speed ranges increased as more engine power became available with the peak speeds coming in the late '70s and early '80s. Engines with 12- to 13-inch pipes, turning 11x7 props at 14,000+ on the ground and 16,000+ in the air, pulled 8-1/2 pound aircraft at 130 miles per hour.

The ear-shattering noise created at these high rpm from both the engine and propeller prompted officials to establish noise levels for some national and world class competitions. As a result, modelers found ways to quiet their engines down. High-pitch props (12x12s) turning at 10,000 on the ground with 19-inch pipes, inverted cowled engines and buried pipes have lowered the decibal levels from their ear-shattering levels of the '70s to the more acceptable levels of today's pattern plane. Sometimes, when several planes are in the air, you can't hear your own engine, especially if some of the other planes are trainer types with marginally effective mufflers.

Engine technology has also marched forward over the past 25 years. From the relatively crude carburetors and power output of the .45 size engines of the 1960s, the present day pump equipped engines with carburetor are generally very reliable through the entire speed range and are a technologic wonder to behold. While K&B and Veco were kings of the '60s, Super Tiger Blue Heads and Webra Black Heads were



Rhett Miller's Compensator.



Jim Ewer's Dirty Birdy 5.

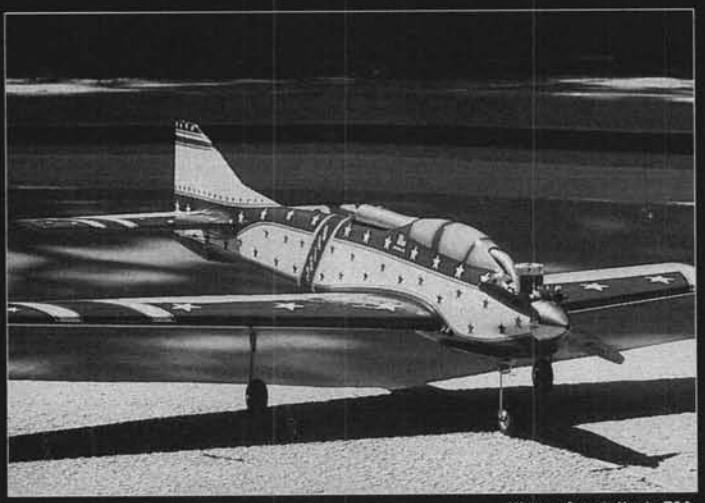
George Albright's Eutopia.

the "in" engines of the early '70s. The widespread introduction of Schnuerle ported engines in the early '70s increased .60 size engine power output to about 1.25 to 1.5 hp without muffler and about 1.1 to 1.3 hp with muffler.

Webra Speeds were king for awhile, but most recently the O.S. pumpers and YS pumpers have dominated most of the U.S. pattern scene.

Bill Knost's Mach I.


Wayne Apostolico's Phoenix 8. Also shown are a Kaos and Dirty Birdy, builders unknown.


Wayne Apostolico's T2A.

I should also mention that at about the same time Schnuerle porting was being incorporated into most pattern engines, John Perry developed the Perry Directional Porting system, which was incorporated into the Super Tiger Blue Head, rated at 1.6 hp, making it competitive with the Schnuerle engines.

Today the YS-120 four-stroke engine appears to be the engine of choice of many top FAI fliers. This supercharged, fuel pump-equipped engine was only a dream a few years ago.

In the mid-'70s, in-flight mixture controls further increased the pilot's ability to put in consistent flights. Gone were the days when you were fighting it out for first and you got off lean on a key flight and blew the contest because you blew a plug or seized the engine. Today, one or two clicks on the in-flight mixture control and you complete the flight at optimum power.

The addition of pumps (Perry, YS, Robart and O.S. pumped engines) has moved the power output up into the 1.8-2.0 hp range when using a tuned pipe. Is turbocharging the next step to increase pattern engine performance? The technology exists, it's just a matter of who does it first.

RADIOS

Radio technology and reliability have also improved since the '60s. Some familiar names that old pattern pilots will recall then and now are Orbit, Kraft, Citizenship, and Bonner. From the reed days with transmitters having several spring-loaded toggle switches (one toggle switch for each control), we have progressed to today's programmable systems with automixing, ball-bearing servos, resolution factors only dreamed of 25 years ago, fail-safe, pulse code modulation to enhance interference rejection, and all at a price less than the average four-channel radio cost in 1970. The new computerized transmitters are providing an added dimension in flexibility and reliability (less parts to go wrong).

The size of our components has been reduced from the huge servo sizes used in the '50s and '60s to the 1.5 ounce weight of the typical pattern servo today. While, in my opinion, the metal gimbals of the Pro Line radio were the best during their day, the injection molded gimbals of today's radios are a good value for the money and provide the necessary centering accuracy for precision flying.

LANDING GEAR

Retractable landing gear became widely used in the '70s. The first plane I recall using retracts was Hal DeBolt's Intercepter. Goldberg, Rhom Air, Spring Air, Sonic Systems, Robart and Kraft are a few of the retract systems that made their mark on pattern flying. Today, both pneumatic and mechanical gears are popular. In an effort to further reduce the weight of the pattern rocketships, lightweight wheels are now available that can shave several ounces off your plane, especially if you're a holdover from the old days and are using the solid rubber Kraft wheels. Weigh them—you'll be shocked!

THE FUTURE

Overall it appears the trend will be to continue developing quieter aircraft with virtually unlimited vertical performance—but I confess, I like to fly fast. I believe that sooner or later a really quiet, affordable, smaller-sized tuned pipe will be developed to replace the large canisters that we now carry around on the back, belly or side of our planes.

I believe that the opportunity exists to reduce noise further with advanced prop design. What about Q-tip props, blade shapes, areas, thicknesses and materi-

als? Has anyone tried the Whitman airfoil shape? I think that more composite model construction will be used as the cost of carbon fiber and other space age laminates becomes more affordable to the average modeler. It is already being used by many T.O.C. builders and is trickling down to the average modeler.

I believe that experimentation with carburetor shapes may provide some drop in noise levels. Engine mounting and cowling techniques provide an area of opportunity to further reduce noise. This area has shown promising results. Innovative construction techniques, including space age lightweight insulation materials that can withstand high temperatures, could further reduce sound. How about a light, sound-deadening material that can be sprayed onto a tuned pipe to kill the rat-a-tat-tat of the pipe?

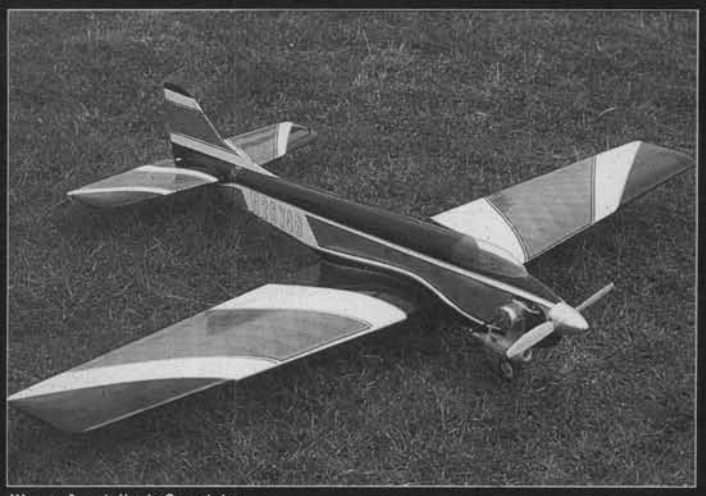
What about a paint that is nontoxic, lightweight, doesn't smell and gives a finish like Imron?

PROPS

How many remember the old Tornado white nylon props used by many in the 1960s? They also sold all-yellow props for a number of years. As engine power increased most pattern fliers went to wood and then to glass fiber laminates; today both glass and wood props are popular.

A limited number of pattern pilots experimented with in-flight variable pitch props. The props never caught on for a variety of reasons, such as general availability, increased complexity, the extra servo required to operate the prop and a questionable gain in performance for money and complexity expended.

As NASA has shown with their experiments with "quiet" props, design changes can dramatically alter the noise generated by a propeller. I think there is room here for a lot of experimenting to provide better props that generate less noise. ***MB***



Wayne Apostolico's Sweetator.

POPULAR PATTERN PLANES

The accompanying chart represents a reasonable presentation of the evolution of pattern aircraft over the past 25-30 years. The list is not meant to represent every pattern plane that has ever flown; however, I've tried to include those that were flown by many of the top guns of their time.

I hope this brief walk down pattern's memory lane was interesting and informative. I know it brought back many pleasant memories for me as I compiled data for this article.

Name	Span	Area (In.)	Length (In.2)	Weight (Ins.)	Engine (Lbs.)	Wing Size Load.
Orion	68	690	45	6-1/4	45	21
Peregee	61	570	—	5-1/4	40	21
Taurus	70	720	53 1/4	5-3/4	45	21
Intercepter	68	748	—	6-1/4	—	19
Banshee	62	630	49 3/4	7-1/2	60	27
Kaos	58.50	644	—	7-3/4	60	28
Eyeball	60	645	43	6	60	21
Dirty Birdy	64	700	57	8-1/2	60	26
Troublemaker	57.50	608	53 1/4	6-1/2	60	25
Mach I	62	715	55	7-1/2	60	24
Tiger Tail	66	717	49	7-1/2	60	24
Curare	64	695	56	8-3/4	60	29
Compensator	64	716	54	8-1/4	60	26
Utopia	64.25	671	51	8-1/2	60	26
Skynight	64	704	56	8-1/2	60	28
Arrow	63	713	53	8-3/4	60	28
Phoenix 8	64	730	55 1/2	8-1/4	60	26
Saturn-SE	64	724	50	8-1/2	60	27
LFX	63	677	55	8-1/2	60	29
EU-1	62	965	68	10	60	24
Dash	70	821	61	8-1/2	60	24
Escape	62.50	770	63	8-1/2	60	25
Super Sicroly	63	—	54	8	60	—
Challenge	70.50	881	63	8-1/2	60	22

Stats were obtained from manufacturer's ads or direct measurement

RC AEROBATICS

BY RICK ALLISON

WHICH FLIES BETTER: BALSA OR GLASS?

Ah, letters! I wish I got more of them from you guys, as this column really should be a two-way street, but I'll settle, I guess. The material this month has been mostly inspired by my mailbox, so I can't really complain.

I received an interesting letter recently from a fellow who is a fairly experienced former modeler, and who is just getting back into the hobby with his first foray into radio control. This fellow was puzzled by the constant references in the modeling press to "thumbs," when a lot of the pictures he'd seen plainly showed some top fliers using the "pinch" (thumb and forefinger) technique on the sticks. Since he didn't have any habits formed as yet, he wanted to know which technique was best or "proper," and he said he'd written to a lot of us high profile magazine writer types to find out.

So far as I'm concerned, neither of these techniques is the slightest bit more "proper" than the other. I know some truly excellent fliers in both camps.

In general, "thumb" fliers seem to set their stick lengths shorter, their stick tension lighter, and their control rates hotter than the "pinch" types. This is probably because the muscles involved in moving the thumb (and thus in flying the plane) are smaller and mostly localized in the hand, while the muscles used in the thumb and forefinger technique are larger, involve some wrist movement (rotation), and are located in the forearm as well as the hand. Thus, longer sticks and stronger stick tension are needed to provide good centering feel.

John Fogelsong with scratch-built balsa and foam Bogie, a Roy Speights design.

This is just an empirical observation, but I've noticed that most people with small hands seem to end up using the thumb technique, while the types with long skinny fingers gravitate towards the pinch style. The whole thing to me looks like strictly a matter of body type, degree of digital dexterity, and physical comfort to me. If there are any physicians or kinesiologists out there who would like to comment on this, I would be absolutely more than happy to print what you have to say on the matter.

For the record, I fly with my thumbs, but I do find the pinch technique very useful when dealing with small objects, Martini glasses, and toothpaste tubes. The pinch technique is very big in Europe also. Some say that this is because of the large Euro-style transmitters, but I prefer to think that it has more to do with the stylistic influence of the Italian and French fliers than with anything else. It seems to come so naturally to them.

The matter of thumb vs. thumb and forefinger may be a moot point, but there is one aspect of transmitter technique which can be rightly divided into "proper" and "im-

Dennis Breene, of Breene Aircraft, with his much modified balsa Escape.

proper." If you are not using some form of transmitter support device, you very definitely should be. The "why" here is very simple: you can't hold and support a heavy object with the same muscle groups that you are using to make fine, precise movements. By trying to do so, you put yourself in the position of a surgeon attempting to operate with a three-pound scalpel. He might do OK slicing up a pot roast, but brain surgery would be out of the question.

The minimum support would be a transmitter neck strap. One is supplied with nearly all decent radio sets, and I encourage you to use it. A step up from the neck strap is the transmitter tray, which not only supports the transmitter, but holds it solidly in position. This allows for a higher degree of precision, as it cuts down on the likelihood of inadvertent control inputs, such as getting a little elevator by mistake when all you wanted was aileron.

Trays come in two basic styles: those which include wrist/forearm rests, and those which don't. The latter style can be used readily by thumb fliers, while the former, or European type, is better suited to those who use the pinch technique. A tray which has become very popular among fliers in this country lately is the Stabilizor, made by KDI. The Stabilizor is a hybrid; a very well made and lightweight half tray/half neck strap. The tray sells for $49.95, and is available from KDI, Inc., 10426 S.E. 206th Place, Kent, WA 98031; (206) 854-8053.

I have been trying to remember a single decent competitor of my acquaintance who doesn't use at least a neck strap, and I can't name a soul. As for myself, I would sooner attempt full-scale aerobatic flight without a seat belt than give up my transmitter tray. Why, I'd rather push an oiled mule up a glass ramp while wearing ball bearing sneakers. I'd even—well, you get the idea.

• • •

Another recent letter asked what appears to be a fairly reasonable question: why don't designers such as myself make pattern plane plans available for those who want to build in balsa and foam rather than fiberglass and foam? I was a bit puzzled by the question at first, since it came from a person who had just purchased some Boxer plans from Salient Designs and was in fact engaged in building the airplane when he wrote the letter. After all, the Boxer *is* a balsa and foam alternative to fiberglass, and it was developed just for these people! Based on my Cursor design, it is an exact aerodynamic duplicate in planform, airfoils, areas, force arrangements, etc., with the only difference being the fuselage shape and open pipe tunnel.

Canadian FAI team member Colin Campbell with his all-wood Nova. Weighs under seven pounds.

Some other designs do exist in balsa and ply versions for scratch builders. Ron Chidgey's Typhoon comes to mind, and Mike McConville just published balsa plans for his Desire in another model magazine. I have balsa plans for the original Cursor available to the discriminating masochists among us. In the past, MK has supplied balsa kits for the Aurora and the Beetle. But still, for the most part, modern pattern ships are available only in glass. Why is this?

Very plainly, it is because aerodynamically efficient shapes seem to involve a lot of smooth contours and compound curves, and those shapes are far more easily reproduced in fiberglass than they are in wood. The fiberglass kits are a lot less labor intensive and cheaper to produce, and the airplanes built from them are more accurate and predictable reproductions of the prototype. Working with fiberglass is largely a matter of learned techniques. Producing the same smoothly flowing, accurate, and symmetrical shapes from chunks of soft wood glued together demands the skills of a sculptor and a master woodcarver. Not everybody has those skills; in fact, not a lot of people have them, although they are far more common among modelers than they are in the general population.

Plans for pattern aircraft are not often published in the modeling magazines, because there isn't a large market for them, like there is for "Sporty Forty" stuff. And, as a designer, I can tell you that it is very nearly the same amount of trouble and work to build and carve a plug for a fiberglass mold that will produce hundreds of identical fuse-

Author's wife, Sandy, holds the original Cursor prototype. Fuselage top, bottom and canopy were one-piece balsa blocks hollowed to 1/8-inch wall thickness. Does anyone really want to work this hard?

lages as it is to build a single balsa prototype model. Unless you are out to investigate a fairly radical new concept, or are building a model you'll never want to reproduce, it usually isn't worth it.

The proponents of balsa over glass say that balsa flies better. I don't know about that. I do know that balsa damps vibration better, but we have soft mounts now. I know that rigid airplanes fly more accurately, but there are ways, like carbon fiber, to make glass rigid. I know that lighter airplanes are better, but glass can often be lighter than wood. I know that wood is more easily repairable, but much harder to fuel proof. In brief, with the balsa situation being what it is today and the rain forests shrinking every year, I wouldn't look for a trend back to all-balsa airplanes, especially as kits. Plan and template sets such as the Boxer (from Salient Designs, 206-827-8348) will hit the market occasionally, but the future will be mostly molded from fiberglass, I'm afraid.

A good many of the letters and calls I get are from people who want to know which currently available pattern plane I think flies the best. I guess I should be flattered that you respect my opinion enough to ask, but consider this. I'm a designer of a currently available pattern airplane, the Cursor, which is available from RC City. I designed the airplane several years ago because I wasn't totally happy with anything else on the market. I still fly it in competition, it does everything I want it to do, and I'm very happy with it. If I thought that anything else out there could do a better job for me, I'd fly it. I'm not saying that other airplanes don't fly very well, because many of them do. All I'm saying is that I'm the wrong person to ask—I'm very biased!

Mike McConville with his balsa Desire prototype at the '90 Nats.

I will say this. If you absolutely have to have a plug-in wing type airplane, then I rate the Meridian (available from Piorun Models, 604-820-9335) as the best available. It flies a lot like a Cursor, which is why I like it. In 1.20 sized airplanes, I like the Typhoon, and the 1.20 sized Desire looks promising, but I haven't flown one yet. Both are available from RC City.

