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ACES AND WINGMEN II, Morris. Over 600 photos, dozens in color, and 55 paintings enhanced a remarkable historical coverage of the 8th Air Force's exploits in Europe during World War II. It combines recollections, stories by 13 combat pilots, and official documents recently declassified to produce a panorama of the air action. Much other data including group histories of all 15 of the 8th AF Fighter groups, plus the 354th group of the 9th AF, Aces lists, and a chronology of 8th AF's major events. 256 pgs., 8 1/2" x 11", sfbd. 1239B **$39.95**

ATTACK ON YAMAMOTO, Glines. Americ's code-breakers intercepted a message in 1943, telling of Japanese Admiral Yamamoto's flight from one base to another, and used the opportunity to attack and shoot down the Japanese aircraft. It was the longest intercept mission in wartime history, one that became a classic, eliminating a powerful enemy leader. More than just the mission story, the book is an attempt to confirm which allied pilot actually shot down the Jap leader. 288 pgs., 6" x 9", hdbd.....3521C **$19.95**

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COVERING MODEL AIRCRAFT: R/C Handbook, Peacock. Covers model skins and their effect on performance, from traditional oiled silk to high-teck films. Includes how to finish and detail the model. 64 pgs., 80 ill., sfbd., 7" x 9 1/2".....3195C **$9.95**

MOULDING & GLASS FIBRE TECHNIQUES: R/C Handbook, Holland. Covers easy and affordable techniques to make your own canopies, cowlings, fuselages, and wing skins. How to build a home vacuum-form machine, heat formed plastics, make composite spars, strenghten structures, rubber moulding, casting and superior finishes. 64 pgs., 80 ill., sfbd., 7" x 9 1/2".....3193B **$9.95**

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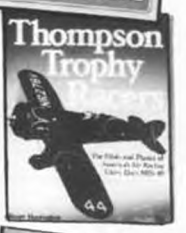

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MODEL BUILDER

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DEPARTMENTS

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CONSTRUCTION

ON THE COVER

This time it's a totally inside job! The photo was taken by our "Electronics Corner" editor, Eloy Marez, and the Airtronics "Eclipse" has been "eclipsed" by our very own advertising salesperson, Brenda Parris. You can find out more about the Eclipse by contacting Airtronics, and if you want to find out more about Brenda, call her at our office. But don't blame us if you end up buying advertising space!

MODEL BUILDER (ISSN 0194 7079) is published monthly by RCMB I NC., 898 W. 16th St., Newport Beach, California 92663. Phone (714) 645-8830. Subscriptions: $25.00 per year, $47.00 for two years. Subscriptions outside the US (except APO & FPO) $38.00 for one year, $68.00 for two years. All payments must be in US funds, drawn on a US bank. Change of address notices must be received six weeks before date of issue that new address takes effect. Send old address with new . . . old label preferred. Duplicate issues cannot be sent. Postmaster send address changes to Model Builder, 898 W. 16th St., Newport Beach, California 92663. Second class postage paid at Newport Beach, California, and additional offices.

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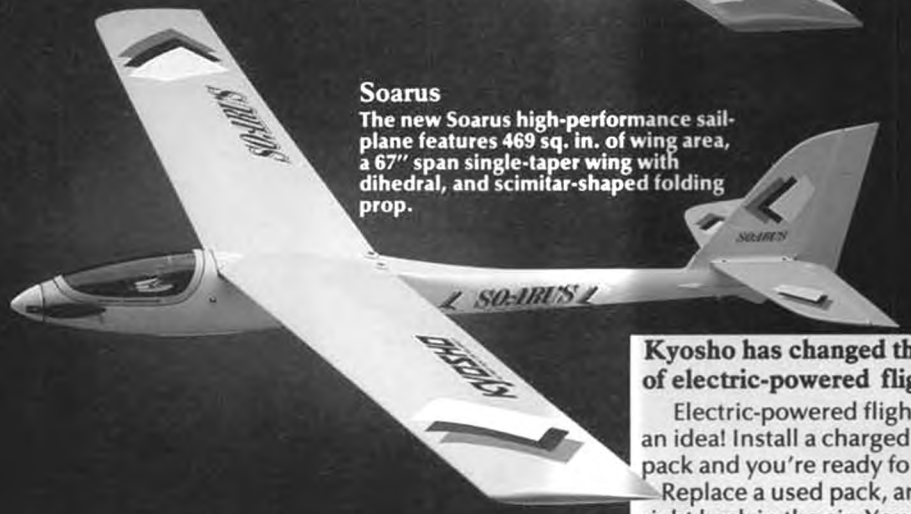

Soarus
The new Soarus high-performance sailplane features 469 sq. in. of wing area, a 67" span single-taper wing with dihedral, and scimitar-shaped folding prop.

Stratus 2000
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STEP 1 - BASIC: START WITH A STABLE HIGH-WING MODEL

KADET SENIOR

KADET MK II

Modelers often want to start in R/C with a good-looking scale model that flies fast. This is a common mistake and never works out! Before you can accomplish your dream of darting around the sky with a sleek P-51, you must get some "basic training". The U.S. Air Force doesn't start its pilots out in the F-16, and you should take the same approach to learning to fly R/C. First attempts at R/C flying should be with an inherently stable high-wing model that flies slow enough to give the student pilot time to think and react. The SIG KADET series of R/C basic trainers are designed expressly for that purpose. The KADET SENIOR, has a super light wing loading that allows it to fly very slow, with true "hands off" stability that enables the student to start flying without a lot of help from an instructor. The KADET MkII is a stronger, faster flying trainer that handles better in windy weather conditions. In addition, SIG has two other models (not shown here) in the KADET family of basic trainers — the KADET JUNIOR (smaller version of the MkII) and the KADET SENIORITA (smaller version of the SENIOR) — for people who want a more economical trainer with a smaller engine.

STEP 2 - INTERMEDIATE: PROGRESS TO FASTER SHOULDER-WING DESIGNS

KOMANDER

KAVALIER

When the student pilot feels secure flying the KADET and can handle it capably, he is ready to take the next step. A shoulder-wing design, like the two shown here, will still be stable enough for him to handle comfortably, yet will allow him to expand into aerobatics. The KOMANDER is the larger of our two shoulder-wing models and features a foam core wing that you plank with 1/16" sheet balsa. The slightly smaller KAVALIER has a built-up balsa wing, and can use the same size engine you had in your KADET MkII or SENIOR. Both airplanes use "washout" in their wing design to eliminate tip stall at slow speeds. This built-in stability allows the model to fly right down to the full stalling point on landing, without snap rolling or falling off on a wing. Piloting boners that would clobber other airplanes are readily forgiven, thanks to the superior handling characteristics of the KAVALIER and KOMANDER. Slowed down to a walk, nose high landings are the norm for both of these excellent intermediate trainers.

STEP 3 - ADVANCED: GRADUATE TO LOW-WING AEROBATICS

KOUGAR

ASTRO-HOG

After some flying time on basic and intermediate trainers, the student pilot will be ready to handle a fully-aerobatic low-wing stunter. The KOUGAR and ASTRO-HOG are two of the very best low-wing models to start with. Both are carefully tailored to be smooth, stable, and responsive. They will do every stunt in the book, yet are forgiving of the kind of mistakes a low-time pilot might make. The jet-style KOUGAR features a foam core wing with built-in washout in the tips for extra stability on landing. The larger ASTRO-HOG has a built-up balsa wing for a lighter wing loading and slower flight speeds than most low-wing airplanes. Once you've mastered either of these excellent low-wing trainers, the sky is the limit! You'll be qualified to fly any R/C model your heart desires without having to worry about whether or not you can handle it.

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WORK BENCH

BY BILL NORTHROP

IMS PASADENA, CA 1991

Wow! Time sure passes quickly when you're having . . . er . . . fun. As this is being entered on the PC Jr., it's just two weeks prior to the Premier IMS Milwaukee show at the MECCA Center, and we're already behind schedule in publicizing the next IMS Pasadena show, which is coming up on January 11, 12, and 13, 1991.

We still haven't shaken the ominous number 13, either, because, although this will be the fourteenth year for the show, it will be the thirteenth at the Pasadena Center, as our first ever show was at the Los Angeles Coliseum.

Here's a "Name the Modeler" that's going to be tougher than the previous ones to solve, not only because you have to get all four, but the time period puts it out of reach for many of our readers. Guy on the far right, pointing with pipe, looks a lot like Walt Moucha does now, but at the time, Walt might not have yet been born!

Based on the success of the revised time schedule for Friday, inaugurated at this year's Pasadena show, we will again schedule the dealer/distributor-only period for Friday, starting at 0900 and ending at 1400 (2 p.m.), when the show will be opened to the public, until 1900 (7 p.m.) closing. Although this shortens the total industry-only period to five hours (industry is still welcome during the remainder of the show, it's just easier to conduct business during the period when the public is not allowed in), our tabulation showed, and exhibitors noted, *more dealers and distributors checked in this year than in the previous years when they were allowed the whole day without public interference!*

Even though there were a few attendees who complained about the discontinuance of the control line, free flight, and radio controlled aircraft demonstrations, all others understood the difficulties and risks involved, and expressed appreciation for the easier traffic flow that resulted. There is little doubt that the hallway connecting the two exhibit areas will remain unused, except for two-way pedestrian traffic, as long as the show remains at the Pasadena Center! There are, however, plans to redistribute the exhibitors in order to provide a better mix throughout the show area and give all facets of the hobby equal exposure.

Farmers and water conservationists in Southern California have requested that we again schedule outside live demonstrations during the weekend. As might be expected, for the first time in about ten years, it rained heavily all day Saturday this year . . . the first time we planned outdoor demonstrations in quite a long time. So get your water-collecting buckets and tubs ready, we're gonna do it again in 1991!

DEEP IN THE HEART OF . . .

Ever since the Dallas-based Southwest Modelers Show discontinued about 13 to 14 years ago, the mid-south area of the country . . . let' face it . . . Texas, has not had a model hobby show. It seems that problem is about to be cured. The Temple Aeromodelers, naturally of Temple, Texas, are introducing their premier Lone Star R/C and Hobby Exposition on March 15, 16, and 17, 1991. Temple is located about halfway between Dallas and San Antonio, on Interstate 35. The show is open for dealers only on Friday, the 15th, and then open to the public on Saturday and Sunday. As is traditional with consumer-oriented model shows, such as IMS Pasadena, Northwest Expo, WRAMS, Toledo Weak Signals, IMS Atlanta, MARC, and IMS Milwaukee, selling by exhibitors will be allowed. For additional information about the show, contact the Lone Star R/C and Hobby Exposition, 401 Van Dyck, Temple, TX 76504, or call (817) 771-1234. We'll see ya there!

NAME THE MODELER

We're having fun with the photos from the late Bev Smith's collection. So far, we have published photos of modelers identified as John Worth (May), Dick Korda and Walt Schroder (July/August), and Lee Renaud (September). The following identifiers have won Uber Skiver knife sets: Patrick Blanco, Westbury, NY, who remembers John Worth from high school days back in Brooklyn, NY; Vince Bonnema, Clifton, NJ, a good friend of Walt Schroder's for almost 60 years; and Bill Davidson, La Selva Beach, CA, who was the earliest to correctly identify Lee Renaud.

Aside from the reader who confused Lee Renaud with Hal deBolt, the only other error, of sorts, was an identification of Walt Schroder. One reader guessed that Walt's picture might be that of "Red" Hillegas. We said "error of sorts," because in his younger days, Walt' hair was red, although by the time he was more publicly known as the editor of M.A.N., his hair went from a graying crew cut to mostly white. (That kinda work will turn anyone's hair a different color!)

This month's puzzler is four-barreled, and because of the time period, can probably only be solved by older, longtime modelers. One of the four is still a member of the model industry, and may be easier to recognize than the others. Do you know their names?

LETTERS

We have received many nice letters in

response to our editorial in the June issue. As a matter of fact, it would be easy to fill a whole issue with them. However, that would be our own personal ego kick, and printing all of them would be like putting you through a slide show of the grandchildren . . . we love every one of them, but you'd soon be asleep! We'll just give you one, which is typical, but also a little unique considering the geographic source. We *do* have a long reach!

Dear Bill,

I am writing to you in response to your editorial in June '90 Model Builder.

I am an Australian living in Hong Kong and have been modeling for some 25 years now. I cut my teeth on Free Flight and Control Line, eventually concentrating on F/F Glider, Hand Launch Glider, and Power.

Later, as the legs started to grow tired of long downwind chases and the income became more disposable, I looked at Radio Control. My interest in RC was squarely and almost exclusively on Gliders. This, I considered, was the only area where pilot skill was pitted directly against the elements. But as in Free Flight, a well built and trimmed model is of paramount importance if you hope to be in the winner's circle. When RC Hand Launch Glider became popular, I immediately moved into this field, relishing the more difficult challenge of picking up thermals from rooftop height. Here, previous Free Flight experience really comes into its own.

When, upon moving to Hong Kong I found flat flying sites and thermals comparatively rare, I moved into Slope Soaring, encompassing Aerobatics, Racing, Scale and Power Scale Soaring. On business trips to Australia, I still manage to find time to fly indoor HLG and Peanut Scale. So my interests in the hobby are fairly wide and varied.

In 1979, I made a conscious effort to find a model magazine that reported all aspects of the hobby that held my interest. Having checked all the available English language magazines about the hobby, I found only two. Airborne, *the Australian magazine which I've always been rather patriotic about, and your* Model Builder. *Where else can one read about the latest advances in RC Soaring, complete with new airfoils to try, followed by Electric Flight and Old Timers? Turn the page to find another lovely Peanut Scale to build then rekindle old memories in Free Flight and Control Line.*

Yes, this truly is a multi-faceted hobby and your magazine is the only one that gives all aspects the coverage they deserve.

Pleased don't change any of your coverage and don't bow to outside pressures. There are lots of people who like your magazine just the way it is. If they didn't, they would be buying one of those 'other' RC magazines.

Yours faithfully,

Steve Nelson, Sai Kung, Kowloon, Hong Kong.

P.S. I like your new format and the increased use of colour, but what happened to the picture of 'Jake?' I still haven't discovered everything in his workshop! **MB**

DEAR JAKE

ADVICE FOR THE PROPWORN—
BY JAKE

JAKE'S CRYSTAL BALL PREDICTIONS

Dear Readers:

The 1990 Tournament of Champions in Las Vegas is about to be history when you read this. It is only Labor Day as I am writing, but since we have a three-month lead time on our columns and because I will not be able to attend this year's T.O.C., I have taken crystal ball in hand and will attempt to prognosticate the course of events and the outcome for November's festivities. Here is what I foresee happening:

• Hanno Prettner won. It was close, but Hanno locked it up during the Three-Minute Free Program on Sunday afternoon when he pushed a button and his airplane exploded into an aerial fireworks display of the Austrian flag while 4000 doves were simultaneously released from the inflated Circus Circus clown.

• Chip Hyde flew a pink airplane.

• In a major upset, second place went to the flyer who had less points than Hanno, but more than anyone else.

• There was a wide variety of aircraft types entered. Those that did not have two wings had only one.

• Both alternates got to fly in the competition. This was precipitated by the unfortunate accident involving the transatlantic bus carrying the Polish team's equipment, which sank upon encountering the coast of Portugal.

• The weather was variable. It was very windy at least one day and extremely calm on at least one other occasion. Rain was not a factor. No rounds were lost due to plagues or locusts.

• Professional video tapes of the event were made and will be available for $29.95 plus shipping.

• Four day sales totals for pink jackets raised the Gross National Product by two-tenths of a point.

• The event program had at least one misspelling, and failed to successfully explain Aresti hieroglyphics to non-aviation enthusiasts.

• Chip Hyde, Ivan Kristiansen, and Wolfgang Matt placed in the top five. The other top five finisher was either Steve Rojecki or a relative unknown who surprised everybody.

• The scale credentials of one airplane were challenged, but the objection was dropped when the full size aircraft was taxied onto the field for comparison.

• The Japanese contestants had beautiful airplanes, but did not finish in the top seven.

• More pink hats were seen than in a San Francisco parade.

•The T.O.C. winner is on the cover of some magazine this month, maybe even this one.

• The two percent biplane bonus did not affect the outcome. One monoplane that finished seventeenth would have moved up to sixteenth had there been no bonus, but the same airplane would have placed fourteenth if its pilot had not botched the second Unknown Program on Friday by performing a 1 and 1/4 roll Tyrolean Avalanche instead of the required 3/4 roll North Atlantic Humpback.

• Spectators ate more hot dogs than sushi.

• An RC helicopter crashed during the between-rounds flight demonstrations. This is becoming quite a popular occurrence and was greatly appreciated by the crowd, although a midair would have been preferred.

• The house came out ahead at the casino.

• The judges did a fine job, but were unappreciated. The usual complaints of favoritism were heard, but were not at all substantiated by the scoring. An Italian judge, who seemed to be giving higher scores to red and green airplanes, was counselled and subsequently lowered his scores to the level of the British judge, who didn't like anything.

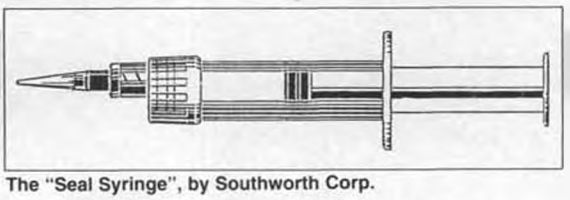
• Someone lost their car keys.

• Hanno Prettner's victory was disallowed. Seems he used a recording of a Lithuanian folk song to accompany his Three-Minute Free Program on Sunday morning. The Lithuanian Orthodox Church tolerates no music on the Sabbath, and so disqualified him.

Soon the coverage of the actual event will be out in all the magazines. You and I will be able to see how well I foretold the future. I think we'll find that my predictions were uncannily accurate. At least I'd be very surprised if nobody lost their car keys.

Jake **MB**

OVER THE COUNTER



The "Seal Syringe", by Southworth Corp.

One of the many neat kits imported into the U.S. by Hobby Lobby and described in their current catalog is the "Golden Eagle" biplane produced by the MFA firm in England. It's a 47-inch span, 800 square inch sweptwing design for .40 two-stroke or .40-.46 four-stroke engines, with a molded fiberglass fuselage (complete with a molded-in fabric effect on the turtledeck) and pre-sheeted obechi covered foam wings. Pre-bent aluminum cabane struts fit into molded slots in the fuselage, making alignment a cinch. All balsa parts are cut to shape, and hardware items such as linkages, horns, hinges, engine mount, fuel tank, and bent aluminum landing gear are included in the kit as well. All this airplane needs is a pair of wheel pants to make it one sexy looking aerobatic machine!

The Golden Eagle is fully described in Hobby Lobby's catalog #16 . . . just write or call and ask for it, it's a freebie. Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444.

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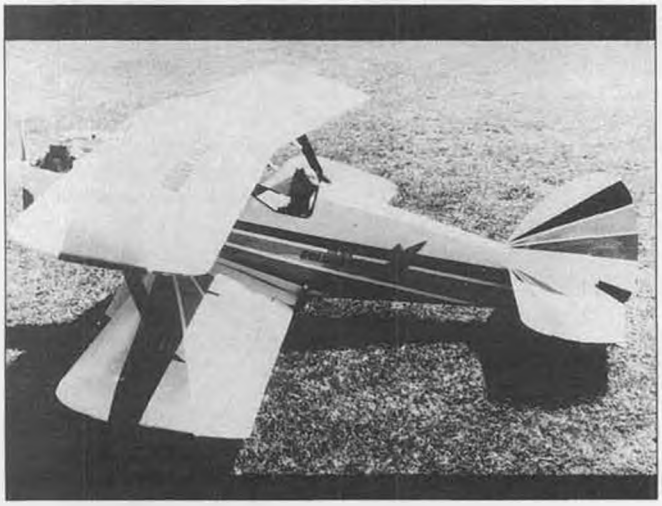
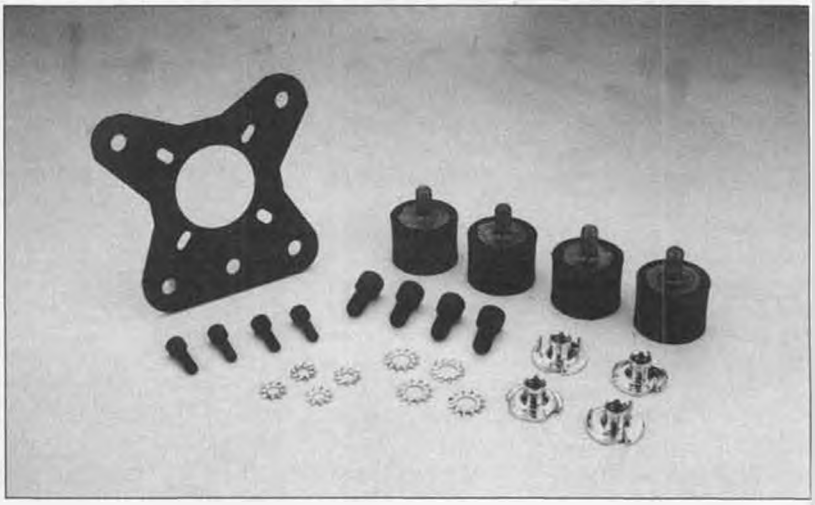
A new "soft" mount for large engines is the Flex-Mount 90 produced by Planes & Things in Lancaster, California. This is a universal type mount that will fit most .75 to 1.08 two-strokes with no drilling or machining required. It's pretty much common knowledge these days that isolating engine vibration from the airframe results in less generated noise, increased radio reliability, and an extended lifespan of your model's structure. If you're currently building something in the above quoted engine size range, you'd do well to consider using such a mounting system.

The Flex-Mount 90 kit is priced at $24.95, available either at your local dealer or direct from Planes & Things, 1226 E. Ave. J-12, Lancaster, CA 93535. If ordering direct, be sure to include $2.50 for shipping and handling, and sales tax if applicable.

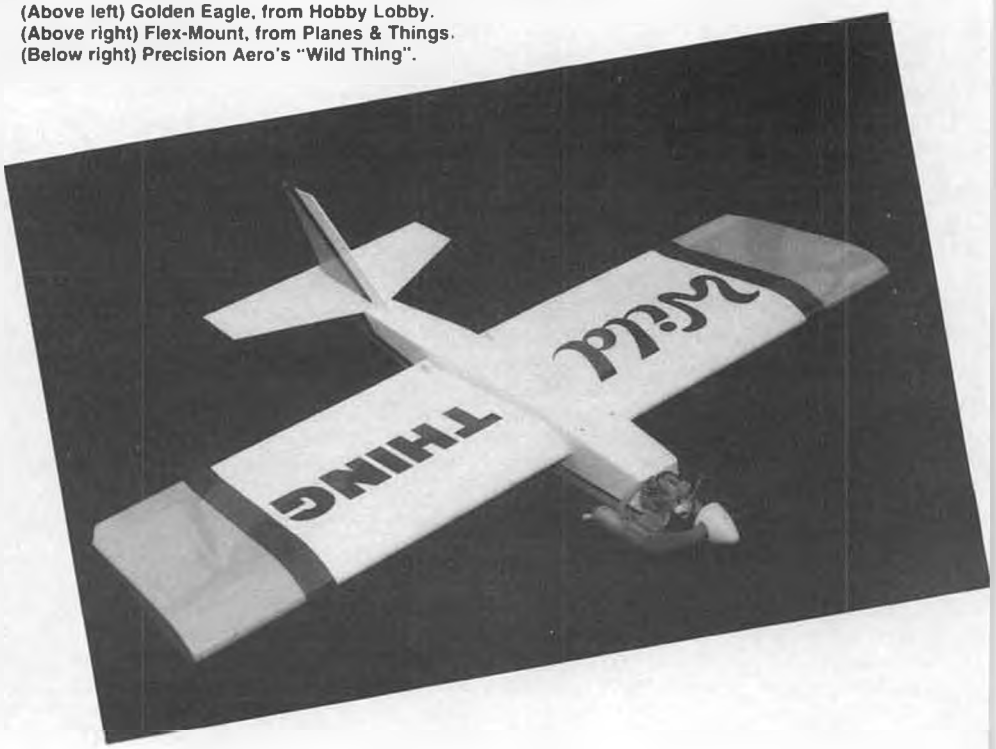
• • •

Scale House Helicopters is now offering scale rivets (rivet *heads,* actually) in three different sizes for your next scale model project. The rivets are made in small (.030-inch), medium (.050-inch), and large (.070-inch) sizes, which equates to 1/8, 1/5, and 1/4 scale respectively. No hole drilling is required; they simply glue to the model's surface. They are CA and paint compatible, and can be easily removed if need be. The rivets are packaged 400 of each size to a bag, and can be purchased directly from Scale House Helicopters, 1152 N. 150 E,

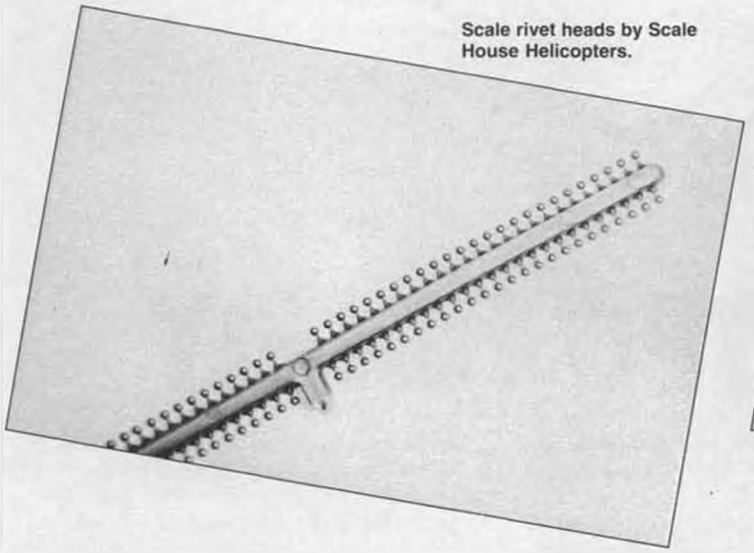




(Above left) Golden Eagle, from Hobby Lobby. (Above right) Flex-Mount, from Planes & Things. (Below right) Precision Aero's "Wild Thing".



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



Scale rivet heads by Scale House Helicopters.

Electric starters distributed by Great Planes.

Chesterton, IN 46304.

• • •

"Nothing flies like an Aero!" That's the motto of Precision Aero, a firm located in the almost unpronounceable town of Oconomowoc, Wisconsin. Precision Aero's major business is prototyping and producing component parts for several other kit manufacturers, but lately they've begun putting out their own complete kits, first for the "Aer-Tote" flight box and now for the "Wild Thing," a .10-.15 powered sport RC model with ailerons/elevator/throttle controls and an emphasis on simplicity. It's simple, all right! The model is all straight lines and has no landing gear, being designed instead for hand launches and belly landings . . . both of which are easy, thanks to the low wing loading of around 13 oz./sq. ft.

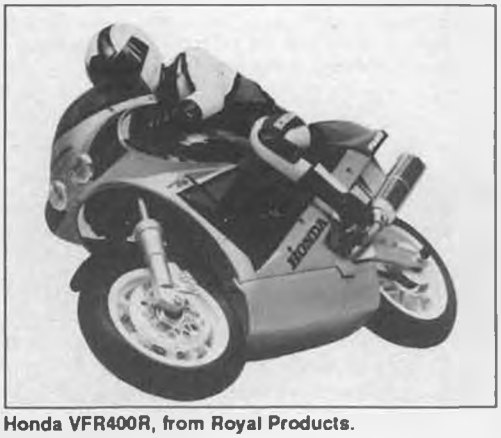
The Wild Thing uses conventional balsa and hardwood construction and goes together quickly. Besides the wood materials, the kit is complete with engine mount, fuel tank, fuel line, hinges, pushrods, and all other necessary hardware, for an introductory price of $39.95. An info pack describing the Wild Thing and other products handled by Precision Aero is available for $2.00, which is refundable with the purchase of a kit. Write to Precision Aero, 1561 River Highlands Dr., Oconomowoc, WI 53066.

• • •

Looking for a good, powerful 12-volt electric starter? Check out the two really nice ones being distributed by Great Planes, the Hobbico TorqMaster 90 ($49.95, for up to .90 size engines) and TorqMaster 180 ($64.95, for engines up to 1.8 cu. in.). Both are supplied ready to use and have red plastic end bells with molded-in stands to keep the switch clean, a five-foot coiled DC input cord with color-coded terminals in-

continued on page 62

"AirCore 40" from U.S. AirCore.



Honda VFR400R, from Royal Products.

R/C SOARING

BY BILL FORREY

2ND ANNUAL TPG FUN FLY

The world famous Torrey Pines bluff is one of soaring's most historic and scenic flying sites. It overlooks the blue Pacific just north of San Diego and perhaps California's most famous (i.e. swimsuit optional) Black's Beach. Torrey Pines is home not only to RC model soaring, but full size soaring via winch tow, hang gliding, and paragliding too.

A small section of the pit area at the Second annual Torrey Pines Scale Fun Fly. Glass slipper row . . . funny how the different factions within scale modeling group together.

This past Labor Day weekend, 78 model glider pilots with 150 or more scale sailplanes gathered at the Torrey Pines Gulls club site for a chance to have some fun in the wind and sun. (This figure is up from last year when the TPG event drew about 60 pilots.) Participants came from as far away as the states of Washington and Nevada. Two gentlemen I spoke with who were both helping and spectating, came from Switzerland and Tasmania. Many hundreds more spectators were drawn from the beaches below and from the nearby hang glider airport as well.

The scale models ranged from tiny P-51 warbirds and Spitfires up through quarter-scale "glass slippers" such as Saltos and Discuses (or should that be Disci?). The weather was picture perfect all three days . . . for photographers, that is. However, the wind never fully cooperated with the model pilots. The flying was fair, but not as good as it should have been given the site and the normally windy late summer season.

An unidentified Glasser-Dirks DG 300 by Multiplex sits next to its Multiplex computer radio and tranny tray. Can somebody say, "European influence"?

Hey! Who took the pinking shears to my trailing edge?! Randy Warner took my vote for most interesting scale subject at the TPG meet. Stealth bomber, B-2, made out of conventional balsa, ply, and spruce. Flew well, too.

Randy Warner, of San Diego, flew an incredibly scale-like B-2 Stealth Bomber at the TPG meet and got my vote for most exciting scale subject. As I watched it fly, I was amazed at how well it seemed to handle. Besides, it looked very weird, just like the full-size bomber must look.

Randy built this B-2 from scratch without plans. He extensively used one photograph taken of the first flight of the B-2 that appeared in Popular Science (October 1989). This gave him the basic top view outline. Other photos helped Randy "fake" the side and front views. As far as documentation goes, Randy doesn't have factory 3-views (top secret?), but as Randy says, "I figure, nobody would argue with me!" And that includes a couple of Northrop engineers who saw his B-2 and were more than casually interested in its apparent accuracy of detail.

Gary Anderson tries hard not to smile as he shows off the Bob Seely Komet flying wing that he sells. He says he can show you a picture of a real Komet in Japanese (not German) colors. Kinda makes you wonder if the Komet ever really flew over the Pacific.

Yet another Seely Komet and a 1/5-scale German Habicht from Jim Ealy plans (see text). Both models were nicely finished, the Komet in camo, and the Habicht in blue and white burst motif. John Raley and wife Gwen, who is a little camera shy.

The B-2's control surfaces are also fairly close to scale. The last tip panel on both sides includes clamshell-type drag rudders at the trailing edge for yaw control (actuated left or right independently) or for speed brakes in landing (actuated together). The

speed brakes are also used in regaining control of the model similar to a "panic button." Apparently, the B-2 gets "squirrelly" when slowed down too much.

This outboard tip panel at the TE and at the TE of the next wing panel inboard include elevons (elevator and ailerons mixed together). An Airtronics Vision transmitter is used to keep all the mixing under control.

The B-2 was built of normal modeling materials: balsa, ply, and spruce. It was then covered in metallic charcoal and black Monokote. The airfoil chosen came out of an old Frank Zaic Yearbook as it was recommended for flying wings. Randy thought it was called an M-16 (Sorry, I don't have this airfoil or I'd run it this month as a feature). He had to "skinny it up" to make the M-16 look right, and because there are hardly any two pairs of ribs alike, the airfoil was just approximated as best as possible. The airfoil works well considering it may not be too accurate.

The wing area for the B-2 works out to about 650 square inches over a 66 inch span. The total weight of the B-2 is about two pounds. The true wing loading is unknown because it is nearly impossible to know how much of the wing area lifts (upwardly) and how much of the wing area is producing a stabilizing down force. On a conventional model this is easy to determine because the whole wing surface lifts (generally) and the separate horizontal tail surface produces the necessary stabilizing down force.