• • •

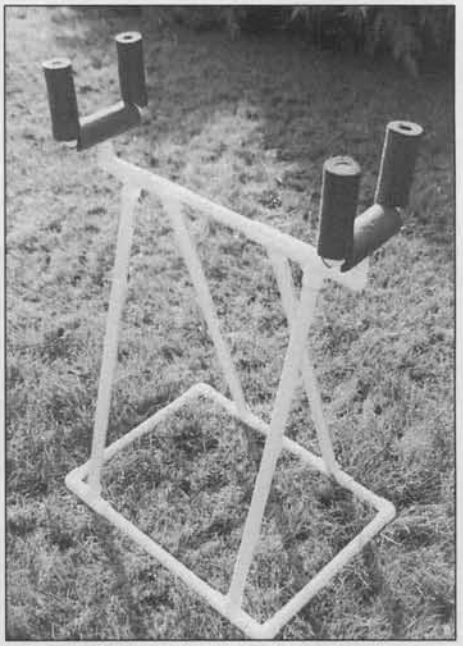
Another item just in from the mail bag is the Snap Rack from Breene Aircraft. Owner Dennis Breene says this is the answer for a portable airplane stand, and after trying the thing, I'm inclined to agree.

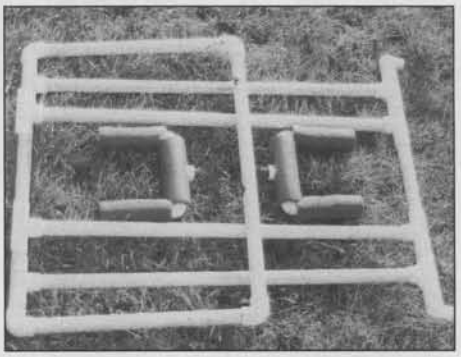
A lot of us have constructed plane racks and stands from PVC pipe, but the Snap Rack is designed to snap apart and fold up to lawn chair size, while the aircraft holders unscrew. Everything is supplied cut to exact size, a bottle of PVC cement comes with each kit, and total assembly time from when I opened the box was 20 minutes. I could have done it faster, but I stopped to read the instructions (very clear) as a matter of kit review policy.

The rack is very solid, and holds the airplane nicely at waist level for starting, maintenance, etc. A shorter version is available for those who simply must crawl around on their knees. The cost is $24.99 plus shipping, which is pretty cheap, considering the trouble you are saved. Buy it at your local hobby store, or order direct from Breene Aircraft at 109 S. Orange, Exeter, CA 93221 (209) 592 6708. You might want to cut some lengths of electrical conduit and slip them inside the base tubes for ballast if you live where the wind blows.

Dennis also says that his company is currently tooling up to produce lightweight built up balsa wings for currently popular pattern ships, to refer back to an earlier topic (and I said the future was glass!). Look for these soon.

That's the wrap for this month. As you read this, spring should be just down the road, and the new airplanes should be popping out of the shops out there in patternland. Send me the baby pictures and let me show 'em off for you. Rick Allison, 15618 N.E. 56th Way, Redmond, WA 98052. ***MB***


"Snap Rack" airplane stand from Breene Aircraft, constructed entirely of PVC pipe. (Below) Snap rack disassembled for carrying.



THE RESULTS SPEAK FOR THEMSELVES...

USA Team—1st Place
Wayne Mann—2nd Place
Curtis Youngblood—3rd Place

M.A. / U.S.A. Congratulates
the USA Team
for their outstanding results.

1991 USA FAI Team Trials

1st—Curtis Youngblood—**X-Cell .60**
2nd—Wayne Mann—**X Cell .60**

1991 USA Nationals

FAI— **1st**—Curtis Youngblood—**X-Cell .60**
2nd—Wayne Mann—**X-Cell.60**

Int.— **1st**—Robert Akers—**X-Cell .60**
2nd—Eulace Mallory—**X-Cell .60**
3rd—Kent Officer—**X-Cell**

1991 Kyosho .30 Challenge

FAI— **1st**—Wayne Mann—**X-Cell .30**
Int.— **1st**—Kent Officer—**X-Cell .30**
Novice—**2nd**—Jim Robertson—**X-Cell .30**
4th—Mark Ghebelian—**X-Cell .30**
Scale— **1st**—Ted Schoodnard—**X-Cell Hughes**

1991 Michigan Champs

FAI— **1st**—Wayne Mann—**X-Cell .60**

1991 N.J. "Nats Tune-Up" Contest

FAI— **1st**—Lance Murphy—**X-Cell .60**

Curtis' Choice of Winning Equipment:

#1002 **X-Cell .60 Custom**
#3680 Rotosports Kevlar Blades
#3694 **M.A./USA** N.H.P Tail Blades
#0561 **M.A./USA** Pro-Paddles
#0802 **M.S./USA** Torque Tube Drive
#0552 **M.A./USA** Constant Drive
Available soon...
Curtis' H.P.F. FAI fuselage (not shown)

Wayne's Choice of Winning Equipment:

#1003 **X-Cell .60 Custom**
#3692 **M.A./USA** Washout Blades
#3694 **M.A./USA** N.H.P. Tail Blades
#0232 **M.A./USA** Tail Speed-Up Gear
#0561 **M.A./USA** Pro-Paddles
#3951 **M.A./USA** Magna-Pipe
#4327 **M.A./USA** Magna-Fuel 30%
#4231M **M.A./USA** Power Concepts
#3817 **M.A./USA** JMW Expert Gyro
#0803 **M.A./USA** Torque Tube Drive

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PLUG SPARKS

BY JOHN POND

Contests In Seasons

As I write this column, it is early December and the contest season is over. The last two meets were the SAM 49 Fall Annual at Taft, and the #7 NCFFC Meet at Waegell Field. It is hard for the Eastern modeler to bear but these two year-end contests enjoyed light winds and temperatures ranging from 65 to 70 degrees. Almost perfect flying weather!

Photo No. 1, taken at the NCFFC (Northern California Free Flight Council) contest, shows the ever-faithful Contest Director, Bill Bowen, on the far right looking over Loren Schmidt's collection of airplanes in company with an unidentified spectator. Main reason for running this shot is to show the reader what a Francis Tlush "Inspirer" looks like. Despite its rather ungainly lines, the Ohlsson 60 powered Inspirer is a good competition model. Some Easterners may remember this model from the Westover AFB SAM Champs, where it lost a wing in the high winds, thus pulverizing a real good running Ohlsson 60.

Photo No. 2. A gorgeous "Mystery Man" built by Dick Monaghan and flown at the SAM 49 Fall Annual. With a 10-inch prop on the Forster .29, there's adequate ground clearance for takeoff without the famous drop-off gear.

(Above) Photo No. 1. Contest director Bill Bowen eyeballs the Loren Schmidt collection. Rare Tlush bird, "Inspirer," on left.

Photo No. 3. An Argo Elfin diesel powered Megow Ranger by Tom Empey. Both are pretty squirrelly fliers.

John Targos attended the SAM 49 meet and sent in several interesting photos. The first one is of Dick Monaghan, seen in Photo No. 2 with an outstanding Joe Weathers "Mystery Man." To show that beauty is not everything, the model placed 3rd in the Class B Ignition event!

Not to be outdone, Tom Empey won second in the Class A Ignition event. Seen in Photo No. 3 is Tom and his Megow Ranger with an Argo Elfin diesel for power. We are going to miss Tom and his fiancee, Pattee, as their latest plans call for moving to Oregon. The SAM 8 boys better watch out!

Tom was quite interested in the activities of the free flight boys on the same field. One of the good flying models (Photo No. 4) was Bob DeShields version of Henry Struck's "Diamond." This model was also flown at Jean, Nevada and photographed by Harold Johnson.

Another old faithful, the Korda Wakefield, seen in Photo No. 5, was faithfully reproduced by Gene Wallock, SCAMPS newsletter editor. This old Dick Korda design is still one of the best flying Wakefields.

Now get a load of the immaculate Mk. II Comet Clipper depicted in Photo No. 6, built by Danny Lutz, modeler par excellence! Feast your eyeballs on the engine, an M&M .29 made a long time ago in Washington. Many an engine collector nearly fainted when Dan got ready to fly this rare, precious engine!

Jumping back to the NCFFC

Photo No. 4. A Henry Struck "Diamond" by Bob DeShields. Good flier. Harold Johnson photo.

meet, we can't help but feature Photo No. 7 showing Eut Tileston with his RC O.T. glider entry, a Jasco "Sailwing" scaled up to 100 inches. This tailless glider is one of the many flying wings Eut has been demonstrating all over the USA and Australia. Tileston must have the greatest eyes in the world, as flying wings are very difficult to see at any angle!

Many West Coast modelers, especially those south of Fresno, have often wondered what the famous Loren Schmidt Ranch looks like Lots of good O.T. RC flying takes place here throughout the year. Photo No. 8 is presented showing Wayne Connor launching his son Tim's Comet Sailplane. Both are members of the SAM 00 club. Note that Loren mowed the grass to provide a good takeoff site. No dust!

This is probably one of the most enjoyable sites possible, as there are plenty of shade trees to sit under while timing or waiting on a flight. Then too, Miriam and Loren have been outstanding hosts, in many cases putting up modelers who got stuck for motel reservations.

It now appears that at least three large O.T. RC Annuals are scheduled for the Schmidt Ranch in 1992. Best part as far as this writer is concerned is that it's only 121 miles from home, whereas Taft is 242 miles! Just think of all the beer drinking time that has been saved!

SAM CHAMPS DATES

The latest letter from SAM President Jim Adams contains the info that the 1992 SAM Champs will be held at Lawrenceville, Illinois, July 5-10, and has been expanded to include two days of Nostalgia events.

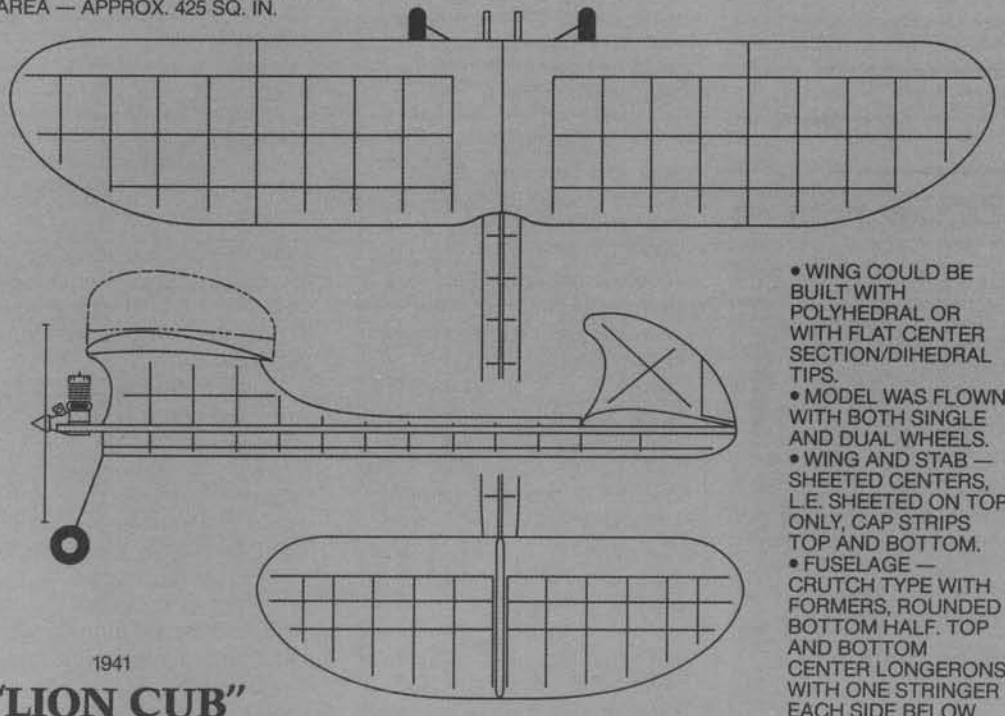
Photo No. 5. Gene Wallock, SCAMPS, seen with Korda Wakefield. One of the most reliable rubber-powered designs. Johnson photo.

Check-in day at the Executive Inn will be July 4. Rooms at the Vincennes University dorms will also be available. The Bean Feed is presently scheduled for Monday night before the SAM competition begins. Don Sachtjen is Contest Manager, with Bud Brown and Bill Brenchley being FF and RC Contest Directors, respectively. Hopefully, the wheat crop will be gone and the corn not too high at that time of the year.

Photo No. 6. an Mk. II Comet Clipper with a 1939 M&M engine (!) by Danny Lutz. No, Dan has not been kicked out of MECA—yet!

MODEL OF THE MONTH

SPAN — 50 IN.; PLANFORM WING AREA — APPROX. 425 SQ. IN.



- WING COULD BE BUILT WITH POLYHEDRAL OR WITH FLAT CENTER SECTION/DIHEDRAL TIPS.
- MODEL WAS FLOWN WITH BOTH SINGLE AND DUAL WHEELS.
- WING AND STAB — SHEETED CENTERS, L.E. SHEETED ON TOP ONLY, CAP STRIPS TOP AND BOTTOM.
- FUSELAGE — CRUTCH TYPE WITH FORMERS, ROUNDED BOTTOM HALF. TOP AND BOTTOM CENTER LONGERONS WITH ONE STRINGER EACH SIDE BELOW CRUTCH.

1941

"LION CUB"

DESIGNED BY MEMBERS OF THE CHICAGO GAS LIONS CLUB

MODEL OF THE MONTH

The influence of the Zipper design was overwhelming, due mostly to its extraordinary series of contest wins. Most all models (many of them better performers) followed this pylon trend: Playboy, Ranger, Pippin, etc. In some cases, clubs adopted the Zipper as their club model but many, like the Chicago Gas Lions Club, came up with their own club design. Such was the development of the "Lion Cub," this month's featured model. This design was one of the earliest approved by SAM as an

PLUG SPARKS

Old Timer, being dated early 1941.

Due credit should be given to Bill Harndon, who supplied the sketches taken from the original model. Conceived as a club project, there were many minor variations employed: two styles of dihedral, single wheel or two, and deleting the landing gear altogether (In 1941, hand launching was officially allowed.)

One of the popular features in new pylon designs was to locate the ignition system and batteries in the highest portion of the fuselage. The thinking then was that when the model would loop from excessive power, it would tend to roll out on top, giving a series of Immelman maneuvers or in some cases a spiral loop. Regardless of adjustment, the models did perform in the climb!

Construction of the model is pretty straightforward, employing "crutch" construction for the fuselage. (This was pioneered by the Skyscrapers in many of their published designs.) The model is primarily constructed of balsa with plywood formers and reinforcements in the engine area. This is one pylon model that lends itself well to RC, as the pylon is high and wide enough to accommodate radio gear.

NOSTALGIA CORNER

Back in 1949, Dick Everett attended a meet that featured flying wings and took Photo No. 9 showing what a Megow "Cross Flying Wing" looks like. Of particular note is the Cox Space Bug engine being used. This is one advantage of the reed valve system; the engine can be run "backwards" so as to avoid having to get a left-hand prop. Nice photo, but unfortunately, Dick left no clue as to who the builder was.

ELFIN DIESEL REPORT

Good news! John Targos of ARGO-USA reports that his long-awaited Elfin 2.49cc diesel replicas (Photo No. 10) are finally coming together. Those lucky enough to be first in line have already received their engines, with subsequent shipments being made at a slow but steady pace. John personally test runs each engine before it goes out the door, to make sure it puts out as promised, a step that necessarily slows the rate of delivery. It's worth the wait, however, as the production engines are very nice pieces of work and deliver performance to match.

Just in case you don't have his address, John Targos can be reached at ARGO-USA, 3229 Dianora Dr., Palos Verdes, CA 90274 or better yet, call (310) 377-6186.

Photo No. 7. A 100-inch (double-size) Jasco "Sailwing" built by Eut Tileston for the O.T. RC Glider event.

Photo No. 8. Wayne Connor launches Comet Sailplane while son Tim flies. Good look at Schmidt Ranch in Elk Grove, California.

THE "RIGHT" DOPE

We are indebted to Bill Schmidt of SAM 56, who wrote the following article describing the various characteristics of nitrate, butyrate, and Aero Gloss dopes. Remember, all dopes are good; like women, some are better.

"Nitrate dope was the first type available soon after the airplane was invented. It is extremely flammable when dry and is actually akin to gun cotton. For purposes of modeling, it has the very best in working qualities and will reward you with an excellent finish and shrink of silk and tissue that the other two dopes cannot offer. Nitrate dope, however, has the principal drawback that it is not impervious to either alcohol or gasoline. Glow fuel attacks it instantly, where today's modern gasolines make it slowly get sticky to the touch over a period of time. This is because gasolines now contain more ethyl esters and other compounds not used in the old days. Nitrate dope can use and accepts automotive acrylic lacquer thinners and their respective modifiers very well. Nitrate dope, therefore, should be used on all models that do not have glow or gas engines unless a final coat of epoxy or urethane is put over it. Sailplanes and rubber powered planes are examples.

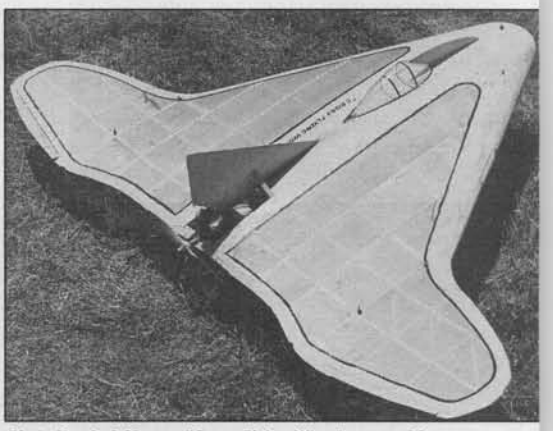


Photo No. 9. A Megow "Cross Flying Wing" powered by a Cox Space Bug. Everett photo.