Another interesting totally scratch built model was Howard Hulin's Canadian Snowbird show team jet. This model falls into the power scale sailplane (PSS) category as its full-size counterpart is not a sailplane at all. In fact it is the Canadian built CT 114 Tudor scaled down to a 56 inch wingspan. Its wing area is 365 square inches, it weighs two pounds, and uses a Selig-Donovan SD6060 airfoil.

It was flown for the first time moments after my photos were shot. As first flights with a brand-new design go, it was a little shaky. The Tudor looked like its balance point was a little too far aft, or like its control throws were a little too extreme. The flight went . . . wobble, wobble, try to land it quickly . . . crash! The T-tail snapped off cleanly and there were a few scratches, but damage was really quite minimal. Back to the workbench.

John and Gwen Raley from Costa Mesa were present with a really neat looking German DFS Habicht 1/5-scale glider scratch built by John from Archaeopteryx Avion plans (aka James Ealy, 128 Etra Rd., Hightstown, NJ 08520, 609-448-8726). This glider was flown in the 1936 Olympics to give you an idea of its age.

I have a set of these DFS Habicht plans, and they look terrific. All bulkheads, formers, ribs, joiners and spars are drawn for you so it is pretty easy for you to make your own "kit." The plans show you a flat bottom airfoil for every rib, which makes building a Habicht a lot easier than some curvy antique airfoil. You can (for an additional fee) get your favorite airfoil for this plan if you prefer to be truly scale down to the wing section, or just have different ideas about how you want it to fly. Ealy's plans are scaled up from factory drawings, so it would appear the airfoil is the only thing which has been changed.

That little flying wing John is holding is his other scale entry in the fun fly, a German

Howard Hulin and his scratch-built Canadian Snowbird (CT 114 Tudor) airshow jet. More and more guys are going to Power Scale Sailplanes (PSS) because of the excitement of their aerobatic abilities.

Angelo Orona of San Diego gets a helping heave from Victor Lanz of Switzerland who earlier walked off the cliff . . . in the harness of his parasail.

Er-r-r-r-r the smell of burning shoe rubber as Victor Lanz avoids a parasailless walk off the cliff while launching Dennis LaBerge's Discus by Roebers.

Richard Jarel launches his aileron trainer "Impulse" moments before handing over the controls to the editor. See text for a quick evaluation of this latest J.A.D.E. kit.

Me163 Komet rocket powered fighter from WW-II. Bob Seely kits this little cutie, and you can pick one up from American Sailplane Designs (CA, 619-429-8281) or Northeast Sailplane Products (VT, 802-658-9482) for about $69.00 (plus S&H and tax). It has a 44 inch wingspan and only 300 square inches of wing area for its 24 ounces and its Eppler 168 airfoil, so it will smoke the slopes at a good clip. However, if your dream to fly with the 1940's Luftwaffe is eating you up, give this fiberglass and foam core balsa bullet a try. It does look like a lot of fun.

Speaking of fun, Saturday evening following the day's flying, Slope Soaring News (aka Charley Morey) and American Sailplane Designs (aka Gary Anderson) sponsored free chips and salsa with beer and sodas for everybody (hundreds of bodies). The cliff-side hangar flying was a great time for all, and one surely to be remembered for a long time to come. Raffle prizes were given out both Saturday and Sunday nights for all those who wanted to participate.

On Monday the Pilot's Choice Award was given to Carl Gortney for his scratch built TG-2 Army Air Corps trainer glider. The big raffle prize was a Vision 8SP radio donated by those great people at Airtronics. Richard Jarel won this fancy rig and left the field with an ear-to-ear grin!

The Torrey Pines Scale Fun Fly looks like it is going to become an annual event that will repeat its success story for many years to come. With the TRICS club in the Richland-Pasco, Washington, area going to an alternating scale fun fly and slope race format every other year, the TPG event will likely gain popularity among scale glider guides.

I am going to let the pictures tell the story on the TPG fun fly from here on out. If you would like to know when next year's event will take place, stay tuned to Model Builder for an announcement, otherwise assume the Labor Day weekend for next summer!

J.A.D.E. AILERON TRAINER: IMPULSE

The J.A.D.E. Impulse is a pretty sleek looking V-tail aileron trainer just now being kitted by Richard Jarel (yes, the same guy who won the Vision radio). Richard, you will remember, makes those fantastic, futuristic looking Shogun (flying wing) and Telos (canard) models you've seen in these pages in months gone by.

Like the Shogun, the Impulse fuselage pod is also made from Richard's newly discovered plastic material that he calls Crash Guard. This plastic is vacuum molded into fantastic shapes and is literally indestructible in normal use. Richard told me that during his testing of this material it wasn't until he froze a Shogun in the refrigerator and threw it Frisby style into an oak tree that he actually got one to even crack! Its repair was easily accomplished with glue and a piece of scrap Crash Guard. Needless to say, the Crash Guard is good, and it is well applied to model fuselages.

The Impulse sports a balsa sheeted foam core wing with a slightly thickened SD6060 at the root transitioning to a slightly thickened S3021 at the tips with a little washout pre-cut into the cores. There is very little dihedral in the two constant taper wing panels, so spiral stability is lacking, but for its intended purpose, aerobatics training, it is probably undesirable.

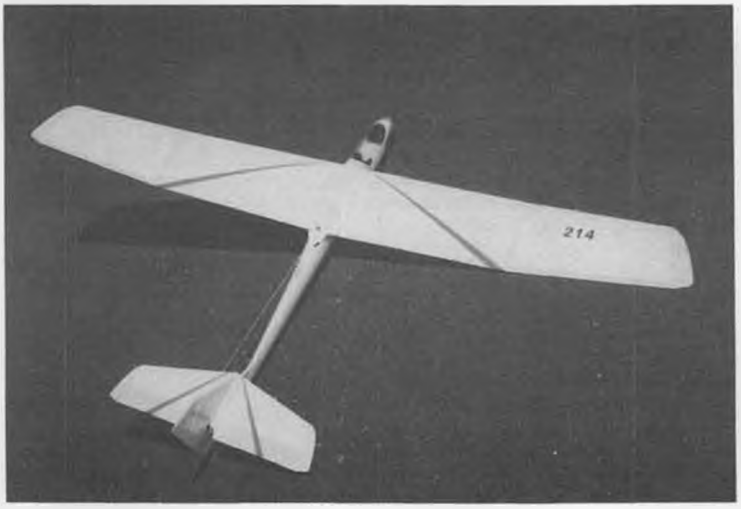
I was given the opportunity to fly the Impulse for two flights (ballasted 10 oz. heavier and unballasted). Richard had the aileron throws set up for his own style of flying (i.e. very responsive!), so I can only guess what it would have flown like with more gentle, trainer like throws. However, it did fly very nicely overall.

Pitch stability of the Impulse was excellent. Yaw stability was excellent. Roll stability was excellent (well damped) even if spiral stability was lacking. The latter giving rise to a definite sag into left and right spirals at very low speeds (not self-righting either).

It handles very much like a pattern power plane. It holds its roll angle as set up by the

Woody Blanchard holds his Competition Products "Phoenix" Unlimited Class sailplane. Woody makes some astonishing claims about it . . . see text.

Woody Blanchard loves the way his EZ Lota 1700E flies. Here is an ARF that you can trim the way you like with Trim MonoKote or use the colorful stock graphics. (Compare with the trim on the Phoenix.)



Dave Thornburg and his 50% reduction Bird of Time model called the Birdy. Mark Nankivil says both pilot and model are nice fliers. Model has fixed stab and moving elevator.

The winner! AMA Nats winner in Two Meter Class (again) is Paul Carlson with the new Great Planes Spirit 2M. Also took first place on Day Two at Ace R/C's MMM Glider Regatta.

last aileron input until the next input changes the attitude to a new angle. There are no surprises with the Impulse, it just goes where you tell it to go.

There was never any tip stall behavior noticed while flying right side up. The lift wasn't strong enough for me to feel comfortable testing its inverted flying abilities. (It is a long, dangerous hike down, and besides why risk damaging a plane that's not yours!) However, according to Richard there is no tip stall behavior inverted either.

Richard claims that anyone who can competently fly a Wanderer type polyhedral ship can step up to an Impulse, but I have some reservations. Get an advanced instructor. Yes, the basics of turning are still the same as with a poly ship: bank, then yank. However, it happens a lot quicker with ailerons. And, just letting go of the sticks will NOT get you out of trouble if you get banked over too far or if you get disorientated when coming at yourself at a weird angle.

What really make the Impulse attractive as a trainer is that with its Crash Guard pod fuselage and hardened aluminum tail boom you are not as likely to come to grief if you should crash. The balsa sheeted foam core wings are tougher, and repair more easily than standard stick and rib construction wings. The tail is just a Vee made of one-inch (more or less) wide sheet balsa . . . easy enough to CA glue together after a break. In this respect, the Impulse is indeed a forgiving trainer.

Another good thing about the Impulse is that once you DO get the hang of ailerons, aerobatic flight is just a flip of the dual rate switch away! On high rate, the Impulse is an impressive and speedy flier! Those Selig airfoils do not pick up significant or even noticeable drag when thickened as on the Impulse. (The SD6060 is like an improved E374, and the S3021 is like an improved E205.)

It looks to me like the Impulse is one of those sailplanes you can grow with for years and never really outgrow! It is a really fun plane to fly.

NOTES FROM THE EAST COAST: COMPETING WITH THE PHOENIX & FUN FLYING WITH THE LOTA

Woody Blanchard has been a friend of mine since January of 1981 when he and his Old Flying Buddy (OFB) Bob Champine came out to participate in the Second Two Meter World Cup held at Lancaster, California. Woody and Bob are both super nice guys who are extremely knowledgeable about things that fly (not just sailplanes). Both are active on the sailplane contest circuits. Bob was the first (and so far only) guy to reach the League of Silent Flight's coveted Level 5 not just once, but twice! He was also one of the first guys behind Chuck Yeager to break the sound barrier. Woody has an aerodynamics background and is always experimenting with electric multi-engine scale models, and in general, keeping up with what's new in quiet flight.

I value Woody's opinions. He knows

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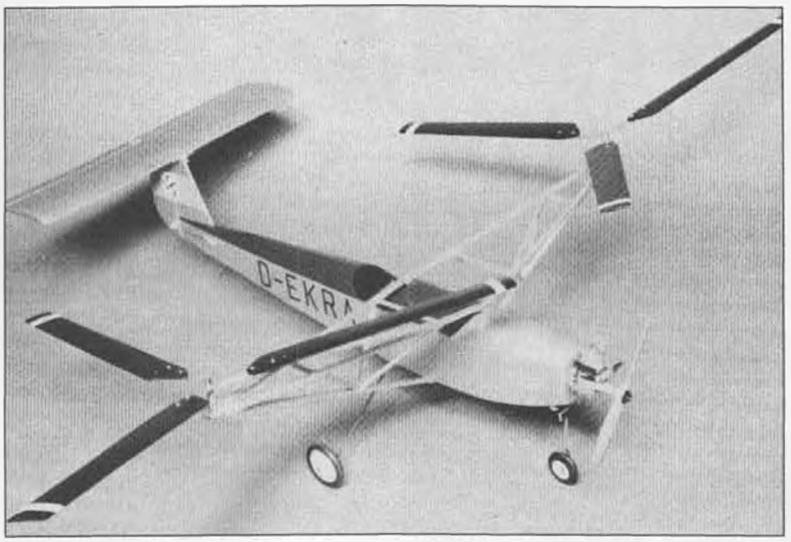
Mark Nankivil of St. Louis with his original design "Silver Lining." Every cloud should have one? That's too much! Mark is in love with the way it flies. SD7037 airfoil. See text for specs.

Dale and Art Frost (dad) with their Std. Class Allusions. Sheeted, built-up wings with S3021 airfoil. Flaps on Art's, spoilers on Dale's. Home brew glass fuselages.



F-A 61 RC AUTOGYRO

BY SKIP RUFF

The author outlines complete trimming instructions for this out-of-the-rut RC model. Be sure to follow them closely, and you'll have all of your chopper flying friends green with envy!

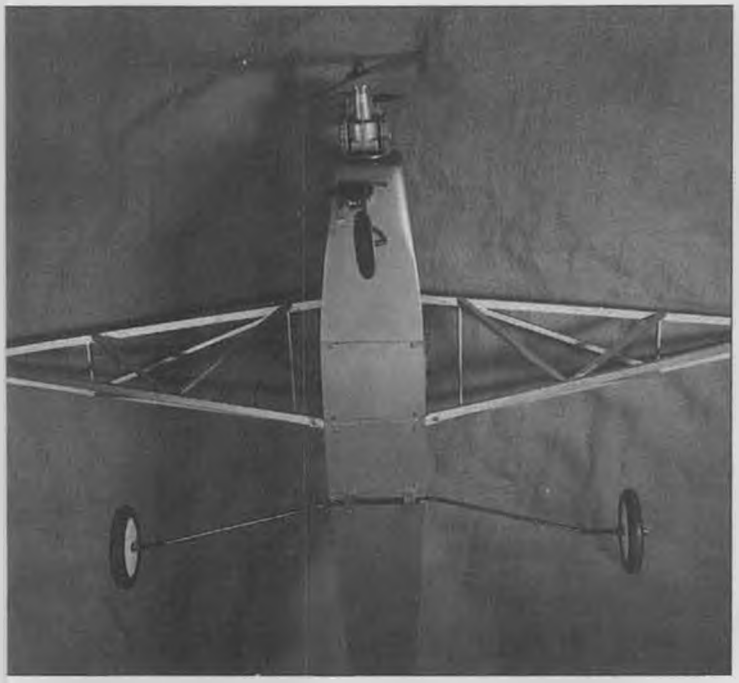
The F-A 61 makes a slow pass overhead for the photographer. With full back stick, the ship will mush along at about 10 mph. It will even fly when slightly out of trim, but looks strange.

This is a reprint of a construction article that first appeared in our April 1975 issue. It turned out to be one of the most popular projects in our nearly 20 years of publishing. The original article was followed up by two addendums, brought about by great numbers of modelers from all parts of the world who built and flew the autogyro, most with great success, and a few who needed additional help in proper trimming. Both of the addendums have been included in this reprint.

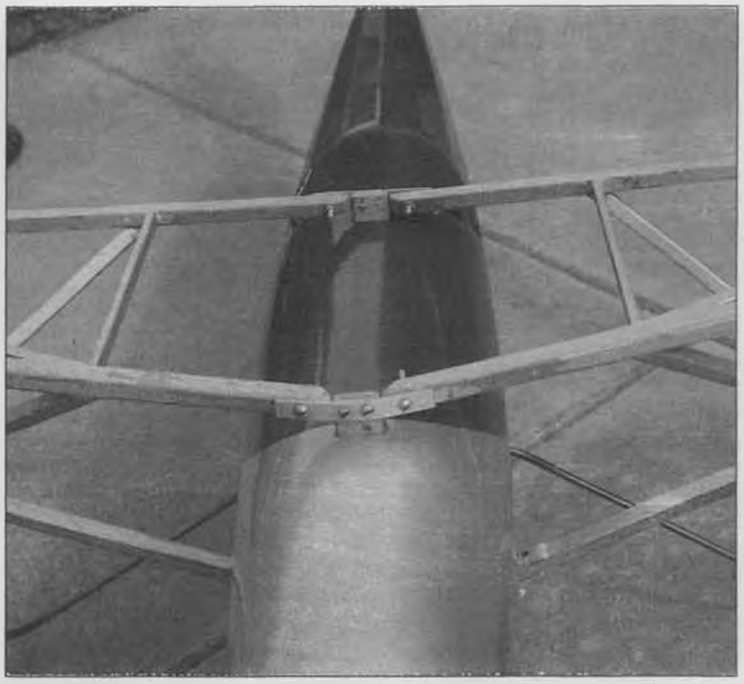
Because of its tremendous popularity, and the fact that our circulation has increased by over ten times since it first appeared, we felt it proper to reintroduce this model for the benefit of those readers who joined us after April 1975.

This twin-rotor, semi-scale helicopter can be flown by anyone capable of flying a 3-channel trainer. The reason, of course, is that the helicopter is not really a helicopter at all, but an autogyro! However, before I confuse everyone, let me give a short history of the real FOCKE-ACHGELIS 61.

The F-A 61 was one of the first truly



Bottom view shows outrigger bracket and radio access hatches. All of the construction is extremely simple.



Upper outrigger brackets. Entire ship may be dismantled for transportation. Outriggers made of spruce, with balsa cross-bracing.

practical helicopters, and was the brainchild of Doktor Heinrich Karl Johann Focke. The machine made its first flight, lasting 28 seconds, on June 26, 1936. The first craft was built using the fuselage and engine of a FOCKE-WULF 44 basic trainer, with the tailplane mounted on top of the fin and the propeller cut down to the diameter of the engine cylinders to serve purely as a cooling fan. It gave no assistance in forward flight, although it probably fooled many authorities into believing that the machine, like the model, was actually an autogyro. The twin rotors, mounted on steel-tube outriggers on both sides of the fuselage, were fully articulated three-blade assemblies with a blade angle that could be increased or decreased so as to provide lateral movement of the craft by creating a lift differential between rotors.

In May of 1937, the F-A 61 made its first autorotational landing. In 1938, the controlability was demonstrated by Germany's celebrated aviatrix, Hanna Reitsch, who flew the machine inside the Deutschlandhalle Sports Stadium in Berlin. These feats were all accomplished by the first prototype which was given the registration D-EBVU. Meanwhile, a second prototype, D-EKRA, from which my model has been copied, was completed and from 1937 onward established many records including the following:

1. Distance: 143 miles on June 20, 1938.
2. Altitude: 11,243 ft. on January 29, 1939.

You may be interested to know that this particular configuration is still in use today in several Russian helicopters, one of which I believe is gigantic, with two 114 ft. diameter rotors.

Specifications of the F-A 61 are as follows:

Rotor diameter (each)—22 ft., 11-5/8 inches

Fuselage length—23 ft., 11 inches

Height—8 ft., 8 inches

Maximum weight—2100 lbs.

Power—160 H.P. Siemens-Halske 14-A radial engine

Cruise speed—62 M.P.H.

Ceiling—8600 ft.

Range—143 miles

The model, of course, is actually an entirely different sort of craft. I have been experimenting with RC autogyros for several years, and have never really had success until now. All the previous models were of single rotor configuration and all exhibited the same sensitivity to one thing, torque from the engine. To overcome this, I had to install small ailerons, and though the machines did fly, they were very erratic and not too stable.

The idea of the twin rotor design came from an old Roy Clough article in a late 1940's *Air Trails*. I thought that possibly, a stable craft could result from this configuration. Not being an engineer, I had to rely on my experience with free-flight gyros for blade angles, sizes, and rotor angles. For other dimensions, it was all hit and miss . . . fortunately for me, more hit than miss.

The first model I built using this configuration was nothing more than a highly modified Falcon 56. To my amazement, and everyone else, the model flew after only a couple of changes in center of gravity location and blade angles. A short time later, I came across a picture of the F-A 61 in an old *Air Progress* magazine, and thought it would make an ideal subject because of its configuration. Since no accurate three-views were available, and to keep the model simple, I built it from photographs, using as basic a construction technique as possible.

The model itself has a simple box fuselage with spruce rotor booms, and a T-tail. The rotors themselves are also simple. They consist of 3/16 sheet balsa blades bolted to hubs made from 3/32 aluminum. No complicated hinges or flapping mechanisms, just light simple rigid rotors. The rotor bearings should also prove to be no problem. They are Cox .049 crankcases. Thus, the possibility of expensive and time-consuming machining is eliminated.

By now, you've decided to build it, so finish reading the whole article first before beginning construction. Once you read the section on flying, I'm sure you will be convinced that you will have to build one just to see if I'm putting everyone on!

CONSTRUCTION

Because the plans are pretty self-explanatory, and the model is simple, I'm not going to give a "glue stick A to former B" type of instruction. I will, however, explain things that are out of the ordinary or troublesome. Be sure to study the plans well before beginning construction.

RUDDER

Begin by laying down one side of the rudder sheeting on the plans. It extends clear to the bottom of the fuselage for strength. The 1/8 square framework is glued in place after having the appropriate pieces drilled for the elevator nyrod. I used the Pylon brand Golden Rod with .030 cable size. The elevator platform is a piece of hard 1/8 balsa, with triangular stock used as a fillet for strength where it is glued to the top of the rudder. The small tailwheel wire can be sandwiched in the bottom of the rudder.

FUSELAGE

Before we begin construction here, let me remind you of the importance of weight, especially on this model. This model is somewhat sensitive to weight and power relationships. Adhere to the material sizes shown on the plans. Excess strength is both unneeded and unwanted.

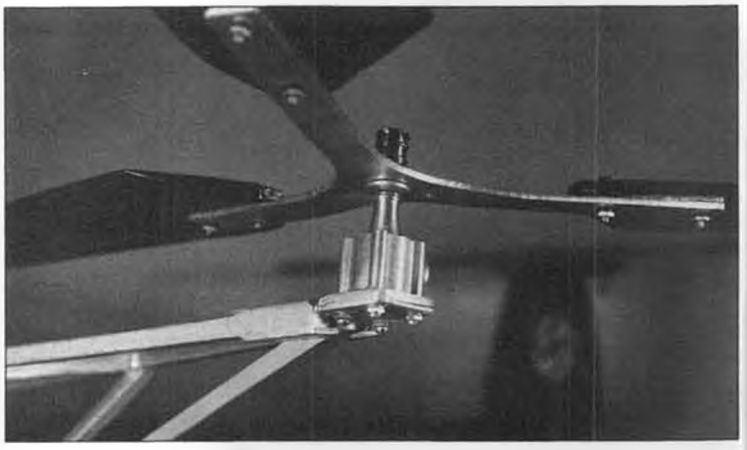
Construct the fuselage from two matched

pieces of 1/8 sheet for the sides. Add the longerons and uprights and also the 1/8 doublers at the nose. Join the two fuselage sides at the nose and tail with the firewall and rudder respectively. Use epoxy on the firewall. Install the rest of the formers and nose gear and main gear attachment points now. The main gear attachment is familiar if you've ever built a Falcon 56. It also makes the rather wide gear removable (for you V.W. Bug owners).

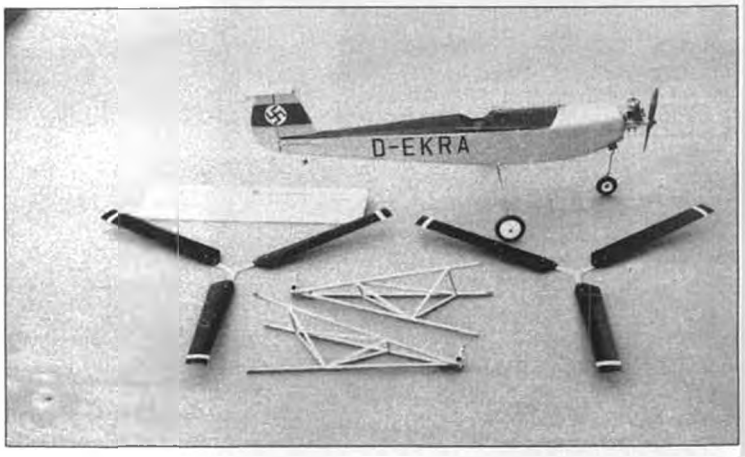
Before covering the top and bottom of the fuselage, you should install the fuel tank and locate the blind nuts for your engine mount.

While on the subject of engines let me say that the O.S. 30 has proven to be the perfect power choice for the model. The Sullivan six-ounce tank gives long flights to the three and one-half pound craft. If you plan on using a muffler, however, a .35 may be needed. I don't think anything smaller than a .29 should be used. Mine flew with a .25 but was hopelessly underpowered.

The bottom of the fuselage is covered with 1/8 balsa. The top, from the cockpit rearward, is 1/8 square stringers over formers. Forward of the cockpit is 3/32 planking, and a small block at the nose. The bottom, from the firewall to the radio area, is 1/2-inch sheet balsa. Make the radio hatches out of 1/16 plywood and secure them with small wood screws into the hardwood strips underneath. Leave 3/8 inch of space between the two hatches for the aluminum bracket that connects the bottom of the rotor booms.

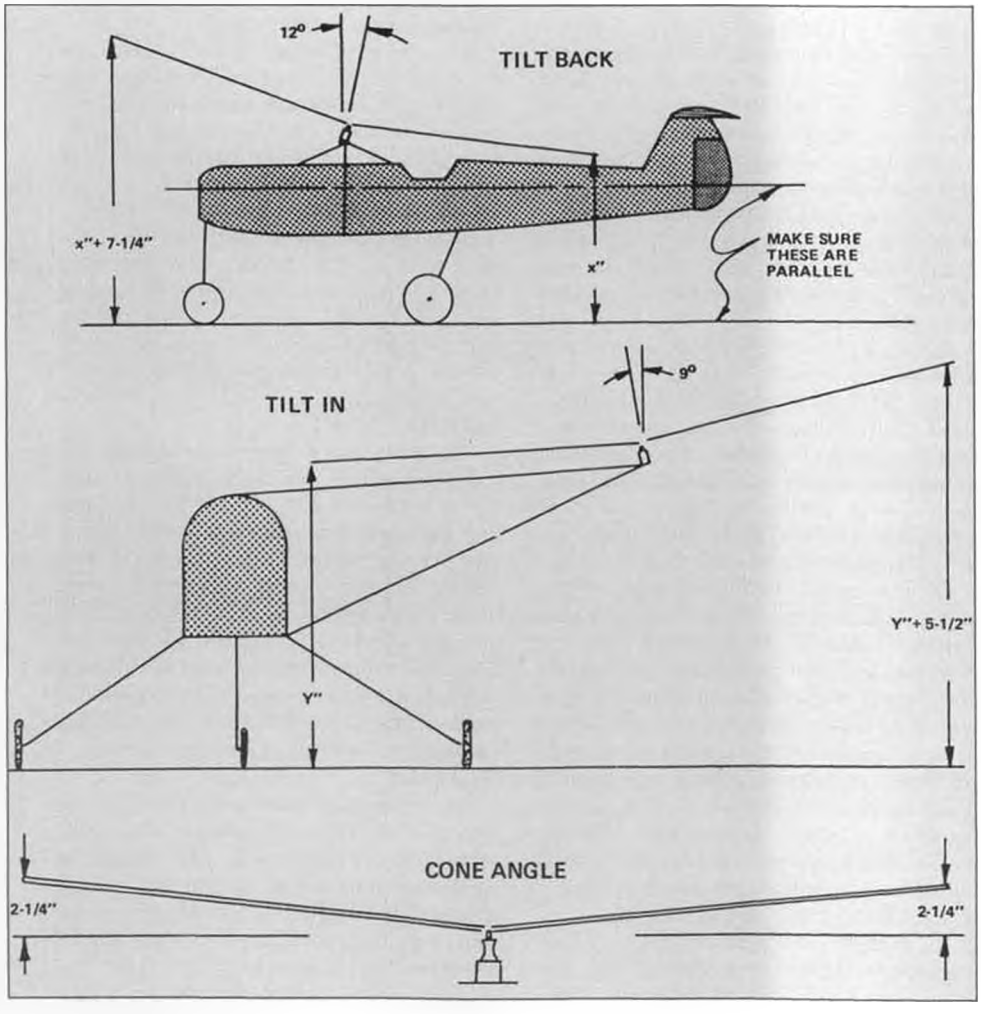


Rotor bearings are Cox .049 cranks and cases . . . no machining required. Hubs are made from 3/32 sheet aluminum, blades from balsa with hardwood reinforcing. Blades are free turning.



They haven't built a car small enough to make you leave this one home! Three channel radio (rudder, elevator, throttle) will do it all. Use a .29 to .40 engine.

Illustration to go with first addendum. See text.



ELEVATOR

Elevator construction is normal except for the cutout portion that allows clearance for the rubber bands and dowel. Remember to make the center section ribs 1/16 smaller on the top and bottom because of the planking. Other than that, just try to keep it light.

ROTOR BOOMS

The rotor booms are made out of 3/8 by 1/4 spruce with 1/4 square and 1/8 by 1/4 balsa crosspieces. Simply build them right over the plans as you would a wing, remembering to make a right and left side. The Cox crankcase mounts should be shimmed up approximately 10 degrees before being epoxied between the 3/8 by 1/4 spruce strips, remembering again to make a left and right side. Don't try to be exact, because we will make the fine adjustments later.

Now cut the rotor boom mounting brackets out of 1/16 aluminum and drill the appropriate holes in them. They are mounted with wood screws, to the stubs on top of the fuselage and to the space between the radio hatches on the bottom. Assemble the landing gear on the fuselage and attach the elevator with rubber bands. Set the model on a flat surface and bend the gear legs until the model sits level. This can be determined by measuring to see if both ends of the elevator are the same height.

Next, place the rotor boom ends in their proper position on top of the fuselage and block them up until the tips are one and one-half inches higher than the attachment points

on the fuselage. This will give 5 degrees of dihedral to each side. Now, with the booms blocked in their proper positions, cut the lower boom legs to the correct length and epoxy them to the boom tip and bolt them to the bottom bracket. Finally, cut and epoxy the balsawood crossbraces in position. This should give a set of booms that are true and very rigid.

ROTORS

The rotor blades are next, and should be made of medium 3/16 balsa. Cut 6 blanks and epoxy the hardwood leading edge, insert, and ply reinforcement to them, remembering to make three left-hand and three right-hand blades. Sand the blades to an approximate Clark Y (flat-bottom) airfoil. For a light finish, give the blades two or three coats of clear dope or sanding sealer, followed by just enough color to cover the wood. I colored mine black. Do not use any of the plastic coverings on the blades as this adds considerable rotating weight and can cause the rotors to set up unwanted gyroscopic forces.

The rotor hubs are cut out of mild 3/32 sheet aluminum. Bolt the blades to the hubs, and before bending the hubs for pitch and coning angles, bolt the complete rotor assemblies to the crankcases on the ends of the booms. The *left side rotor turns clockwise when viewed from the top* and *the right rotor turns counterclockwise.*

We are now going to adjust the rotor angles by wedging shims under different sides of the Cox crankcases until the rotors have the same backward and inward tilt. Again, with the model sitting on a flat surface, begin with the left rotor by measuring the height from the surface to the rotor tip as it is pointing straight forward. Now rotate the *same blade* 180 degrees and again measure its height off the flat surface. Do the same with the right rotor. The difference in height should be about 6 inches. This gives a rotor tilt equal to about 10 degrees. It doesn't have to be exact because the angles aren't critical here. What we do want is for the two rotors to be equal in their angles to each other. That is important. Shim the crankcases with washers or thin cardboard until the rotors match.

The same procedure is used to check the inward slope of the rotors, except the difference in height is measured with the blades pointing directly at the fuselage and 180 degrees or directly away. A 5 degree angle will give 3 inches difference in height. Time spent here will help to insure that your rotors will produce equal lift when flying, and thus a stable aircraft.

The rotors can now have their pitch and coning angles bent in. This is done by bending the aluminum hubs with pliers. A simple jig may be made out of an 18 inch 2 by 4, with a Cox crankcase on one end, and a plywood plate with a 3 degree angle on the other end, fitting in a slot cut in the board. Adjust the blades of the rotors until they all have a minus 3 degree pitch angle (trailing edge higher than leading edge).

Now put the rotors back on the crankcases to bend in the coning angle. This can be done by sight. Each rotor has a 5 degree coning angle. Therefore, when they are bent properly, the blades should be level to each other when the tips are closest to one another . . . while pointing directly at the fuselage. Bend the hubs by hand until all blades are parallel to each other and the same height, when 90 degrees to the fuselage. Taking your time and doing it correctly will guarantee success. The rotors can now be balanced by epoxying slivers of solder to the tips of the light blades.

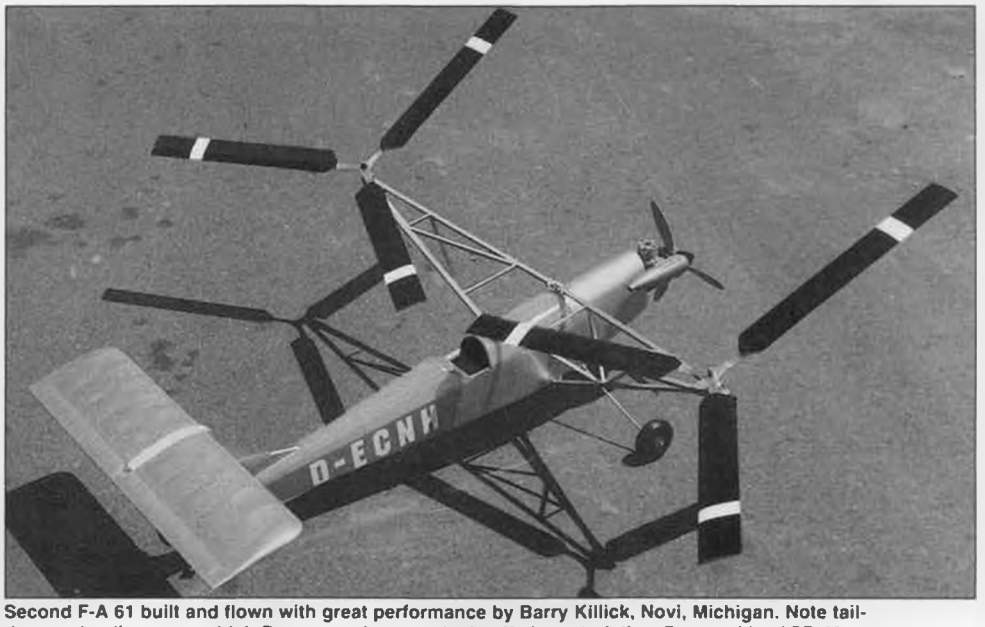
FINISHING

Except for the booms and rotors, the model is finished entirely with Super MonoKote. The booms were sealed with clear Aero-Gloss and then sprayed silver. The fuselage, on top, was covered with blue MonoKote from forward of the cockpit to the tail. Except for the red band on the tail, the rest of the fuselage and elevator are covered with aluminum MonoKote. The white disc and Swastika on the rudder are trim MonoKote, as are the black letters on the fuselage. The red band and white disc are 2-1/2 inches wide. The letters are 2 inches tall and 1-1/8 inches wide.

Assemble the complete aircraft and install the radio, positioning it so that the craft balances about a 1/2 inch forward of the rotor center-line. The rudder should have about one inch of total movement and the elevator about 3/4-inch total. My model required about 3 degrees of down and 3 degrees of right thrust. This can be added by washers, or by filing the mount. You may have to add or subtract from yours, so make it adjustable. I lube the .049 crankcases with a drop of STP every flying session.

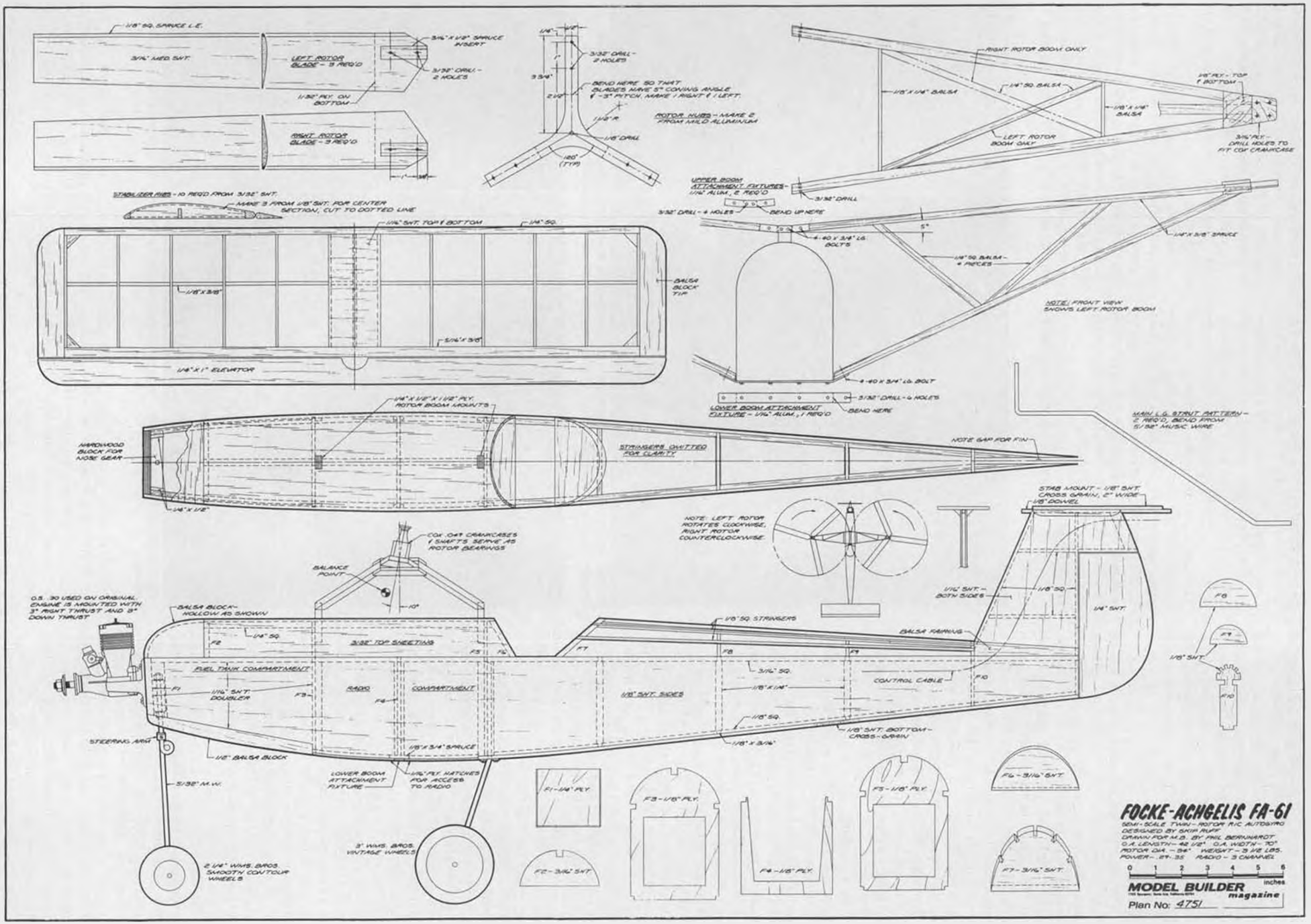
FLYING

continued on page 63



Second F-A 61 built and flown with great performance by Barry Killick, Novi, Michigan. Note taildragger landing gear, which Barry says improved takeoff characteristics. Powered by ASP-40.

Skip's latest has taildragger gear, constant 2-inch chord rotor blades, and is powered by a muffled K&B 40.


1/8" SQ. SPRUCE L.E.
3/4" MED. SHT.
LEFT ROTOR BLADE - 3 REQ'D
3/4" X 1/2" SPRUCE INSERT
3/32" DRILL - 2 HOLES
1/32" PLY. ON BOTTOM
RIGHT ROTOR BLADE - 3 REQ'D
BEND HERE SO THAT BLADES HAVE 5° CONING ANGLE & -3° PITCH, MAKE 1 RIGHT & 1 LEFT.
ROTOR HUBS - MAKE 2 FROM MILD ALUMINUM
1/16" DRILL
120° (TYP)
RIGHT ROTOR BOOM ONLY
1/16" X 1/4" BALSA
1/4" SQ. BALSA
1/16" X 1/8" BALSA
1/16" PLY. - TOP & BOTTOM
LEFT ROTOR BOOM ONLY
3/16" PLY. - DRILL HOLES TO FIT COX CRANKCASE
STABILIZER RIBS - 10 REQ'D FROM 3/32" SHT.
MAKE 3 FROM 1/8" SHT. FOR CENTER SECTION, CUT TO DOTTED LINE
1/16" SHT. TOP & BOTTOM
1/4" SQ.
1/16" X 3/8"
5/16" X 3/8"
BALSA BLOCK TIP
1/4" X 1" ELEVATOR
UPPER BOOM ATTACHMENT FIXTURES - 1/16" ALUM., 2 REQ'D
3/32" DRILL - 4 HOLES
BEND UP HERE
3/32" DRILL
4-40 X 3/4" LG. BOLTS
5"
1/4" X 3/8" SPRUCE
1/16" SQ. BALSA - 4 PIECES
NOTE: FRONT VIEW SHOWS LEFT ROTOR BOOM
4-40 X 3/4" LG. BOLT
3/32" DRILL - 4 HOLES
BEND HERE
LOWER BOOM ATTACHMENT FIXTURE - 1/16" ALUM., 1 REQ'D
1/4" X 1/8" X 1 1/2" PLY. ROTOR BOOM MOUNTS
HARDWOOD BLOCK FOR NOSE GEAR
STRINGERS OMITTED FOR CLARITY
NOTE GAP FOR FIN
1/4" X 1/8"
MAIN L.G. STRUT PATTERN - 2 REQ'D, BEND FROM 5/32" MUSIC WIRE
STAB MOUNT - 1/16" SHT. CROSS GRAIN, 2" WIDE
1/8" DOWEL
NOTE: LEFT ROTOR ROTATES CLOCKWISE, RIGHT ROTOR COUNTERCLOCKWISE.
COX .049 CRANKCASES & SHAFTS SERVE AS ROTOR BEARINGS
BALANCE POINT
10°
O.S. .30 USED ON ORIGINAL. ENGINE IS MOUNTED WITH 3° RIGHT THRUST AND 2° DOWN THRUST
BALSA BLOCK - HOLLOW AS SHOWN
1/16" SQ. STRINGERS
1/4" SQ.
3/32" TOP SHEETING
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
FUEL TANK COMPARTMENT
RADIO COMPARTMENT
1/16" SHT. DOUBLER
1/16" SHT. SIDES
3/16" SQ.
1/16" X 1/4"
CONTROL CABLE
1/16" SQ.
1/16" X 3/16"
1/16" SHT. - BOTH SIDES
1/16" SQ.
1/4" SHT.
BALSA FAIRING
1/16" SHT. - CROSS GRAIN
STEERING ARM
1/2" BALSA BLOCK
1/16" X 3/4" SPRUCE
1/16" PLY. HATCHES FOR ACCESS TO RADIO
LOWER BOOM ATTACHMENT FIXTURE
5/32" M.W.
2 1/4" WHIS. BROS. SMOOTH CONTOUR WHEELS
3" WHIS. BROS. VINTAGE WHEELS
F1 - 1/4" PLY.
F2 - 3/16" SHT.
F3 - 1/16" PLY.
F4 - 1/16" PLY.
F5 - 1/16" PLY.
F6 - 3/16" SHT.
F7 - 3/16" SHT.
FOCKE-ACHGELIS FA-61
SEMI-SCALE TWIN-ROTOR R/C AUTOGIRO
DESIGNED BY SKIP RUFF
DRAWN FOR M.B. BY PAUL BERNHARDT
O.A. LENGTH - 42 1/2" O.A. WIDTH - 70"
ROTOR DIA. - 54" WEIGHT - 3 1/2 LBS.
POWER - .29-.35 RADIO - 3 CHANNEL
0 1 2 3 4 5 6
inches
MODEL BUILDER magazine
Plan No: 4751

BY WAYNE YEAGER

RC Pylon Racing At The '90 Nats

The boss (Bill Northrop) approached this writer at this year's Toledo Show and said, "How about writing a pylon article on a regular basis for my magazine?" I said, "You betcha, how about starting with the Nats?" "You betcha," he replied, and here we are.

The AMA Nationals were called the "Mid-America Nationals" and were held in Lawrenceville, Illinois, which I suppose is somewhere near the middle of America, although not right smack dab in the middle, close enough to at least not call them an East coast Nats.

Anyway, Saturday the 12th was for Quickie 500 processing, which started off with a glitch because the planned processing areas at the headquarters motel was taken over by two different wedding receptions. To digress, the headquarters motel was in Vincennes, Indiana, about eight or nine miles from the flying site, so we moved the entire operation to the AMA site headquarters which was under a huge circus-like tent.

Dave Layman, Houston, Texas, with his "Best Finished" Form I Polecat. Winning Best Finish is rewarded by being the first plane flagged off in every heat that he flies this plane.

Rich Verano, from Carson, California, holding the plane and the official watch used to time his new World record FAI F3D time of 1:11 flat. The watch reads 1:11.03, however, all F3D times are rounded to the nearest tenth.

Form I trophy winners. (kneeling, l-r) Champion Wade Clark, 2nd place Dave Layman, 3rd Lyle Larson with his caller Henry Bartle (behind), Dave Shadel 4th, with his son Bryan holding his plane, and Mike Heisel 5th with his caller, Pete Reed. (Standing, l-r) Jim Shinohara, caller for Shadel, "Best Senior" Gary Schmidt, Bill Hager 6th with his caller J.P. Hanway, Mike Langlois 7th with his caller Greg Doe, Rich Verano 8th, and Chuck Wahl 9th with his caller behind him.

Quarter Midget trophy winners. (Kneeling, l-r) Champion Paul Bene-zra, Dub Jett 2nd, Craig Grunkemeyer 3rd, Ken Heatlie 4th, and Mike Katz 5th. (Standing, l-r) Henry Bartle 6th, Billy Johanson 7th, Duane Gall 8th, Bob Greer 9th with his son/caller, and "Best Senior" Pete Waters Jr.

Quickie 500 trophy winners; in front left is Bucky Miller, "Best Junior." (Kneeling, l-r) Champion Craig Grunkemeyer, Bob Lamb 2nd, Mike Pate 3rd, and "Best Senior," Fred French 4th, Duane Hulen 5th, and Rick Landers 6th. (Standing, l-r) Doug Wilmes 7th, Mike Tallman 8th, Doug Whitaker 9th, Mike Greer 10th (Behind father Bob), Ron Grey 11th, Joe Dodd 12th, Paul Benezra 14th, and Gail Jacobson 15th. Missing is Eric Meyers, 13th.

RC Pylon Racing At The '90 Nats

FAI F3D winners are (kneeling, l-r), Champion Rich Verano, Dave Shadel 2nd with son Bryan, Mike Katz 3rd with his caller Rick Landers. (Standing, l-r) Jim Shinohara, caller for Shadel, Dub Jett 4th with his caller, John Shannon (rear), Greg Doe caller for Mike Langlois 5th (holding trophy) and Dave Doyle 6th with his caller, wife Diane.

This tent was very large, with tons of room, however, it was very crowded because AMA requires all transmitters to be checked for correct frequency along with band width, so imagine if you can, 96 Quickie Pylon entrants intermixed with tons of Pattern flyers all standing in one long line waiting for their transmitter verification and then standing in another line to process models!

Most of the 96 had back-up planes, so we measured, safety checked, and inspected engine components on one big bunch of models! My guess is somewhere around 175 of them. As far back as anyone could remember, this entrant number was the greatest ever, surpassing the 83 at the Dayton Nats in '76.

To digress again, the event director is the same guy writing this, so when I speak of "I" or "We," you'll know why.

We started earlier than scheduled in an effort to get in a decent amount of flying because our allocated hours, since we share the frequencies with Pattern, were 7 a.m. until 1 p.m. for a total of six hours each day. The Quickie schedule was two days or 12 total hours, which isn't very much for 96 entries.

We held a pilot's meeting at 6 a.m. and told them we had to push and asked their cooperation by being ready and on time. To this end they really did the job. We didn't have to wait for anyone and things really cooked along. We started at 6:40, with Hubert Willis, Alan Booth, John Whitsitt, and Ron Adams being in the very unpopular, first heat of the first round. From there on things became a blur, because heats were soon being run in a range of 4 minutes, 30 seconds. A few were clocked at 4 minutes, 15 seconds, flag to flag.

As there were 24 heats per round, the fliers had plenty of time between rounds and the first round only used a little over two hours and went faster later. At the end of Round One there was a 24-way (of course) tie for first place, with the best time of 1:21 flat being turned in by Robert Lamb, of Bridgeton, Missouri (St Louis area). Right behind was Doug Whitaker, of the Nashville area, with a 1:21.32, and Mike Langlois, from North Carolina, with a 1:21.66.

We kept things moving and at the end of day one, had completed three full rounds with the sorting out process starting to work, because the 24-way tie for first at the end of Round One was now down to a 7-way tie with Craig Grunkemeyer, of Columbus, Ohio, on top by virtue of his fast time of 1:17.36. Following behind were: Duane Hulen, Mike Pate, Robert Lamb, Freddie French, Rick Landers, and Larry Burns, all with perfect scores.

Day two started at 6 a.m. with Allen Booth, Aubrey Nottingham, Jeff Faleo, and Leo Spychalla in heat one and Nottingham the winner. Heats continued at a fast rate and after Round Four, Bob Lamb was on top after a very hot race with Fred French in which he turned in a new Quickie record of 1:15.73 and French turning a 1:17.31.

Still tied for first were Lamb, Grunkemeyer, Pate, Hulen, and Landers and after five rounds the people still at the top were: Lamb, Grunkemeyer, Pate, and Landers. Round Six started with Allen Booth, who was always in the first heat, Wayne Pewitt, Bob Lamb, and Tom Scott. The CD started quarantining planes at this point for engine inspection and was holding anyone with a potential trophy position.

At the end of Round Six, which would be the last, the tie for first was down to Bob Lamb, Craig Grunkemeyer, and Mike Pate, so a flyoff was called to decide the winner. This was an excellent heat, with very tight racing and a couple of cuts resulting in Craig Grunkemeyer becoming the 1990 Nationals Quickie 500 champ! Bob Lamb was second and Mike Pate, who is a Senior, was third.

Paul Benezra (l) and his caller, "Racer Rick" Landers with the loot from winning the Quarter Midget Championship plus turning the meet "Fast Time."

Quickie 500 Champion Craig Grunkemeyer along with his caller, the ever smiling Joe Dodd, who in addition to being part of the winning team, was celebrating his birthday the same day.

Tied for 4th through 8th was "Fast" Freddie French, Duane Hulen, "Racer" Rick Landers, Doug Wilmes, and Mike Tallman, and with five tied, no flyoff could be run and fast times decided the positions.

At the end, the CD handed out the trophies, thanked the workers and the fliers for their cooperation, and headed for Quarter Midget processing.

QM had 42 entries, which was very respectable considering there was only one flying day on the schedule. The fliers were told to report for a 6 a.m. pilot's meeting and racing started soon after.

The dreaded first heat of the first round contained Jim Gager, who immediately midaired with Joe Dodd, and Bob Dible who cut out, so this start wasn't something to brag about, however, things got going and heats started cooking out at a fast rate and rounds were being run at about an hour each.

At the end of Round One, Craig Grunkemeyer was on top by virtue of his 1:18.85, closely followed by Gail Jacobson, Ken Heatlie, Dan Kane Sr, Jim Katz, Paul Benezra, Dubb Jett, Henry Bartle, Dave Gohn, and Jim Young, all winners of their first heat.

At the end of Round Two, the top guns were Benezra with a time of 1:16.85, followed by Jacobson with a 1:17.53, Grunkemeyer who did not better his first round time, Heatlie with a 1:19.91, and Katz with a 1:20.61. In addition, Jim Gager was involved in another midair and was out of the meet. Two heats, two lost planes. Too bad! (Also two bad!)

As time was of the essence, we kept on boogeying and worked our way through Rounds Three, Four, Five, and into Six. After Five, the leaders were Jim Katz, and Ken Heatlie, plus Paul Benezra, a point back, who turned in the event's fast time of 1:11.20. In Round Six, both Katz and Heatlie lost their heats resulting in a four-way tie for first between Benezra, Dub Jett, Craig Grunkemeyer, and Ken Heatlie . . . and without a frequency conflict, all four flew off for the Championship.

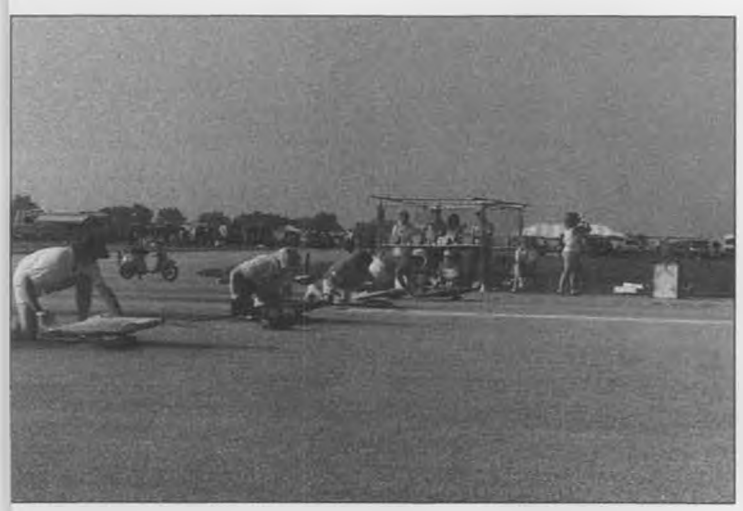
Unfortunately, Heatlie crashed after he finished his Round Six heat and had to go to his back-up for the first place flyoff, and it was not his best equipment because he was soon being eaten up by the other three. At the end, it was Benezra who ended on top and probably the one who deserved it the most because in the six rounds flown, he consistently turned in times of 1:11, 1:14, 1:15, and 1:16.

Again, trophies were passed out to the winners and off we went once again to FAI (F3D) processing. We had 18 entries this

continued on page 72

The writer and Event Director laughs at the droll humor of Paul "Neckrub" Benezra, Quarter Midget Champ. In the middle is Bob Brown, AMA District 3 Vice president, who also served as Pitboss for the meet. At right are Bob and Marc Greer, two of the contestants.

During Quickie 500 processing, every model entered was measured for adherence to specifications which included weighing. This is typical processing action with Ken Hulik using the "No-Go" gage to check a model height.



Form I starting action. The starter prepares to drop the flag when the 90 second clock hits "Zero" and the callers watch closely to launch their model on the correct drop of the flag. Callers/Mechanics in this heat are (l-r) Gordon McWilliams, Edie Oliver, Randy Rich, and Dub Jett. Note the timers are completely enclosed in chain link fencing for safety purposes. The author's "legs" (motorscooter) is also in the background.

Identification for the pylon staff is important in keeping the planes sorted out. Here is typical pre-start action, where the callers hold up the planes so that each pylon judge and the timers can get a good look at them. Note there is a two-person crew in charge of starting these heats. The Assistant Starter, Cathy Waters, calls in the model colors to each of the pylons, by radio, while the Chief Starter, Karen Yeager, writes down these colors on the heat card. This is very important during a race especially if there is a cut called, because only the correct plane must be penalized.

BIG BIRDS

BY AL ALMAN / BRUCE EDWARDS

BILLINGS FLY-IN REPORTS

Al called the other day and asked for some ink and paper, hopefully arranged in the form of a "Big Birds" column. I thought maybe he wouldn't ask again after my last epistle, but Al's a tough old bird and I couldn't think fast enough to come up with an excuse.

The holiday season will be upon us by the time you receive this issue of *MB* . . . so it might be an excellent time to drop a hint in the right direction that a subscription to *MB* would make a nice holiday gift.

My youngest son, Brian, informed me a couple of years ago that it was difficult to find old dad a Christmas gift. I suggested a yearly renewal of my *MB* subscription; that way he doesn't wonder what to get me and I don't miss an issue.

BIG BIRD FLY-INS

My wife, Eileen, and I attended the Billings, Montana, Annual Fly-In on June 22-23. There were Big Bird pilots from eleven states. I drove 830 miles from Tacoma, Washington, and there were still nine other guys who covered even more road miles.

It was well attended by 50 pilots and 60 airplanes. We had a 90 degree crosswind on Saturday and I got to test the Mustang club's safety fence with my Big Bee on my last flight. Of course, I acted as if I had intentionally done it to make sure the fence was able to do the job. Since I obviously couldn't dazzle them with that last landing I used Al's favorite trick of trying to fake 'em out.

The Mustang is a large club (about 100 members), which is pretty darn good considering that Billings has a total population of 60,000. The landing strip is paved and these guys are *friendly*. That so many pilots drive hundreds of miles to attend the Annual Fly-In says a lot about what a great time everyone has . . . in spite of temperatures in the 90s.

Bill Carpenter (CH Electronics, Box 1732, Riverton, WY 82501) was there and, as usual, outflew everyone. Bill always pulls a hangar full of planes with him wherever he goes. I've been using the CH Electronics Throttle Coupled Spark Advance for years on my Big engines and I've yet to see an engine that doesn't run better with a correctly installed T.C.S.A. Bill also has the new Stitt spark plugs available and he sez that they're even better than the NGK plugs.

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1. Fred Pierce's scratch-built Fokker D-VI—looks to have almost the same fuselage as the DR-I triplane, doesn't it? Weighs in at 17 pounds with Big Supertigre power.
2. Nicely finished Proctor Nieuport 28 belongs to John Jorgensen. Refer to last month's issue for a look at Proctor's latest kit, the Albatros DVa.
3. The big cowl and spinner give a mighty powerful look to Bill Ensley's Gloster Gladiator. Engine is actually a Zenoah G-62. Photo was taken at the OMAS club field in northwestern Oregon.
4. Lloyd Marohl has been giving his Polar Bear anabolic steroids! His Sachs 3.2 powered Grizzly Bear really performs.
5. One of the most popular non-scale Big Birds around is the Roadrunner, an example of which is seen here with builder/flier Bruce Grah am.
6. Gene Wagner usually flies his pretty Baby Ace (left) on floats, but converted it back to a landplane in order to participate in the fly-in. Right: A Supertigre 3000 makes this Laser 200 an incredibly quick and agile performer for Bob Hernandez.
7. Ken McCaudle's Fly Baby biplane (a Balsa USA kit) gets the once-over from Jim Arnold and John Carlton.
8. Len Bosman puts on quite a show with his marvelous 32-pound Avro Lancaster bomber. Power is by two Quadras in the inboard nacelles; outboard props merely freewheel in flight.
9. Another of Bill Ensley's Big Birds (he brought four to the OMAS fly-in), a gorgeous Curtiss Hawk P-6E built from Wendell Hostetler'splans. Alas, it exists no more; a wing bolt failed in flight.

My Saito 270 was tuned and propped for sea level and the first flight at the 3000 foot field elevation was not too impressive. However, by dropping down to an 18x6-10 from an 18x8-14 and using 5% nitro, the 270 was soon purring happily.

The fuel I purchased was Gary Patterson's 4-Stroke Formula. Gary is the owner of Patterson Hobbies, 103 North Jeffer, North Platte, NE 69101. The fuel is excellent quality and, while Gary does mail order everything else, you have to drop in to buy his fuel. I'm told that fliers from four states drive in to purchase this brew.

I didn't miss the Puget Sound Rocs 8th Annual Big Bird Bash on July 14-15. No major traveling for this one, as it's only 20 miles from my house. This was the Rocs' first fly-in at their new field and the grass strip was well prepared. Airworthiness inspections were handled in a friendly but professional manner.

The Rocs apparently suffered from the same malady that seems to be affecting so many Big Bird Fly-Ins: fewer pilots each year. This was true for every fly-in I attended.

I think the problem is that most clubs expect other pilots to attend their meets but don't reciprocate when the club down the road has theirs. We have six Big Bird clubs within a 100-mile radius, but most of them

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ELECTRIC POWER

BY MITCH POLING

ELECTRIC HELICOPTERS & SOLAR PLANES

The line-up of five electric R/C helicopters entered in a recent meet in Weilmunster, W. Germany. The performance of these machines is getting better all the time—see text for Mitch's comments.

On June 23 and 24 the Weilmunster club here in Germany had its electric meet, with a new feature: an event for electric helicopters. The takeoff and landing pads were one meter square, and spaced 10 meters apart. The helicopters had six tasks:

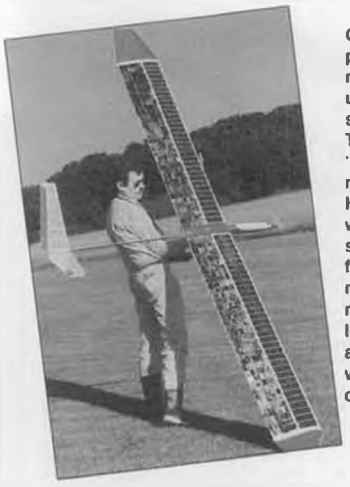
1. Two 360° circles, starting from the start pad, landing in the landing pad.
2. Figure eight, at 5 meters height, with model nose always facing the wind.
3. Simple hat, 4 meters up, 4 meters horizontal, 4 meters down.
4. Simple turn.
5. Flyby 5 meters high, 30 meters long.
6. Landing with a 180° rotation in the landing pad.

Three flights were allowed; the lowest was dropped. The event as flown had landing and takeoff for each of the six tasks. You can figure out for yourself that this is a fairly heavy duty requirement for electric helicopters, given that each task will take from 30 seconds to a minute. The two top helicopters were capable of six-minute flights, and completed the tasks. Five helicopters entered; four were capable of doing at least half of the requirements. I could not stay for all three rounds, but the standings at the end of the first round were: W. Wiedesheld, 69 points; G. Schweidler, 93; K. Reutes, 67; C. Hultsch, 62; R. Heinisch, no attempt.

The photos show some of the helicopters. The helicopters in general were very good looking, both on the ground and in the air. The statistics on the ships were as follows:

- Wiedesheld: 30 cells, 5.0 kg flying weight, Plettenberg cobalt motor, Heim mechanics, Lockheed 286h fuselage.
- Schweidler: 28 cells, 4.8 kg flying weight, Geist 90 cobalt motor, Heim mechanics, Jet Ranger fuselage.
- Reutes: 24 cells, 4.4 kg flying weight, Plettenberg cobalt motor, Heim mechanics, generic canopy.
- Heinisch: 16 cells, 3.0 kg flying weight, cobalt motor, Kyosho mechanics, no canopy or fuselage.

(Left) The non-scale electric chopper built and flown by K. Reutes is a 60-size ship powered by a Plettenberg cobalt motor on 24 cells, and weighing in at 9.7 pounds. With the big motors and high cell count, the airframes on these aircraft have to be built as light as po ssible to get good performance. (Right) Sleek Lockheed 286h is the work of W. Wiedesheld. Uses a Plettenberg motor, 30 cells, Heim mechanics, and weighs just over 11 pounds . It's capable of six-minute flights and mild aerobatics.



One of two solar powered models to show up at Weilmunster was Erich Topfer's "Solarmax" motorglider. High cost is what keeps solar p ower from becoming more common—you're looking at around $1200 worth of solar cells here.

Solar planes were not part of the competition program, but two were at the contest as part of the "show fly" (lunch time break) time. Erich Topfer's "Solarmax" plane was particularly impressive. It is pure solar, with no backup NiCds for the motor. It is a beautiful plane besides being a very good flier. Erich flew it at 9 a.m. (June 23) under a cloudless sky. Even this early in the morning, the climb was strong, much like my Olympic II with seven cells and a 100-watt (05) motor. It could have climbed forever, and flown all day! Erich has put in some incredible skill and labor on this plane.

The photos show the solar panel wings. The cells on the back side of the airfoil (a conventional Clark Y type) are on the upper surface, since it is flat. The cells forward of the spar are inside the wing, since the upper forward surface is curved, and the upper forward surface is covered with clear plexiglass. However, this presents a problem, in that the top part of each rib stands above the solar cell surface and can shadow the cells. This can cause a drastic loss of power. So, Erich made the ribs truss style, out of transparent plastic. Each one of them looks like the old style truss type bridges, and there is no shadowing. I count 66 of these ribs! He probably used the sliced rib technique, where you build a block and slice the ribs off like bread, but still, it's quite an effort. I have used this technique for the ribs in my indoor electric RC Sopwith Tabloid. It makes very light ribs, and they are strong.

The main wing panels have only a slight dihedral, while the wing tips are angled up at 30 degrees. The angled wing tips have the effect of a large dihedral, and make rudder-

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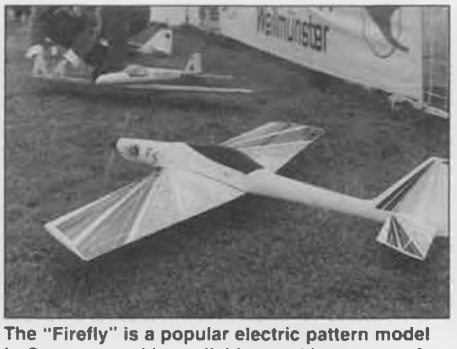
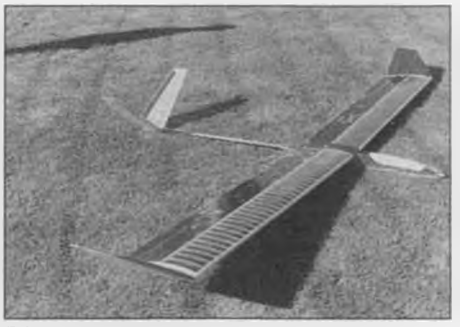
Jens Bartels flew his original design "Pink Panther" in the pattern event at Weilmunster. Mitch reports the model is an outstanding performer and pattern-competitive on only 14 cells. Unfortunately, no plans are available.



The "Firefly" is a popular electric pattern model in Germany and is available as a kit—see text for details.



Erich Topfer obviously put a lot of thought and work into his Solarmax. Unlike most other solar models we've read about, the Solarma x's motor is run directly by the solar cells, with no buffer NiCds used.