"Butyrate dope is next and is a bit more difficult to work with, as its adhesive qualities are poorer than those of nitrate dope. Butyrate dope is fairly fuelproof, but a high nitro fuel will affect it and leave it marred or discolored. Butyrate is not a supporter of flame when dry; hence, its widespread use on full-size aircraft starting after WWII. It has high shrinking qualities.

"A great difference appears when butyrate dope is used on tissue paper and on silk. On tissue, the modeler very seldom puts on as many coats as he would on a silk-covered model. This is because of the basic differences in the weaves of the two types of covering. As the coats of dope are built up on a silk cover, a crystalline inner structure begins to form. As you begin to get a gloss on the struc-

ture, what started out as a vivid blood red silk is now a pastel pink! This happens to all colors. They start out bright and turn pastel as the dope film builds.

"Just compare a butyrate finish to a silk job done in either Aero Gloss or nitrate. Butyrate also has the unpleasant tendency to fuel soak the model around the engine and surfaces receiving fuel exhaust spray. This fuel soaked area is darker and is the same depth of color you would have had if you had used nitrate or Aero Gloss dope on the model. Don't forget that the above applies to *silk* and butyrate, not tissue. The tissue model fuel soaks but doesn't suffer the high color differential due to the lesser number of coats of dope used on this type of model covering. Generally, only butyrate thinners may be used to thin butyrate dopes.

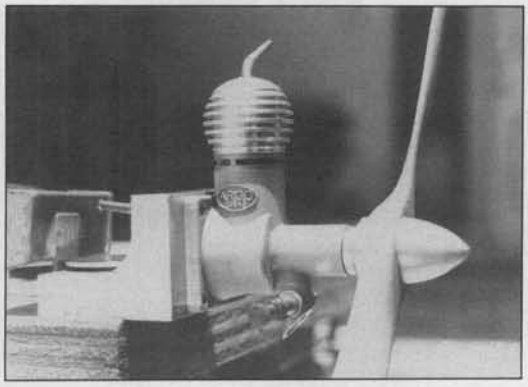


Photo No. 10. The improved Argo Elfin diesel, now ready for delivery.

"When doping with nitrate (in order to keep the color), one can put butyrate dope (clear or pigmented) over clear nitrate. The reverse of this system is nothing but pure disaster. Any patching must also be done in this order. This writer found this worked great over silkspan; generally three coats of nitrate followed by three of butyrate.

"One must be careful of butyrate dope. Thin coats are recommended. Butyrate dopes have a long curing period. Wings, in particular, should be stacked or racked in straight jigs. With butyrate dope still taking a set as much as a year later, very disconcerting warps can develop.

"The final subject is Aero Gloss. This writer has always regarded this dope as nitrate with a fuel resistant inhibitor added. Aero Gloss is actually a modified acrylic lacquer produced by Pactra. Its basic formula of modified nitrate dope was changed around 1972. Aero Gloss possesses all the good and bad characteristics of acrylic lacquer.

"Automotive acrylic lacquer thinners can be used with Aero Gloss, as well as retarders and modifiers. Slow drying, high gloss thinners work best. The working characteristics are like butyrate. It is not as good as nitrate in the adhesive area. Vivid colors remain true no matter what the film thickness. Aero Gloss dope is the most fuelproof of all the dopes. High nitro can affect it, but rubbing compound will restore it locally. The big problem with Aero Gloss dope is again found in dealing with using it on silk. Acrylics are like enamel in that when they are dry, they are chemically different from what they are when wet. When you cover a model using Aero Gloss and silk, you

continued on page 80

FREE FLIGHT

BY BOB STALICK

Modifying Nostalgia Rules

As reported in "Free Flight" column in March, Harry Murphy has proposed a modification to the Nostalgia rules. This modification would establish an "Original 1/2A" class wherein only certain early 1/2A engines would be allowed in competition. The idea, of course, is to attempt to establish a different atmosphere around the 1/2A event so that it would be more like what was flown in the early 50s and less like a tuned-down AMA event.

After some checking at a recent swap meet and reviewing the latest issue of the MECA Swap Sheet, I was able to find some of these early engines at a reasonable price. The engine that I bought was an O.K. Cub in excellent condition. The price was $14.00, well within the price range I had set for myself. Early Wasp .049 engines were also available, but the prices were in the $20 to $25 range. I wanted something truly inexpensive that could be used in this suggested event.

The ever-active Hank Struck showed up at a recent Galeville, New York, meet, seen here holding photographer Stan Fink's "Couple Du Jour." Hank still flies Wakefield competively.

So, the next step seemed to be to locate a plan for a model that was designed to fly with this kind of power. About this time, my friend Bill McDow, of Portland, Oregon, honored me with a full-sized sketch plus three-view of a model called the "Flattop." This model was featured in the Zaic Yearbook for 1953. I thought you might like to see it with full-sized rib patterns, just in case the suggested Original Nostalgia 1/2A event strikes your fancy.

APRIL THREE VIEW—FLATTOP

BY DAVE HEWITT

Dave Hewitt was a successful free flight competitor from the Portland area in the 1950s. This model, the Flattop, at one time held the National 1/2A AMA Gas Record. What is especially unusual for this design is that its center of gravity is located 2-1/2 to 3 inches behind the trailing edge of the wing. The model is built to be very light, so that the climb is improved even with the rather tepid engines used during the early 1950s.

A couple of tips about the model—just in case you decide to build one. Choose the very lightest wood you can for construction. The original designs weighed in at 4 oz. Second, trim the model so that it has a tight right turn in the power phase—it should spiral in the climb. Finally, the glide turn also should be very tight. Circles of 50 to 100 feet are the goal. The object of a tight circle in the glide is to eliminate any tendency to stall, which could be disastrous in a free flight with such an aft C.G.

So, if you are looking for an unusual 1/2A design, check out this three-view, look over the 1953 Zaic Yearbook (if you can locate one) and consider building the Flattop. I am.

MYSTERY MODEL WINNERS

We find it was way back in the July 1991 issue that we last updated the MM winners, so we've got a lot of catching up to do! Several correspondents took us to task for not publishing the winners in a more timely manner, to which we can only plead guilty as charged. From now on, we'll do an update each month for the model presented three months previous—the February model in May, March model in June, etc. Keep in mind also that winners are no longer determined by postmark date; correct answers are instead put into the hat and drawn at random. Makes it easier on us and gives everyone (with the right answer) a truly equal chance. Those whose names are picked receive a free one-year subscription or extension to *Model Builder*. How you gonna beat that? Entries should be sent to Mystery Model, c/o Model Builder, 34249 Camino Capistrano, Capistrano Beach, CA 92624.

May 1991: "Pyloner" by Earl Cayton, published in Bill Winter's *Model Aircraft Plan Book*. Of the ten guesses received, all but one were correct. Rich Tanis, of Hawthorne, New Jersey, was selected as the winner.

June 1991: "Blunderbus" by S. Calhoun Smith. Plans for this cute little 1/2A sport model originally appeared in *Air Trails*, October 1953, and were later reprinted in the 1965 *American Modeler Annual* in a special section devoted to Cal Smith's designs. Apparently a lot of readers are familiar with the model, as we received 34 correct entries, from which we drew the name of Lester Hollans, Birmingham, Alabama.

• Jack Mahoney, Nova Scotia, Canada, recently built a Blunderbus to hang above his two-year-old grandson's crib. "You can't start them too young," Jack writes.

• Bob Hatley, Goltry, Oklahoma, told us he still has an .049 powered Bus with a pylon wing mount instead of the wire bird cage (the plan showed both), and was starting to do a double-size version for 05 electric.

• J.G. Castellanos, Menlo Park, California, had a Bus with a Cox .020 and single-channel RC: "Since the darn thing flew so well in free flight the RC gear was only used to keep it over the field and in sight."

July 1991: "Past Due" by Howard Robinson. The August 1953 issue of *Air Trails* featured the plans for this slick 1/2A job which was shown with both a single wheel and floats. This was apparently a tough one to identify as we received only five replies, and one of those thought it was the Phoenix Skipper. Of the correct answers, Ed Turner of Fort Worth, Texas, was chosen as the winner.

August 1991: Carl Hermes'

"Olympia" Wakefield, from the Zaic 1959-61 Yearbook. Gene Post, Stillwater, Oklahoma, wrote that we would "get a lot of correct answers on [the Olympia]—maybe a million." Nope—only six! The name of David Rosenberg, Henrietta, New York, was drawn out of the hat.

September 1991: "Hot Head" FAI by Jerry Ritz. Columnist Bob Stalick submitted it as appearing in the 1959-61 Zaic Yearbook, but Newt Stansfield, Milwaukee, Wisconsin, mentioned in his note that the plans were published in *American Modeler*, January 1958. Of the nine correct replies received, Jerry Barnette, Fredricksburg, Virginia, wins the free subscription.

October 1991: "Osolong" Wakefield by Henry Cole, Jr. *Air Trails* featured the model in its March 1952 issue. Chet Bukowski, Wilmington, Massachusetts, was chosen as the winner from the 13 guesses received.

• Well-known FFer Jerry Rocha, Napa, California, recalls as a boy of 11 watching Hank Cole fly the model: "Boy did it go up."

• Carl Loehle, Wartrace, Tennessee, says he built one in 1952 and another in 1985, when he returned to model building.

November 1991: Arthur Collinson's "Near Miss" FAI Power ship from the October 1959 *Flying Models*. Larry Loucka, Willoughby, Ohio, whose name was drawn from the five answers sent in, wrote that Collinson, a British FFer, flew the model to second place at one of the 1950s World Champs, hence the "Near Miss" moniker.

December 1991: "Gastove" by Michael Gaster of England. Gaster flew the ship to first place at the FAI World Champs in 1955. Plans for the model appeared in both the 1955-56 Zaic Yearbook and in the June 1956 *M.A.N.* Charles Alba of Houma, Louisiana was picked from the 14 replies we received.

January 1992: Carl Goldberg's "Cumulus," kitted by Top Flite in 1949. This one brought a record number of of correct responses—44—as well as a record number of *incorrect* replies. Nine thought it was a Korda Powerhouse, with two votes apiece for Shulman's Zombie and Goldberg's Sailplane, and one for the Advanced Hurricane 69! Of those who sent in correct answers, Louis Previati of Arroyo Grande, California, was the lucky winner.

From C.O. Wright comes this shot of David Hodges and his electric-powered E-30, named "Nikola" in honor of Nikola Tesla. Dave is a bit over 70 years of age and is one of the Sky King Club's most active members.

• Robert Quinn of Cleveland, Ohio, mentioned that a construction article on the Cumulus appeared in a 1950 issue of *Model Aviation*, a short-lived English publication. No full-size plans were offered, but full-size parts patterns were included in the article.

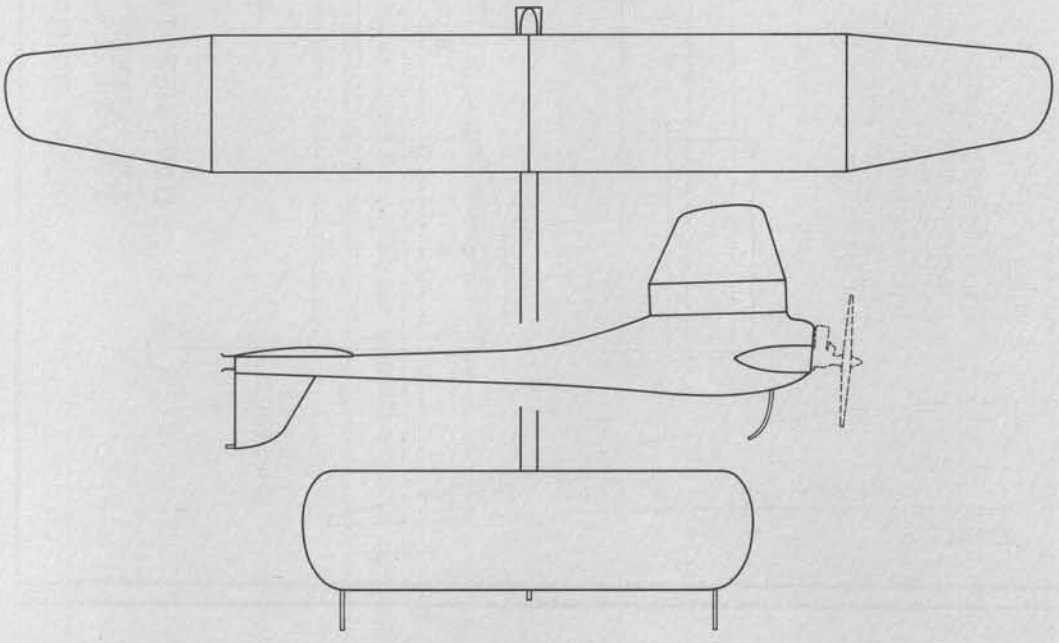
• George Batiuk, Huntsville, Alabama, wrote that Dave Kneeland used the Cumulus wing and tail on his famous Vapor Trails competition FF.

• George Peters, Cucamonga, California, still has an original kit with 1949 Chicago newspaper packing inside.

• Pete Van Dore, Elkins Park, Pennsylvania, built a Torp 29 powered Cumulus around 1953. Its maiden flight was at a contest—an unheard-of practice—and Pete says the ship was reduced to splinters when it did a wingover and went straight in on concrete.

• John Bortnak, Calgary, Alberta, Canada, has two Cumuli in his collection. One has a K&B .29/.32 combo which John says is "a little hairy" to adjust—the understatement of the year!

MYSTERY MODEL

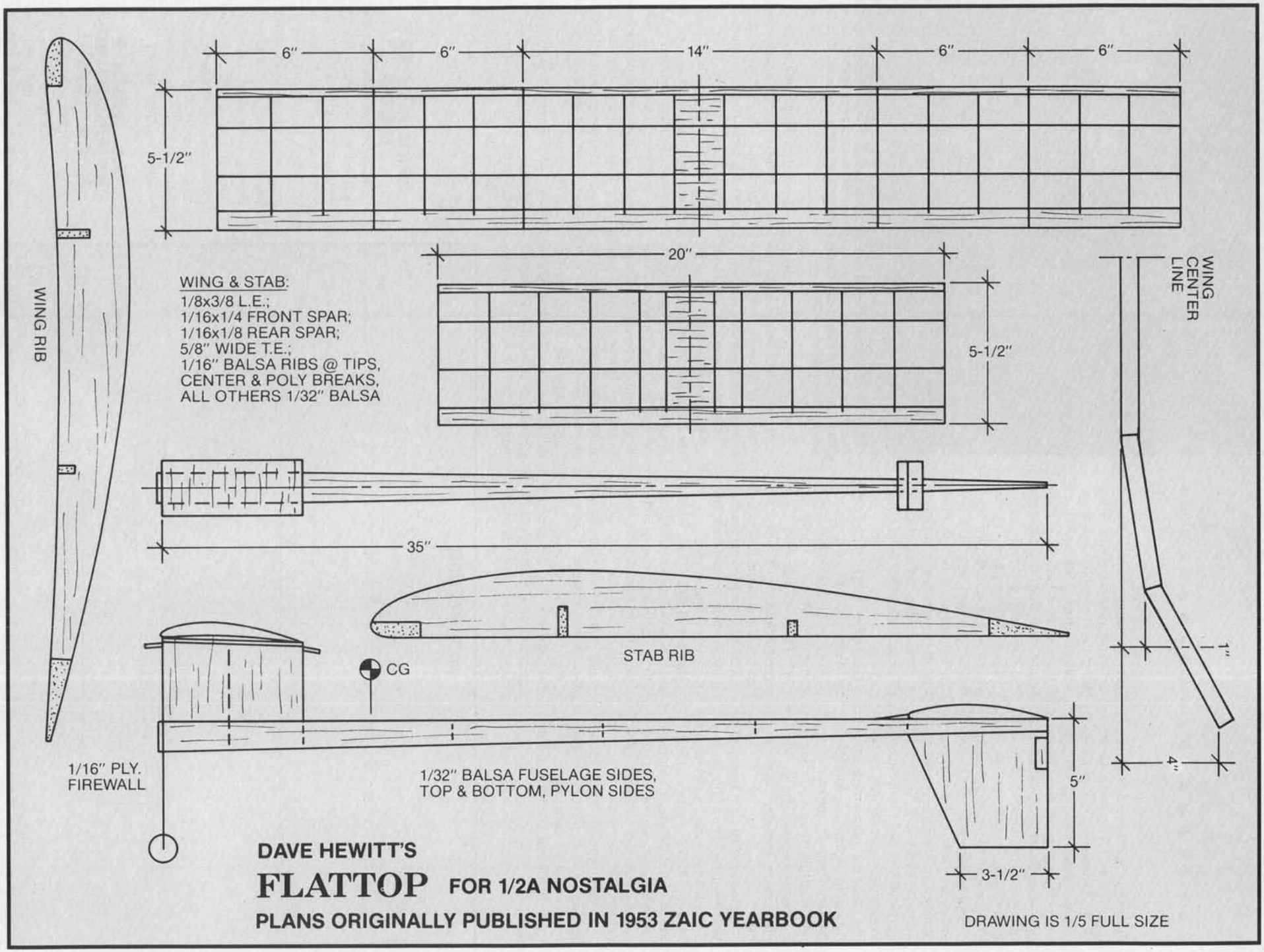


APRIL MYSTERY MODEL

This is one of those ships that should be seen more on the Nostalgia contest circuit. It's got modern lines, a high aspect ratio wing, simple fuselage construction, and comes in several different sizes, so no scaling is needed. The model was flown with Johnson .29 or .32 sized engines and was allegedly quite competitive for its time. Know what it is? Mail your answer to the address noted above.