• Hultsch: 30 cells, 5.0 kg flying weight, Geist 90 cobalt motor, Robbe Pro mechanics (similar to Heim), Jet Ranger fuselage.

All the helis had speed controls and gyros. I didn't get much in the way of details on the speed controls; Hultsch had a Schutz unit, Reuter built his own. Next time I will try to get more details on the speed controls, since they are critical. They have to be able to withstand a lot of back voltage, i.e., have good brakes, since the rotor blades act as a generator when power is pulled back. Note that the most successful helicopters were 60 size; the motors are equivalent to the Astro 60, and so is the cell count.

As for the flying, the scores I gave do not tell the whole story. I got to watch some fun flying by Wiedesheld and Reutes the evening before the event, and it was impressive. Both helicopters flew for six minutes, with hovering, high speed passes, steep stall turns, and an obvious abundance of power. These ships were not underpowered! Wiedesheld did a loop with his ship, the first I have ever seen by an electric helicopter. They were obviously having fun. The impression on the spectators was that electric helicopters are here now. If that fun flying had been part of an airshow, the spectators would not have known these were not gas powered other than by the lack of engine noise. You can hear the blades quite clearly, though; in flight the familiar "chopper" sound is quite evident. My congratulations to these builders and pilots who have shown that electric helicopters have come of age.

Frequent *MB* contributor. Bob Benjamin, sent these photos of his modified and highly detailed Astro Flight Porterfield Collegiate, which carries the distinction of being the first electric powered model to qualify for the U.S. Scale Masters Championships, to be held in Dallas, Texas as we go to press. Bob says the model has been so extensively modified that it is now essentially a scratch -built effort. Power is a standard Astro 25 Cobalt on 14 cells, controlled by an Astro 205 electronic throttle. Covering and finish is per the Stits Polyfiber system, used exactly per full-scale practice. Flying weight is just under seven pounds, for a wing loading of 23 oz./sq. ft., and at that weight the model cruises in a realistic scale-like fashion at about half power. We'll try to let you know how Bob fared at the Scale Masters in next month's issue.

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JET TRAILS

BY SCOTT STAUFFER

BAY OF QUINTE FLY-IN

Every year, about mid-June, the cool winds begin to blow down from the great white north. And every year a young jet model flier's fancy turns toward the call of the North, because mid-June is when the Canadian Bay of Quinte club holds its annual fan jet rally. This year was the first year I was able to respond to the call.

After clearing customs, one of the first things you will notice is that the locals drive a little fast. It's not uncommon for them to be cruising about 70-80 mph *(We never do that here in Southern California! wcn)*. This may seem a little dangerous but not really. The roads are wide with long, flat straightaways, all very well maintained. As long as you stay over in the right hand lane, the locals will just whiz around you. Probably muttering something about slow poke American tourists.

Another thing you will notice is that things seem to be a bit more expensive. Like gas at $2.35 a gallon. But the American dollar is worth a bit more up there, so it's not too bad. Example: Our hotel room was $69 Canadian. But when I paid it in American money, it was only $57. Not bad. The Bay of Quinte is located near Belleville, Ontario, which is located about 70 miles west of the New York

One of the biggest crowd pleasers at Quinte was the sport scale Hawker Sea Harrier being developed by Canadian modeler Eric Dainty. The wing was removed for this photo to show the internal fiberglass ductwork. Eric has the Harrier to the point where it's almost, but not quite, capable of honest-to-gosh VTOL performance—just needs more power. As it is now, takeoff and landing rolls are a scant 20 feet or less. (Inset) Close-up of the thrust vectoring mechanism at the tail of Eric Dainty's Sea Harrier. Control is via cables connected to the rudder and elevator horns. (Below) Jean-Guy Rechefort's scratch-built F-104 Starfighter in pretty W. German livery. She weighs in at 11 pounds and even with a span of only 3-1/2 feet, performed very well with Rossi .81 power.

State Interchange of 81-401, just off Route 401.

The fan rally was held at Mountain View CFB (Canadian Forces Base), near Trenton. The base is located about 10 miles south of Belleville on Route 62. We arrived early Saturday morning to get a good pit position near the flight line. The entry fee was $15, which included a ticket to the club cookout Saturday night. The show was hosted by the Bay of Quinte Aeromodelers, a medium sized club of about 65 members, whose regular flying site is a grass strip a few miles up the road from Mountain View. Once registered we chose time to fly during the day. Because of the large number of entries (about 55), a flight time schedule was used to keep track of the flights and frequencies. This is partly based on the honor system. It relies on everybody returning their frequency pins on time. Unfortunately, some did not. This cut into other fliers' time. I considered this a minor problem and the overall show was very well run. Our hosts were friendly and helpful. They employed a nice sound system with a bilingual announcer. Speak-

One of the biggest planes at the meet was John Carlson's foam-and-fiberglass MiG-29 Fulcrum, possibly to be offered as a kit. John didn't have the MiG finished in time to fly at Quinte, but it should be a spectacular performer at 31 pounds with two Byron/O.S. .91 fans.

John Carlson's unusual Saab J-29 Tunnan (Swedish for "barrel"—appropriately named!). John brought it along for static display only, as no test flights had been made prior to the meet.

Pretty CT-114 Tutor in Canadian Snowbirds colors is the handiwork of Martin Lefebure. Fiberglass fuselage and foam core wings, Byron /Rossi .81 fan combo . . . a possible future kit. Of special interest is that, because the scale air intakes are so small, the two forward sections of the painted windscreen are hinged to blow inward in flight to provide additional air to the fan—a clever idea!

Well-known jet flier Dennis Crooks drove up from Illinois to fly his big F-14 Tomcat, one of the three F-14s in attendance built from Yellow Aircraft kits. Yes, the wing sweep is variable in flight.

One of only a few non-military jets at Quinte was this Cessna Citation with two RK20/O.S. .25 fans, as built from the Royal kit by Yues Sansfacon of Montreal, Canada.

ing in both English and French, he kept the spectators (about 1500) informed about the planes. He got his info from cards we filled out about our planes during registration.

Saturday evening they had a cookout dinner for all the participants, which I really enjoyed. Fried chicken was the main entree with all kinds of side dishes and desserts. I must have gained five pounds. The picnic was a veritable feast. They had entertainment as well; a local magician performed some pretty neat tricks, some involved audience participation. They had open flying as well. This mainly consisted of prop planes.

The majority of the planes present were of kit construction, but quite a few were scratch-built. I compiled a brief count of the more popular kit-built ones: By far the most popular plane was the Reagle Eagle; there were 12 of them. At one time during the show, there were five of them in the air at the same time! There were also five Starfires, four Byron F-16s, three Yellow A-4s, three Yellow F-14 Tomcats, two Parkinson Blue Hornets, and two Yellow F-4s. But my main interest lies in the scratch-built planes. They represent the true innovators in this hobby. These are the planes that will eventually become the kits of tomorrow.

Both Saturday and Sunday were sunny and hot! At times the intense heat got to both plane and pilot, with shade at a premium. Despite the heat, there was some of the best flying we have seen anywhere . . . with some very innovative equipment. Case in point: Eric Dainty, of Kanata, Canada, brought and flew his scratch-built British Sea Harrier. While not to scale and with only a primer paint job, it flew remarkably well. This was the second airframe constructed in a multi-year project. The first airframe just hovered. This second one operates in forward flight but cannot hover. However, it can take off and land in a very short distance. I watched it taxi out, throttle up, roll about 20 feet or less, and lift off.

It was amazing to see the vectoring nozzles and flaps rotate as the plane transitioned into full forward flight. Once airborne it was no slouch. I estimate it cruised at about 130 mph. When it came time to land, Eric rotated the nozzles back down, which also lowered the flaps, and started his descent. It seemed odd to see a plane land at full throttle. By the time it touched down, its forward movement was so slow, it only rolled a few feet, turned, and taxied back to the pits.

The Harrier fuselage was fiberglass, with some very ingenious duct work. The wing was built-up balsa construction incorporating a hollow box spar. This is used to supply air to the roll reaction dampeners at the wing tips. The aircraft also used a unique tail reaction system, incorporating a ball and socket mounted plate. The plate was cupped which deflected the thrust evenly in all directions. The plate was coupled via small cables to the rudder and elevator controls. When tail reaction is needed, you simply move either control. This moves the plate, directing air pressure to the appropriate side and directing it in the opposite side, thus moving the tail. Powered by a Dynamax/O.S. 91 fan system, this agile little plane only weighed 7-3/4 lbs. In order for the plane to properly V.T.O.L., additional thrust will be needed. It used a six-channel radio with nine servos for control. As clever as Eric is, there's no doubt that in a few years he will have solved all the problems.

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A view of the Yellow Aircraft pits. Our columnist says he had to climb a scaffolding to take this shot. The things people will do to get pictures. . . .

Dan Fish had one of the five non-scale Starfires that flew at Quinte.

Gorgeous F9F Panther is another of Jean-Guy Rechefort's scratch-built efforts. Features a Byron/Rossi .81 fan, wooden fuselage, foam wing, and removable wing tanks.

Scale jet models don't get any simpler than this. Ken Rawlins' scratch-built Heinkel He-162 flies very well with a Turbax 1/Supertigre X-40 fan setup, thanks to its relatively light wing loading.

Products I·N U·S·E

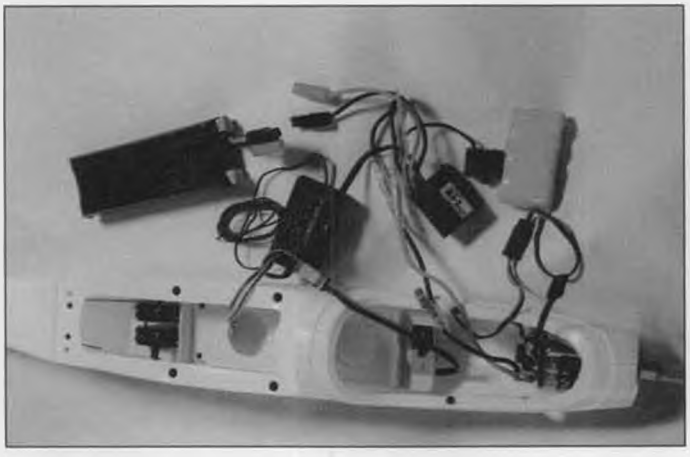
Kyosho 'Stratus 2000'

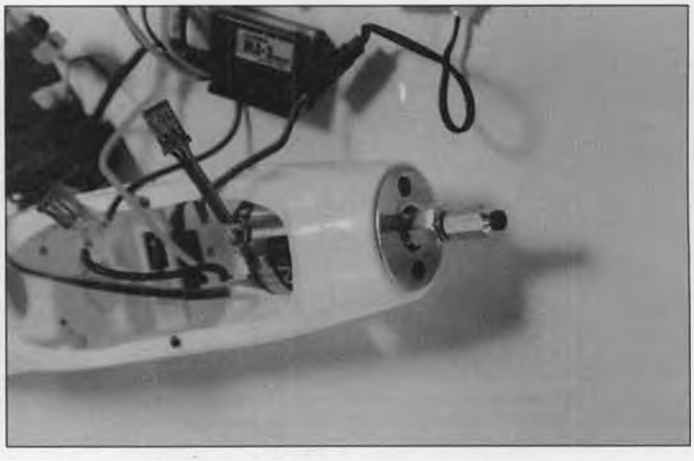
BY BILL NORTHROP

The first electric powered RC model aircraft we ever built was actually for someone else. You may recognize the name. Roy Firestone is a TV sports broadcaster who is presently featured on ESPN's "Sports Look," a one-on-one star sports figure interview program. He was introduced to RC aircraft by a Dodger baseball player whose name escapes us at the moment.

We met Roy at one of our IMS Pasadena shows several years ago, and subsequent talks resulted in our building for him a "Piece O' Cake" glider from a Craft Air kit (now Dynaflite) and installing an 05 electric power system. We chose to use electric power for several

(Left) Finished Kyosho "Stratus 2000" and *MB's* editor at Fairview Regional Park, Costa Mesa, CA. About five minutes from *MB's* office, the site is reserved for RC gliders and electrics only . . . used recently for F3E Team Finals. (Below left) Good grief! All of that stuff has to go inside the fuselage! From left: Receiver 250 mAH pack, Airtronics Speed Control and switch, Airtronics 92370 receiver, and six-cell motor battery pack. Already installed are the mini servos, radio switch, and electric motor. (Below right) Motor mounts to front of fuselage using two small bolts and metal plate. Mounting spacers between motor and inside of fuselage can be tricky. See text for solution.





reasons. One; a powered glider or any other type of inherently stable model aircraft is the easiest type with which a rank beginner can learn to fly ("No, Roy, the fatter, rounded edge of the wing goes in front."). Two; we figured electric power would be easier to handle for a total newcomer to the hobby who would only fly on rare occasions, than having to tangle with the learning curve of mastering glow engines, and third, we were itching to try electric!

Next there was the conversion of a full-size Comet Clipper from free flight to electric powered RC. This flew well, though flight times were kinda short, until an unexpected g-load broke the wing in half at about 400 feet. The results should be obvious.

The Kyosho "Stratus 2000" is our third electric model. The kit, which is distributed to hobby shops by Great Planes Model Distributors and/or sold directly to modelers by Tower Hobbies, both out of Champaign. Illinois, is definitely in the ARF category. It features a molded white plastic fuselage, built-up three-piece wing and built-up tail surfaces covered with white plastic film, an AP36L electric motor, motor leads with an in-line fuse installed, folding propeller, tinted canopy, radio installation hardware, die-cut plywood bulkheads and mounting trays, molded plastic flying surface tips, decal set (no need for any painting), nuts, bolts, and screws, and a 12-page illustrated instruction booklet. Span is 75 inches.

Assembling the Stratus, as well as flying it, is not for the raw beginner to modeling, however, it's a perfect introduction to electric powered flight for the modeler with a bit of experience in assembling ARF-type models, and particularly with some experience in making radio equipment installations . . . it's a snug fit to get everything installed correctly in the Stratus, and it takes some forethought and planning that can only come with experience.

Accumulate the radio and electric power equipment "not included" before you get started; like most ARFs, you're into radio installation within minutes of starting assembly. Our equipment consists of the Airtronics Championship Series radio on six meters (we're W6MGK), with the little 94501 servos and a 250 mAh radio pack, the Airtronics MA-3 speed control, and a six-cell motor battery (six or seven-cell can be used; we swiped the pack from an RC car). We also changed all motor power connectors to the highly efficient Sermos type, to avoid power loss. Actually, a speed control is somewhat overkill. On-Off switching is all that is required with a powered glider. You won't be shooting touch-and-goes or just cruising around . . . climb and glide is the name of the game!

The perspective line sketches with the instructions make assembly quite easy, but no matter how experienced you are, it's simply common sense to read the instructions all the way through, check parts as you go along, and mentally complete assembly of the aircraft before you actually start putting pieces together. The following are some notes we made in the instruction book at various stages of assembly.

Everything stuffed in but the power pack. Folding prop and spinner, included with kit, installs quickly. Sermos connectors used to cut down power loss.

Small item, but pilot head at least has pleasant features. Hair brown, earphones black, glasses lenses tinted with green ink. Not a lot of work, but enough for effect.

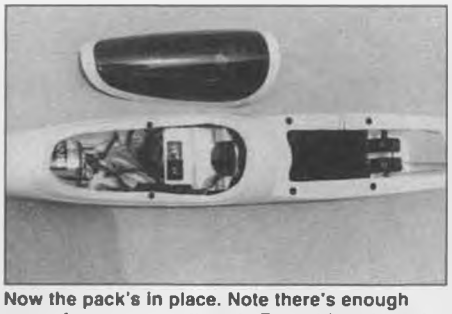
When cutting the ventilation openings, start by making holes with an awl, then finish the openings with a fine, sharp model knife (naturally, we recommend the Uber Skiver for this).

When mounting the electric motor to the fuselage and motor plate, tack the beveled spacer washers to the front of the motor with a spot or two of thick Hot Stuff in order to prevent total frustration and bad language!

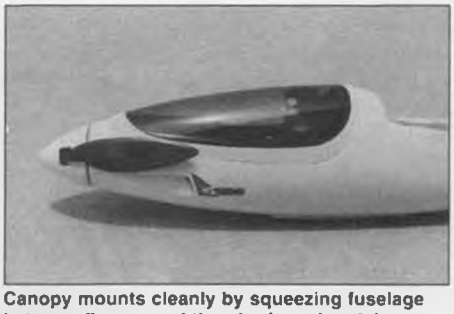
The illustration is a little misleading about the front mounting screws for the plywood battery plate. You'll have to make additional cuts on the fuselage wing saddle area in order to clear the shank of your screwdriver (check photo).

To prevent more frustration and bad language, follow Dave Thornburg's suggestion in his "Old Buzzard's Soaring Book," and coat your receiver antenna with talcum powder before attempting to push it through the antenna tube. We can almost guarantee that it'll jamb up about halfway through unless you do . . . sure you're gonna try it first, but don't despair, the talc will fix it!

Whichever member of the family is the best at getting the most luggage in the trunk of the car when you go on a trip, should be requested to stuff all the radio and power gear in the fuselage. It may not look that difficult, until you find out that the balance point will come out way too far forward, and you have to re-stuff in order to concentrate weight farther aft. In spite of all efforts, we had to resort to some tail weight to get the balance where it should be.



Now the pack's in place. Note there's enough space for a seven-cell pack. Everything shoved back as much as possible to obtain proper balance.



Canopy mounts cleanly by squeezing fuselage between fingers and thumb of one hand, just over "Kyosho," allowing two screwheads visible in other photos to slip into tapered slots on molded interior of canopy. Presto!

As our ARF columnist, Art Steinberg, has admitted, if you are going to build ARFs, you kinda have to get used to poor fitting parts that do the job but just don't give the close-up appearance that a proud builder prefers. On the Stratus, this problem is pleasantly minor, and the only thing we can pick on are the wing, stab, and fin tips. These are molded plastic shapes that first have to be cut from

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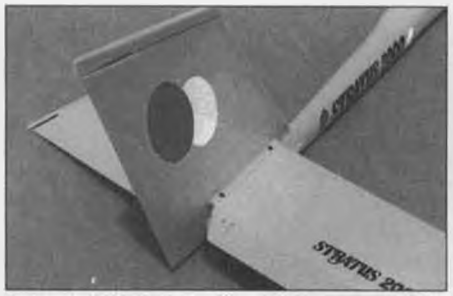
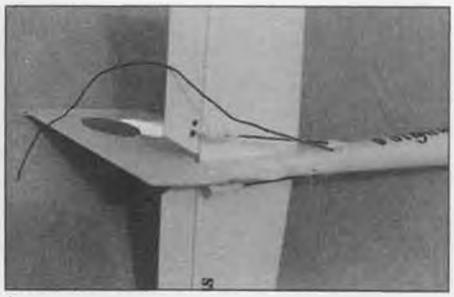


Clean and simple mounting of tail surfaces. Note built-up balsa frame visible through plastic film covering, also tip caps. See text about these.



Supplied pushrods exit through molded fairings. Clevises include rubber sleeve to prevent accidental uncovering. Note antenna tube. Text explains how to feed antenna through tube without jamming.

Products

I • N U • S • E

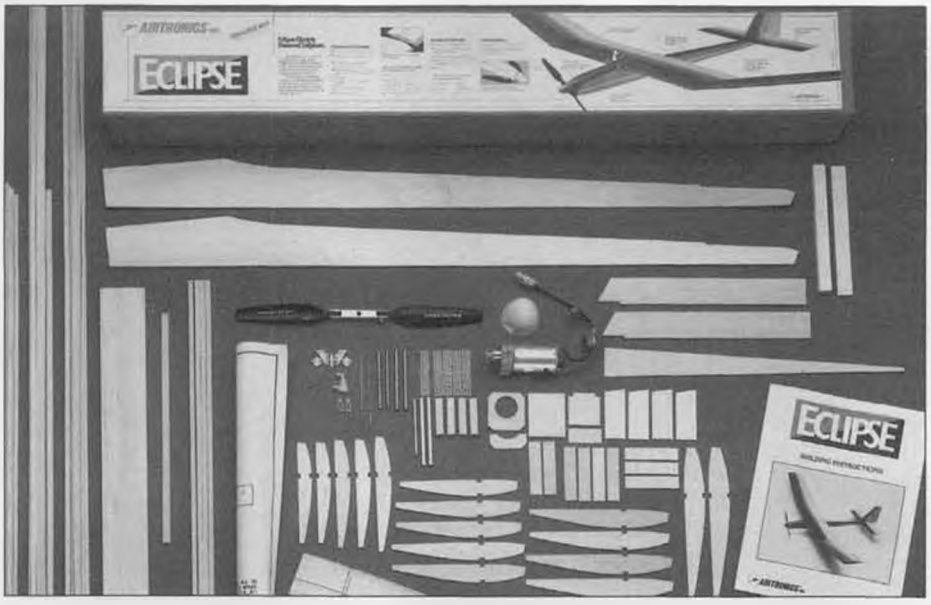
Airtronics 'Eclipse' Electric Sailplane

BY ELOY MAREZ

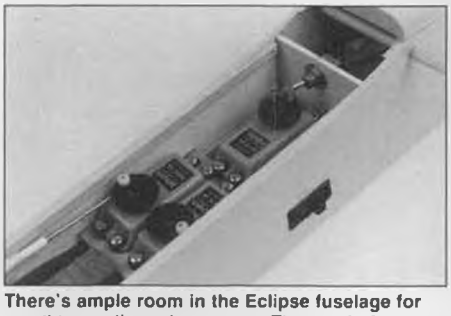
The Airtronics "Eclipse" electric powered sailplane is an all-wood model in the popular 05 motor, 80-inch wingspan class. It is intended primarily for soaring flight, with the electric motor being used to gain thermal altitude without the need for any auxiliary launch equipment.

The high performance semi-symmetrical wing spans 78 inches, with an area of 660 square inches, and is built with removable plug-in wing tips for ease of transportation. The fuselage length is 39 inches; all-up ready-to-fly weight is 45 ounces. To save you having to find your calculator, that works out to a wing loading of 9.83 ounces per square foot. Included are full-size highly detailed plans, and a fully illustrated instruction manual. I would class this as an easy project for those with any model building experience at all, and a not impossible task for those with no experience at all, requiring only that they can read and follow instructions and not be afraid of a little work. All the materials in my kit were of good quality, correctly shaped, and were all used. I say that because I often find kit parts that I don't use, due to poor wood selection or improper fit.

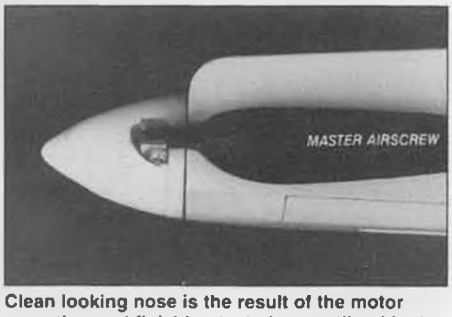
The Eclipse is available in two versions, both of which include all necessary hardware such as linkages and pushrods, horns, clevises and hinges. Even a nylon tail skid is included! The two kits differ in that the Deluxe version (at $99.95) also includes an electric motor and gearbox, folding propeller, and spinner. Additionally, the motor comes completely wired with battery plug, fuse, and on-off switch. This switch is intended for operation by a throttle channel servo. The Standard version ($59.95) does not include these latter items. Naturally, both require the normal adhesives (CA and epoxy are recommended) covering material, radio equipment, battery, and battery charger. The instruction manual lists the tools and materials recommended to build



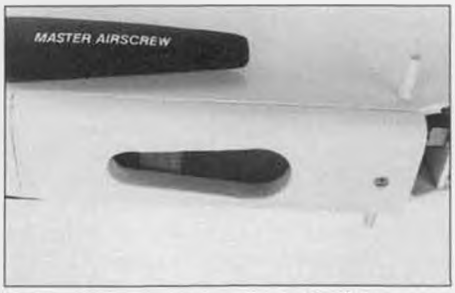
Parts breakdown of the Airtronics Eclipse kit. This is the Deluxe kit; the Standard kit does not include the pre-wired motor, folding prop, or spinner. All parts are of high quality, are well finished, and all fit without any necessary trimming or shimming . . . in other words, it's a typical Airtronics kit!



There's ample room in the Eclipse fuselage for small to medium size servos. The one in front actuates the motor on-off switch (supplied in the Deluxe kit). Simple and effective!



Clean looking nose is the result of the motor mounting and finishing technique outlined in the text.



The ventilation opening in the motor/battery access hatch is a slight modification of the one detailed in the kit instructions; this one's a bit easier to make and works just as well.

the model; nothing out of the ordinary being required. Though my shop is equipped with all necessary power tools, I know that not everyone has those luxuries, and that the working of plywood and hardwood can be an unpleasant task. All such pieces in the Eclipse kit are preshaped and *fit*, again bearing out the fact that nothing unusual in the way of tools is required.

I can state unequivocally that I thoroughly enjoyed building the Airtronics Eclipse. In part, this is because a lot of my model building projects in recent years have been of fiberglass and foam construction, requiring completely different techniques from this one. I like those materials; fiberglass being far more durable for engine powered model fuselages than wood. I also like the extra space resulting from the thin sides, and the ease of applying a good paint job. I find too, that knowing the fuselage is going to look great pushes me into making sure that the other wood or wood covered parts are also properly prepared and will look equally good once painted.

On the other hand, building the Eclipse piece by piece, watching it grow on my workbench, brought the type of satisfaction from which model building evolved in the first place. It helped, as I have already stressed, that all materials and fit were more than just acceptable to me, and that any questions that arose were simply a matter of reading the instructions.

In that respect, the only caution I have for any prospective builder of the Eclipse is to pay attention to the cutting of the rectangular stock in the kit. It is planned so that a piece of some specific length is cut by you to provide certain pieces in the model. Indiscriminate chopping up of these materials could lead to having to replace or splice to get the desired lengths later on in the building process.

For those looking for a faster climb than can be realized with the Mabuchi motor supplied with the Eclipse Deluxe kit, try substituting an Astro Flight geared 05 Cobalt motor . . . and prepare yourself for a *major* boost in performance!

An alternate to the servo-operated motor on-off switch is the *electronic* on-off switch shown here, also made by Astro Flight. No moving parts, no mechanical actuators to hook up.

No surprise in the building of any subsection of the Eclipse! Nothing unusual! Standard built-up wing and tail assembly techniques are used throughout. The fuselage is also a normal plywood and balsa box, the only real shaping necessary being on the removable top hatch and nose, which must be rounded and faired into the spinner. To get a perfect fit on the latter, I borrowed a method I have used successfully with engine powered models for years. I install all the necessary nose blocks, and in this case, motor (different from engine!) mounts. Then, being doubly sure that all motor openings are covered and protected, I install it in place, including the spinner backplate, with some spacers to provide the necessary clearance. The outer edge of the spinner is then also protected with a layer of masking tape.

The nose blocks are then whittled and ultimately sanded to contour into the spinner backplate. Especially during the initial sanding, when relatively coarse paper is necessary, be sure that you don't sand through the tape protecting the backplate. Obviously, to do so will score and scratch it. If necessary, stop and replace the tape. In a few minutes, you will have a nicely shaped nose on your model, far better looking than those that were done with a machete and Number Five sandpaper.

My Eclipse, the Deluxe version, included a Mabuchi 550S motor, a Leisure Electronics 3:1 geared reduction system, and a Master Airscrew 12x8 folding propeller. Plywood

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Products IN USE

The prettiest model engines in the world are those very few that are machined from barstock . . . like the British Lasers. The second prettiest in the world are the O.S. model engines from Japan! It doesn't matter if you're eyeballing O.S.'s FR5-300 five-cylinder four-cycle radial or a simple two-cycle like this month's Max-25SF, the quality of the die casting and machining is absolutely impeccable! And this astoundingly beautiful outside appearance of the entire O.S. engine line isn't just external eyewash. The same polished machined look is *inside* these engines too.

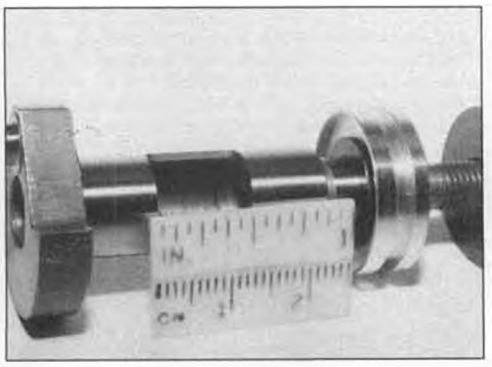
We're now hearing stories in the USA that O.S. has a new prohibited-entry engine factory running in Japan. I don't know of anyone who's been in the new facility to report on it. Rumors are that the newer style O.S. engines are made in that factory and that the work is practically all done by industrial robots! I expect this new O.S. Max 25SF came from the robotic factory, although the old factory is reportedly also still in production.

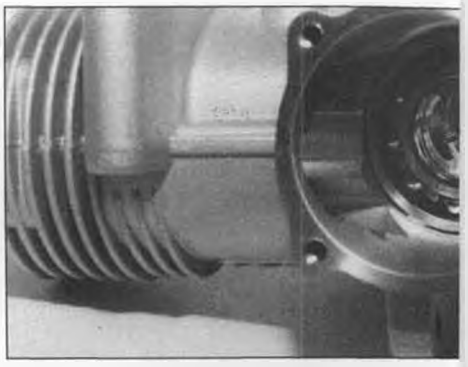
We had our choice of either of two versions for this month's review. The higher priced one is the Max 25SF ABC, which is

In finish and workmanship, O.S. engines are unsurpassed—and they're just as pretty inside as they are outside! This engine, the 25S F, replaces the popular O.S. 25 FSR and is considerably more powerful than the lower priced O.S. 25FP.

Inside The OS25SF

BY STU RICHMOND





(Left) With few exceptions, the O.S. 25SF is of pretty much standard design. Stu suspects the engine is made in O.S.'s new robotic factory purported to be operating in Japan. (Middle) The crankshaft's disc is extra thick to aid balancing. (Right) Even a close-up shot reveals faultless workmanship. Lubrication for the front ball bearing is via the groove in the crankcase casting (11 o'clock position).

made with an aluminum piston running in a chrome plated brass cylinder. We chose the lower cost ringed version with a nickel plated steel cylinder as being more durable for sport flying.

I believe the non-ABC engine is always the better choice for the sport flyer, as it usually takes more abuse in terms of dirt tolerance. ABC engines usually run a bit faster because the actual windows or ports through the cylinder walls are of bigger total free area. The use of a cast iron piston ring requires a series of smaller windows in the cylinder so that the piston ring doesn't bulge out and catch the top or bottom lip of these square porting windows. That's why when you look into the exhaust stack of a ringed engine you always see the series of closely spaced square windows, it's the vertical steel between the windows that keeps the ring from getting caught as it rides up and down inside the cylinder. It is also these vertical sections that restrict breathing a bit. So, generally speaking, an ABC will run faster than a ringed engine.

As I've said before, a model engine with a cast iron piston ring tends to take more long-term abuse. One piece of grit can destroy an ABC's soft aluminum piston. The same piece of grit in a ringed engine will usually only get crushed at the edges of the iron ring as it passes a porting window, and the engine keeps on running.

So I opted for the lower priced ringed Max 25SF for this review, but—surprise, surprise—the first look in this engine's exhaust shows *it has no piston ring!* All the Great Planes (they're the importers) advertising says the non-ABC version is ringed, but this O.S. Max 25SF is *not!* It has the same three great big intake ports and the same big oval-shaped exhaust port as the ABC version . . . no little square windows to minimize the port area of this little powerhouse . . . no verticals to hold in a dragging piston ring and to restrict the engine's breathing.

This month's engine has the time-tested and well-proved mix of a precision, centerless ground, cast iron piston running in a nickel plated tapered steel cylinder. Our review engine has its maximum horsepower rated by O.S. running at 16,000 rpm and the ABC engine has its maximum horsepower rated at 18,000 rpm . . . we're into apples and oranges. I strongly suspect both engines will produce virtually identical power at 16,000 rpm. I'd suspect the ABC version has a slightly higher compression ratio (the cylinder head's part number is different). That engine comes with a 2FB carburetor, which has an inside diameter of .235 inch, whereas this review engine's 2F carb measures only .225 inch; I feel the smaller carburetor throat contributes to the slow reliable idle speeds the sport flier often enjoys . . . and gets in this lower priced version. There's no fun in trying to shoot touch-and-go landings with an idle well above 2500 rpm. So much for engine philosophy this month; let's get inside this new beauty!

Four 2mm socket head bolts hold the backplate on, and six bolts hold the cylinder head in place. The engine comes with both a 2mm hex key wrench and a 7mm open end wrench for carburetor nuts. I recommend *never* taking a new engine apart . . . not to look for loose pieces of metal (this engine had none) . . . not to look for things that are wrong (you'll be disappointed) . . . not to satisfy your curiosity (look at the Inside Engines photos instead). This engine has a nonmetallic gasket between the backplate and crankcase and another between the fuel nipple and the carburetor body so it *is* alright to lightly snug here, but don't loosen anything! That's what your generous two-year guarantee is for!

As the cylinder head was removed it was apparent the .012-inch soft aluminum head gasket that forms the head-to-cylinder seal was put in place and then the head was machine spun a bit to enhance the seal . . . clever. A tiny steel roll pin in the rear top surface of the crankcase locates the cylinder so the three intake ports align properly in the crankcase. The top of the combustion chamber is a single bowl (not spherical) that looks like an inverted dishpan; the outer squish band is .135-inch wide and is angled to squish towards the glow plug's coil at ten degrees. Angled squish bands seem to extend glow plug life. My two favorite glow plugs (because they *perform* best) fit to the bottom of the head's internal threads well. The K&B #4520 with the welded-on idle bar has the bar and bottom coil protrude into the combustion chamber; the Fox Miracle Plug has its snoot protrude .050 inch down into the chamber. For model engines that are expected to idle well, these two

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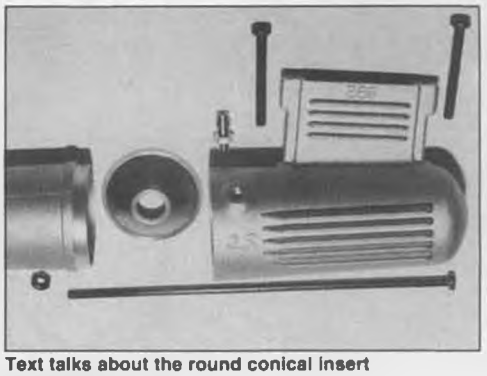
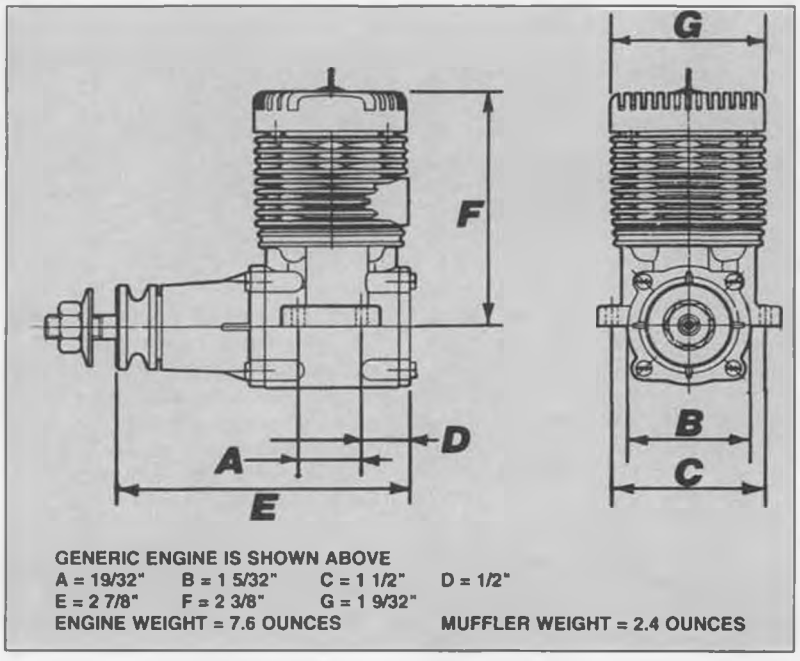
These internal parts really shine. Conrod is machined from aluminum bar stock and is bushed at both ends; the piston is cast iron and runs in a plated steel cylinder. This engine is made to last!

The O.S. 2F carb comes with a piece of silicone tubing installed to prevent air leakage through the needle valve threads—a good idea. Carb barrel is easily removed for cleaning.



Text talks about the round conical insert between the O.S. muffler's front and rear sections.



GENERIC ENGINE IS SHOWN ABOVE
A = 19/32" B = 1 5/32" C = 1 1/2" D = 1/2"
E = 2 7/8" F = 2 3/8" G = 1 9/32"
ENGINE WEIGHT = 7.6 OUNCES MUFFLER WEIGHT = 2.4 OUNCES

CHOPPER CHATTER

BY JAMES WANG

Today's RC helicopter modelers are a lucky bunch because modern helicopter kits are all well engineered, very slick looking, and have better handling qualities than the first generation helicopters of the early '70s. Furthermore, we have some really high-tech radios designed just for chopper pilots. All the fancy looking knobs and chromed switches on the new helicopter radios not only look high-tech, they actually improve the ease of handling of an RC helicopter.

I believe one of the great gismos that really improves the handling characteristics of a modern RC helicopter is the rate gyro. Kavan was the first hobby manufacture to introduce a rate gyro for RC use. When Kavan started selling them in the U.S. in 1976, I immediately bought one. I installed it in my second RC helicopter, an American RC Revolution 40. Instantly I found the tail rotor control had become a breeze. From then on I have firmly believed that a properly set up rate gyro can speed up a beginner's learning curve and helps make a tyro looks more like a pro. However, there are always some down to earth people who disbelieve in using a rate gyro. They either think that it is not worth the money for the job it does, or they simply believe that "real men don't use gyros." This is probably the same bunch that says real men don't eat quiche!

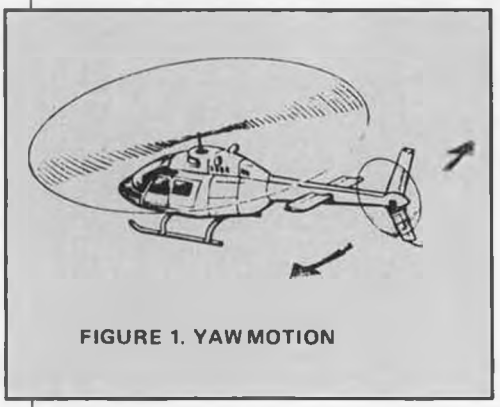


FIGURE 1. YAW MOTION

What is a gyro? A gyro is a delicious Greek sandwich that has lots of meat in it. Gyro is also a generic name that describes an electromechanical device that can sense rotational motion. For real airplanes, missiles, and helicopters, there are various types of gyros. For instance, there are attitude gyros, vertical gyros, rate gyros and integrating gyros, etc. Each one of them senses a slightly different rotational motion. For example, an attitude gyro senses the angular attitude. A rate gyro can only sense rotational rate. A rate gyro mounted on an RC helicopter in the yaw axis will only measure how fast the tail is swinging. This is called yaw "rate." See Figure 1.

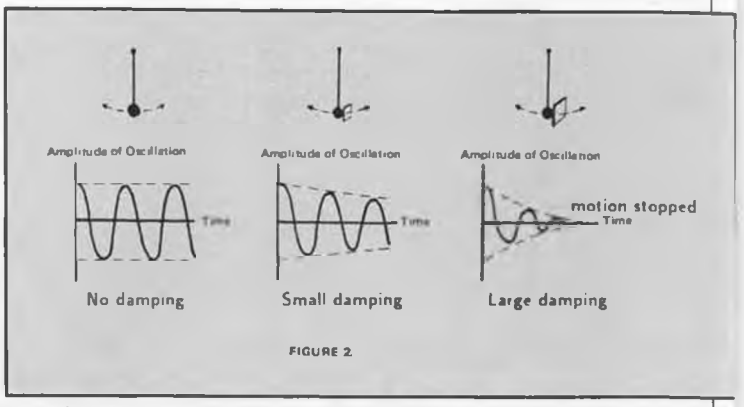


FIGURE 2

Why do we want to sense the yaw rate? Because, if the helicopter's heading is drifting or if there is a sudden gust that causes the tail to swing left, we want to dampen this swinging motion before the tail can swing very far. What does damping mean? Damping force is what retards motion. A large damping will retard motion and cause it to die quickly. For example, inside a grandfather clock we have a large oscillating pendulum. The pendulum is usually pivoted on a very low friction bearing. As the air resistance is small, the heavy pendulum can swing back and forth for a whole day before it stops. Now, if we add a piece of cardboard to the bottom of the pendulum, the increased air resistance will dampen the pendulum's oscillation and cause it to die down rapidly. See Figure 2.

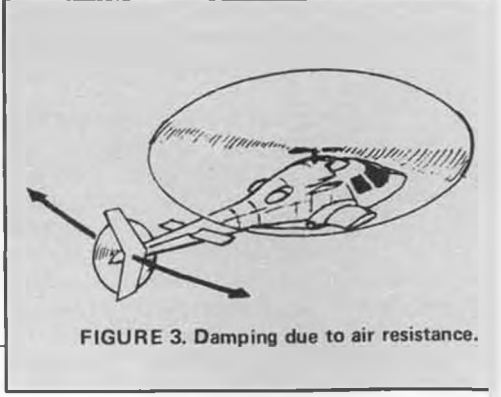


FIGURE 3. Damping due to air resistance.

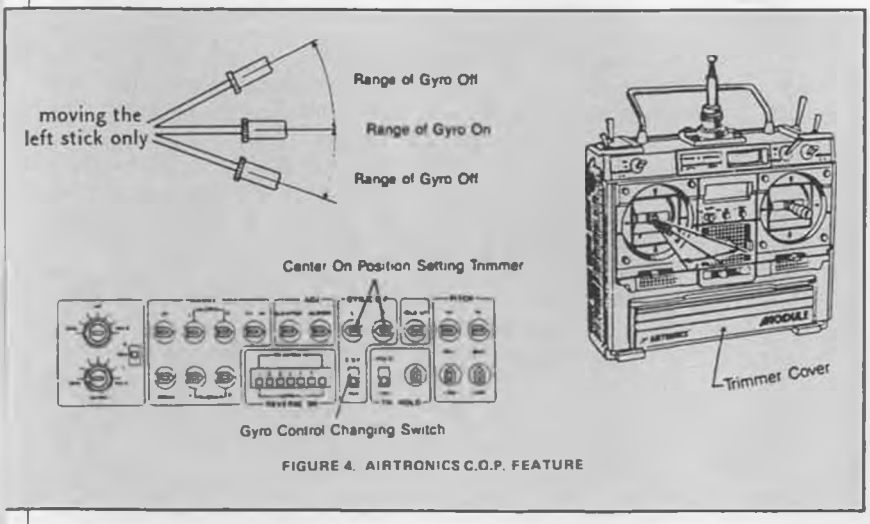


FIGURE 4. AIRTRONICS C.O.P. FEATURE

The vertical fin on a model helicopter functions exactly the same way as the piece of cardboard on the clock pendulum. The tail fin adds yaw damping to curtail any unwanted yawing motion. See Figure 3.

Of course, the larger the fin, the more damping, and the better. But there is a physical limitation to how big a vertical fin we can put on the tail. A super large vertical fin looks funny, adds aerodynamic drag, and makes the helicopter tail heavy. So the solution is to provide the yaw damping artificially by using a rate gyro. A yaw rate gyro mounted to measure the yaw axis rotational motion will only sense the helicopter's yaw rate. When the yaw rate gyro picks up a turning motion on the tail, it commands the tail rotor servo to adjust the tail rotor thrust to resist the unwanted yawing motion.

The reason we choose to measure the "rate" is because damping force is always proportional to the rate of change of the motion. For example, try to move a piece of cardboard in a tub of water. The faster you move the cardboard in the water the more resistance you will feel. *(Until it gets soggy, and then it doesn't matter! wcn).*

Increasing the gain setting on the rate gyro is like increasing the size of the cardboard paper in our previous example, which results in larger damping. Too high a gain setting makes the tail rotor control sluggish. Some of the rate gyros on the market, like the GMP gyros, have a "stick preferential" system built into the gyro circuitry. The advantage is that as the pilot inputs a tail rotor command, the gyro will be smart enough to automatically feed in less and less damping as the pilot feeds in more and more stick. In the engineering world this is called a "feed forward design." On the Sanwa/Airtronics 7H and 7HI helicopter radios, the stick preferential feature is built into the transmitter. Sanwa/Airtronics calls this feature C.O.P., which stands for Center On Position. Figure 4 shows this feature. As the pilot moves the left stick beyond a certain preset point, the gyro feedback will be shut off. These preset points are set by two trim pots underneath the transmitter front cover. The advantage of this system is that it is a feature of the transmitter, so it can work with any brand of rate gyro.

How does a rate gyro measure yaw rate? A gyro is a relatively simple device. It has a spinning flywheel on both ends of a small electric motor. The motor is mounted on a one-degree-of-freedom gimbal. According to the laws of physics, when a rotating flywheel senses a yawing motion, it will try to pivot the complete flywheel assembly about an axis perpendicular to both the spinning axis and the input axis. See Figure 5.

The difference between a "gyro" and a "rate gyro" is that a rate gyro has springs attached to the flywheel/motor assembly. The springs provide the restoring force to restore the flywheel/motor assembly to a level position after the assembly has been disturbed. Without the springs, the gyro is called an integrating gyro. An integrating gyro senses the yaw angle instead of the yaw rate. Inertial navigation systems on the Boeing 747 transport aircraft and space rockets use integrating gyros similar in concept to Figure 6 to measure the attitude and the heading of the aircraft or the rocket.

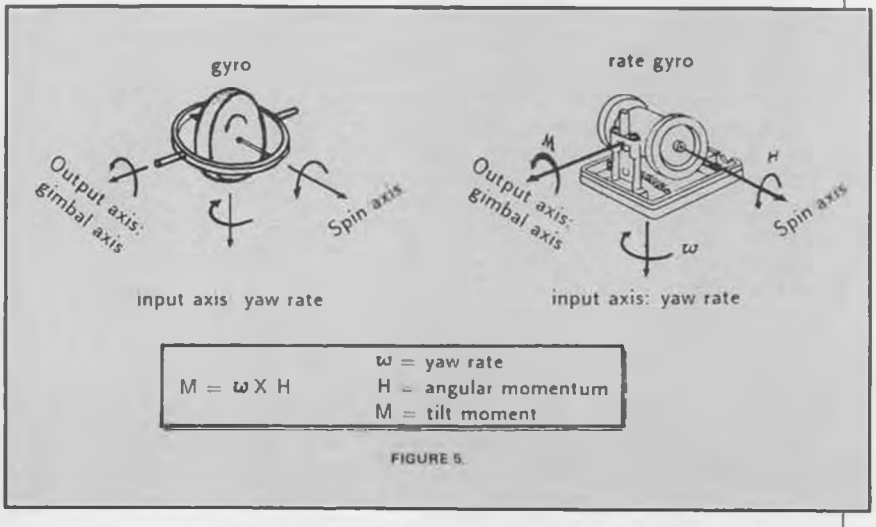


FIGURE 5.

If the rate gyro is so simple in concept, then handy modelers like us should be able to home brew a rate gyro in no time. True, the concept is simple, the mechanical and electrical parts required are few, but in reality you should go buy one. We do not want to corner the gyro market and drive our friendly RC equipment manufacturers out of business. And, it simply is not worth the time and effort to build one. But for you gung-ho modelers, who get more satisfaction fussing around with RC stuff than simply buying it, or you

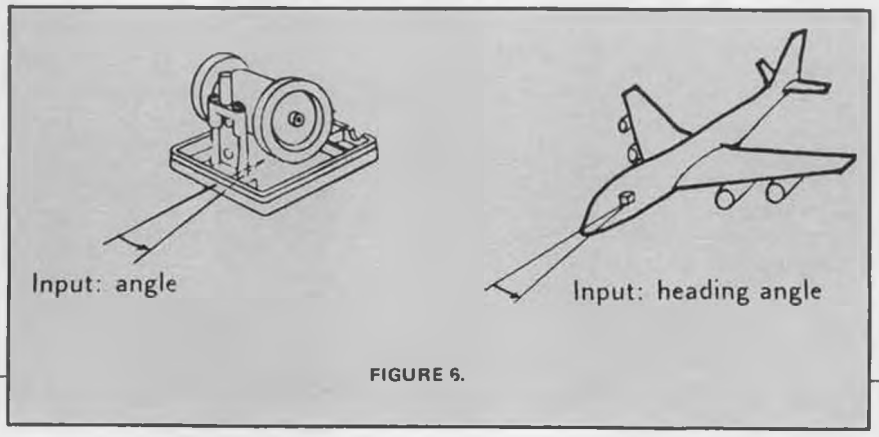
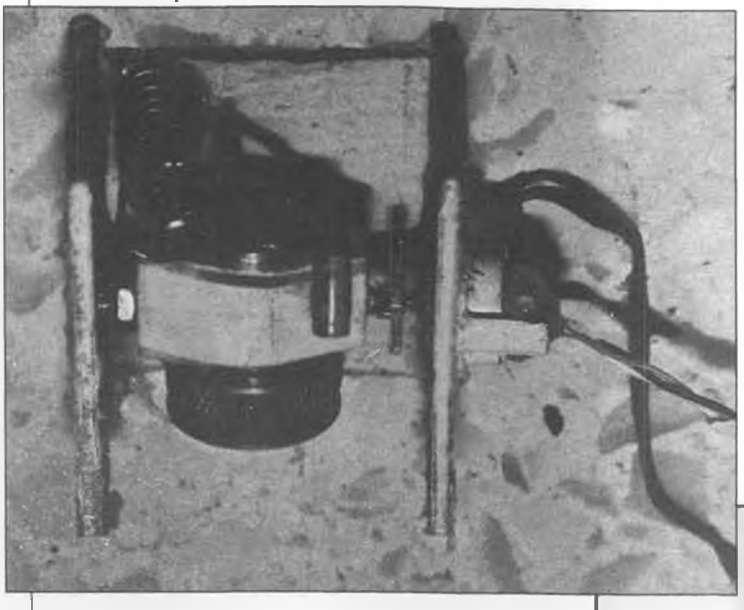


FIGURE 6.

Figure 7. A completely scratch-built rate gyro that James experimented with in 1983.



are stranded on a Polynesian island with lots of dancing girls but no hobby shop, then here is how to build a very simple rate gyro.

Figure 7 shows a completely scratch-built gyro. The electric motor is from an old broken Futaba servo, the single flywheel is a flywheel for a Cox .049 boat engine. The flywheel is made by a U.S. company called Sterling. You can easily cut the flywheel from bar stock brass or aluminum, or machine it on a lathe. I only used one flywheel because one big flywheel will do the job almost as well as two small ones. The pickup for the tilt angle is the potentiometer from that same broken Futaba servo.

The sensitivity of a gyro depends on the angular momentum of the flywheel. The higher the angular momentum, the more responsive the gyro. You can increase the angular momentum by doing three things. Either increase the rpm of the spinning flywheel, increase its weight, or increase its diameter. Typically, the flywheels weigh about a 1/2 ounce. Normally the gyro is run off the 4.8 volt receiver battery pack, but some modelers use a separate 6-volt battery for the gyro to increase the rpm. By increasing the rpm you need less flywheel mass to maintain a given angular momentum. Low flywheel/motor assembly weight will give the gyro a quicker response time to a given yaw rate input. Thus, if you want your rate gyro to correct any unwanted tail motion faster, then increase the rpm a lot and lower the weight of the electric motor/flywheel assembly.

The alternative to making the mechanics from scratch is to salvage a broken gyro. Figure 8 shows a gyro that I made from a salvaged JR gyro. It also shows the electronic circuit. Since it is a very simple circuit *(That's easy for* you *to say.* HELP, *Eloy! wcn),* using only OP AMPS, I will not explain the details. The electronic parts cost less than ten U.S. dollars.

The basic concept of the circuitry of any rate gyro is that there is some sensor that will sense the tilt of the motor/flywheel assembly. The signal is converted to voltage, the voltage is sent to the tail rotor control servo to correct the tail. A first generation gyro, like Kavan's, uses a potentiometer mounted inline with the motor/flywheel gimbal axis to measure the tilt angle. (The gimbal axis is also called the output axis.) The disadvantage is that the potentiometer adds friction that impedes the motor/flywheel assembly's ability to tilt freely. Almost all the modern rate gyros on the market use a magnetic Hall Effect sensor to pick up the tilt angle. There is a small magnet attached to the motor/flywheel assembly. As the assembly tilts, the Hall Effect sensor senses the change in the magnetic field. The great advantage is that there is no physical contact as with the potentiometer. The Sanwa/Airtronics gyros use an optical pickup. The result is the same; no mechanical contact.

Going back to Figure 8, the Hall Effect sensor produces a voltage on the green wire and a voltage on the white wire. The difference between the two voltages determines the tilt angle. (Remember that the tilt angle is proportional to the input yaw rate.) The voltage

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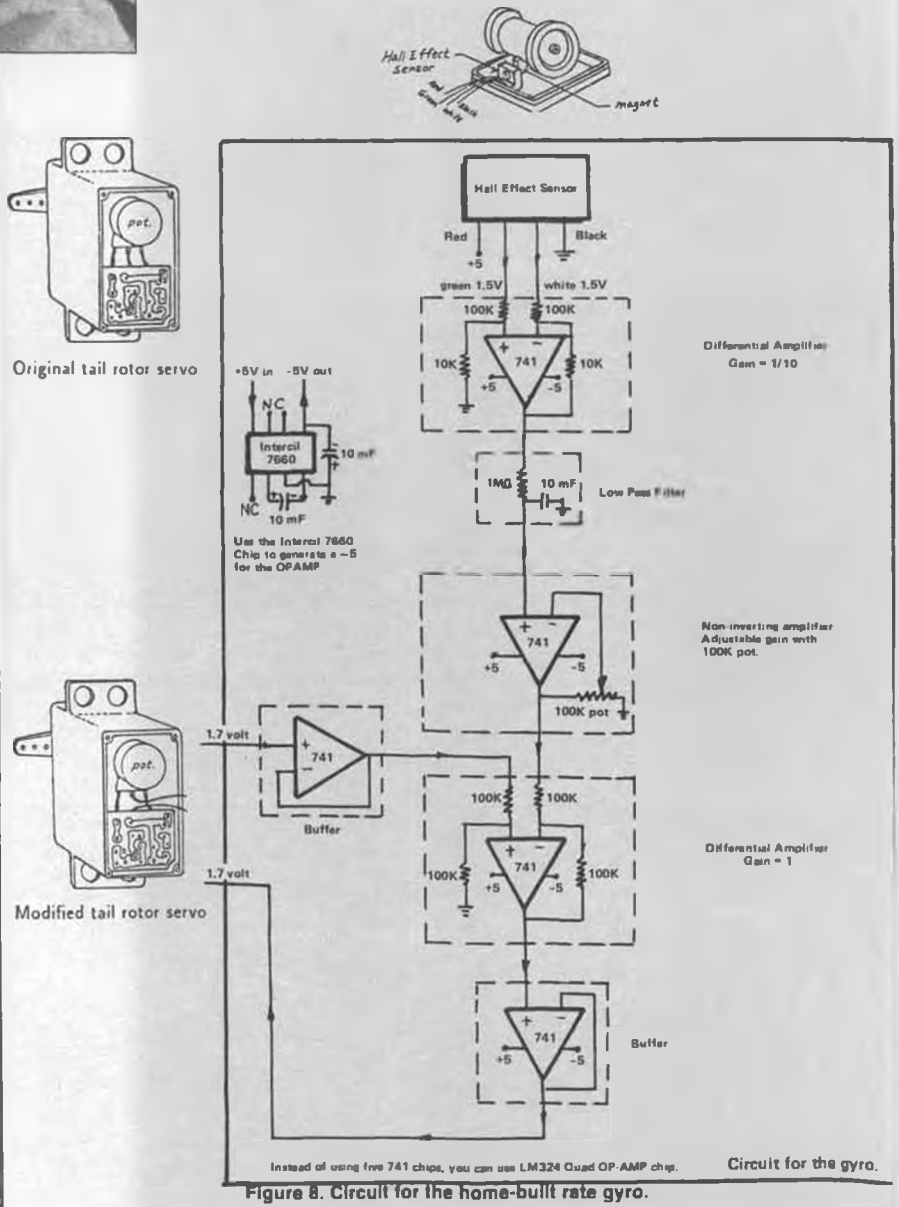


Figure 8. Circuit for the home-built rate gyro.

Helicopter WORLD

HIROBO SHUTTLE ZX

BY JAMES WANG

This month we will look at the 30-size Hirobo Shuttle ZX. As of the middle of 1990, Altech Marketing in New Jersey has become the new U.S. distributor for Hirobo model helicopters of Japan. The original Shuttle was an extremely successful beginner helicopter. It was the first ARF, almost ready to fly, RC helicopter to appear. It was introduced to the U.S. in 1985. By now probably well over 20,000 Shuttles have been sold. We reviewed the top of the line Shuttle XX in January 1990 *Model Builder*. Now, Altech is offering nine different versions of the Shuttle.

Shuttle ZX built by 77 year old George Walker, being flown here by Bruce Wheedon. ZX is very stable. With gyro set at 100% you can still do 540-degree stall turns.

The different Shuttles are: Standard Shuttle, Shuttle XX, Shuttle Z, and Shuttle ZX. In the October issue, we showed pictures of all four models. All of these come as almost ready to fly, as shown in the picture. Altech also sells these four Shuttles complete with an Enya 35H already installed. Finally, there is a ninth version, which is the ZX, unassembled, and without engine. The standard Shuttle is the most inexpensive. It uses bushings for the control bellcranks. This is the proven one from two years ago, but with a few minor changes, such as canopy styling. The XX is identical to the standard Shuttle, except it has ball bearings for all the control bellcranks (total of 18 bearings). In our January review, we gave the XX a very high score for flying qualities. It's stable and aerobatic, but we did point out many areas that can be improved. Well, it seems like Hirobo has improved the proven Shuttle even further by introducing the new Shuttle Z and ZX. The biggest change is that the rotor diameter has been increased from 43.3 inches to 48.8 inches for the Z and ZX. The tail boom is also longer, to accommodate the larger main rotor. The XX still has the older, proven floating axle main rotor head, with the flybar mounted above the main rotor head. The Z and ZX have the newer floating axle rotor head with the flybar mounted below the main rotor blades. Hirobo calls this the FZ rotor head. This is in response to the current vogue in which every model helicopter company is using an underslung flybar. To tell the truth, I have flown both the XX and ZX, and I think where the flybar is located makes no difference at all, although the underslung version feels better in the palm when you try to stop the rotor when the clutch is disengaged! And you are also not exerting forces on the flybar and control linkages, because you are not palming the flybar and seesaw assembly.

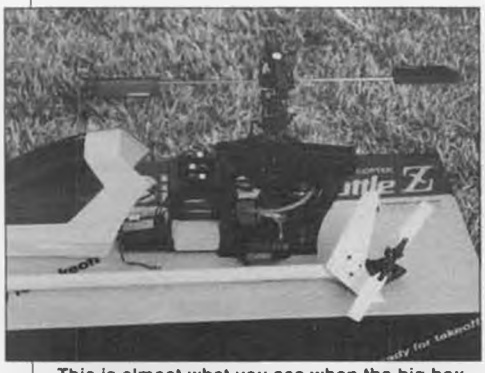
The advantage of longer main blades is the aerodynamic efficiency, called the *Figure of Merit*, which goes up as blade length goes up. Higher Figure of Merit means less power is required to hover

and cruise. This translates to longer flight time on the same size gas tank, and more power reserve. I have flown three different ZXs. Two of them seem to move faster than my ZX. This may be partly due to the longer blades. The Z versions also come with weighted main blades for increasing the rotational inertia for better autorotation. The weighted blades improve stability, too.

The ZX that we are reviewing here also comes with a larger gas tank. It is now 230cc, rather than 190cc. This is great because I used to think I did not get enough time on a tankful! Another great change is the tail pitch control, which is now similar to those on the 60-size helicopters such as the Legend or X-Cell. The tail pitch change mechanism has a sliding bearing on the outside of the tail rotor shaft. Older Shuttles used a sliding wire inside a hollow tail rotor shaft. The new system gives more precise tail pitch control. By the way, the tail rotor control on the Shuttle is phenomenal. Even with the gyro set at maximum, it can still perform super fast pirouettes. In this respect, the Shuttle has a more powerful yaw control than its competitor, the Concept. This must be due to the longer tail boom which gives a stronger tail control moment. Also, the tail rotor blades spin faster. The gear ratio for the Shuttle is 9.625:1:5.5 (engine: main rotor: tail rotor). The gear ratio for the Concept is 9.64:1:4.6. As we can see, the main rotor-to-engine ratio is about the same for both helicopters, but the tail rotor gear ratio is much higher for the Shuttle. The ratio of 9.625:1 means that for every 9.625 turns of the engine, the main rotor makes one revolution. And 1:5.5 means that for every one revolution of the main rotor, the tail rotor makes 5.5 revolutions. Typical model helicopters all have main gear ratios between 8.6 to 10. For tail rotors, the typical ratio is between 4.3 to 5. The Shuttle uses a toothed belt for tail rotor transmission, while the Concept uses a 1.5mm piano wire. Which system is better? This is open to debate.

Another thing that is unique on the ZX, but not on the other Shuttles, is that the ZX has a metal clutch, while other Shuttles have plastic clutches. (No longer unique. Since this was written, all Shuttles have been upgraded to the metal clutch! wcn). In the January review of the XX, we said the metal clutch is really desirable. We are glad to see it is now standard on all Shuttles. The ZX comes with 20 ball bearings, and only the ZX comes with the sleek looking raked-back landing gear. The amount of extra upgrade items that come with the ZX far outweigh the small jump in price. In the long run, it saves money. And on the ZX, Hirobo seems to have remedied most of the weak areas that we pointed out previously.

Now let's talk about the handling qualities. Many people like to use 60- size helicopters as a bench mark for comparing 30-size helicopters. Well, the ZX may not be physically as big as the 60-size



This is almost what you see when the big box is opened. The canopy is molded white with tinted window. The model with the Enya 35H is already installed. Just mount the tail boom, main rotor head, landing gear and radio, then it's ready. From opening the box to flying took six hours.

The new Shuttle paddle. The rear half is hollow. Lead weights are inserted by Hirobo in the leading edge. The tapered tip reduces induced drag maybe by one percent.

This shows the tail rotor drive belt. After the drive belt is slipped into the small drive pulley, pull the tail boom back sufficiently to ensure the drive belt is fairly tight.

A very pretty set of blue decals come with the ZX. It took 6 hours to build the ZX because there is no wood work and no painting! That is a treat!

The canopy is mounted with a rail system as shown in the picture. It slides onto the servo tray, and there is a click-lock mechanism that secures the canopy. Very convenient. All the 1990 Shuttles have louvers on the side of the canopy to enhance the looks . . . just like on the Ferrai Testarossa!

The Enya 35H is started with a belt. This means you do not need to buy a starter extension. Whether you purchase the Shuttle with the engine or without the engine, a free metal muffler is included. The 35H provides plenty of power. Many shops carry tuned pipes for the Shuttle to boost it into outer orbits!

The new underslung flybar FZ main rotor head. It is almost like a scaled down Elite rotor head. This head has the stiffest flap response of all the 30-size helicopters. It gives quick and positive cyclic controls, which lead to excellent aerobatic capability in capable hands.

machines, but out of all the 30-size helicopters, the ZX is one of the few small choppers that resembles 60-size machines' handling characteristics. This is probably because its main rotor head is almost like a scaled-down version of the GMP Elite rotor head. This is not surprising, because when the ZX was developed a year ago, Hirobo and GMP were partners in selling and developing model helicopters. Just like the 60-size Elite rotor head, the small FZ rotor head uses an underslung flybar with a crossover Bell Hiller mixing arm designed to give a very high Bell Hiller mixing ratio; on the order of 85%. The floating axle flapping system makes the FZ rotor head much stiffer as compared to other 30-size helicopter rotor heads, such as Concept and Enforcer. A stiff rotor head makes the ZX extremely nimble and agile. Stiff flapping also makes the model respond more positively to cyclic commands.

The ZX is fast in forward flight and it tracks very well on path, a bit like a Quickie 500 model airplane. Hover is precise. The control responses are quick and positive. In this respect I recommend it to experienced flyers who are looking for a second smaller machine, or to beginners who like to dominate their machine. The ZX will do all the aerobatics that you ask in a very non-mushy manner, and will still hover solidly. The Concept has a slower control feel as compared to the Shuttle. The Concept is an easy and calm machine to fly. Here is where the two schools of pilots separate. People who prefer more relaxing and softer control feel would probably enjoy the Concept. People who like quick response may like the FZ rotor head on the Shuttle ZX. For myself, on a lazy evening after work, or doing a flight at a picnic, I would probably bring my Concept. On a bright Saturday morning, if I feel like I've had lots of sleep and just want to burn up the sky and go crazy, I might pick the Shuttle. It is difficult to describe the control "feel" on paper, I hope that you have a good idea of how the Shuttle will perform. If not, please reread this last paragraph.