U.S. INDOOR CHAMPIONSHIPS IS ON AGAIN!

After the 1991 Indoor Championships at Johnson City, Tennessee, Tony Italiano announced that he would no



DAVE HEWITT'S

FLATTOP FOR 1/2A NOSTALGIA

PLANS ORIGINALLY PUBLISHED IN 1953 ZAIC YEARBOOK

DRAWING IS 1/5 FULL SIZE

longer be the contest director of this big time event. However, Chuck Slusarczyk has picked up the reins and announces that the 1992 event will be held on June 4-7 at the Johnson City Mini-Dome. Twenty-five events will cover the spectrum of indoor flying. The Mini-Dome is one of the world's best indoor flying sites, with football field floor space and no hanging obstructions. Come fly and vacation in scenic East Tennessee. Bring the family. The annual banquet will be held on Friday, June 5.

Send a large SASE for entry forms, dorm and motel lodging info and directions to USIC, P.O. Box 470635, Broadview Hts., Ohio. This event is sponsored by the National Free Flight Society.

INDOOR CHAMPS AT KIBBIE DOME

Andy Tagliafico announces that the Kibbie Dome at the University of Idaho in Moscow, Idaho, will be the site of the N.W. Indoor Championships. The dates for this event, which was not held in 1991, will be July 23-26, 1992. Many events are scheduled from the usual AMA and FAI to Federation ROG, O.T. Challenge, P-24, Mini-Stick and various scale events.

Andy notes that contestants should anticipate preregistration in this relaxed format meet. Since the Kibbie Dome has been confirmed for this contest, you can make plans to show up at another one of the country's best indoor sites. For further information, contact Andy Tagliafico at 650-B Taybin Rd. N.W., Salem, OR 97304; telephone (503) 371-0492.

BRADLEY MODEL PRODUCTS NEW MATERIALS AVAILABLE

Jim Bradley has developed quite an inventory of high-tech model supplies. In fact, he has the only supply of .003 carbon fiber sheets that I have been able to find. Jim also announces that he has found a very high quality fiberglass cloth that has the same number and thickness of fibers in both directions. Jim managed to purchase 585 linear yards of the stuff, and he is willing to share it with you—for a reasonable cost, of course.

If you haven't sampled the wares from Bradley Model Products, it's time you started. In addition to the carbon fiber, Kevlar, and fiberglass cloth, Jim also has circle towhooks and electronic D.T. timers. Contact Bradley at 1337 Pine Sap Ct., Orlando, FL 32825. If you want a copy of his complete catalog, drop him a good old USA buck. That should do the trick.

VIC JAY'S FAI AIRFOILS SEARCH PAYS OFF

Way back in November, 1991, I publicized the search that Frank Parmenter was undertaking to qualify Vic Jays' 1956 FAI Power Model, as detailed in the 1957-58 Zaic Yearbook, for Nostalgia competition. I am pleased to report that Frank was able to locate Vic in England and to receive the authorized version of the wing airfoils. Consequently, the model has now been submitted to the Nostalgia committee for acceptance. My guess is that the model will be approved by the time you read this column. When everything is official, look here for the details that will make this ship another design to consider for the 1992 Nostalgia contest circuit.

MODIFYING COX REED VALVES FOR NOSTALGIA COMPETITION

This article is adapted from a newsletter article from SAM 40, as presented by Bob Erpelding.

"Let's start at the top and work down. The glowhead should be the competition head for peak rpm—it's part number 1702. Use one head gasket, but if you have difficulty setting the needle valve, try adding another head gasket or two.

"Next is the cylinder and piston. You want a cylinder with two bypass ports. This is standard on the Black Widow and QRC engines but not the Babe Bee or Golden Bee. Hint: they are also on a number of plastic model engines. Check your local garage sales or flea markets. You can see these ports with the piston fully down, or look for a #1 stamped on the cylinder. These are completely interchangeable, but I suggest keeping the pistons with the cylinders when swapping. This is all completely legal as long as the parts are Cox Mfg. (and not Tee Dee). As long as you have the piston out, check the fit of the rod in its ball joint. It is probably sloppy and should be tightened with a special tool. There are several on the market, and if your hobby dealer doesn't have one, he or you can get it from Ace RC. It's a good investment.

"The reed valve can be a big troublemaker. I find the new teflon ones a bit more reliable than the old style brass ones. They are not hard to change but make sure the crossbar on the retainer spring is away from the reed. The reed operation can be checked by taking the reed end of the tank in your mouth (YUUUKK!), you should be able to suck in air, but not blow it out. Do remove the tank back and fuel before making this test. There is also a little O-ring on the end of the venturi at the rear of the tank. It usually needs replacement. These two items cause most of the poor starting and running problems with these engines. These two items can be found in the Cox Overhaul Kits available at your dealer or from Kustom Kraftsmanship.

"Back to the outside of the engine. Remove the needle valve and check that the tip is not bent, broken, or worn. Remove the spring and replace it with a 1/4-inch piece of silicone fuel line and a couple of washers. This will hold the needle setting and help seal the threads, which makes for more reliable running.

"For fuels, I recommend that you use a tachometer and determine which gives you the highest rpm with the prop you intend to use in competition. Most Nostalgia fliers will use the highest nitro content fuel they can to eke out the most rpm. As far as fuel tanks go, do not use pacifier pressure on reed valve engines. High pressure simply overwhelms the reed, and the engine will not run. If you want to use any form of pressure, use a penny balloon setup. This arrangement is low pressure and works well in reed valve engines. The best arrangement is a hard tank with no pressure system at all.

"I use an Astro Flight electric starter and find it eliminates a lot of frustration. Shoot some fuel in the exhaust port, turn over the engine by hand a couple of times, hook up the battery and away you go. If it doesn't start with one or two flips and the needle is set correctly, it probably needs fixing. A bad reed or a clog in the fuel system are likely culprits.

"After you do all of the above things, you must pick a good design, build it light, and come out and beat me. Of course, I don't win all of the time anyway." ***MB***

The Galeville meet also drew these two fellows from Russia. Vladimir Feoderov with Wake on the left, and Alexei Yegorov with A-2 glider. Photo by Stan Fink.

BY ELOY MAREZ

Cox Cobra Two & Three Channel RC System

There are two primary considerations that one should address when considering the purchase of a new RC system. They are: 1) Is it a narrow-band system, *both* transmitter and receiver? 2) Just how does it fit my present and future requirements?

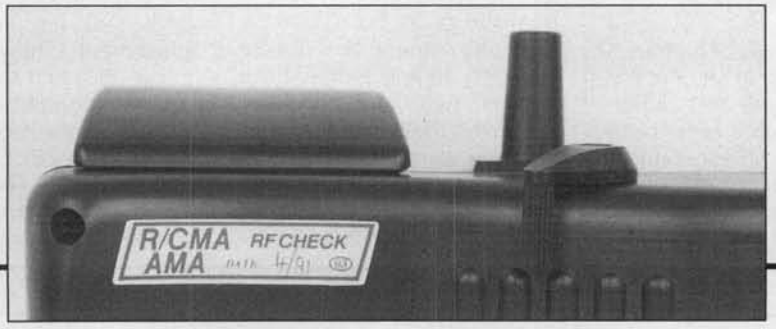
Definitely a departure from the more normal RC transmitter configuration, the Cox Cobra proves its common sense design from the first moment it is handled.

Fortunately for us, where 1) is concerned, we no longer have to depend solely on the maker's (or importer's) advertising claims. Our Academy of Model Aeronautics, in its *Model Aviation* publication, provides us a monthly listing of those RC systems that have been reported to it as having been independently tested and which meet a definite operating criteria. The transmitter then can be labeled with an R/CMA (Radio Control Manufacturer's Association) "Gold" sticker, those meeting only lesser strict requirements being "Silver" labeled. Bear in mind that this does not translate to "AMA Approved," or any such blessing. It does not otherwise indicate electrical or mechanical quality, or that the system is completely immune from any and all outside interference. It states only that it does meet the narrow band standards which are considered minimum for safe RC flight.

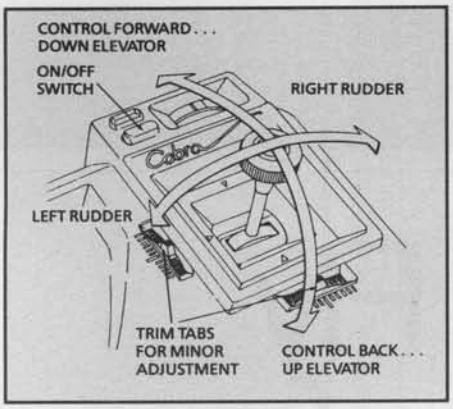
It should also be clarified that in the case of the transmitter, bandwidth requirements can be established and enforced. In fact, our Federal Communications Commission (FCC) does exactly that for all radio transmitters, regardless of their intended use. In the case of RC equipment, AMA has been successful in getting the FCC to legislate narrow-band requirements for all transmitters being shipped by manufacturers or importers after March 1992. There will be a "grandfather" period during which retailers will be allowed to dispose of stock on hand, but ultimately we will all be using narrow-band equipment. Don't look at it as some sort of push to get you to buy new radios, it is for our—all of us—own protection.

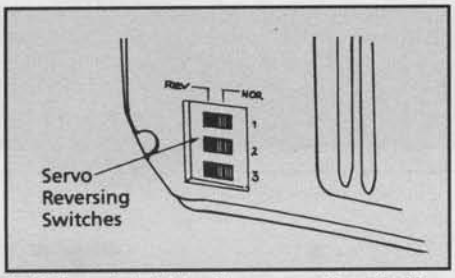
However, the receiver is another story. Narrow-banding a transmitter is seen as a requirement to keep from interfering with those on nearby frequencies. Since the receiver is not capable of causing interference in any manner, it is not subject to legislation of any sort. The narrow-band specs in this case are those that are *recommended* (only) by the AMA as those necessary to keep the receiver from accepting signals from transmitters on adjacent channels. Regardless, narrow-banding of both units is necessary and works when properly controlled.

In the case of the Cox Cobra RC system, it is indeed included in AMA's current listing, both in the two-channel (No. 918320, Receiver No. AXZ9MF82I9) and three-channel version (No. 918330, Receiver No. AXZ9MF83I9). This transmitter then can by all standards be considered as "narrow-band," "Gold," "1991" or however you may care to brand it. It definitely meets all current criteria.



Rear top view of the transmitter shows the location of the third channel control in a natural position for the left-hand index finger. Note also the "gold" R/CMA sticker.





(Left) The control stick functions as normally used with this type of transmitter configuration, basically Mode Two as far as the primary flight controls are concerned. (Right) Positive operating servo reversing switches are externally located as shown, adequately recessed and completely safe from accidental operation during flight.

Which leaves us with concern #2—though maybe we should speak of it more as a question than a concern. Still, the idea of how well does a particular radio fit *my* needs is not one to be taken lightly. Unfortunately, this is something that is of more importance to the complete beginner, who is less able to make such a determination for himself. Generally, he is buying his radio equipment "by the pound" and can be easily led astray by an overzealous or unknowing salesperson.

The point is that the Cox Cobra, as any less-than-four channel equipment, can have serious limitations. In all fairness, Cox Hobbies does not gloss over them in any way. It markets this unit to fill a definite need for certain fliers and models, in large its own small airplanes that it produces and which are intended for a definite segment of the hobby.

In my opinion, the beginner who clearly intends to pursue that dream jet with retracts, smoke and bombs, should be advised against the purchase anything less than a four- or five-channel system. When he is ready to advance from a two- or three-channel airplane, he is not forced to buy different equipment, and then too, the beginning flier should start by using the type of transmitter mode and configuration he will ultimately use to fly high performance airplanes. Obviously, I am more concerned with poor advice and the push to make a sale than I am with the design or operation of the Cox Cobra units. In fact, the other side of that story is just as obvious. For the confirmed sport glider or small airplane flier, I find this system to completely fill all needs without having to also purchase other "competition" type features that he might never really use.

The Cox Cobra system is manufactured in Japan by Sanwa, which is in fact a major electronics equipment manufacturer, producing well-known products other than RC components. In general, all parts of the Cobra system are well made, with sharp, clean molded plastics and electronics making use of current techniques such as through-hole plated PC boards and extensive use of Surface Mount Devices (SMD).

The Cobra is an AM system, available only on 72 MHz. It is basically a "dry" system, that is, it is furnished without batteries of any sort. It is configured for alkaline dry cells, and only the best quality alkalines are recommended. Two different airborne battery boxes are available, for AA and AAA cells, the airborne weight (with two servos) being 7.1 and 5.3 ounces respectively. At the very minimum, I strongly recommend that NiCd cells be used for the airborne

continued on page 72

Servo and receiver sizes in comparison to the common "AA" battery. Exact dimensions are given in text. A smaller, lighter case for "AAA" cells is also available.

The Cobra family includes everything you will need, with the exception of batteries, for your two-channel airplane. Additional servos are available if required.

Learning To Fly An RC Helicopter

Or, Teaching An Old Dog New Tricks

BY AL TUTTLE

Having seen various ads in the model magazines advertising RC flying schools, I have often wondered how effective they are. Are they worth the money and time? Unfortunately, I have yet to meet someone who has attended one of the schools that teaches fixed wing flying. However, I did meet a modeler who had attended Ernie Huber's RC Flight Training Center, located in Crescent City, Florida. This modeler had nothing but high praise for it and said it was well worth the money and time.

Ron's first attempt. Models are X-Cell 30s with whiffle ball training gear.

Last May, when attending a fly-in at Apopka, Florida, I talked with Ernie about attending his school sometime in the future. I have known Ernie for many years and watched him develop one of the first, if not *the* first, successful RC helicopters. Although I've been around RC helicopters all these years, I had never flown one or attempted to fly one. In November 1991, I happened to drop by Ernie's digs and he asked me if I could attend a class starting the following Monday, as he had a class of beginners coming in and that there was an opening available. Naturally, there was only one answer to that question.

Who is Ernie Huber and what qualifies him to run a flight school? As I stated earlier, Ernie is a pioneer in RC helicopter flight. He was the first to hover inverted back in 1979 and invented the invert switch. He is a five-time national RC Helicopter Champion. He has flown RC helicopters in several major motion pictures including *The Towering Inferno, Capricorn One* and *Blue Thunder*, to name a few. Although he is retired and devoting 100% of his time to his RC Flight Center, he still finds time to design and develop advanced RPV helicopters.

When you sign up for the school, you only have to bring yourself and a change of clothing. Room, board and the use of all model equipment is included as a package deal. Meals are family style, and Ernie's charming wife, Mary, sets an excellent table. There is no bunk house. You live in the same house as Ernie and Mary. In fact, you are treated as family. It is surely a relaxed and warm atmosphere, conducive to learning as well as having an enjoyable time.

Behind the house is a building which features a workshop, classrooms and an office. Adjacent to the building is a well-maintained grass strip which was once used as an airstrip for full-size lightplanes, but is now used as the helicopter training area.

MONDAY, DAY 1

I arrived on site at 7:30 a.m., and was introduced to the three other students who had arrived the night before. Because I live less than an hour's drive away, I elected to go home each night rather than stay on the premises. I did take my noon meal there. The three students were Gary Ellis from Muskoka, Ontario, Canada; Ron Barker from Spring City, Tennessee; and Bruce Staring, from Stone Mountain, Georgia. Two of the students, Ron and Bruce, had never flown a helicopter. Gary had been attempting to fly only since February of 1991.

Before starting out, Ernie sat us down in the classroom for a thirty-minute introduction as to what we were going to do that day and the rest of the week. In addition, he laid out the ground rules. We were there to learn how to learn, therefore we would do as he told us. In other words, when he gave you an exercise to perform, you would practice it. There would be no aimless boring of holes in the sky! He also stated that at the end of the course we all should be able to hover the helicopter and perform basic maneuvers, and that because we are all individuals, some of us would progress faster than others and not to get discouraged.

Next, we loaded the golf cart with two helicopters, three transmitters, a box of Rx and Tx battery packs and fuel. Ernie uses the X-Cell 30 helicopters manufactured by Miniature Aircraft USA. There are two flight areas, one at the south end of the field and one at the north end. The north area was used daily as it is the closest to the building complex. Upon arriving at the training area, the

equipment was off-loaded onto one of the two benches where we were taught how to install the training landing gear.

The training gear is made up of two 3/8-inch diameter wooden dowels with four-inch diameter plastic "whiffle" balls attached to each end. These two assemblies are attached to the helicopter skids via rubber bands to prevent the helicopter from turning on its side in a less-than-vertical descent to touchdown and to provide a springy shock absorbing cushion in the event of a hard touchdown. The balls on the ends of the dowel are used as an orientation aid while learning to hover.

Ernie performs routine maintenance on a helicopter. Surprisingly, the original five helicopters used to start the school are still in use.

After the training gear was installed, he explained how to use it to detect motion of the helicopter. If all four balls are level, then you are hovering properly. If, say, the front ball starts to lower, you can expect the helicopter to immediately begin to move horizontally. In other words, go by the tilt of the helicopter.

Next, under his supervision, we checked the Rx battery packs to see that they were fully charged and then installed them in the chopper. Packs are held in via rubber bands for ease of replacement. These batteries are changed after approximately four flights, or when the battery check indicates a low voltage condition has been reached.

I noticed that when facing the helicopter, it sat on the bench with a decidedly starboard (right) tilt. When asked why, Ernie told us that when a helicopter hovers, it generates a drag up at the rotor. As we have a tail rotor that's about seven inches lower than the main rotor, keeping the tail from spinning around from the torque of the main rotor, it causes the helicopter to tilt. Helicopters tilt at all different angles. It depends on how long or where the mass is below the rotor, and how low the tail rotor is. You see some tail rotors way up at the top of the tail fin on some helicopters. This is to get the the torque cancellation at the same plane where the torque is being generated and therefore reduce the tilt while the helicopter is in a hover. Wow! Already I had learned something. This was going to be an intense experience!