The ZX's Hiller paddle is very unique because it has lead weight inserted in the leading edge of the paddles. This serves two purposes. One is to give the flybar more rotational inertia, thus making it a better inertial reference system to greatly improve model helicopter dynamic stability. The effect is the same as adding flybar weight. For beginners, it would be an excellent idea to purchase a set of GMP flybar weights for the Cricket to put on the Shuttle. Do not buy the 60-size flybar weights, because 60-size helicopters use a 4mm flybar, hence the hole on their flybar weights would be too big. The alternative is to purchase a set of Concept 30 DX Hiller paddles. They are about $15. The DX paddle is completely molded from aluminum, thus it is much heavier than the Shuttle or any other 30-size paddles. I am using a set of DX paddles on my Shuttle XX with the scaled Hughes 500 fuselage, it makes flying a breeze! The second reason Hirobo installed leading edge weight in the plastic paddle is that they feel this will properly balance the paddle to make it more aeroelastically stable. The idea is correct, but have you ever seen a model helicopter paddle flutter? I have not. Hiller paddles do not flutter because they are short and stubby (low aspect ratio). On main rotor blades, adding weight to the leading edge will prevent flutter (some modelers call it woofing). To flutter means that the blade will suddenly go out of track and almost want to tear itself off from the blade grip. The bottom line is, adding weight to the paddles does more to improve the helicopter stability than to prevent paddle flutter. But with the paddle chordwise balance in front of the

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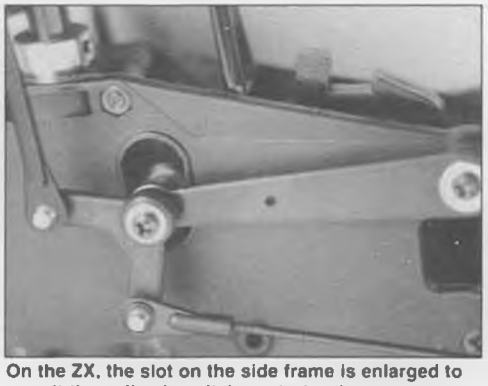
The Shuttle Z and ZX use a sliding bearing for tail rotor pitch control. This is excellent. It provides more precise pitch control than the old sliding wire through the hollow shaft. This is almost identical to the control mechanism on the 60-size Legend.



On the ZX, the slot on the side frame is enlarged to permit the collective pitch control swing arm to swing a greater arc for plus to minus 10 degrees of collective pitch travel. This is more than sufficient for any type of right-side-up or inverted aerobatics.

Author's old Shuttle XX is now fitted with a E&G scale Hughes 500 plastic fuselage and Concept 30 DX aluminum paddles for more relaxed flying. The ZX has taken over the role of pint size rocket ship!

R/C PRECISION AEROBATICS

BY RICK ALLISON

PATTERN AT THE '90 NATS

Your faithful scribe has just arrived from the site of the 1990 Mid-America National Model Airplane Championships, where 213 brave pattern warriors slugged it out for six days to pick five new National Champs. There were a few surprises, a few new wrinkles, and a heck of a lot of very good pattern flights. It was quite a show.

This year's site was the Lawrenceville-Vincennes Airport, located nearly mid-way between Vincennes, Indiana (a small American town), and Lawrenceville, Illinois (an even smaller American town). There were over 40 preregistered no-shows in pattern, no doubt partly due to the shortage of motel rooms in the area. The turnout was still an all-time high for the event. Have no doubt; pattern competition is very much alive and well in this country. And from the looks of the F3A results, pattern isn't doing too badly in Canada, either!

This won't be one of those 3000-horse-power contest reports that comes complete with names, numbers, mug shots, and the exact brand of wheel collars used by the tenth place finishers in all the classes. The AMA has an excellent house publication devoted to such coverage, although the exact name of that worthy mag escapes me for the moment. Perhaps it will come to me on my next trip to the water closet. What I *can* do is give you a contestant's view from the gurgling innards of what has undeniably become the worlds largest pattern meet. (Yes, I know that a few people do things unrelated to pattern at the Nats, but nobody expects me to write about that stuff. . .

For starters, the site was excellent; over 5000 feet of 150 foot wide blacktop backed up by about 400 feet of nice green grass. The

FAI winner, Ivan Kristensen, of Canada, gets a noise check before a finals flight. The Canadians really cleaned up at the Nats, taking three of the top five places in FAI! We'll gettum next year, right?

Dean Koger's Vortex II, 7th in FAI. Dean uses a two-stroke engine belt-driving a huge 15-inch prop for almost helicopter-like performance.

Jeff Crawford placed 17th in Sportsman with his four-stroke powered Vortex, currently a popular design for AMA pattern competition.

LA-1 designer Geoff Combs displays his latest effort, the SL-1 with four-stroke power; 20th in FAI.

Frank Kelley (left) and George Manning prep George's YS-120 powered Runaround. George finished 15th in FAI.

overfly space was a very open, and mostly flat potato farm, which provided a great horizon to fly against. Parking was ample, although distant enough from the flight line to make one consider acquiring a lighter flight box. Runway alignment was such that the sun was a factor only when you were deciding how much sunscreen to use. No dirt or dust problem. All in all, this was a very nice spot for a pattern contest, and I heard no complaints from the masses that weren't related to the approximately three zillion hungry chiggers which lived in the 400 feet of nice green grass. Alas, even the golden streets of paradise develop an occasional pothole!

The weather was about all that you could reasonably expect at a Nats, given the recent history of the event. I mean, we were blown out at Lincoln, wilted like elderly lettuce at Lake Charles, and sandblasted at the Tri-Cities. Nats hands of late have developed sort of a cynical "let's see what can possibly happen next" attitude about the heavens, and there were lots of knowing looks exchanged when we all arrived to find thunderstorms predicted for Nats week.

Event Director Greg Frohreich's anti-rain dance worked, however, and the promised deluge never really materialized, except for a short isolated thundershower which delayed the last two flights of the FAI finals an Friday: the last day of competition. Instead, we were treated to moderately high temperatures, moderately high humidity, moderate (5-15 mph) winds, and skies that were mostly sunny to partly cloudy. The group verdict: Not bad, and could have been a lot worse.

The flying conditions actually resembled a game of golf on a tough, well designed course. By turns, the pilots were greeted with fairly light and steady wind nearly on the runway heading, moderate quartering crosswinds with light chop, calm air, and nearly 90 degree stiff crosswinds (blowing out) with moderately choppy air. Visibility conditions ranged from bright blue and severe clear to bright haze to near twilight against dark clouds. It was an all-round good test of pattern skills and equipment, with most of us seeing a little bit of everything. The winners were the guys who were best able to get it done under all the various conditions.

So what happened? Well, a little of everything. We had a contestant from Japan (Sadami Hara, Higashi-Osaka, Japan; 76th in F3A), a contestant from the People's republic of China (Han Zhongsheng, Beijing, China; 82nd in F3A), and one from Japan by way of California (Shunichi Suzuki, Laguna Niguel, CA; 18th in F3A). We had two ladies competing: Linda Hill of Goose Creek, South Carolina—38th in Sportsman; and Joan Anastasio of Redmond, Washington—22nd in Expert Turnaround. We had far too many Canadians to count. In fact, there are some who may argue that we had far too many Canadians!

In the 47-member Sportsman class, the big winner was young Junior member Ron Segura, of New Iberia, Louisiana. I didn't catch this young man's age, but there is no way that he is as tall as his airplane just yet. Ron put this one away in convincing fashion, winning three out of six rounds. Ben Hall, of Henderson, Texas, was second, with Everette Carpenter, of Franklin, Tennessee, a close third. The flying in this class looked to be of a little higher quality overall than the last several Nats.

The class flown with Sportsman during the first three days of competition was the new Expert Turnaround. Turnout here was lower than expected, with only 25 showing up to fly. Nonetheless, the flying was of surprising quality. Sixteen-year-old Senior member Luke Christian, of Rohnert Park, California, rolled to a convincing victory with several excellent flights in what might have been the roughest air and worst crosswinds of the meet. Another impressive Senior pilot, 17-year-old Shane Gray, of Chiro, Texas, was second. Shane was last year's National Champion in the Advanced class. Dave Lockhart, of Abescon, New Jersey, was third. At the advanced age of 19, poor Dave is probably just too old for the event!

The start of the last three days of competition on Wednesday, July 18, provided Event Director Greg Frohreich with problems of near biblical proportions. The turnout in F3A was huge, with 85 pilots checking in for the event. Add to that figure 18 Master pilots and 38 entries in Advanced, and you get 141 fliers on six available lines. Contrast this with the Lake Charles Nats, where the total pattern turnout in all classes for all six days was only 123!

Because pattern was once again forced to share a site with pylon racing due to some severely constricted and outmoded thinking by the Nats Planning Committee, Greg had only three half-days of flying time available. Early on, it became very obvious that six

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Mike Harrison with his Obsession design, soon to be kitted.

A pair of colorful Beetles belonging to Tim Borsetti (foreground) and Paul Hohensee.

China was represented by Han Zhongsheng, of Beijing. Han flies his Dasheng 22 pattern model with a *hand carved* three-blade prop!

Steve Helms with his Silent ST entry. Engine is the incredibly powerful YS-120 four-stroke.

Nova designer and Canadian team pilot, Colin Campbell, brought two identical Novas to the Nats. Colin ended up 5th in FAI.

Canadians Phil Hick (left) and Steve Lyons with a pair of Novas.

PLUG SPARKS

BY JOHN POND / PHOTOS BY HAROLD JOHNSON

THE SAM CHAMPIONSHIPS

The recent 1990 SAM Championships at Chicopee, Massachusetts could be summed up by that old Scottish saying, "The best laid plans of mice and men gang aft aglee." Or as they say in the modern edition, "If it can happen, it will." Murphy's Law!

No question about the preparations for this meet, they were outstanding. Contest Manager George Armstead, and his SAM 7 boys, put in a terrific amount of work to make the Champs a success. Imagine getting the use of an active airbase (Westover AFB) during the work week . . . incredible.

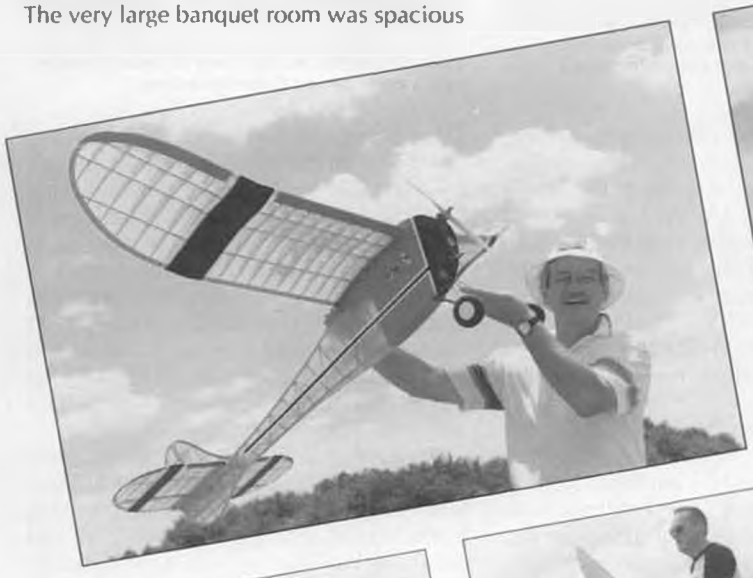
Armstead also secured the exclusive use of the Comfort Inn wherein all activities were held within the confines of the hotel. The very large banquet room was spacious enough to accommodate all with no crowding. Meals were handled with expedition and little waste of time. This was great!

Well, first things first. After driving 3,323 miles one way with my partner, Bill Bowen, we arrived with no problems in locating the Comfort Inn compared to the frustrations of getting on the right road to the Rodeway Inn, and later called the Quality Inn. After a half-hour of bull, meeting the incoming modelers, the room was ready and quite a good surprise; roomy and cool, with good air conditioning.

ANNUAL "BEAN FEED"

This is one of the oldest traditions of the SAM Champs. However, the term "Bean Feed" is quite outdated as there has been no true Bean Feed type get-together in several years.

The original idea was that on the day of test flying prior to the actual contest, the fellows at the field would start up a fire, heat up the beans. These were consumed with various cold cans of drink, beer, Coke, 7-Up, you name it. The first deviation from this was at the Las Vegas Champs in 1977 when the Contest Manager, Al Hellman, secured



(Clockwise from top left) 1 You can always tell a Tom McCoy model, both by the excellent workmanship and by his trademark color scheme of yellow silk with black/white/blue painted trim. Tom is seen here with his R/C version of the George Reich "Albatross" with Super Cyke power. 2. John Delagrange (left) and Mickey DeAngelis with John's "Miss Fortune X," an early DeAngelis design. An O&R .23 powered it to a 3rd place win in F/F 30-Second Antique. 3. An R/C Scientific "Red Zephyr" in original red/white sunburst colors, as replicated by Bob Meili of Southampton, Pennsylvania. 4 Ed King is one of only a handful of souls who are brave enough to tackle such a formidable building project as the Goldberg Valkyrie. He produced this lovely purple silk covered replica for RC flying with a K&B .61. 5 A very nice looking Cessna C-34 O.T. Rubber Scale entry by Bob Moulton, built from Dick Korda's plans in *MAN*. Bob did pretty well in the F/F rubber events.

the use of the Mint Casino and used their banquet facilities for an indoor bean feed. Once this precedent was established, it became the norm for all subsequent Champs. We must be getting old as this columnist can remember those outdoor meetings lasting until dark.

This year, Armstead and his boys outdid themselves in putting on a more formal type of meal that was complete with a drawing for over 170 prizes. No one went home empty-handed that night!

Of course, with a more formal type dinner, announcements regarding the contest were made by George Armstead. When he warned that if the free flights overflew the active portion of Westover, flying would be curtailed, little did we know what we were in for!

MECA "GRANDO"

We jump ahead a day here to get in a small report on the MECA Grand Collectogether, held in the Comfort Inn. The turnout was rather slim which gave some of the collectors (I call them "entrepreneurs") an excuse to demand outrageous prices for engines barely above average condition. One was asking $400.00 for a McCoy .60, a common black case model at that. This writer wonders what happened to the good times we once had with the small engine auction and general trading.

THE CONTEST

Contestants were greeted with stiff winds of 15 to 30 mph. Most modelers sandbagged, trying to outwait the wind. As Armstead put it, "No one could find a wind on-off switch." Worst part of all from the free flighter's viewpoint was the shifting of the wind direction. Monday was not too bad, but Tuesday was cursed with a southeast wind directly across the main runway. When a C-5A pilot reported a model crossing in front of his cockpit, all free flight activity was shut down for that day.

The situation on Wednesday and Thursday didn't improve much, as the wind started dropping models east of the launch site into the trees and the swamp. Two-minute max flights were now reduced to 1-1/2 minutes duration.

Let's take a look at what was on the field, starting off with Photo No. 1 showing Tom McCoy of SAM 39 with a George Reich

(Clockwise from top left) 6. John Lessig tunes the O&R .60 in his F/F Megow "Super Quaker," ably assisted by Frank Fay. The S.Q. is a high performance O.T. cabin model with many desirable features, including a single retracting wheel which John wisely chose to use. 7. The big win in F/F Class C Cabin went to top indoor competitor Bud Romak, of Moraga, California, and his Super Cyke powered Cabin Playboy. Bud is a tough man to beat, both indoors and out! 8. Here's a rare one for you: a 1940 Bob Meuser "Cloud Chopper," as built for F/F by Mal MacLean of E. Northport, New York. Took 5th in Class B Cabin. 9. Larry Nigh, Cedar Rapids, Iowa, shows his copy of the 1942 Scientific "Larkey," which he flies with a Bantam .19. Nice to see these little-known designs being built. 10. Morton Ross produced this handsome F/F version of the Bay Ridge "Topper" with O&R .29 power. 11. New Hampshire's Richard Sherman cranks the last few winds into his 1939 Fred Bowers Wakefield. This was the design that placed 2nd behind Dick Korda's famous 39-minute flight. 12. Bill Bell's pretty Monocoupe 90A, built from Megow kit plans, ended up only one second shy of tying for 1st place in F/F O.T. Rubber Scale.

design, the "Albatross." Most of the few this writer has seen are generally powered with a Super Cyclone; this one was no different. Free flight versions require a considerable amount of adjusting. Radio control models like Tom's also come in for their share of trimming quirks. One thing in common, the Albatross is marked by its majestic glide. Once you are able to get these models up there, use a calendar to clock them!

As usual, McCoy's model is covered with yellow silk with sky blue trim marked with white and black. This has been Tom's trademark for as long as I can remember. Tom was another of the boys like myself who elected not to fly in the heavy winds. One broken wing was enough!

It was a real pleasure to meet John Delagrange, SAM 100 president, and Mickey DeAngelis at the "coffee klatch" on Sunday afternoon. Photo No. 2 shows Delagrange and Mickey with John's version of a "Miss Fortune X" powered by an O&R .23. This design by Mickey appeared in 1936-37 and since having been drawn up, has become quite popular.

No matter how many photos this writer receives of the "Red Zephyr" as originally conceived by Herb Greenberg and marketed by Scientific Model Airplane Co., all the models seem to follow the original red and white sunburst decoration. Such is the case in Photo No. 3 showing Bob Meili, of Southampton, Pennsylvania, with an Orwick .64 powered version.

The wind, in cutting down the flying, gave this writer and photographer Harold Johnson plenty of time to interview and take photos. Ed King showed up with a K&B .61 powered Goldberg Valkyrie. This RC beauty is seen in Photo No. 4. As can be seen in the background, not a heckuva lot of free flight activity is going on.

SAM BUSINESS MEETING

This meeting was primarily a vehicle for awarding SAM Hall of Fame recognition to modelers who have contributed to the Old Timer movement.

Rather noticeable was the lack of agenda and amount of business permitted. It appears now that the Board of Directors is having executive meetings, and that more and more of the decisions are made by this group rather than being presented to the membership. Two motions were submitted and promptly rubber stamped by the membership with no discussion. Again, this writer is editorializing but centralization of power does have its drawbacks.

Fifteen well-known modelers were nominated and voted into the SAM Hall of Fame. This writer cannot recall all, but the following were presented plaques: Joe Elgin, Herb Greenberg, Henry Struck, Ben Shereshaw, Joe Beshar, Mike Granieri, Joe Kovel, Charlie Grant (deceased), and Gordon Light. Of all, Joe Elgin seems to be the most popular choice as Joe's "Playboy" design is still extremely popular. All nominees were acknowledged by standing ovations. Great stuff!

THE CONTEST (Cont.)

By the time Wednesday arrived, free flight max times had been cut to 1-1/2 minutes. Those who flew on Tuesday and were unable to complete their flights that day were permitted to finish their flights on Wednesday. Inasmuch as they started with two-minute flights, the times were multiplied by 75% to compensate for the shorter times (60 seconds became 45, etc.).

Would you believe it, models were still drifting over the active runways! Made for more foreshortened days. Rather surprising was that, even with the very short flight times, 17 models were lost! If you could just get in three flights you could win or at least place.

Taking a walk through the free flight area

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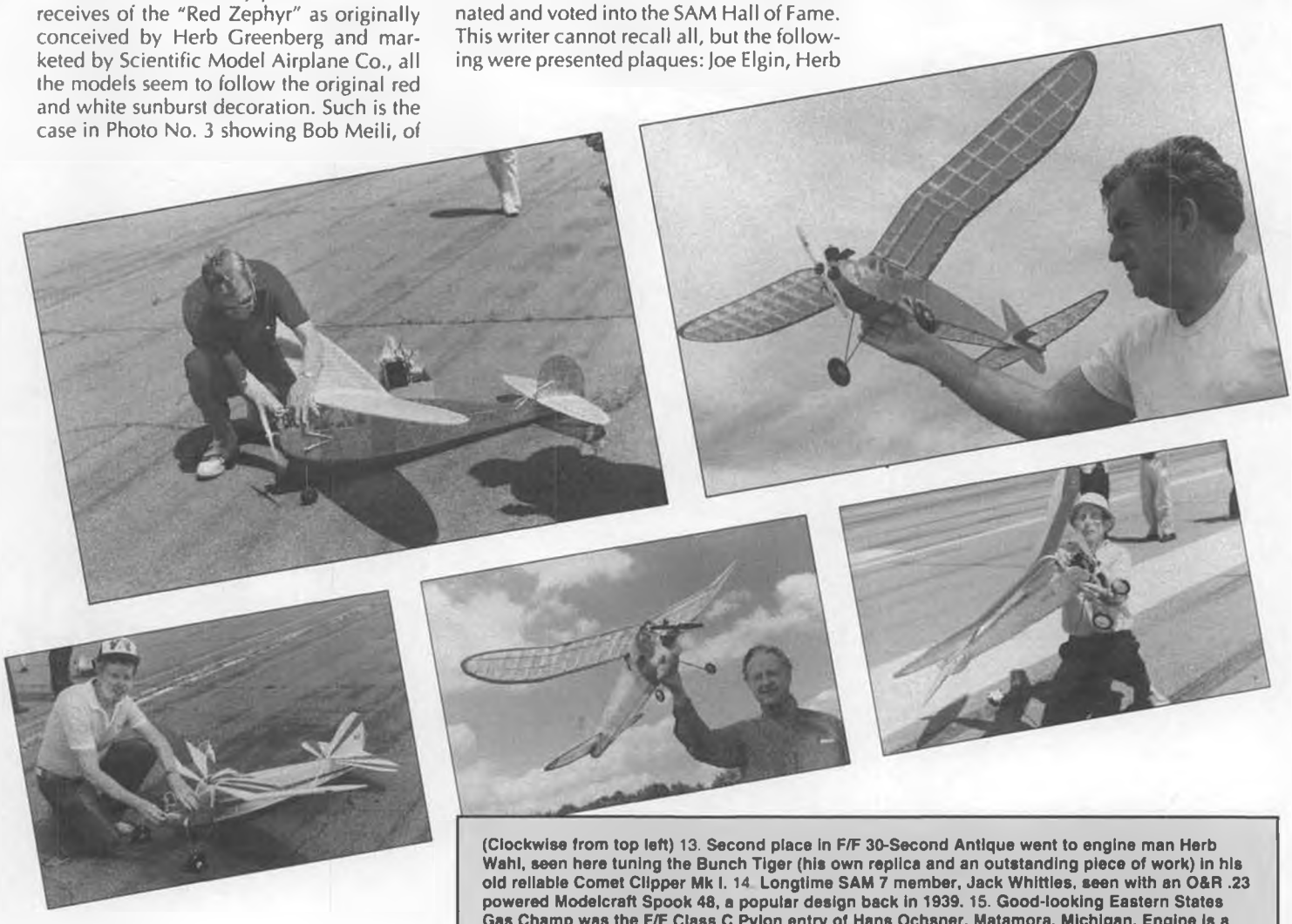

(Clockwise from top left) 13. Second place in F/F 30-Second Antique went to engine man Herb Wahl, seen here tuning the Bunch Tiger (his own replica and an outstanding piece of work) in his old reliable Comet Clipper Mk I. 14. Longtime SAM 7 member, Jack Whittles, seen with an O&R .23 powered Modelcraft Spook 48, a popular design back in 1939. 15. Good-looking Eastern States Gas Champ was the F/F Class C Pylon entry of Hans Ochsner, Matamora, Michigan. Engine is a strong running O&R .60. 16. Top Canadian O.T. F/Fer, John Bortnak, always does well at the SAM Champs, and this year was no different. His Class C Cabin entry was this much-flown Brooklyn Dodger with an O.S. .30 ignition conversion. 17. Another Red Zephyr, an attractive F/F version with Wahl Brown Jr. power, as built by Ted Lewis of Chelmsford, Massachusetts. Note that the color scheme is just the opposite of the one in Photo No. 3.

SAM CHAMPIONSHIP RESULTS • JULY 2-5

RADIO CONTROL

TEXACO

1. Jim Reynolds	Bomber/OS .61-16 ign.	38:45
2. Robert Walter	RC Stick/Orwick	33:00
3. Joe Percy	Bomber/OS .61	31:01
4. Steve Boucher	MG-2/OS .60	27:13
5. Ed Shilen	Bomber/Spitfire	24:53

1/2A TEXACO

1. Armand Cote	Dallaire	30:00
2. Larry Davidson	Anderson	24:52
3. Fred Mulholland	Sailplane	22:54
4. Steve Boucher	MG-2	22:05
5. Buck Zehr	Playboy	21:57

.05 ELECTRIC

1. Fred Mulholland	Bomber	20:30
2. Peter Rafferty	Bomber	19:50
3. Tom Acciavatti	Bomber	17:36
4. Ed Goretzka	Playboy	16:00
5. George Chaplick	Bomber	12:32

1/2A SCALE TEXACO

1. Armand Cote	Aeronca Chief	11:22
2 Robert Walter	Cessna C-37	6:02
3. Pat Harrison	Piper Cub	3:43
4. Art Peterse	Piper Cub	0:12

CLASS A GLOW

1. Tom Acciavatti	Playboy/Veco .19	18:10
2. Fred Mulholland	Bomber/OS .20	18:09
3. Larry Davidson	Bomber/K&B .19	17:04
4. Eut Tileston	Scorpion/K&B .19	15:48
5. Walt Geary	Playboy/Rossi .15	11:44

CLASS B GLOW

1. Arthur Peterse	Swoose/K&B .29	20:52
2. Eut Tileston	Scorpion/K&B .21	20:10
3. David Robenett	Bomber/OS .28	19:38
4. Murvil Lisey	RC-1/OS .29	18:39
5. Walt Geary	MG-2/Fox 29X	18:15

CLASS C GLOW

1. Larry Davidson	Playboy/ST .35	19:23
2. Arthur Peterse	Swoose/K&B .40	18:51
3. Fred Mulholland	Bomber/OS .50	18:27
4 Richard Huang	Nomad/ST .40	13:43
5. Peter Rafferty	Cumulus/Fox .50	12:03

CLASS A IGNITION

1. Larry Davidson	Playboy/Elfin	19:18
2. Walt Geary	Playboy/Elfin	18:38
3. Jim Reynolds	Bomber/Elfin	18:04
4 Eut Tileston	Westerner/Elfin	16:39
5. Thad Kusak	Wasp/Elfin	16:04

CLASS B IGNITION

1. Fred Mulholland	Playboy/K&B .29	21:00
2. Jim Reynolds	Bomber/Orwick .29	18:13
3. Murvil Lipsey	Playboy/Torp .29	18:13
4 Joe Percy	Bomber/Torp .29	17:06
5. Robert Walter	Kerswap/Forster 29	16:13

CLASS C IGNITION

1. Peter Rafferty	Bomber/Cyclone	31:26
2. Jim Reynolds	Bomber/Orwick	31:15
3. Larry Davidson	Bomber/Orwick	29:58
4. Arthur White	Bomber/Hornet	29:45
5. Fred Mulholland	Bomber/Spitfire	27:43

PURE ANTIQUE

1. Charles Thuet	Miss Delaware/Spitfire	25:43
2. Fred Mulholland	Bomber/Spitfire	25:21
3. Eut Tileston	Westerner/Spitfire	24:24
4 Walt Geary	Bomber/Spitfire	23:44
5. George Murphy	Bomber/Orwick	22:08

ANTIQUE

1. Joe Percy	Commodore/Rossi	30:00
2. Larry Davidson	Bomber/Orwick	30.00
3. Jim Reynolds	Cumulus/OS .60	28:12
4. Ed Shilen No	Record	26:15
5. Steve Boucher	MG-2/McCoy .60	25:13

SPECIAL AWARDS

R/C Grand Champ	Jim Reynolds
Roberts Trophy Texaco	Jim Reynolds
Spirit of SAM Concours	Larry Davidson
F/F Grand Champ	Bob Edelstein
White Hi-Time Cabin Champ	Bud Romak
Shailor Class B Pylon	Bob Edelstein
Kelly Class C Pylon	Gene Martha

FREE FLIGHT

SMALL CABIN RUBBER

1. Ed Konefes	Crusader	12:20
2. Don Reid	Dynamoe	8:59
3. Stan Colson	Boxcar	7:05
4. Ed Wallenhorst	Dynamoe	6:00
5. John Bortnak	Red Bird	4:12

CLASS A PYLON

1. Ted Dock	Kerswap/Hornet .19	5:40
2. Joe Beshar	Fox/Arden .19	4:30
3. Sal Taibi	OOS/OR .19	4:26
4. Gene Bowers	Ranger/OR 19	4:20
5. Gene Martha	Ranger/OR .19	4:02

CLASS C CABIN

1. Bud Romak	Playboy/Cyke	4:24
2. Tom Lucas	Playboy/Atwood	4:18
3. Hans Oschner	Albatross/Atwood	4:07
4. Bob Edelstein	Clipper/Cyke	4:06
5. George Armstead	Bombshell/OR .60	3:44

.020 PYLON

1. Gene Martha	Interceptor	4:29
2. Gerry Persh	Zipper	4:22
3. Wayne Cain	Interceptor	3:48

RUBBER SCALE

1. Stan Colson	Skyfarer	4:01
2. Bill Bell	Monocoupe	4:00
3. Chet Bukowski	Curtiss Robin	3:54

CATAPULT GLIDER

1. Bill Colish	Huguelet	3:11
2. Joe Konefes	Zoomer	2:42
3. Henry Hill	Bowers	2:38

BABY R.O.G. MASS LAUNCH

John Stott	OTT Sky Flyer	Last Man Down

LARGE STICK RUBBER

1. Ed Konefes	Lanzo	11:32
2. Jim Fiorello	Lamb Climber	10:15
3. Don Reid	Lanzo	9:00
4. Ed Wallenhorst	Lanzo	7:30
5. Stan Colson	Lanzo	6:00

30 SECOND ANTIQUE

1. Tom Lucas	Rambler/Atwood	6:00
2. Herb Wahl	Clipper/Bunch	4:56
3. John Delagrange	Miss Fortune/OR .23	3:45
4. Bob Edelstein	Clipper/Cyke	3:26
5. Bill Bell	Trenton Terror/Brown	3:14

CLASS B CABIN

1. John Lessig	Dodger/K&B .29	6:00
2. John Bortnak	So-Long/OS .25	4:30
3. Bob Edelstein	So-Long/OR .23	4:09
4. Gene Martha	So-Long/OR .23	4:04
5. Mal MacLean	Cloud Chopper/OSAM	4:00

IGNITION SCALE

1. Karl Spielmaker	Corben/Vivell 35	2:43
2. Jasen Youck	BEZC/AM 10	1:11

NOSTALGIA RUBBER MASS LAUNCH

Stan Colson	Jasco Traveler	
	Highest at 45 sec.	

GLOW-IGNITION PYLON

1. Bob Edelstein	Alert/Forster .29	4:10
2. Gerry Persh	Zipper/Forster .29	3:57
3. Tom Lucas	Playboy/Atwood	3:55

SMALL STICK RUBBER

1 Bill Passarelli	Gollywock	7:30
2. Bob Moulton	Korda 35	6:02
3. John Rice	Gollywock	6:00
4. Bud Romak	Korda	4:35
5. Stan Colson	Gollywock	4:30

CLASS C PYLON

1. Gene Martha	Alert/OR .33	4:25
2. John Bortnak	Wasp/OS .30	4:20
3. Bob Edelstein	Wasp/Forster .305	3:57
4. Jim Walston	Playboy/Atwood	3:00
5. John Carbone	Zipper/Forster .305	2:41

.020 CABIN

1. Gene Martha	Dodger	4:30
2. Jim Onotno	Dodger	3:25
3. Jason Youck	So-Long	3:13

CLASS A CABIN

1 Sal Taibi	Dodger/Elfin	4:30
2. Gene Martha	So-Long/OR .19	4:26
3. Bob Edelstein	So-Long/Arden .19	4:07
4. Jim Walston	Cabruler/Arden .19	3:53
5. Hans Ochsner	Coronet/OR .19	3:44

TWIN PUSHER MASS LAUNCH

Bob Moulton	Zaic Streamliner	L.M.D.

TOWLINE GLIDER

1. Jason Youck	Beaumont	4:21
2. John Stott	Modelcraft Soarer	4:06
3. Stan Colson	Floater	3:05

LARGE CABIN RUBBER

1. Ed Konefes	Korda DT	9:00
2. Bud Romak	Korda DT	9:00
3. Tom McCoy	Lanzo	4:11
4. John Rice	Korda DT	4:08
5. John Delagrange	Korda DT	4:01

H.L. GLIDER

1. Jim Fiorello	Hervat	4:30
2. John Bortnak	Zoomer	4:04
3. Gerry Donahue	Wallerstein	2:50
4. Henry Hills	Bowers	2:34
5 Ed Novak	Hervat	2:12

CLASS B PYLON

1. Bob Edelstein	Wasp/Forster .29	5:25
2. Jim Walston	Am. Ace/Torp .29	4:30
3. Gene Martha	Ranger/OR .23	4:25
4. Bud Romak	Zipper/OR .23	1:22
5. Hans Ochsner	OOS/OR .23	1:16

NOSTALGIA POWER

1 Gerry Persh	Powerhouse/Cox	4:30
2. Bob Edelstein	Spacer/Fox .35	4:14
3 Gene Martha	Y-Bar/OS .09	4:10

WAKEFIELD MASS LAUNCH

Bob Moulton	Wakefield Gull	
	Highest at 45 sec.	