When you ask Ernie a question, you will get an answer and it will be explained to your satisfaction. If he thinks you still do not understand, he will keep at it until you do.

Next, the functions of the transmitter switches and sticks were explained, and which controls they moved on the helicopter. We then were shown how to hold the helicopter when starting the engine and the proper hand holds to use when carrying it.

Now, finally, we are going to get to fly this thing! Ernie uses the buddy box method of instructing. Two transmitters are hooked together via a cable known as the trainer cord. The instructor's transmitter is the master and the student's transmitter is the slave. The helicopter is under the student's control and when necessary, i.e., when the student gets in trouble, the instructor simply flips a switch on his, the master transmitter, and takes control. This method, especially for helicopters, is ideal and prevents a wipe-out of the helicopter during training. Even though Ernie uses the buddy box, his use of it is such that you do not depend on him being with you all the time. When he uses the buddy box he calls it "plugging in."

For our first flights, we used one helicopter. This was started and carried out to the practice area, where Ernie explained what we were going to do. The first day, each student gets about twelve to fourteen minutes on each flight, learning how to just get it off the ground, hover it and get it down on the ground again.

We stood approximately twenty-five feet in back of the helicopter, and with the helicopter nose facing away from us, we were to hover the helicopter at an altitude of between two and three feet. Ernie demonstrated this and then each of us students gave it a try.

FLIGHT #1

After watching the other students' first attempts, it didn't look all that difficult to me. With Ernie at my left elbow and coaching me, I slowly gave it power and got the rotor up to speed where the helicopter was starting to get light. So far so good. A little more power and then all hell broke loose! The nose went to the left and the helicopter started lifting off and banking to the right at a high rate of speed. I whipped in a left correction on the stick. Did it come back to the left? No! The damned thing continued to the right and was now going backwards at the same time! I pushed the nose down, which only worsened the matter, so I cut the power—the wrong thing to do! While simultaneously hollering in my ear, *"Don't chop the power!"* and switching to his Tx, Ernie managed to save the helicopter from being re-kitted. He flew it back to the home position and told me to try it again.

Now let me tell you, it was the most helpless feeling I've had in a long time. Ernie, with his infinite patience, explained that because of my fixed wing experience, I would automatically pull or cut power to slow the plane down. You don't do that with a helicopter! You pull power and it drops out of the sky. My next few attempts resulted in similar excursions, but not quite as violent as the first attempt. Each time Ernie would show me what I had done wrong and each time I would screw up in a different manner.

At the end of my first tank of fuel, I was one chastened modeler. This was the first real flying challenge that I had had in many years of flying RC. I was at ground zero and it was disturbing. I was told that it was going to be a new learning experience, but no one told me it was going to be so humbling! Talk about having a tiger by the tail! Yet, it was fun, and a real challenge.

Ernie Huber's workshop.

Each of the students' first flights were critiqued by Ernie, who told us what we were doing wrong. During lunch break, I had time to think about my reactions to the school so far: 1) The course is intense and there is no wasted time. Everything is done with an express purpose. 2) You get "hands-on" experience immediately.

3) You are taught one thing at a time. He shows you how to perform the task and then you go out and do it.

FLIGHT #2

This was 1000% better! I started off with great trepidation and was about to really screw up again, when Ernie took the chopper up about twenty feet and let me fly it to see the control effects. Dawn started to break over Marble Head! After that little demonstration, I was able to do a few shaky hovers and one half-decent landing. At this stage of learning, Ernie has you concentrate on the cyclic control. You fly the nose and if the nose gets off more than 45° to the left or right, you land the helicopter and by using the throttle/collective/tail rotor control, make the helicopter light enough to be able to swing the nose so it is facing away from you again. This maneuver teaches you just how much collective and directional control it takes to move the helicopter without it leaving the ground.

Ernie demonstrates the transmitter controls to Ron Barker. Other students are Gary Ellis (left) and Bruce Staring.

At the completion of this flight, everyone was making good progress. Gary, who had a bit of experience, was light years ahead of the rest of us at this point. He was having a problem though. He had been teaching himself to fly using the tail method for directional movement. Ernie teaches the nose method. Consequently, when Gary saw nose movement he gave it the wrong control. However, it didn't take Gary too many flights to overcome this problem and at the end of the course he was doing an excellent job of flying. Ernie stresses from the very beginning that the course isn't a head-to-head competition. Everyone has their own speed and will be treated as such.

FLIGHT #3

I was able to hover it a few seconds before it got away from me. We were still plugged in. End of day one. Flying stopped at 4:30 p.m., and after a debriefing, I headed for home. For those students who live in, there is a TV room where Ernie has a super collection of RC helicopter tapes that are well worth watching, or you can read or talk shop.

TUESDAY, DAY 2

We loaded the gear onto the golf cart and proceeded to the practice area. Ernie placed a three-foot, carpet covered plywood circle out in the center of the grass strip. He then placed four small orange plastic cones in a rectangle around the disk, which was called "home." From then on, at the beginning of every flight, the helicopter was to be placed at the home position, nose facing out, and the pilot was to stand midway between the rear cones. We were expected to stay within the parameters of the cone.

FLIGHT #4

This was the first flight of the day, and it was as if I had never flown before. Terrible! Ernie had to take over a couple of times. One thing about Ernie, he lets you get in real deep trouble before he takes over. He just doesn't stand by while this is happening, but is continually telling you what to do to try and get out of the mess you got yourself into. After this flight, I was getting a little depressed about my lack of progress. After all, maybe I just wasn't cut out to fly one of these whirlygigs.

FLIGHT #5

Still no improvement that I could see. I just couldn't seem to get the hang of it. The drill for this flight was to take off and hover at a two to three foot altitude for a few seconds, then, maintaining that altitude, slide the helicopter over to the right cone, stop and hover a few seconds, and then return back to home and land. This was repeated for the left cone. Altitude changes were also practiced. We were to put the helicopter into a hover at a six foot altitude, then lower it a couple of feet and go into a hover without losing or gaining altitude. I was still plugged in and flying the same helicopter. Ron, Gary and Bruce were unplugged during their fifth flight.

FLIGHT #6

The other three students performed their solo flights. Ernie stood over by the fence. By the time Ernie turns you loose, he is absolutely sure that you have absorbed the basics to the point where you won't do anything rash. I thought my flight was a bit better, and Ernie must have thought so too, as partway through the flight, he removed the trainer cord, told me to have at it and walked away. I finished out the tank of gas without crashing. I soloed!

We were now at what I call Phase II. Ernie paired us off into teams. Gary and Ron were one team; Bruce and I comprised the other team. Each team now had its own helicopter. We were to continue practicing the maneuvers that we had been shown. Ernie had set up another practice area just south of the first one. In this manner, he could stand or sit by the fence and watch both teams.

FLIGHTS #7-9

This flight was my first complete solo flight and I did better. After this flight I serviced the helicopter for Bruce and while Bruce was flying, Ernie debriefed me on the flight, told me what I was doing wrong and how to correct it. By this time I was getting the feeling that perhaps I may learn to fly one of these things after all. On #8, I was still having problems hovering. Ernie said it was a difficult maneuver, and he wasn't kidding. Now I see why they still have

Ernie Huber's R/C Flight Training Center; his house is on left, workshop on back right.

it in FAI competition. On #9, I was getting more confidence, but I was still not flying the helicopter! This hovering is a bugger! This was the last flight for the day.

FLIGHTS #10-17

On Wednesday, I was doing better. I could now anticipate the helicopter's movement. Starting to hold altitude better. Could perform sudden altitude or columnar changes without losing control and was able to make a half-decent landing occasionally.

On Wednesday evening, Ernie held a class on how to set up a helicopter and transmitter. This was hands-on. Bruce had pre-ordered an X-Cell helicopter, which was ready for him when he got there. This was the helicopter that was used for the lesson, as it had not been flown yet. I was just beginning to realize how complex it is to set up a helicopter, and to do it right. The night before, Ernie had held a class on balancing rotor blades.

THURSDAY, DAY 4/FLIGHTS #18-20

Ernie demonstrated in-flight transmitter control settings that affect your initial setup, and also demonstrated the rate gyro function.

I was doing a lot better. This was getting to be fun! But I was still having trouble performing a steady hover. In an effort to help me fly smoother, Ernie placed his hands over mine on the control sticks and then had me fly. If it wasn't so pathetic on my part, it would have been hilarious! Ernie teaches the "pinch the sticks" method and I have always flown with my thumbs on the sticks. Consequently, I would start out pinching the sticks and then subconsciously revert back to flying with the thumbs.

FLIGHTS #21, 22, 23, 24

I was finally actually flying the thing! Hurrah! A bit shaky to be sure, but I was able to perform some semblance of hovering, the slide, and altitude change maneuvers. Went up into the blue and performed figure eights. I thought I did pretty well. Because of the forward speed it was a lot like flying a fixed wing aircraft, using coordinated turns and back pressure to hold the nose up in the turn. I did get confused in one turn but had the presence of mind to place the helicopter into a hover in order to collect my thoughts. Since I had not practiced landing from forward flight, Ernie did the landing.

FRIDAY, DAY 5/FLIGHTS #25-26

Horrible! I couldn't get the damned thing off the ground, and when I did, it would chase me out of the circle. What was I doing wrong? Ernie said that everyone would experience regression sometime during the course. But on Friday? Come on! This was devastating! Ernie had been watching me from the fence, yet hadn't said a word. After the 26th flight, I told Ernie that I had forgotten everything I had learned. Ernie exploded! "Everything you have learned? *You haven't learned anything, so how could you forget it?*"

Well, that made me think a bit. Was I that slow a learner? One thing I am not, and that is a quitter. I made up my mind then and there that I was going to fly that whirling mess of plastic, wood and aluminum before leaving!

FLIGHT #27-31

Ernie plugged me in and found that in an effort to fly smoothly, I wasn't giving enough control soon enough, thereby letting the helicopter fly me. After yelling a few endearments in my ear, he turned me loose. I started improving immediately and flights 29 through 31 were excellent! I was really flying the thing and was having a ball. Unfortunately, it was time to wrap it up. Ernie had taught us the basics up to and including the tail end 360° circle and figure eights. Now it was up to us to go home and practice. The last hour of the day was spent With Ernie demonstrating various flight maneuvers and how to perform them properly.

SUMMARY

I asked the three other students if the course was worth the cost. They all said definitely. Gary stated that he spent almost as much for broken parts in the crashes resulting from trying to teach himself to fly as he did for the school. We all agreed that if you are seriously contemplating purchasing a helicopter, this school should take top priority *before* making that purchase. Attending the school will enable you to not only learn to fly a helicopter, but to ascertain whether or not you really have the talent and disposition to get involved in this marvelous sport.

All of us could perform the basic maneuvers, and some had more progress than others. I can't say enough about the helicopters Ernie uses. For five days we beat the living daylights out of them, yet did not experience any downtime because of mechanical failures. He bought ten helicopters two years ago and assembled five to start with. The helicopters we used are two of the original five and have 5500-5600 flights on them. Ernie says he gets approximately 350 flights on an engine before it goes over the hill. And parts do wear, particularly the little metal ball in the connectors. As he changes the parts, he throws them in a drawer and at the end of the season he tallies up the used parts. He says the operating cost of the helicopters is quite reasonable.

"Old Dog" Al Tuttle did learn some new tricks!

The 1992 sessions started in January and continue through the end of June. Fall classes start on September 23 and continue into November. If you are interested in attending this top notch school this season, I suggest you get in touch with Ernie ASAP, as classes fill up fast. Maximum class size is four students. The fee is $995.00 per person per class. This includes five days of instruction, training on X-Cell helicopters and Futaba computer radios, five nights of lodging and all meals. Ernie also has a school for pilots with intermediate experience. Many students who attend the beginner's school return for the intermediate school. Also, if you want a helicopter, Ernie will have one built and will deliver it to you at the school. Send for the info pack today for more information. Write to: R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112-727; or call (904) 698-4275.

You *can* teach old dogs new tricks and now when I read James Wang's "Chopper Chatter" column, I am able to understand what he is talking about. ***MB***

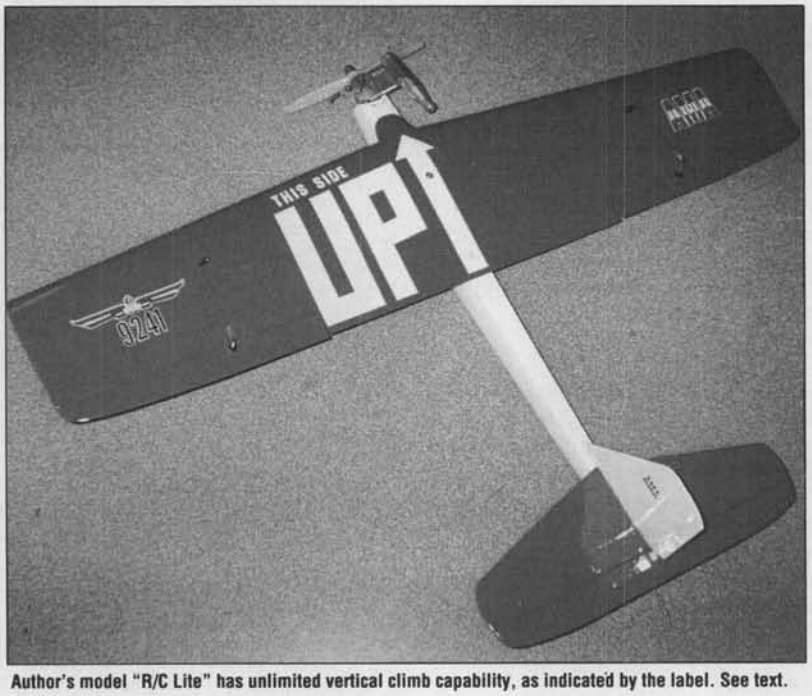
VERTICAL PERFORMANCE UNLIMITED

Way back in the dark ages (April 1991 to be exact) we talked about hand launching models without landing gears, and about very light and powerful models with excellent vertical performance. Let's talk about it some more, since your author has achieved a goal since then.

When I wrote that column I had been making models with successively better vertical performance for several years, but I had not yet personally achieved "unlimited vertical."

In fact, at that time I had seen only one model fly with unlimited vertical, the 12-oz. Cox .09 powered Spitfire built by Tom Davis, which I showed and discussed in April '91. Now I have designed, built and flown an RC model with unlimited vertical myself.

Vertical performance is a popular objective in modeling these days, but we talk about it rather loosely. "Good vertical performance" seems to mean the model will climb at a fairly steep angle without stalling. Better vertical means it will climb steeper yet. Such models can be zoomed fully vertical for a few seconds, perhaps a hundred feet or more, but few can fly vertically indefinitely.



Author's model "R/C Lite" has unlimited vertical climb capability, as indicated by the label. See text.

It is sometimes said that anytime the static thrust exceeds the weight, the model can fly straight up. Not true. I completed a model in July '91, which I had designed for good vertical. It weighed 3.15 lbs dry, had a Schnuerle .40, and had a little more thrust than weight with a full fuel tank. It had the best vertical performance of any model I had ever built, but it wouldn't hold a true vertical climb indefinitely.

One problem is that dynamic thrust is less than static thrust. As soon as the plane picks up speed, the thrust decreases—in this case, to less than the weight of the model. Even if I had had dynamic thrust slightly in excess of the weight at flying speed, it still could not have continued to fly vertically. For continued vertical flight the dynamic thrust must equal the weight of the model plus the total drag of the model at the speed it is flying.

The total drag of a model climbing vertically is much lower than the drag on the same model flying horizontally however, since its vertical velocity will be much lower and there is no induced drag component when the model is "flying" straight up. I put "flying" in quotes because flying usually means supported by aerodynamic lift on the wing. When going straight up there is no wing lift and therefore no induced drag, which is a byproduct of lift. In the straight-up mode the only lift is helicopter-type lift generated by the prop. A wing flying straight up will have no induced drag, but the prop blades have induced drag, which contributes to the prop torque.

The optimum prop for vertical flight will have less pitch, because we won't be flying nearly as fast vertically as we do horizontally. Because it has less pitch, we can use a larger diameter, which will increase the prop efficiency and the low-velocity thrust. However, we will probably be flying our model horizontally in conventional modes more than we will vertically, so we need to compromise on the prop choice. The best prop for vertical flight alone would probably have too little pitch for decent normal flight.

On November 9, 1991 your author successfully passed the unlimited vertical barrier with an RC model. This original model, "RC Lite," is shown in the photo. It is almost identical to the one that wouldn't quite sustain vertical flight in July a year ago, but has a .60 instead of a .40. Unfortunately the bigger engine and bigger fuel tank made it heavier, but the dry weight is still only 4.01 lbs. (64.2 oz.). It is 4.6 lbs. with its 12-oz. tank full.

My buddies, Paul Weston and Gene Wood, and I measured the static thrust on the model with a digital fish scale before the first flight. We got 6.6 pounds with a 12x5 prop, the only one we bothered to test. That is the prop I then flew with. It worked.

Six point six pounds of static thrust minus four point six pounds of fueled airplane equals two pounds of excess vertical static thrust. I don't know what vertical velocity my model continues to fly at, but I will guess it sustains between ten and twenty mph straight up. Whatever its velocity, I am getting enough thrust to balance the weight and the drag at that velocity, and the velocity is giving me enough control that I can steer it right and left, forward and back, and roll it to keep it oriented and flying straight up for as long as I can see it. It is a big kick!

Competition free flight models are designed to be stable climbing at a near vertical angle. Not so with RC models. I have to keep constantly on the sticks to keep its nose to the zenith, but any average RC pilot could do it.

Unlimited vertical is a go, no-go matter. The model can either do it or it can't. The model is usually the limiting factor, not the pilot.

The essential ingredient for vertical flight is a high thrust-to-weight ratio. We could get that by more power or by less weight, or both. I dislike tuned pipes and screaming engines, so my effort to date has been on the weight reduction side of the equation.

This four pound model weight includes a muffler on the .60, a 500 mAH battery, five

continued on page 83

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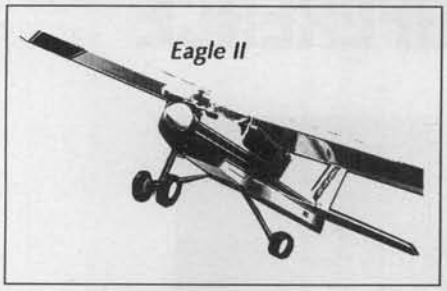

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ELECTRIC POWER

BY MITCH POLING

PREVENTING MOTOR INTERFERENCE

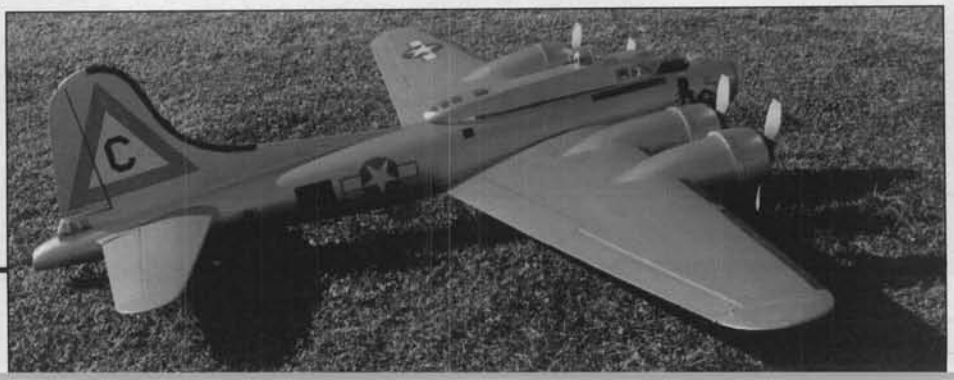
Bob Johnson wrote a very good article on preventing motor interference to RC systems in the August 1991 issue of *RC Report*. Gordon Banks, the editor, gave me permission to use excerpts, so here are some of the highlights.

Test the range of your radio both with the motor off and with it running. If you lose 10% or less of the distance (transmitter antenna collapsed), there is not likely to be any problem with interference. Example: 100 feet with the motor off; 90 feet with the motor on should be okay. Bob says many models do all right even with a loss of 25%.

"Seawind" by Laddie Mikulasko is based on the "Laker" design, but is scaled down to 54-inch span for a geared Astro 15. Takeoff on water is an astonishingly short 30 feet!

Fleet biplane in Canadian colors is the work of Dr. John Mountjoy. It's basically an Aerodrome kit with some subtle changes to keep the weight down. Power is an Astro 40 on 21 cells.

The equipment layout is important. Ideally all the power components should be far forward, the radio components far aft. That is the way I set up my planes, and I have had very little problems with glitching. The ser-



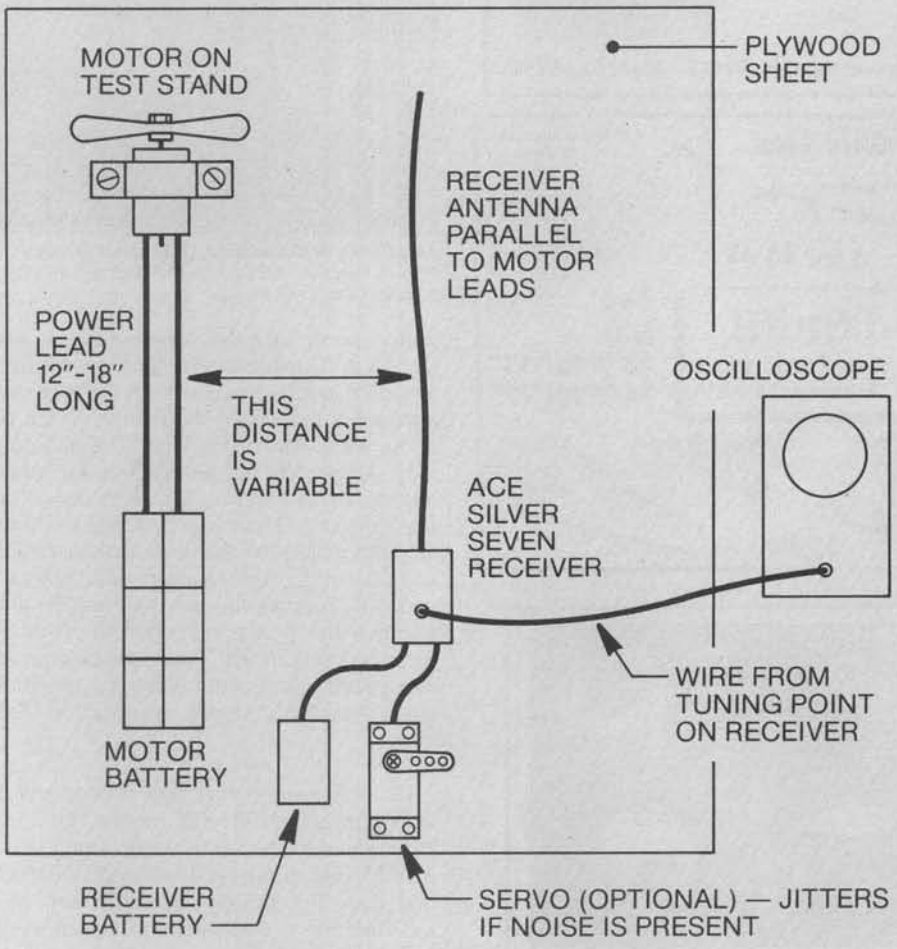
Reliable, clean electric power is a natural for multi-engine models. Joe Beshar uses four Astro 035 cobalts in his 78-inch B-17, based on the Royal kit plans.

vos are in the very back of the cabin, then the receiver, then the speed control, and finally the batteries. This also minimizes damage in case of a crash, as all the heavy stuff is in front.

If radio interference is still a problem, Bob recommends using RF chokes. You can make these from FT-82-43 ferrite toroids. Wrap both motor wires through the toroid four times, about half an inch or so behind the motor. Don't put it closer, as the magnetic field of the motor can saturate the toroid. This should solve the glitching problems. You can also reduce noise going to the receiver with an FT-50-43 toroid, by wrapping the lead from the receiver to the speed control through it four times. This has the same effect as putting 10 microhenry chokes in each lead.

The ferrite toroids are available from Amidon Associates, 2216 E. Gladwick St., Dominguez Hills, CA 90220, telephone (310) 763-5770. The FT-82-43 toroids can handle four turns of #16, #15 or #14 high-flex wire. The four turns require about six inches of wire per lead. The FT-114-43 toroids are large enough to accommodate four turns of #13 or #12 wire, which will require about nine inches of wire per lead. The FT-50-43 is for servo leads.

(Left) Nelson Whitman, probably this country's most experienced electric seaplane man, is at it again! This time he's created a pretty little 1/10-scale Savoia S-56 flying boat for Astro 035 power. Doesn't appear to be quite finished when this photo was taken. (Below) Novel variable-dihedral flying boat is another of Nelson Whitman's brainstorms—details in text.



BOB JOHNSON'S MOTOR NOISE TESTING SETUP — SEE TEXT

The numbers for the toroids are important. For example, in FT-114-43, FT stands for ferrite toroid, 114 means 1.14 inches outer diameter, and 43 stands for the type of ferrite material. Type 43 ferrite material is the best for suppressing RF noise on 72 Mhz.

Bob Kopski has also had some very good information about suppressing motor interference. He recommends using the ten microhenry chokes in each lead of the servo or speed control cables. Several readers have written me to say this helped clear up glitching they had experienced. Bob's setup is three .001 mfd ceramic disk capacitors (1000 pfd). One disk goes from brush to brush, the other two go from brush to motor case. This setup is common for offroad car racing also. Bob had to drill and tap his Astro motor for the brush-to-case capacitor connection. The offroad car can motors usually have a screw that connects to the case. For those that do not, a 40-watt iron is enough to solder the capacitors to the case. Solder

them at the back of the case, away from the magnets, as the heat could damage them. Kopski found that this setup did away with interference he had been experiencing.

Bob Johnson, in a letter to me, commented that it is easy to measure the series resonance of capacitors with a grid dip meter. Disk capacitors rated at 500 to 1000 volts DC and between 500 to 1000 pf (.0005 and .001 mfd) capacitance show the most effective resonance at 72 Mhz. However, there is quite a bit of variation on this depending on the manufacturer. Kopski recommends the Radio Shack .001 mfd capacitors. Bob Johnson went on to say that larger capacitors (such as .01 or .05 mfd) had too much self inductance for optimum results. These capacitors may be recommended by manufacturers to extend brush life. The 1000 pf capacitor can be added in parallel to the larger capacitor with good results.

Johnson also described his setup for looking at RC noise generated by a motor. An oscilloscope is required to do this. The drawing shows the layout. Bob uses a Silver Seven receiver from Ace R/C, which has a

Keith Shaw's latest masterpiece is this sleek 1/4-scale Percival Mew Gull, that does about 80 mph with an Astro 60 on 28 cells. A real beauty.

tuning point that the oscilloscope is attached to. This setup is for looking at noise radiated from the power wiring. The receiver antenna is parallel to the wiring, which is about 12 to 18 inches long. The antenna may be as close as two inches for quiet motors, or as much as two feet away for noisy motors. The servo is optional, to show the amount of jitter the noise causes. Once you have the right receiver antenna distance, you can compare the noise picture on the screen with the picture you get when noise suppression is added. This might be a good way to test speed controls too, to see what effect they have. Thank you, Bob, for the info!

• • •

Dr. Fred Sauerberger sent photos and a videotape of the 1981 KRC meet at Hatfield, Pennsylvania. The fun-fly was a big success, with 156 registrants, and very good weather both days. Bob Kopski's Senior Skyvolt has a 60-inch span, 600 square inches of wing area, and weighs 88 ounces ready to fly. It uses an Astro cobalt 40 turning a 10x6 prop, running on eighteen 1200 mAH Sanyo SCR cells. The speed control is by Horak. Bob

Another B-17, this one built by Eric Mey from his own company's kit (address in text). Eric chose Goldfire 05 motors powered by three seven-cell packs in series.

says the Senior Skyvolt is a straight scale-up of the Skyvolt designed by him and kitted by Today's Hobbies. I have had many favorable letters about the Skyvolt from readers—they all say it performs well and is a pleasure to fly. It is a 50-inch span, and will fly with cobalt 05 to 15 systems (125 to 250 watts). It is available from C.S. Flight Systems, 31 Perry St., Middleboro, MA 02346, telephone (508) 947-2805. Hopefully the Skyvolt Sr. will be a kit too. Come to think of it, I know of no kits available for the 40. How about it, Bob?

The Fleet biplane was built and flown by Dr. John Mountjoy from the Aerodrome kit. It uses a geared Astro cobalt 40 turning a 13x8 prop, 21 1500 mAH Sanyo SCR cells, and the speed control is by Horak. Flying weight is 8-1/2 pounds, and it is covered with the new 21st Century Coverite. John did lighten the plane with cutouts; he estimates that he saved about half a pound that way. The plane flies very well. The Fleet kit is also available from C.S. Flight Systems, and they offer it in quarter scale as well!

Keith Shaw flew his Percival Mew Gull, a model of a Mew Gull that was modified by Alex Henshaw. Keith's is quarter scale, with a 75-inch span and 800 square inches of wing area. It is powered by an Astro Sport Wind 60 turning a 13x10 prop direct drive at 9000 rpm. Twenty-eight 1200 mAH Sanyo SCR cells are used, along with a Jomar SC-6 speed control. The plane weighs ten pounds, and has flaps. The wing loading is about 29 ounces per square foot. I ran a quick calculation on all this, and the plane is flying on about 1.3 horsepower at the prop, about 30 amps draw, and about nine pounds of thrust; flying speed is about 80 mph. The thrust-to-weight ratio is nearly 1:1! No wonder it is so lively!

Joe Beshar's B-17G is a model of the plane that he flew in during World War II. Joe scratch built it starting from the Royal kit plans. The wings and fuselage are made of stringers, then balsa planked. It is 78 inches in span, has 5.36 square feet of wing area, and weighs 132 ounces for a wing loading of 24.7 ounces per square foot. It is powered by four geared Astro 035 cobalt motors turning Rev-Up 10x8W wood props cut to nine-inch diameter. Joe did a lot of testing to get the best thrust to current ratio, and this was the best prop for his setup. Twenty-four 800 mAH cells are used with a Jomar SM-4 throttle. The landing gear is fixed in place, no retracts, though these may be added later. The plane is covered with Century 21 Micafilm. I saw the videotape of Joe's B-17 in flight and it flew very realistically. The full-scale B-17's are very graceful in flight—they seem to "float" in the air. They are also much quieter than you would expect, with a humming sound. Electric is an ideal way to model these planes realistically in the air.

Another photo shows Eric Mey's 1/16-scale B-17, sold as a kit by Meys Hi Tech Hobby, Inc., White Pond Road, Stormville,

continued on page 76

Products In Use *continued from page 61*

system, as it is foolish to make any takeoff with questionable or unknown batteries, especially in this application where it is difficult to measure the actual current consumption.

The transmitter is a slightly different case. Its current drain is an economical 80 milliamperes; a steady and constant 80 mA. Figuring on the manufacturer's rating for Duracell AA cells at 1500 mAH, this then gives one over 18 hours of operating time. That's a lot of flying time, isn't it? However, unless you are also religious about measuring and recording your flight time, you are either going to replace cells before they are really exhausted or you are going to run out of battery power. In common with all minimeter equipped transmitters, the half-inch wide meter on the Cobra transmitter is a useful indicator that the unit is on, but it should *never* be used as a gage of remaining battery life. It actually depends on your use—if you are an active flier, the move to an all-NiCd system is certainly warranted. An accessory battery charger is available from Cox Hobbies. Both the two- and three-channel Cobra systems come with two servos only. The third one can be obtained directly from Cox Hobbies should your local supplier fail you in this respect.

The most noticeable feature of the Cox Cobra is the transmitter design—esthetically attractive and graceful, unlike the square box that many of us grew up with. Obviously well planned and proportioned, the transmitter drops comfortably into my average-sized hand, with the forefinger naturally going to the third-channel lever with which the three-channel transmitter is equipped. The two-axis stick assembly with its large knob is obviously intended for thumb-and-forefinger flying, but is contoured so that the thumb flier will not find it uncomfortable or unsafe. Trim levers are located in the normal adjacent positions. There is no trim lever on the third channel control.

The useful servo reversing feature is included, the recessed switches being readily available on the lower left rear corner. A battery charge plug is included and prewired into the switch to ease the NiCd conversion for those so inclined. Overall, the transmitter measures 6-1/4x6x2-3/8 inches, less the length of the stick, and for those of you who care about such things, the battery-equipped transmitter weighs in at 20-1/4 ounces.

The Cobra receiver is something of a rarity, or a minority anyway, being double conversion AM—most others being FM. However, as stated, it satisfies the AMA requirements. The size is what is expected with equipment such as this: 1-5/16x 2-1/16x15/16 inches, and weighs just one ounce. Inside, except for the decoder, it contains everything that one would expect to find in this type of receiver with more channels including a crystal filter and the 11

MHz crystal and its required circuitry. Extensive use of practically microscopic SMD devices has allowed the designers to pack a lot of electronic circuitry into this small package.

Servos? The servos furnished with the Cobra can be classified as medium small. The Cobra 80111 measures 1-3/4 inches long x 17/16 inches high x 3/4-inch wide. Their weight is 1.1 ounce, including a harness that could be half its length and still be practical for the type of model this equipment will most often find its way into. There are no torque figures published for this servo, but based on its size, and the available space for a motor, which after all pretty much determines its output power, my best guess in this case is 20 to 25 ounce/inches. Since this is not a system intended for ducted fans or quarter-scale airplanes, I will not hesitate to consider it completely adequate for any models that one would want to fly with a system of this type.

The system instructions are rather humble, but adequate. After all, this is basic, completely uncomplicated equipment. It comes with a six month warranty, with the usual and logical precautions against misuse, crash damage, shipping, or Junior working on it with his blowtorch and wrecking bar. In addition, a Courtesy Line is maintained for your discussion regarding any performance tips, problems, or parts. That number is (800) 451-0339.

There is always another side to every coin, which should not be overlooked. Back at the beginning, I mentioned the importance of judging a radio system based on its application to *your* needs. Well, for *my* needs, I personally would not use this system in a high performance airplane. But whoa!—not due to any concern about it, the radio. My concern is merely that I am a Mode One flier, and with this type of transmitter (basically a Mode Two) I can only fly with adequate time to stay ahead of the airplane, time to think before reacting. Should I get out of step, my reflexes take over and I start flying Mode One, with the inevitable results. Sounds like something of a personal problem, doesn't it?

The other thing I didn't really care for might make more sense to more of you—I found the gimbal stick a little short, resulting in somewhat a faster control response than I normally like. However, some of that has to be due to the abnormal mode (for me) in use. Should you also feel the need, the knob screws off, and anyone with a small lathe and metric threading tools can add a half inch or so of length in a matter of minutes.