GLOW-IGNITION CABIN

1. Mal MacLean	Stokes/OWAT .301	4:30
2. Tom Lucas	Playboy/Atwood	3:38
3. Gerry Persh	No Record	0:52

ELECTRONIC SPEED CONTROLS

BY BOB BOUCHER

INTRODUCTION

A new generation of electronic speed controls has arrived on the modeling scene. They are known as HIGH RATE CONTROLS. I will attempt to explain the differences between the various types of controls used in our cars, boats and planes so that you can choose the most appropriate type for your particular application.

A BIT OF HISTORY

We are now in our 20th year of electric flight and electronic speed controls have been around almost as long. In the early years we needed all the power we could get and seldom flew at anything less than full power. A few speed controls were available but they weren't very popular. One of the first was a high-rate controller manufactured by VANTEC. But it was rather bulky and was preferred more by boaters than by airplane people. In 1975, Leisure, Workwrite, BoLink and others promoted the electric powered radio controlled car as an alternative to the gas cars then on the market. It wasn't long before the electric car dominated the racing scene. As many RC car racers were ex-slot car drivers it should be no surprise that they almost universally chose the slot car resistor controller as the control of choice. After all, the resistor was reliable and it was cheap. And the tin can motors used in 1/12 scale cars were limited to a bit more than 50 watts.

When we tried to use these slot car resistors in our high power planes and boats we found that they burned up rather quickly. Luckily, two electronics engineers who were also modelers, worked for Signetics in Silicon Valley. Their names are Jim Hansen and Hans Stellerecht. They designed the Signetics 544 servo chip that was soon to be an industry standard with almost all radio control manufacturers. They designed a car control with a brake circuit and began to produce the control in Hans' garage, they called their company Electro-Craft. Hans designed a version of the control for Astro Flight and helped them get their first control, the Astro Model 4016, into production in 1975. The 544 chip was a "LOW" or frame rate control, and pulsed at the frame rate of the transmitter which in those days was 14 milliseconds (60 cycles). The Astro Model 4016 became the prototype for almost all airplane controls, such as those made by Airtronics, Futaba, and later Robart. The Electro-Craft control became the prototype for almost all car controls, such as Tekin, Novak, Futaba, and others.

But a strange phenomenon was noticed almost as soon as the frame rate control became popular . . . the 12th scale stock motors began to burn out at an alarming rate. The windings overheated and the magnets demagnetized, but people felt that the frame rate control was better than a resistor and continued to buy them. The motor manufacturers improved their motors by going to high temperature wire and better magnets and the motor failure rate became acceptable.

A few companies experimented again with high rate controllers, such as Canadian Power-Miser . . . but all we had to work with in those days was the Texas Instruments TIP-35 Power Transistor, and it wasn't quite up to the task. But in 1981 Siemans, in Germany, figured out a way to mass produce a reasonable MOSFET transistor, the BUZ-71. The price was right and the performance was very acceptable. Joe Utasi, of JOMAR, latched onto the BUZ-71 and began to produce limited numbers of his high rate controls. They worked very well and were used by many electric pioneers like Bob Kopski and Keith Shaw. The rest of us took the easy way out and simply adapted the BUZ-71 to our old frame rate designs.

For the airplane and fast electric boat modelers, the frame rate control had no bad habits. We all used Cobalt motors that could take the heat and besides, we seldom throttled back except for landing. Efficient operation at half throttle was not really important to us at that time. But as motors and batteries became more and more powerful a major weakness of the frame rate control became evident. The frame rate control generates very large current pulses which are hard on the MOSFETS and these same pulses generate a lot of radio interference. For instance, a motor that drew only 25 amps at full power would draw current pulses well over 100 amps at partial throttle. The same current pulses that were burning up our motors in 1975 were now beginning to burn up our Speed Controls. By now the year was 1990 and it was time for a change. At the 1990 RC Exposition in Toledo, Ohio, Astro, Graupner, Jomar, Novak, Robbe, Tekin, and others introduced their NEW high rate controls.

WHAT DOES A SPEED CONTROL DO?

A speed control allows the operator to vary the voltage applied to the electric motor in his plane, boat or car. The DC permanent magnet motor runs at a speed closely related to the voltage applied across its terminals. So that by controlling the motor voltage, the motor speed will be controlled. This relationship is shown in Figure 1.

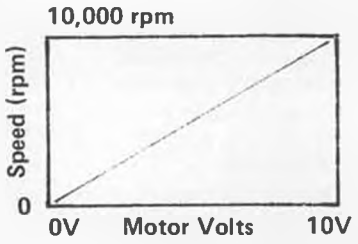

Fig. 1. Elect. Motor RPM vs DC Voltage

With zero volts applied the motor does not turn. With five volts the motor turns 5000 rpm. With ten volts applied the motor turns 10,000 rpm. If our motor were a perfect motor with no internal resistance its speed would follow its voltage exactly, regardless of load. In the real world of modeling the speed does droop a bit when a load is applied, but we can still say that more volts means more rpm and less volts mean less rpm. Rather than complicating

this discussion about speed controls with the peculiarities of DC motors, let's use our speed control to control the voltage across a 100 watt 1 ohm load resistor as shown in Figure 2. With 10 volts applied across its terminals the load resistor will conduct 10 amps and absorb 100 watts. These are the kind of volts and amps you would see if you ran your tin can "05" motor on 8 cells. If the voltage were varied in one volt increments the results would be as shown in Table 1.

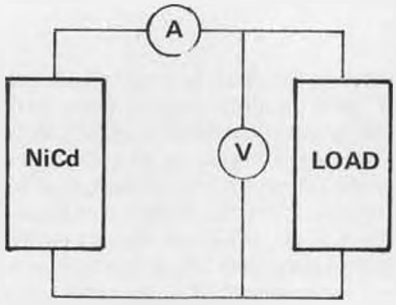

Fig. 2. The Load Circuit

This circuit is 100% efficient as all battery power is transferred to the load . . . too bad we can't use it. Tapping the battery might work if we only used slow, overnight charging. But with fast charging, using battery taps will result in premature battery failure.

THE RESISTOR CONTROL

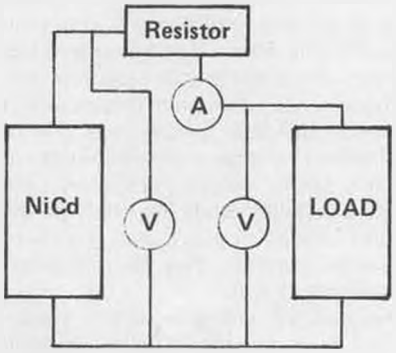

Fig. 3. The Resistor Control

The CONTROL resistor is connected in series with the load resistor thereby reducing the voltage applied to the LOAD resistor. The result of varying the control resistance is listed in Table 2.

In this circuit the current flowing from the NiCd is identical to the current flowing through the load. But the voltage across the load is reduced by the amount of voltage lost in the control resistor. This loss causes quite a bit of heat to be generated in the control resistor. The most heat is generated at half throttle and is 25 watts in this particular circuit. And the maximum heat is about 25% of the maximum power available (100W). This heat loss limits the resistor control to small motors. Trying to use a resistor on an ASTRO 40 capable of 1000 watts would require a power resistor of 250 Watts. Such a resistor would be twice as large and twice as heavy as the 40 motor and would be quite impractical. Please note that the resistance required to get linear control speed is very nonlinear. An 0.11 ohm resistance change is required to drop the power from 100 to 90%, but a 5 ohm resistance change is needed to drop the power from 20 to 10%. The resistor control does not produce a linear speed change with throttle stick movement. The overall efficiency of the control is good at high power but bad at low power and is in fact proportional to the throttle setting. At half throttle the efficiency is 50%. At half throttle your motor will run twice as long as at full power, but if you had a 100% efficient throttle it would run four times longer.

THE FRAME RATE CONTROL

The typical frame rate control is shown in Figure 4. Here the series resistor has been replaced by an electronic switch. The switch itself is assumed to have no loss, the switch is either open or it is closed. Maximum current, in this case 10 amps, flows when

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TABLE 1.0

NiCd Volts	Load Volts	Load Amps	Load Watts
10	10	10	100
9	9	9	81
8	8	8	64
7	7	7	49
6	6	6	36
5	5	5	25
4	4	4	16
3	3	3	9
2	2	2	4
1	1	1	1

Table 2.0

NiCd Volts	NiCd Amps	NiCd Watts	Load Volts	Load Watts	Resis. Ohms	Heat Loss	Eff. %
10	10	100	10	100	0.0	0	100
10	9	90	9	81	0.11	9	90
10	8	80	8	64	0.25	16	80
10	7	70	7	49	0.43	21	70
10	6	60	6	36	0.67	24	60
10	5	50	5	25	1.00	25	50
10	4	40	4	16	1.50	24	40
10	3	30	3	9	2.30	21	30
10	2	20	2	4	4.00	16	20
10	1	10	1	1	9.00	9	10

Table 3.0

NiCd Volts	Duty Cycle	NiCd Amps	NiCd Watts	Load V DC	Load A DC	Load W DC	Heat W AC	Eff. %
10	100%	10	100	10	10	100	0	100
10	90%	9	90	9	9	81	9	80
10	80%	8	80	8	8	64	16	70
10	70%	7	70	7	7	49	21	60
10	60%	6	60	6	6	36	24	50
10	50%	5	50	5	5	25	25	40
10	40	4	40	4	4	16	24	30
10	30%	3	30	3	3	9	21	20
10	20%	2	20	2	2	4	16	20
10	10%	1	10	1	1	1	9	10

Table 4.0

NiCd Volts	Duty Cycle	NiCd Amps	NiCd Watts	Load Volts	Load Amps	Diode Amps	Load Watt	Eff. %
10	100	10	100	10	10	0.0	100	100
10	90	8.1	90	9	9	0.9	81	100
10	80	6.4	64	8	8	1.6	64	100
10	70	4.9	49	7	7	2.1	49	100
10	60	3.6	36	6	6	2.4	36	100
10	50	2.5	25	5	5	2.5	25	100
10	40	1.6	16	4	4	2.4	16	100
10	30	0.9	9	3	3	2.1	9	100

ELECTRONICS CORNER

BY ELOY MAREZ

SOME BATTERY BITS

THE PRETTY GIRL in the photo is a very, very, dear friend whom I want all of you, my friends in reader-land, to meet. Her name is (was!) Dao Huynh, and obviously, she is a recent bride. I know you will all want to join me in saying "Congratulations," because I am not straying as far from the RC electronics subject as you might think . . . are you ready for this? Dao is a radio control equipment technician!

I have a lot of respect for this young lady, and her older (by two years) sister, Thi. They came to the U.S. as teenagers, learned enough English to get through high school and electronics training and are both now highly respected RC technicians at Novak Electronics. Thi is as good as anybody I know on electronic speed controls, with Dao being not far behind, though her real specialty is the Novak NEC-2 Peak Detector Charger.

Unfortunately, Dao's father has not yet been able to join them here in this country, and I had the tremendous honor of giving her away at her wedding . . . a chore I accepted with the greatest pleasure. Don't bother to send SASEs, I don't have any more like her to give away!

AIRBORNE SYSTEM BATTERIES is the subject of a letter from another old friend . . . pen pal, anyway . . . Pat Page, of Campbell, California, who wrote:

"I don't remember seeing info on how to prevent a battery opening up and leaving you 'dead in the water.' I always put diodes back biased across each cell to conduct if the battery opens up (See sketch). Germanium diodes would be better because the forward bias needed for conduction is about .25V instead of the .65 or so for silicon. I use one amp current rating diodes. If a cell opens, the diode bypasses it.

"I wonder if receivers can safely operate with five cells. Do you have info on this? In that case, if a cell opens you still end up with 4.2V (1 cell dead, minus 1.25V and diode drop .65V)."

MY *MB* ELECTRONICS INDEX quickly told me that the last time I discussed this subject here in EC was in March 1984, so I guess we can bring it up again without being unacceptably repetitious. I wonder how many new RCers there are since then?

Protecting NiCd cells with parallel diodes is not a new idea, having first appeared in Pro Line radio systems back in the late sixties. Actually, it does sound like a terrific idea, being relatively inexpensive, trouble and maintenance free, and possibly saving a major disaster. However, I have always questioned the actual benefits, and now, as in my discussion back in '84, I add strength to my argument by asking why, if it is such a good idea, none of the other manufacturers ever picked up on it?

We (you and me!) just had a wedding in the family . . . see text.

This home brew operations counter, capable of recording sequential operations in 12-digit numbers, is being put to work to test servo longevity. Details in text.

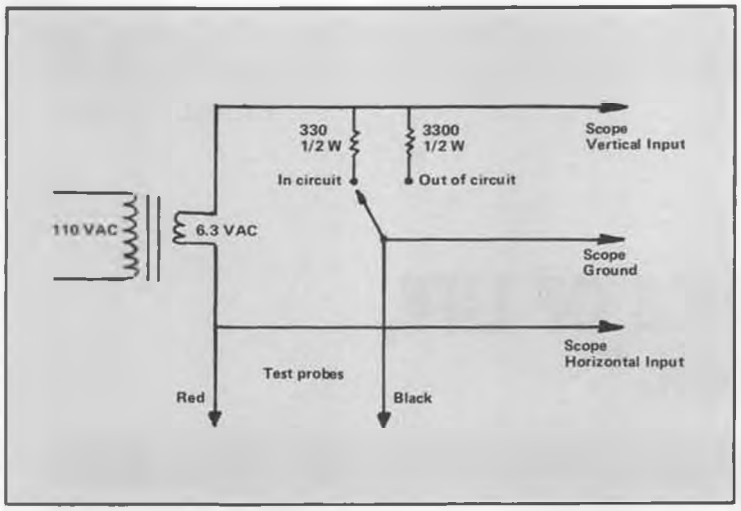
In theory, the diode in parallel with each NiCd cell is usually just going along for the ride. Remember that it only conducts in one direction, from anode (-) to cathode (+). When the cell which it parallels is good and producing current, the diode has absolutely no effect at all. However, should the cell open, the diode then allows passage of the current being furnished by the other batteries, less the inherent voltage drop as mentioned.

My reasoning, based on my experience which goes back to before the ProLine system, is that NiCd cells seldom . . . I cannot remember ever seeing one . . . fail open. NiCd cell failures, other than simply low capacity, generally occur with an internal short circuit. I don't have an actual resistance value for these shorts; some resistance has to be present, but it is low enough so that even with a half-capacity load, the battery will still exhibit a normal three-cell voltage.

However, there is nothing like an added sense of security, and if one is concerned about the long odds, a diode installed in this manner will definitely do the job described. However, since germanium diodes seem to get harder to locate all the time, I would recommend a newer development, the Schottky barrier diode, most often called simply a Schottky diode. Not only do they abound in many ratings, but at airborne equipment currents, they have a voltage drop of only .3 volt.

The five-cell airborne battery pack is another thing altogether. While I cannot positively state that all receivers now being sold will operate correctly . . . and more importantly, for a normal life span . . . with five cells as primary power, I feel safe in saying that most of them that are of modern design will do so. In other words, not all receivers now being sold can be called exactly state of the art! On the other hand, most receivers now available, at least with our better radios, are actually equipped with internal voltage regulators, and are operating below the nominal four-cell voltage. This voltage regulation is in some cases an IC, in others a transistor being used in what is called a shunt type regulator. The preferred voltage range is all below 4.0 volts, as low as 3.2 in one case that I know of. One of the reasons that such voltages are chosen is that the regulator will continue to operate under one-cell out conditions.

Note that this regulated voltage is applied



Circuit for curve tracer, which can be added to any oscilloscope for rapid in- or out-of-circuit component tests. The current drain is minimal, so any small transformer will suffice.

only internally to the receiver circuits, the full battery voltage is passed though to power the servos. And the servos can be another story, because they do operate on the full applied voltage without any regulation or reduction at all. I doubt if the additional 1.2 volts will cause great distress to the amplifier circuitry, but there is a question, based fully on theory, in my mind about the effects of this additional voltage on the motor. True, the servo will pep up noticeably with the higher voltage, due of course to the faster motor speed, which is why I have cause to wonder. Obviously, the motor is running faster, causing it to wear faster, and the brushes are going to arc more. Though the actual voltage increase may be small in actual value, we are talking about a respectable percentage increase (20%). The motor has to age faster, and is going to fail sooner. The question is how much sooner, or is the difference inconsequential? I don't have a clue at this point, however, knowing that some pattern flyers use five-cell packs for that additional servo performance I mention, if any of you have any feel for this possible faster servo wear, won't you share your experience with us?

By a coincidence, I have just finished up a digital operations counter, and even have a photo for you to admire! The counter advances one digit every time it is triggered by the closing of an input switch, and is capable of reading up to twelve digit numbers. It was made specifically to test servos . . . I plan to load them to half the advertised power output, and let them cycle, with the counter recording the number of operations until the servo dies. Obviously, a lot of time might be required with some servos, but I think in time, it will give worthwhile results. After testing at the normal 4.8 volts, it'll be interesting to make additional tests at 6.0 volts. Have patience, I'll report on this later.

Back to the requirement for airborne battery reliability. I have thought for a long time that the RCer in general is missing an important bet by generally ignoring the various battery backup systems that have appeared on the market. They have been overlooked so much they probably need an introduction to most of you . . . being a secondary low capacity battery that is automatically switched in should the primary battery stop producing power for any reason. Except for installation and periodic topping off of the charge, these batteries require or do nothing, just riding along awaiting that emergency at which time they take over and save your airplane.

Probably as many as ten different such systems have appeared in recent years, most of them disappearing soon after, obviously due to lack of interest on our part. However, the first such system to emerge is still available, which ought to tell us something!

THE ACE RC 2x5 REDUNDANT POWER SOURCE, as it is called, provides airborne system power from two five-cell packs, with an added 20% increase in voltage, unless one of the packs fails, at which time it is switched out and you continue to fly merrily along on one battery. LED indicators are used to indicate status at all times. In kit form, without connectors, the 2x5 is only $14.95 . . . now isn't that cheap insurance against the cost and time to build an airplane?

THE OSCILLOSCOPE is without a doubt the most useful test instrument to be found in

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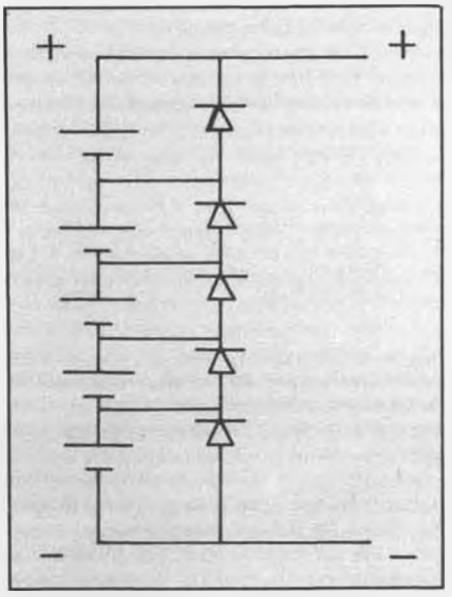
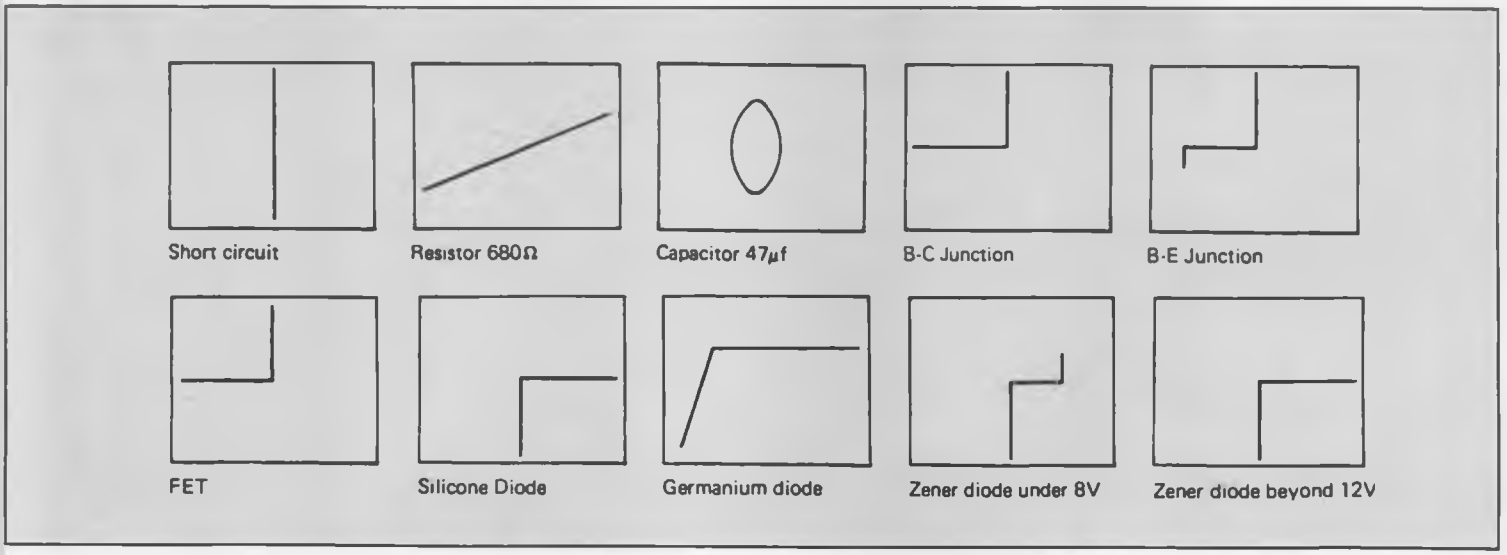


Five-cell, diode protected airborne battery pack suggested by Joe Utasi, of Jomar.

Some of the traces that will be obtained with the curve tracer shown. Definite shapes shown are obtained with out-of-circuit components, or if parallel with high resistances; modified versions seen in some circuits.



HANNAN'S HANGAR

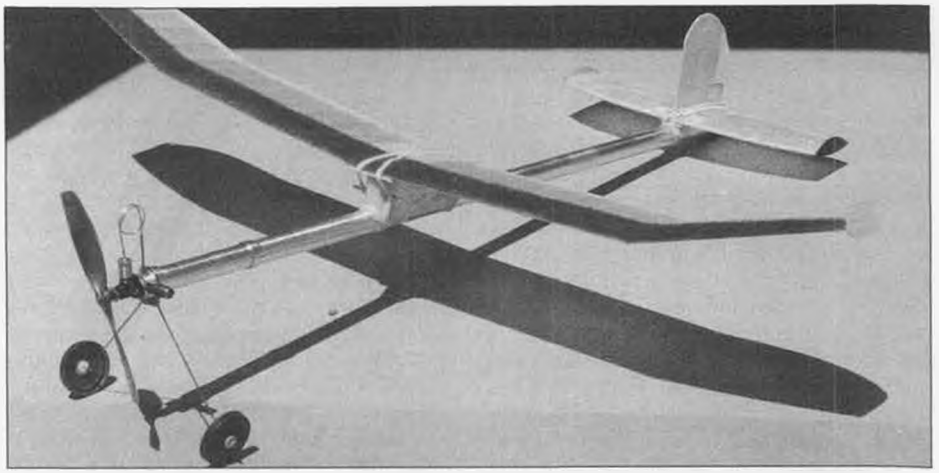
BY BILL HANNAN

"VARIETY'S THE VERY SPICE OF LIFE, THAT GIVES ALL ITS FLAVOR."

Our lead-in line, from the pen of English poet William Cowper (1731-1800), certainly applies to model building, and our photographs this month offer graphic proof of the nearly infinite variety of options open to us.

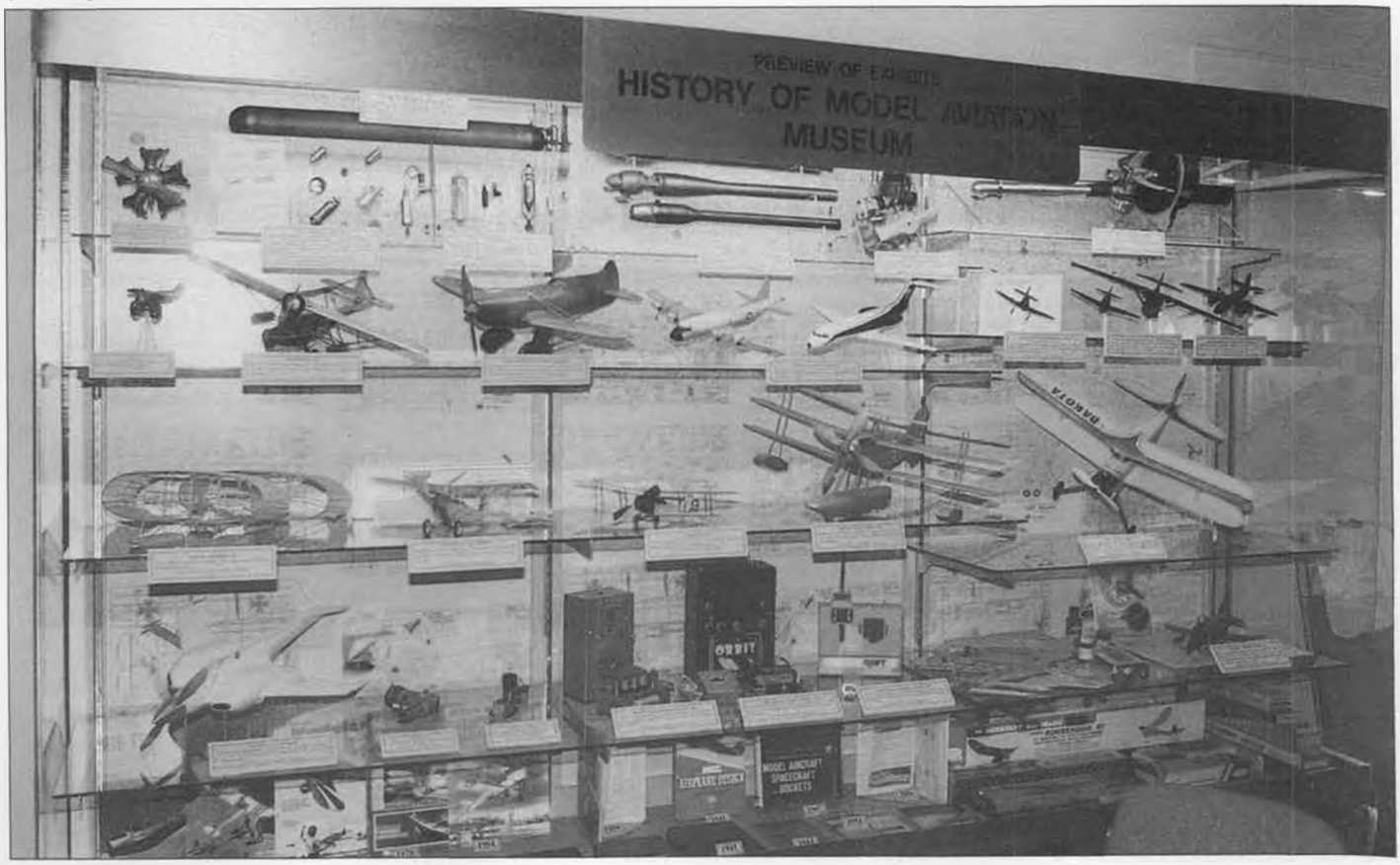
Think about the rich array of possible choices; we can elect to build static-display, free flight, control line or radio guided models. We can decide to fly gliders, helicopters, autogyros, ornithopters or fixed-wing aircraft, indoors or outside. Our range of power sources is also varied, including, most commonly, gravity, rubber, compressed-air, CO_2, electric, diesel and "gas."

Our creations may be fabricated from materials as simple as paper or wood, as durable as metal, or as exotic as the aerospace-industry composites. We can construct scale or original designs, suitable for



Louis Schmidt, of Apple Valley, California, powers his cute CO_2 engined model with compressed air pumped into the tubular aluminum fuselage. You wouldn't think that skinny tube could hold much air, but it apparently works OK.

Note the amazing variety of models and related stuff in this San Diego Aerospace Museum "History of Model Aviation" display. Featured is a wind tunnel model, display types, F/F and C/L ships, WWII I.D. models, accessories, various types of engines, vintage RC equipment, plans, kits, and magazines (including *MB*, of course!). Photo by Jim Alaback.

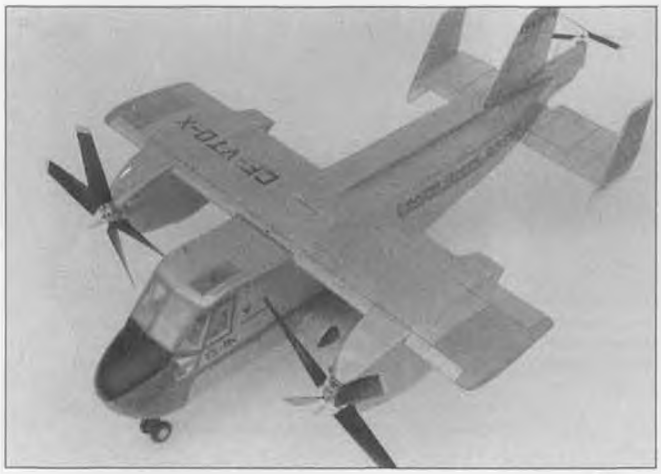


sport or competition use, working from "scratch," plans or kits. In summary, how could anyone become bored with model building?

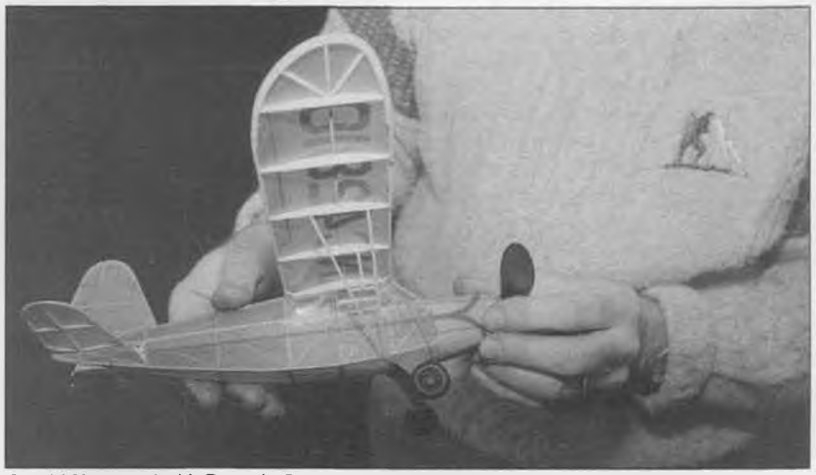
SAMENESS AS WELL AS VARIETY?

Herb Weiss, of Palos Verdes Peninsula, California, was attracted to a book entitled *Folk of the Air*, by Peter S. Beagle. It turned out not to have anything to do with our hobby, however it did yield this intriguing idea: "People who get together because of a hobby or obsession start to look a certain way. Boat people, backpackers, science fiction types, comic book collectors. Even short-wave radio freaks sort of have a look."

A good old-fashioned wooden solid model of the Martin China Clipper, by Don Campbell, will remain in its natural wood color.



Now here's a model we'd give our right arm to see perform. It's a Canadair CL-84 Dynavert STOL as replicated by Tonda Alfery, of Czechoslovakia. The rubber-powered model is capable of 50-second flights, but what's really amazing is that it employs a timer to (get This): *actuate wing tilt, retract the landing gear, and eject cargo during flight!* Wow!



An old Megow 10c kit Rearwin Speedster by England's Doug McHard uses single-surface wing and stab covering as called out on the plan. Doug, however, first airbrushed the exposed structure to match the tissue color, and says the bare airframe is unnoticeable in flight. Photo by Pete Redhead.

Herb Weiss wonders if that may also apply to model builders, and says: "On looking at any of the model magazines it is pretty clear that all model airplane enthusiasts do dress and even look pretty much alike, and if you further divide them by classes such as rubber, gas, indoor, outdoor, etc., the likenesses within each class are even greater.

"Now that it's called to my attention, I am reminded that all the people who collect baseball cards look pretty much alike too. Or do they?