There not being anything else quite like the Cobra on the present market, I feel that it fills a definite need for those in our ranks who don't need ten channels with throttle to rudder coupling - there really is such a thing! Like everything else in today's hobby world, the Cobra is available for a variety of prices; I have seen the three-channel advertised for under $100. Do your shopping carefully. More info? Contact Cox Hobbies, 350 West Rincon St., Corona, CA 91720-2004. ***MB***

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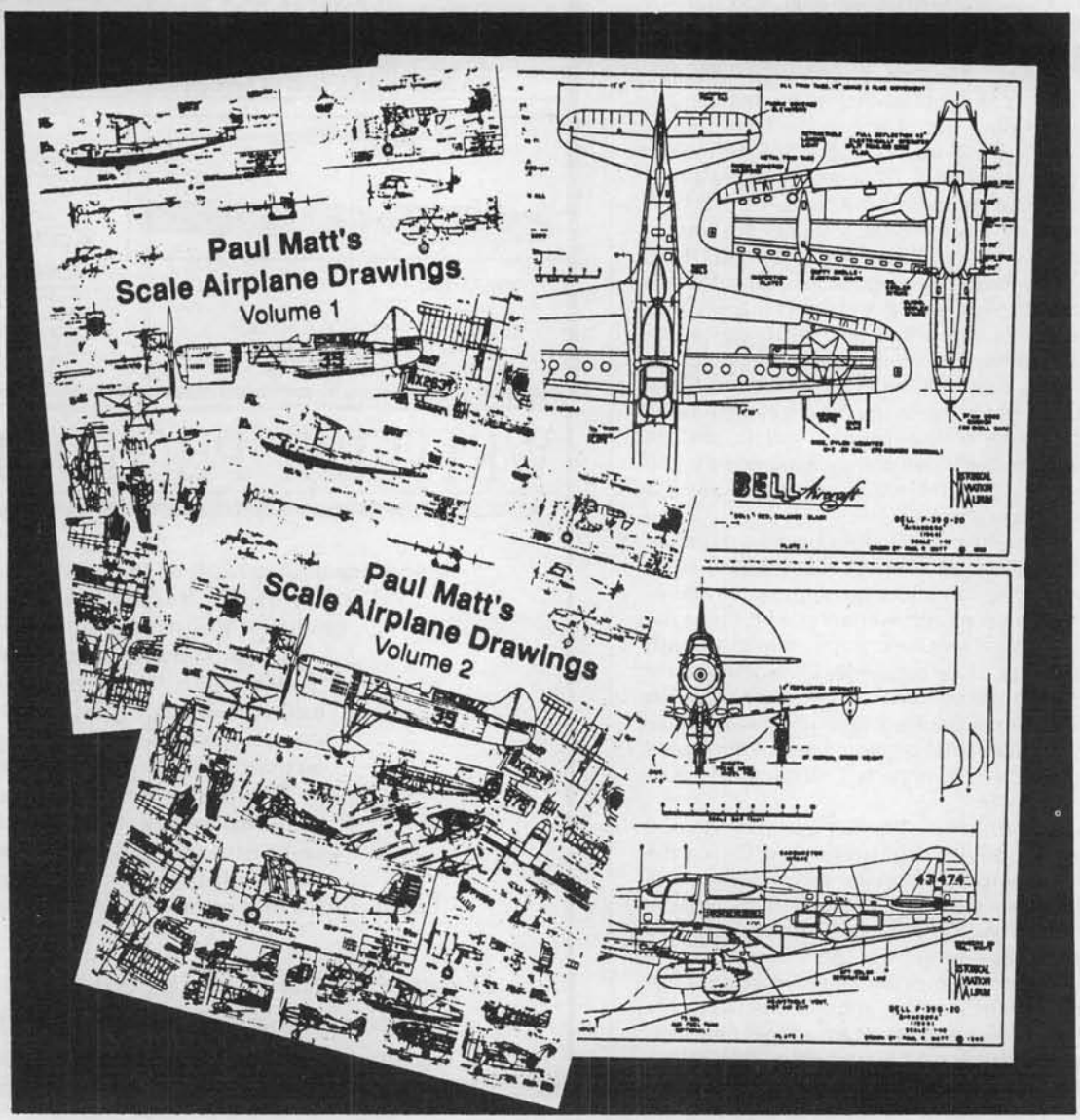

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ELECTRIC POWER *cont. from page 71*

NY 12582, telephone (914) 878-7523 (9 a.m.-3 p.m. EST). The kit includes a fiberglass fuselage, foam core wings, and vacuformed cowlings. Eric's plane has retracts and is powered by four Goldfire 05 motors, direct drive, turning 8x4 wood props. Three seven-cell packs in series (size not mentioned, probably 1200 SCR) drive the four motors, which are connected in series. A Novak 828 speed control is used. The span is 78 inches, flying weight is 10.5 lbs., for a wing loading of about 31 ounces per square foot. Mey will also be kitting an electric OV-10 and a C130 later. For those who like gas, the B-17 can also fly on gas engines (I would guess four .15s).

There were seaplanes at KRC too! Nelson Whitman built the Savoia S-56 at 1/10-scale, powered by an Astro 035 geared cobalt motor turning a 10x6 prop. Six SR 1100 mAH cells are used, along with a Horak throttle specially made for six cells. Flying weight is 40 ounces. Nelson's Shag 5 seaplane is the culmination of a long series of electric seaplanes going back at least ten years. "Shag," by the way, is a New England name for the cormorant. The Shag is powered by an Astro 25 with 2:1 belt drive turning a 12x8 prop. The throttle is by Horak, the pack is fifteen SR 1250 mAH cells, flying weight is 96 ounces. An R.O.W. takeoff requires only 50 feet or less, with an excellent climb. Nelson built in a very unusual feature: the dihedral can be remotely controlled! For takeoffs, the plane uses negative dihedral, so the wing tips, which are floats, are in the water. Once on plane or in the air, the dihedral is changed to neutral. Very clever!

Laddie Mikulasko's 54-inch Seawind is a scaled-down Laker. It is powered by an geared Astro cobalt 15, turning a 12x8 pusher prop. The motor was retimed for reverse rotation as required by the gear drive. The battery pack is twelve 1200 mAH cells; the speed control is a Horak. Flying weight is 3.25 pounds, and R.O.W. takes only 30 feet! There is a chance that the Seawind may be kitted. Hope so—it's about time some electric seaplanes were available as kits. Thank you, Fred, for the great photos and info!

The Horak speed control is new to me. I have not tried one, but it has obviously become quite popular. The Horak throttles are available from C.S. Flight Systems. There are ten different types available, ranging from the SPC 1 for four to 14 cells, to the SPC80SB for eight to thirty cells, with brake, for $153. All of the Horak throttles are optocoupled and high rate, with built in heat sinks.

Till next time, fly for fun, fly electric! My U.S. postage address is: Mitch Poling, 7100 CSW/MC, Box 734 PSC 2, APO NY 09220-5300. My address for overseas postage is Normannenweg 20 D-6200, Wiesbaden-Biebrich, Germany. ***MB***

WORKBENCH *cont. from page 7*

thumb and first finger, something I don't have. It also restricts access to various transmitter switches.

"Just as an observation of a scale competitor and judge, the transmitter strap has come a long way. It is a lot more convenient than a tray and nearly as stable. With a strap, you can either thumb or pinch and have reasonable access to the other transmitter functions. A word of caution though, if you leave the strap around your neck, tuck it in your shirt to keep it out of the prop . . . the strap, that is. Another rather obvious caution is not to turn off the transmitter when hooking up the strap. It can be rather humorous when it happens to your garden variety yard dart, but it's pretty hard to laugh when a beautiful scale aircraft rekits itself.

"Probably the most precise method of controlling an aircraft is to use a transmitter tray. It also allows free access to any transmitter switch without affecting the aircraft's flight path. If you happen to be flying a complex aircraft with all the scale functions of the full-size, a tray is almost mandatory for a smooth, realistic demonstration. My TBM Avenger was flown for four years and the F-14 Tomcat for three years—neither one was ever flown without a tray. Admittedly, a tray can be somewhat cumbersome. It can also give you a sense of restricted movement. If you fly with a lot of transmitter 'english,' it will take longer for a tray to feel comfortable.

"For the longest time I was the only one in scale competition to use a tray. Probably because trays were difficult to find and not very accommodating. I had to make my own. Now LAW Racing Products makes a transmitter tray to accommodate any radio and most any body.

"So . . . for competition flying, pinching is better, and pinching with a tray is better still.

"Now, about the downwind turn. . ."

Dennis makes an extremely valid point, and it's backed up by some of the world's best fliers, such as Hanno Prettner and Wolfgang Matt. A sturdy transmitter tray provides a solid base from which to operate your controls. However, if you use transmitter "english," as Dennis points out, the tray can have a restrictive effect. Oh boy! Here comes the next discussion to add to the "thumb or pinch" debate: Is "transmitter english" real or imaginary, and, are the sticks being moved during "english" gyrations, or are the gyrations being done to "wish" the airplane through a maneuver, much like "controlling" a bowling ball after you have released it and it isn't on the exact course to hit the "sweet spot" that will get you a strike?

Can you imagine some beginning RCer reading the above, and wondering what the h— we're talking about!? ***MB***

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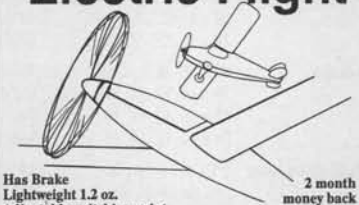

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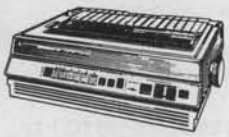

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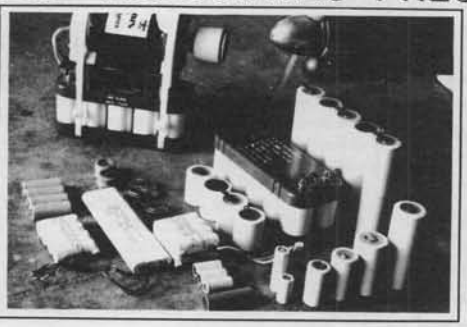

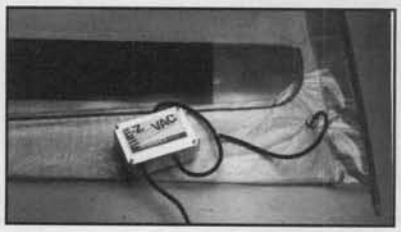

SPARKS continued from page 55

are committed to a time window in that once you start covering the model, you must finish it through its final coats in a given period of time. This time period varies from two weeks to a month, depending on drying rate. What happens if you don't? You'll be sorry! If you re-enter a doped structure that has passed out of its time window, the finish will immediately spider-web crack and your model will take on the appearance of a car rear window that's had a brick tossed through it. Also, a high gloss finish of Aero Gloss will, in about a year's time, develop numerous cracks in its film surface.

"Aero Gloss dope is the most expensive choice in dopes, probably because it is for modeling only and is not marketed for full-scale aircraft. Rumor has it that the EPA has mandated that acrylic lacquers will not be used on cars in the future, and it may be only a matter of time before it is no longer made. I don't know how this will affect the manufacturing of the other dopes, but it doesn't sound good."

HELP WANTED

Received a most interesting letter from Pat Page, former SAM 21 member who we featured in the write-up on modeling activity in Chile during WWII.

Pat now lives in Arnold, California, and is desperate for company in modeling. Right now, Pat is actively engaged in Old Timer flying and wants to organize a SAM Chapter (need at least five to start).

If you're near the Arnold area, Pat would entertain a call at (209) 795-2811. Here is a great chance to get started in old timers!

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OBIT NOTICE

It has recently come to our attention that Herb Clukey, proprietor of Flyline Models, died of a stroke on November 20, at the age of 59. The original Flyline partnership of Clukey and Hurst Bowers was dissolved after several years. In continuing on, Herb offered (in addition to the flying scale kits) a 1/2A version of the Quaker Flash, which turned out to be a great success. Herb will be remembered for his many contributions to modeling. ***MB***

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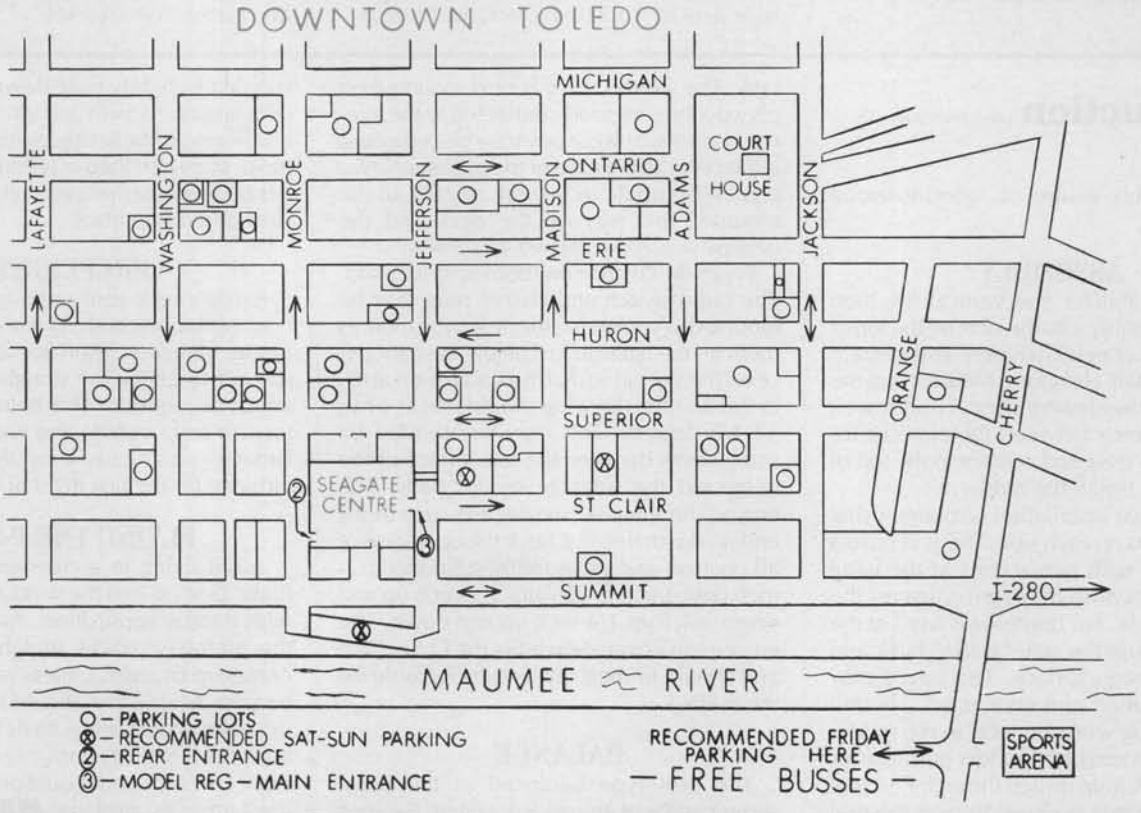
Include a check or money order in U.S. funds made payable to the "Weak Signals R/C Club." Ticket prices are: $5.00 per day for adults and $1.00 per day for children.

Deadline for ticket orders is March 29, 1992. All sales are final.

Hotel info or map of the area may be obtained by sending a stamped, self-addressed envelope to the Ticket address.

Any other Exposition information is available by contacting Wayne Yeager, at the Ticket address or by fax or phone, 313/941-6661, *10 A.M. to 6 P.M. EST, Monday thru Friday.*



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FIRST FLIGHT of the Wright Brothers. Collectors quality photograph made directly from the original print. Other historical Wright Brothers photographs available. Free information. E.W. Davis, PO Box 162-MB, Fairborn, OH 45324-0162.

MODEL BUILDER WRITERS WANTED: Looking for feature articles, construction plans, cover photos, etc., for Model Builder magazine. Contact Phil Bernhardt, Model Builder, 34249 Camino Capistrano, Capistrano Beach, CA 92624. (714) 493-2101.

MYFORD LATHES for model builders. Super quality from England! Catalog $1.00. Blue Ridge, P.O. Box 536-MB, Hurricane, WV 25526. (304) 562-3538.

VACUUM FORMING: Do it yourself. New 128 pg. illustrated book shows you how. Make car bodies, helicopter canopies, airplane parts, boat hulls. Start with ultra low cost basic setup, or form up to 1/8 in. thick plastics with innovative two-stage vacuum system. Make a high vacuum source for less than $6. Eight chapters include Plastics, Molds, Heat & Vacuum Sources, Tips & Examples. It's easy! Try it! $9.95 + 1.05 postage. Vacuum Form, 272D Morganhill Drive, Lake Orion, MI 48360.

PLANNING AN ARTICLE on your latest model design? I can help you prepare the text. Editing, ghost writing, etc. J.M. Thompson Editing Services, 1145 Birch Ave., Cottage Grove, OR 97424.

construction *cont. from page 25*

cemented; this assures a wood-to-wood bond.

ASSEMBLY

Join the stabilizer and vertical fin, then slide the assembly into the slots on the top of the fuselage; check alignment and cement in place. Install elevators. Measure for the filler behind the elevator connecting dowel, assure clearance between the elevator inboard ends, cover and cement to the top of the fuselage. Install the rudder.

Landing gear installation is routine using two "U" straps on each side. The gear covers are installed with two screws at the wing only. Bend them so they spring against the end of the axle. No fastening is used at the bottom because the gear "walks" back and forth on a rough surface. The servos may now be installed and connected. The tail wheel steering wire connects to the rudder servo arm inboard of the rudder pushrod (for less throw). A hole drilled through FB4 will allow the throttle pushrod to pass the fuel tank. The aileron servo is next mounted on plywood mounts and connected to the aileron controls. The canopy may be cemented in place or, in the case of the prototype, two pieces of small triangular stock can be mounted mid-way on the deck and the canopy secured with two #2 screws.

Engine installation and hookup is standard. The radio switch and charge plug may be mounted as you prefer; the prottoype mounts them on the left side just below the canopy. Level the aircraft so that the stabilizer is at 0°. In this attitude the wing should seat at +1 to +1-1/2 degrees. This may be adjusted by using shims between the top surface of the wing and the fuselage mount pads. The engine should have two degrees right thrust and no down thrust. Check the operation of all controls and set as follows: Rudder 1/2-inch right and left, elevator 1/2-inch up and down, ailerons 1/4-inch up and down. The engine top cover shown fits the O.S. .25FP and should fit most any engine suitable for the P-50+1.

BALANCE

The prototype balanced at the point shown, without any added weight. Balance should be slightly nose down with the fuel tank empty. As with any aircraft, do not fly it tailheavy! Many otherwise good models have screwed themselves into the local terrain because proper balance was not considered important.

PREFLIGHT

Range check your radio and recheck all control throws, both for correct travel and proper direction. Roll the aircraft on the ground to check for straight tracking and adjust as required. This being a first flight, take an extra minute and tug on all hinged surfaces—it's nice to know they'll be on the airplane for the first flight at least.

FLYING THE P-50+1

Avoid flying in a crosswind on the first flight. Line up into the wind and be positive with throttle application. As stated earlier, the prototype tracks straight and the tail comes up by itself. Unless you have built a banana, neutral trim should be a good starting point. In keeping with its EEE-Z-FLI heritage, the P-50+1 racer/fighter has a "polite" flight envelope and should provide you with a great fun-fly airplane! ***MB***

ADVERTISER INDEX

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TECHNICAL

continued from page 66

servos (one on each aileron), 670 square inches of wing, and a plane-finding beeper with its own battery. The wing was also designed and built a little stronger (and heavier) than the one on the lighter lower-powered July model. All five servos are Futaba S133 micro servos weighing 18 grams (0.63 oz.) each. Yes, they are plenty powerful enough for this light model.

Building models moderately lighter than we usually do is easy. When we *really* try to squeeze weight out, however, we run into an interesting phenomenon. There are a lot of major "fixed" weights that we can't reduce much, if any. I used the lightest .60 with muffler I had (an old Webra), the micro servos, and eliminated the landing gear, but I opted for a twelve ounce tank because I like long flights, and also for a 500 mAH battery instead of a 250 or less.

The powerplant plus the RC gear plus the finder beeper weigh a total of two pounds or a little more, so the total airframe can only weigh two pounds on my four-pound model. That wouldn't be so little if this airplane would always float like we would expect a model with its 5.36 wing cube loading to do. (Its wing loading is 13.8 oz./sq. ft., with an area of 670 sq. in., if you still think in those terms.) This model floats in the glide or when throttled way back, but most of the time, with its hot .60, it is certainly not floating. Only two pounds of structure on a highly-aerobatic sixty-powered model with a displacement loading of 6.7 lb./cu. in. and 670 squares is distressingly little. It takes a bit of work in the structural design department, and careful selection of thicknesses and materials.

The monocoque aft fuselage is a single wrapped sheet of 1/16 medium balsa with no longerons. I know it is strong enough because it has survived a vicious crash. Making a light tail allows the use of a light aft fuselage. The tail is mostly quarter-square balsa sticks and MonoKote.

The wing has a through (no center joint) tapered spar, with spruce spar caps and balsa shear webs. There is a white foam core, which is solid up forward to support the D sheeting, but aft of the spar the core is all cut away except for 3/8-inch wide foam ribs on 3-inch centers. These foam ribs have 1/32 soft balsa cap strips top and bottom. The D sheeting is also only 1/32 soft balsa. This wing is good for at least ten G's, so I can and do fly the airplane recklessly. It of course uses my slip-off wing mount which allows wing and fuselage to be built lighter. The entire plane is MonoKoted. I chose film instead of the lighter Micafilm because it works more easily.

By the way, the chosen Webra .60 and its muffler weigh five and a half ounces less than a new O.S. .60 and its muffler! In my opinion the engine manufacturers aren't paying enough attention to weight.

I did one thing to the Webra to save some more weight. I eliminated the molded motor mount, cut the mounting ears off the engine, and used a light homemade radial motor mount bolted to the backplate and to the firewall. That saved 2-1/2 ounces more. The firewall is Lite-Ply, which saved another half ounce or so.

Normally we mount our engines upright or on their side with the muffler down. Either way, the powerplant is unbalanced in roll and we have to add weight to the opposite wing tip to balance it. Adding weight was a no-no for this airplane, so I tipped the engine over the opposite way just enough so that the engine/muffler combination is balanced in roll. No wing balance weight needed.

The name of the weight reducing game is to look at everything on the model, ask yourself what it is there for, is it essential, or could it be made lighter and still be strong enough. I could make my next vertical-performance model a little lighter than this one, but it would be tougher. This one is getting close to the essentials.

If you don't want to design your own vertical model, order a set of plans for the "BOSS Hovercraft Trainer." These are the only published plans I know of that will give unlimited vertical with an unpiped sixty. I know of no kits or ARFs (if there are some, I expect I will hear about them).

The BOSS plans, by McInnis and Radford, consist of four full-size sheets plus ten pages of very complete instructions, including tips on how to learn to hover hanging on the prop. The price is $20.00 postpaid. Order from R&D Engineering, 2215 Southampton Rd., Jacksonville, FL 32207.

The BOSS is an Ugly-Stik looking design, quite different from my R/C Lite. By chance we both came out at four pounds on a .60 model and have comparable wing areas, although we did many things quite differently. I like some of Rhett and Dean's techniques, and will use some of them in my next model.

Beware of their wing structure, however. Their spar caps are 1/4x1/2 untapered balsa. Their own instructions warn, "You must be extremely careful of overspeeding. This is the point at which a full up-elevator com-

mand will cause the wing to fold up like a briefcase." I would at least substitute tapered spruce spar caps, at almost the same weight, but good for a 10-G pullout.

VERTICAL HOVERING

Rhett Radford and Dean McInnis were the pioneers in developing hanging-on-the-prop hovering. Their achievement was written up in one or more of the model mags several years ago. Dean McInnis phoned me today and we chatted for a half-hour about hovering RC airplanes. He tells me that as far as he knows there are still only three or four pilots total who have accomplished unlimited hovering under full control at low altitude. It is much more difficult than learning to hover an RC helicopter, and takes an awful lot of practice. The problem is that the only airflow over the control surfaces comes from the propwash. When the model is backing down to a lower altitude the aileron control reverses, since the airflow is then from trailing edge to leading edge. Dean tells me that all controls interact in a hover. If you change the throttle setting, for instance, it upsets everything else.

We average pilots must have enough air velocity over the control surfaces to maintain semi-normal control. Vertical flight provides that, but hovering does not.

I happened to see some RC hovering on TV last night, but with a model that was designed chiefly for hovering. It was in the "Scientific American Frontiers" program. The model was apparently designed, built, and flown by Texas University engineering students for a flying robot competition. It was more like an airplane than a helicopter, in that it hung on a direct-drive model prop, but it seemed to have two sets of wings in cruciform configuration, and special control surfaces in the prop blast. If any of those Texas students read this, please write to me. I would like to report on their interesting model in this column.

At my age I will probably never master the hover, but it is tempting. Whether or not you take the time to learn to hover, having a model capable of unlimited vertical flight is more than worth the price of admission. An average RC pilot can easily learn to hold vertical flight. The rudder is used more than in horizontal flight, however. Most aerobatic maneuvers can be performed starting from vertically up and finishing going vertically up, but such things as stall turns become meaningless, as does "inverted."

Continuous rolls with full aileron while going straight up are so fast that I haven't been able to correct for deviations from the vertical. The result is that the model rolls going straight up for awhile, then its path gradually arcs over into a ballistic trajectory until it is heading straight down and still rolling. It is a simple, impressive, and fun stunt.

I'm interested to hear about your efforts at vertical performance. If you have achieved true unlimited vertical RC flight, please write and describe your model and its performance. Tell me its exact weight dry and fueled, powerplant, thrust (if you can), and area. If you are doing it with an electric model, what vertical duration are you getting?

Unlimited vertical seems to me to be a significant achievement in RC model design and construction, and the ability to hover such a model is a major achievement in piloting skills. I would like to publish a list of the modelers who have flown vertical indefinitely, and publish a (much shorter) list of those who can hover a model airplane hanging on its prop.

WING STRUCTURE

In the December 1991 issue we talked about model wing structural design. I received a letter from Will Kuhnle, of Richardson, Texas, which pointed out several errors in that column. Will has helped our column out several times in the past, and as usual, he is right this time.

On the subject of wing spars I had pointed out that the strength of a beam is proportional to the square of its depth, and gave some examples based on using yardsticks as beams and spar caps. I thought I had a statement in my write-up to the effect that the square of the depth law didn't fully apply in my examples, since I wasn't increasing the cross section of the spar caps when I increased the depth of the beam, but I see it didn't get said.

Where I said the strength of a one-inch-deep "I" beam with yardsticks for spar caps would be 25 times as strong as a single flat yardstick, Will points out it would be about 19.6 times as strong. Likewise, a two-inch-high "I" beam with yardstick spar caps would be about 48.8 times as strong, instead of the 100 times that one would get by the square law if the thickness of the spar caps was increased proportionally to the depth of the beam.

Even with strict adherence to the facts, the increase in strength of a full-depth spar just from making the wing thicker, is very impressive.

In example number four of my sketch, I showed a wing cross section with a number of small spars on top, as used on some rubber models, and said I didn't think much of it.

Will thinks this configuration is not so bad on small, light models. He says, "There the covering is proportionally thicker and not negligible. The upper spars serve as the top flange, the leading and trailing edge serve as the bottom flange, and the covering serves as the shear web." Thanks again, Will.

PARTING WORDS

There is no such thing as an airplane that is too light. The wing loading may be too light for certain types of flying, but we should cure that by reducing the size of the wing, not by adding weight. Also, "light" is not a synonym for "weak." If it is too weak, think and build-in just enough strength, keeping weight to a minimum. ***MB***

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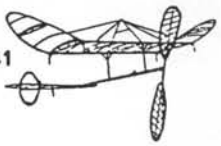

Products In Use continued from page 43

horns supplied for the split elevators. The elevator is actuated by a built-up pushrod with two metal threaded rods attached to the rear end. These exit through slits in both sides of the fuselage, just forward of the elevators. All the control exit openings are supplied with streamlined fairings—just another example of the manufacturer's attitude that nothing is too good for this airplane. The rudder is actuated by a pull-pull wire system which was somewhat unorthodox. Instead of braided steel cables, the kit supplied tough, solid wires. I admit I was apprehensive, but went ahead and used them anyway. I guess I have a lot of faith in Mr. Yoshioka's design skills. After sixty or so flights I can report that they are thusfar superior to the braided cables I have used previously in that they never seem to stretch and require tightening. So far so good.

The fuel tank supplied fits in the forward compartment like a glove, and the motor mount is constructed of wood and is well fuel proofed, ready to receive the engine of your choice. The recommended engine range is .40 to .49 for a two-stroke, and .61 to .70 for a four-stroke. There is absolutely no doubt that the Liberty 45 will perform satisfactorily with any high performance engine in these displacement ranges, but I would caution against the use of an ordinary sport .40 with a standard muffler, or any four-stroke of less than a .70 to .80 size. The Liberty 45 is the flyingest airplane around in an ARF, and is capable of sparkling performance that will turn the heads of everyone at the local field if the proper powerplant is utilized. Accordingly, I decided to install my powerful Rossi .40 along with what I consider an absolutely mandatory muffled tuned pipe from MACS Products. I have been using exhaust systems from this company for many years, and I never cease to be amazed at the quality and variety of their line of products. They offer tuned pipes and headers for virtually every engine on the market, and their pre-tuned systems are ready to go, requiring no tinkering or adjusting. For a complete listing of their offerings, write MACS Products, 7935A Carlton Road, Sacramento, CA 95826, or see your local dealer.

The Liberty 45 is very tuned pipe friendly, as the fuselage incorporates a grooved channel to accommodate the exhaust header. For those wishing to use a standard muffler, the groove also works well in that case. There is a slight inconvenience in the way the tuned pipe runs along the bottom of the fuselage, as the pipe must be removed in order to dismount the wing. However, I designed a quick release retainer to hold the pipe in place, and field assembly of the airplane takes only three or four minutes. However, a better solution would be to use a bigger vehicle and keep the airplane assembled.

Thusfar we've raved on and on about the merits of the Liberty 45, and haven't really mentioned any of its faults. Quite honestly, I found very few unsatisfactory things about this model, but the one I did encounter was really a doozy. It happened when I was installing the retract servo, a standard 180 degree type which was a perfect fit into the retract servo compartment in the wing. This compartment comes all marked out and ready to receive the servo, so installing it was a piece of cake, only taking a few minutes. Next I installed the retracts in the wing and hooked up the push-pull wires between the servo and the retracts. With a little adjusting the system worked smoothly, so I began to bolt the wing to the fuselage for final testing. Guess what? The fuselage was too narrow to clear the servo! As a matter of fact, I found the servo was located about 1/4 inch too far from the centerline, necessitating relocating the servo to the middle of the wing. In order to do this, I had to remove some material from the center ribs, but when all was done, everything was fine. I would advise that anyone assembling this model with retractable landing gear ignore the marked location for the retract servo and install it right on the centerline instead.

Even though there was a complete range of hardware supplied, there was no spinner included, nor were there any wheels. This is quite understandable, even though most of the less expensive ARFs do include these items. The proper spinner to use on a high performance plane such as this would be a quality aluminum spinner, and most good pilots like to choose their own. The usual inexpensive plastic spinners which come with most ARFs would be unsuitable for a competitive setup. And as for the wheels, pattern fliers are also finicky about these, especially when used with retract gear. In my case, I was lucky enough to have a set of the old Kraft wheels stashed away, waiting for just such a project. Many pilots like the Kraft wheels because they are thin and enclose the wheel collar, allowing for a snug fit inside the wheel wells. Next time you run across a pair at a swap meet, grab them! You'll be glad you did.

I would recommend the Liberty 45 to any RC flier who is fed up with aimlessly guiding one sport plane after another around the sky. While this airplane can also be flown by haphazardly pushing the sticks all over the place, it is really at its best doing wide, sweeping, controlled pattern maneuvers. It flies so solidly, and answers the helm so perfectly, that it inspires the pilot to discipline his flying and clean up his act. To borrow a quote from the U.S. Army, it lets you be all that you want to be! I guarantee that after a few enjoyable flights with the Liberty 45, you'll find out what it really means to "fly with the eagles!"

Send your comments and questions to me at any time, but please enclose a SASE for a personal reply. Art Steinberg, 2267 Alta Vista Drive, Vista, CA 92084. Telephone (619) 726-6636, or FAX (619) 726-6907. **MB**

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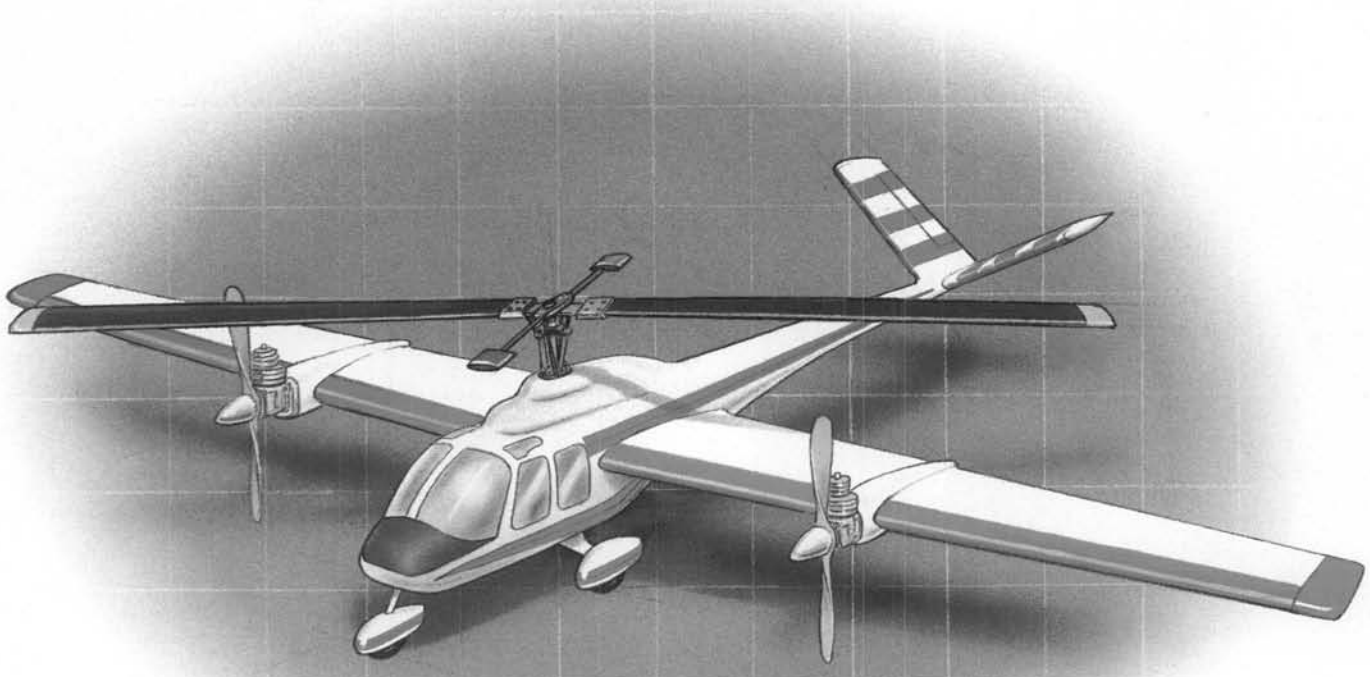

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