"This suggests a story about two model clubs back in the A-frame twin-pusher days, who sent club pictures into one of the model mags, and the two pictures were printed with club names and lists of member names interchanged. No one ever spotted the switch, but the wife of one member came close to it when she said the picture made her husband look better than he had since the day they were married. . . ." Herb thinks the two clubs involved were the "Rubber Dub Dubbers" and the "Rubber BandITS." Hmmmmmmm.

HANGAR MAIL

Model building is unusual in combining elements of skill, science, philosophy and luck. Letters from our readers continually remind us of this, and we would like to share a few assorted extracts:

"Something which came from model building and design for me and for some of my friends has never been adequately explored in public press. (At least I've never seen a thorough discussion of it.) It is just this: Any creative hobby stretches the mind and motor-skills of its practitioner away from the cares and obligations of existence. Dance, painting, music (to name only three) require concentration, dexterity, and dedication to perform at a level which is self-acceptable. But, in their way, they are passive. The problems which are solved, the dexterity which develops, all are limited to two dimensions: sight/sound and time. From these, great emotional and physical satisfactions can result as accomplishment grows. The rewards and the measure of accomplishment are fully subjective. There is no objective measure of accomplishment. The emotions of an audience, the perceptions of judges select outstanding performers.

"Model airplanes are different! They move in three-dimensional space, and can have an objective measure of performance. Given one set of rules, models can compete on the basis of speed, duration, or precision—all of which can be measured. Free flight models (all of 'em, powered or not) demonstrate to perhaps the highest degree the requirements for successful solution of many problems of physics, mechanics, structures, and aero-balance. Only in the flight of the model can the success of its designer/builder be determined. Until it has flown, it is merely another example of two-dimensional creativity. The painter, the sculptor, can never experience, nor can they project to others the experience of seeing their creation fly free with a life of its own, as can the veriest tyro modeler when his production makes a sustained flight." The above is from a letter to Frank Zaic, by Bill Kincheloe, of Magalia, California.

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John Walker's variation of Louis Garami's wingless autogyro is unusual in that it is a stable, dependable flying model—most F/F gyros are not!

FREE FLIGHT

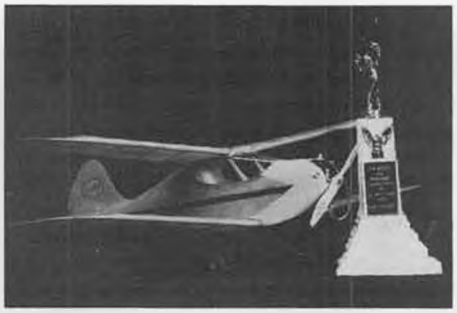
BY BOB STALICK

RE-GLOW THAT HORNET!

It's time for me to ask for your understanding. Several months ago, I spoke highly of the carbon fiber fuselages and tailbooms being produced and sold by CRG Enterprises. Shortly after the plug appeared in this column, I found out that the proprietor of CRG had moved and left no forwarding address. Unfortunately, some folks had already ordered the carbon fiber parts. As of the time of this writing, I have received letters from two free flighters inquiring as to the whereabouts of their parts. All I can say now is that if you were one of the people who sent in an order, and you have heard nothing, please drop a letter to Ron McBurnett, 2265 Greenwood Rd., Rickreall, OR 97371, or call Ron at (503) 363-7180. Ron was involved in the product development stage for the CRG booms, and he is now attempting to accommodate those who submitted orders. His stock of parts is being expanded, and for those who are patient, I know he will make things right. Please spread the word among others who may have submitted orders. If Ron doesn't know that you submitted an order, there is no way that he can help make things right for you.

Now, let's get on with this month's column. It's big. It's full of information. It's *Model Builder* Free Flight for December!

Are we having fun yet? Randy Archer apparently is as he prepares to send his F1C model up into the wet and windy skies over Lost Hill Is, during the 1990 U.S. F/F Champs. Photo by Joel Chesler.



Starduster it ain't, but Vern Clements' "Bi-Gone" did earn itself a place in the modeling history books by placing 1st in 1/2A Gas F/F at the 1954 Jim Walker Northwest Model Airplane Championships at Ft. Lewis, Washington. Full-size plans are available from Vern —see text.

REID HULL's HIGH L/D P-30

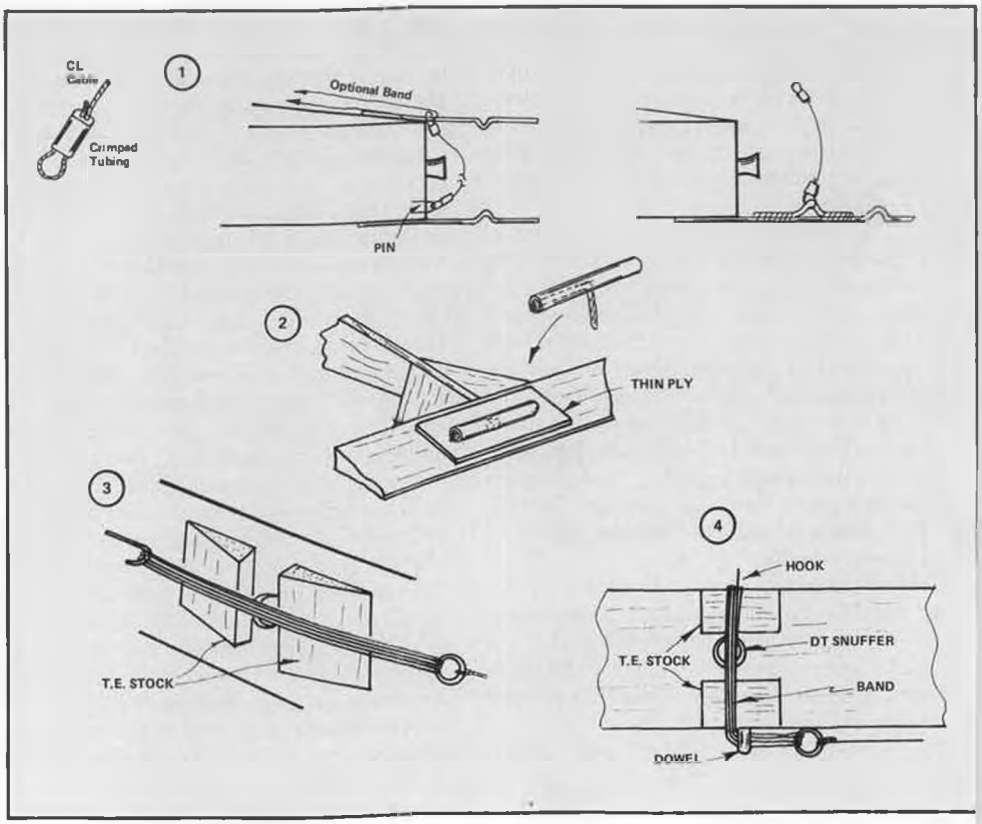
The *Brainbuster* newsletter from Virginia provides this month's three-view. It is a P-30 design from longtime free flighter, Reid Hull. As you look over the plan, you will see a number of different features that set this model apart from the usual run-of-the-mill P-30—notably, the wing mounting system, a removable tailboom, and V-tail. According to Reid, the model will climb 200 feet on a six-strand motor using 3/32 rubber. He claims that the motor run alone lasts 60 seconds. Reid also proposes that if you use a five-strand motor made from 1/8 rubber, you will get a 10% increase in power.

Note that the fuselage has no pylon, but rather that the top of it has been flattened for a 3-inch long section at the wing mount. The wing center section has been trimmed to a 3-inch chord where it sits on the fuselage. In order to hold the wing in place, Reid has designed a balsa ring that has a wing mount wire facing rearward. The wing is held in place by routing the wing hold-down bands from the wire on the ring forward, around the fuselage and then back to the wire on the ring.

The stabilizer airfoil is not detailed but it appears to be a thin flat-bottomed section. The stab features a dihedral of 3-1/4 inches on each side. No rudder or fin is used, since the stabilizer serves both purposes, just like a Beechcraft Bonanza.

Finally, the removable tailboom allows the model to be wound from the rear. This practice has been used on larger rubber models, such as Wakefields and Mulvihills, for years, but this is the first time that I have seen this feature on a P-30. Reid holds the tailboom in place by using masking tape and rubber band hooks on both the boom and the fuselage.

It seems to me that this design has a number of interesting features that would be

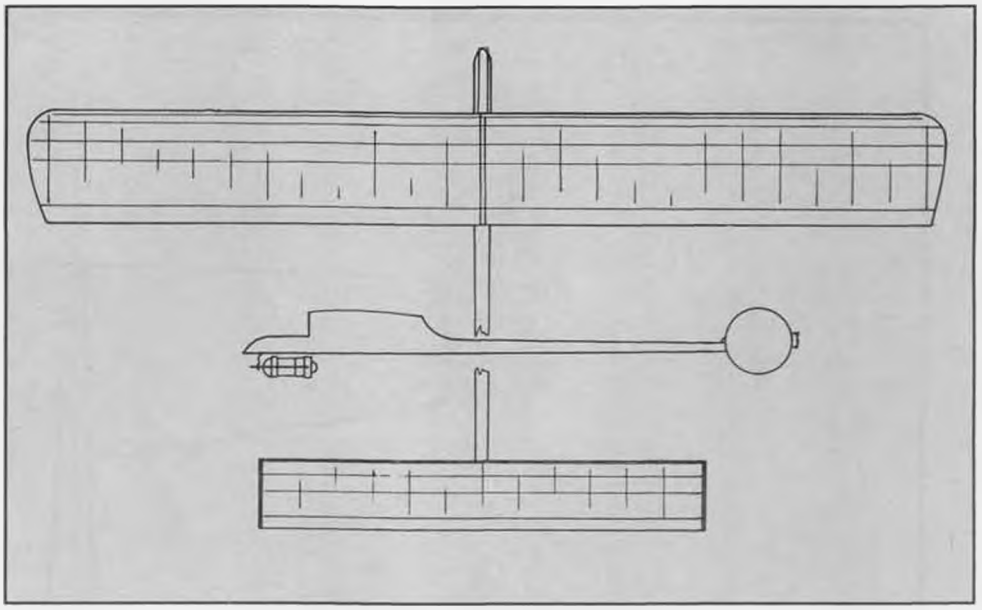


fun to try, if you are into experimenting.

It also seems to me that a simple event such as P-30 has just become more complicated.

MYSTERY MODEL FOR DECEMBER

Dan Ciesla drops me a note every so often, usually after he has spent a number of days in his 16-wheeler. I think he does so before he has a chance to clear the road dust from his mind, because he usually has one or two weirdo suggestions for the Mystery Model. Such is the case this month, as well. Actually this one isn't that weird, but how long has it been since you have seen a contest where Jetex was flown? Anyhow, once upon a time, two of the better known free flighters in the U.S. of A. put their heads together and came up with this design. They put tip fins on the thing and made them circular, and they used a stab aspect ratio like you haven't seen on an outdoor model since 1959. Here's the deal . . . if you know the name of this design, you write it on a sheet of paper, put it in an envelope with *Model Builder's* name and address on it, direct it to Bill Northrop's attention, affix a 25 cent stamp, and put your name and address on it as well. If you get there with the correct answer first, using the patented *Model Builder* weighting system, you will win a free one-year subscription to my favorite magazine.



DECEMBER MYSTERY MODEL

DARNED GOOD AIRFOIL—GOTTINGEN 257 (Flz. Ago)

Once again, I have headed to my *Comprehensive Guide for Light Plane Airfoils* and come up with still another Gottingen section. This one was tested in 1918 and has a couple of excellent features for use in free flight power models. For one, it has a sharp leading edge, which makes for a faster climb. Additionally, it has an almost imperceptible undercamber—barely over 5%. And the high point is at the 35% mark, a rather average location. It is on the thick side for

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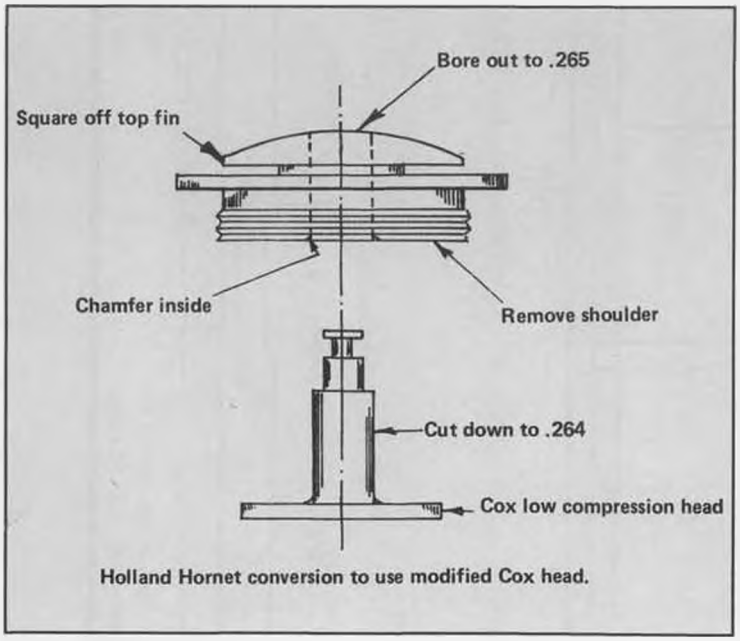
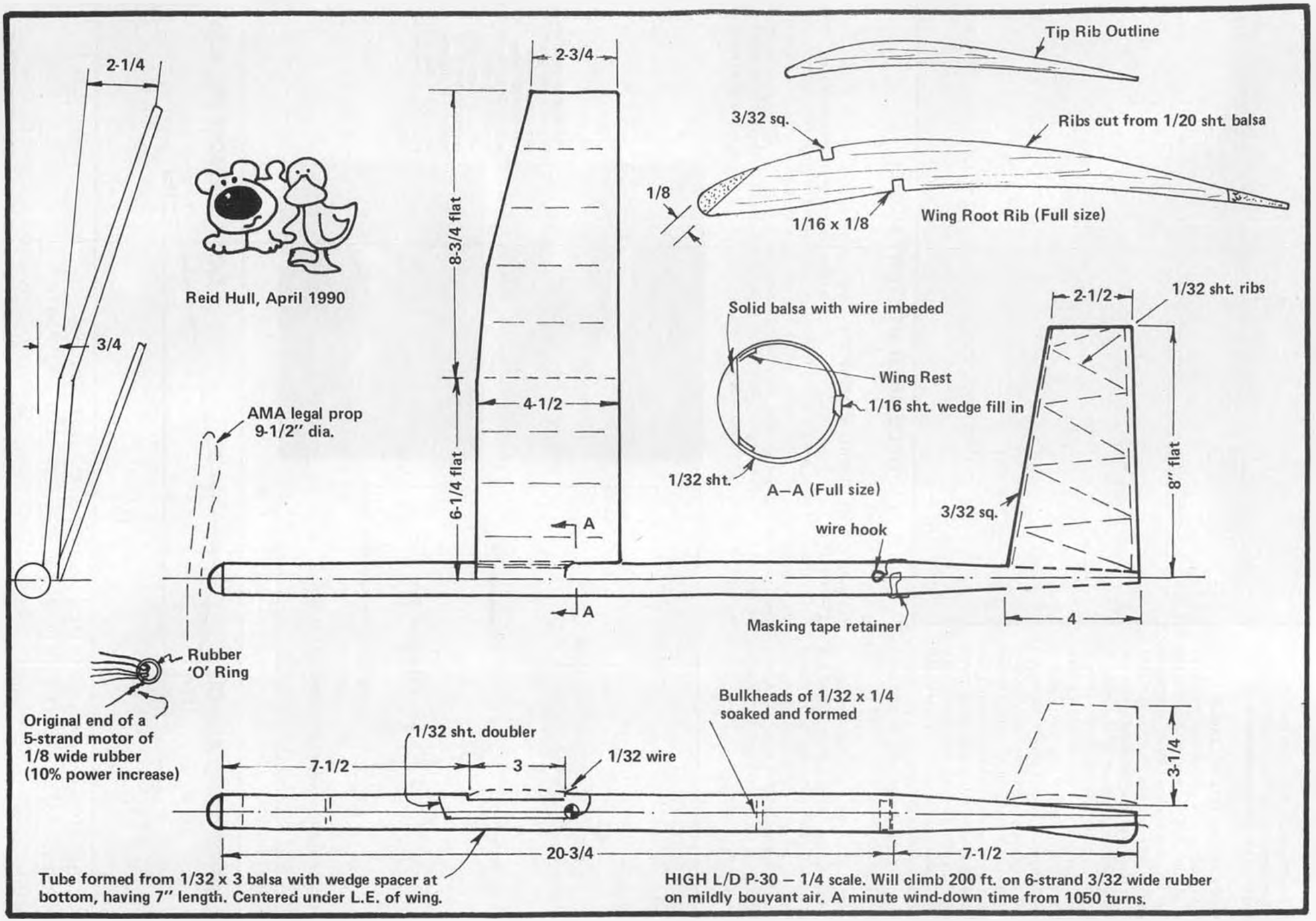


Holland Hornet conversion to use modified Cox head.

The latest plans offering from Al Lidberg is a 25-inch rubber scale replica of the sexy looking Glenn Beets Special homebuilt, which in many ways resembles the Stolp Starlet. For plan info, write to Al Lidberg, 614 E. Fordham, Tempe, AZ 85283.

DARNED GOOD AIRFOIL **GOTTINGEN 257 (Flz. Ago)**

STA	0.00	1.25	2.50	5.00	7.50	10.0	15.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100.	
UPR	0.96	2.57	3.48	4.71	5.78	6.68	7.86	8.56	9.36	9.20	8.56	7.38	6.00	4.65	3.00	2.14	1.28	
LWR	0.96	0.00	0.00	0.05	0.11	0.21	0.32	0.43	0.53	0.58	0.53	0.53	0.43	0.32	0.16	0.00	0.00	



Tube formed from 1/32 x 3 balsa with wedge spacer at bottom, having 7" length. Centered under L.E. of wing.

HIGH L/D P-30 – 1/4 scale. Will climb 200 ft. on 6-strand 3/32 wide rubber on mildly bouyant air. A minute wind-down time from 1050 turns.

PEANUT SCALE: HOWARD'S PETE

BY JOHN BERRYMAN

It's hard to resist the appeal of a Golden Age racer. One of the most famous of the designers of that era was Benny Howard, who gave us "Ike," "Mike," "Mr. Mulligan," the "DGA" (Darned Good Airplane) series of civil aircraft and "Pete," the subject of this construction article. Pete as presented here needed no modifications—no blowup of stab or rudder, no lengthening of the landing gear, no changes in outli nes or moments at all. The only readily apparent change is in the dihedral . . . Benny called for three degrees, but since our Pete will be on autopilot at all times, I roughly tripled the dihedral to aid stability. Like any racing thoroughbred, Pete is not for a tyro, but is intended as a rewarding project for an experienced flyer. Let's build Pete.

Flying Surfaces

Yawn. Nothing sexy here. The wing tips and curved surfaces of the rudder and stab are made from 2 laminations of 1/40 balsa. The ribs are 1/32, except for the center rib which is made from 1/16. The leading and trailing edges of the wing are made from 1/16 stock, as is the wing spar. The internal structure for the rudder and stab are cut from 1/20 balsa.

Fuselage

The fuselage is built in the classic "half shell" manner, and no, it isn't easy. However, I have evolved a couple of tricks that mak e the process a bit easier . . . not easy . . . just a bit easier. . . First, cut the four 1/20 main longerons (or "crutches") and the smaller 1/32 longerons that will serve to give the fuselage its beau tiful flowing lines. Then soak the longerons in a 9x13-inch baking pan filled with hot water to which a glug or two of household ammonia has been added. Next, cut out the half-formers. Select light,

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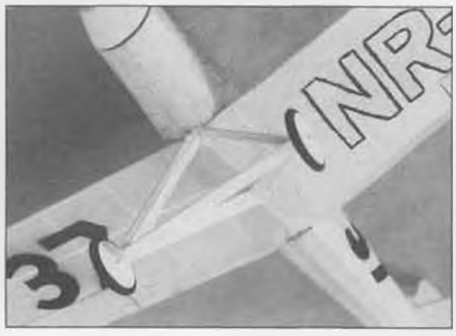
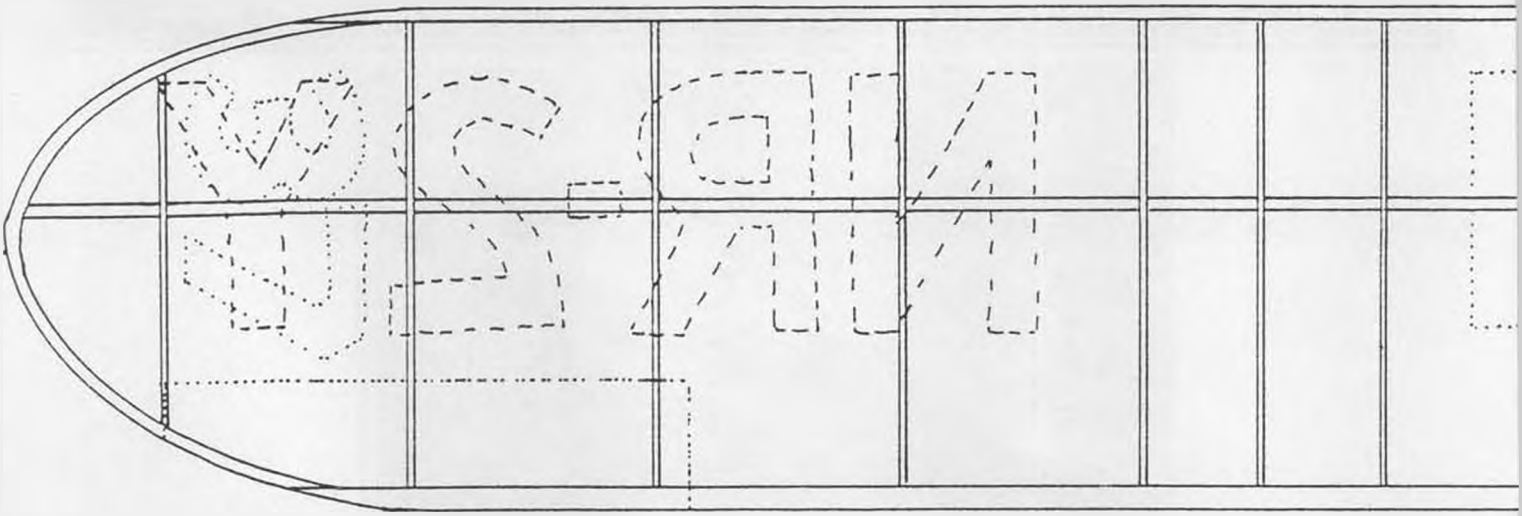
Close-up shows "cutaway" in cowl that was a field modification, apparently to improve cooling.

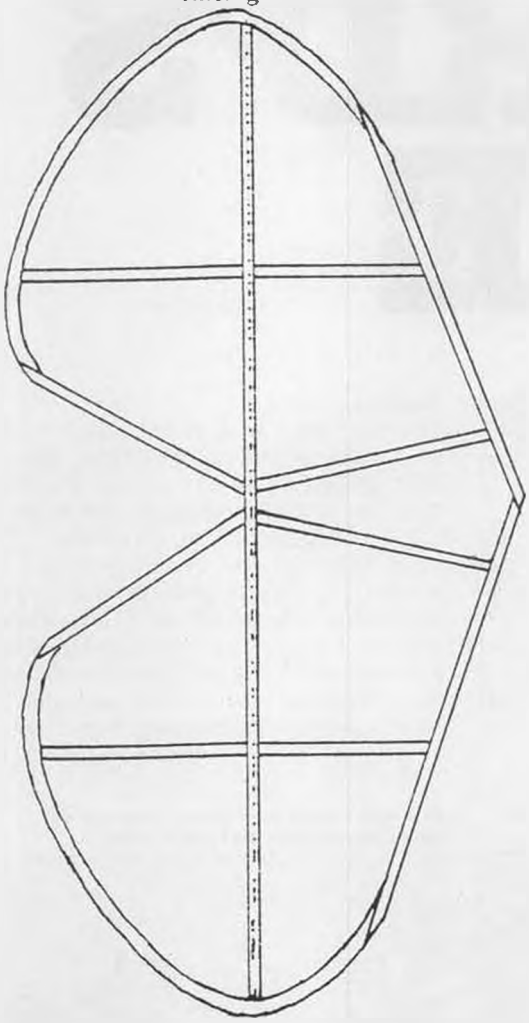
Flip-over photo showing landing gear. Original had flying wires to wing from wheel hub.

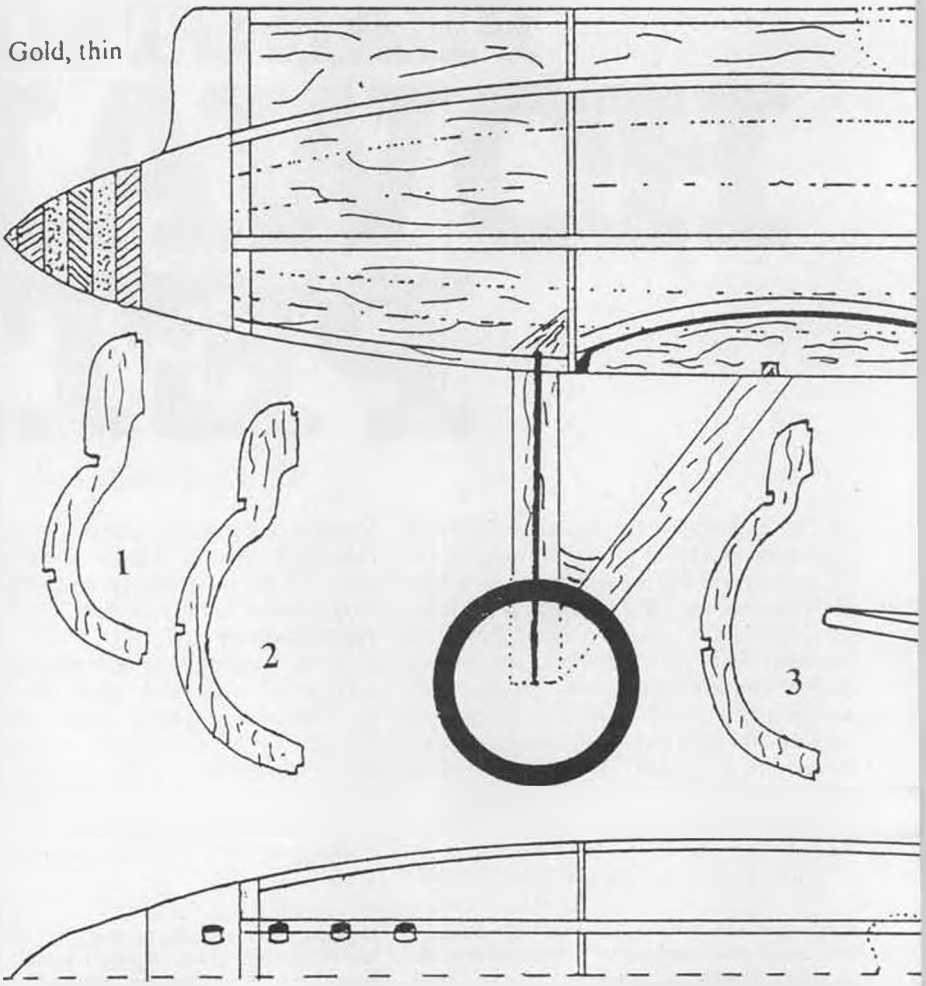


First ever Peanut Scale contest was won by Henry Struck, flying his Howard "Pete."



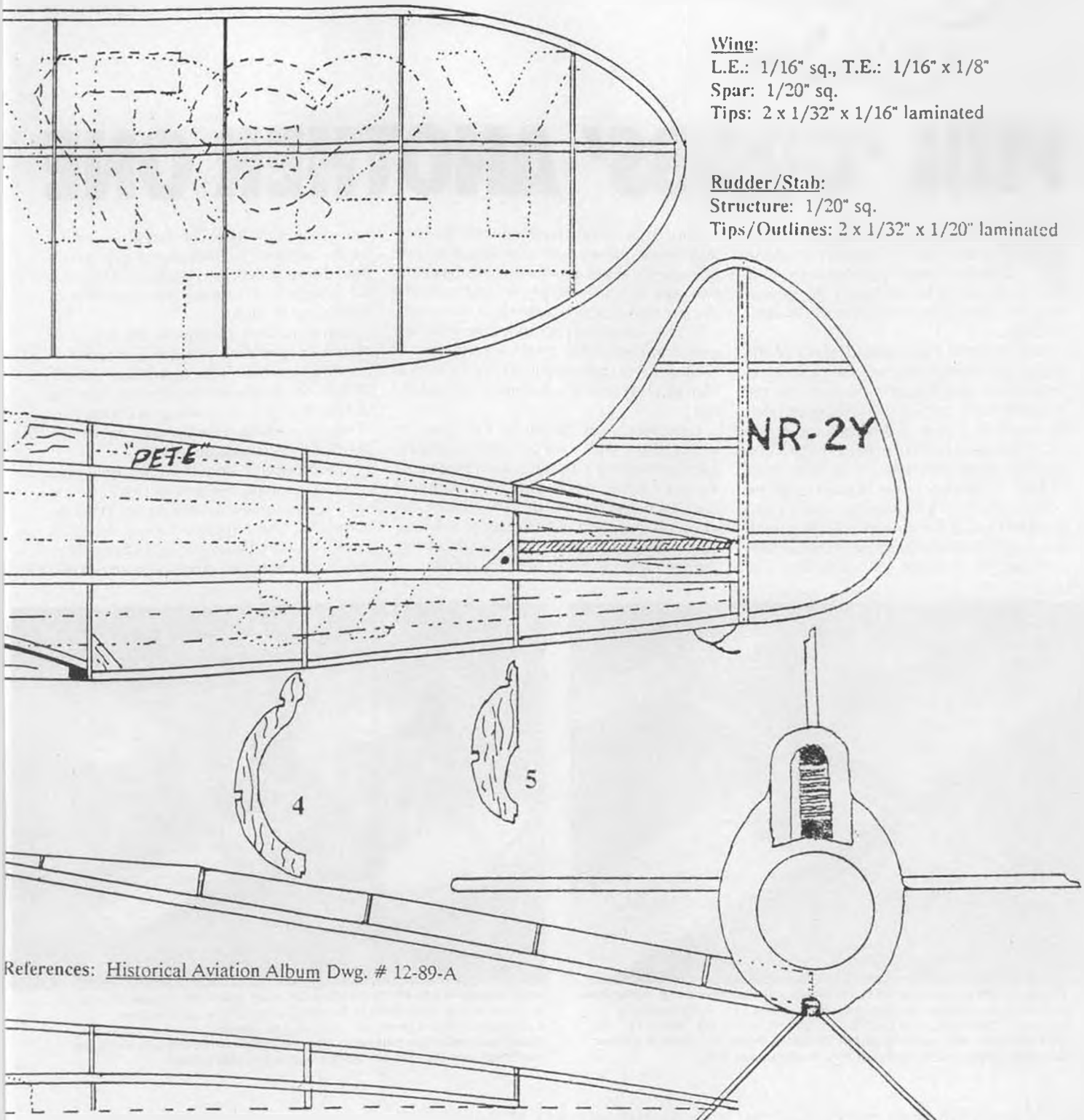
Color Scheme:
Aircraft: White
Reg. Numbers and "Pete" Logo: Gold, thin black outlines
Racing Numbers: Black





Fuselage:
Crutch and Main Stringer: 1/20" sq.
Aux. Stringers: 1/32" x 1/20"
Bulkheads: #1 = 1/16", # 2-5 = 1/32"
Sheet: 1/64" from B.H. #1 to B.H. # 2, Cowl/Turtledeck from B.H. #1 to B.H. #3

Flight Settings:
Wing: + 1°, Washout right pa
left panel (about 1/16" each).
Dihedral: 1" each panel.
Stab: - 1.5°
Rudder: Left 3-5°
Thrust: - 1.5°, right 1.5°
C.G.: 30%



Wing:
L.E.: 1/16" sq., T.E.: 1/16" x 1/8"
Spar: 1/20" sq.
Tips: 2 x 1/32" x 1/16" laminated

Rudder/Stab:
Structure: 1/20" sq.
Tips/Outlines: 2 x 1/32" x 1/20" laminated

References: Historical Aviation Album Dwg. # 12-89-A

l, washin

Miscellaneous:
Prop: 4.75" Peck, or 5.0"D, 8"P carved prop (see text)
L.G.: .020 music wire. Legs: 1/32" x 1/4" balsa. Wheels: 3 laminations 1/32", bush w/ 1/16" dowel.
Nose Block: Carve from balsa block

Howard DGA-3 "Pete"

Designed and Drawn by John Berryman

CONTROL LINE

BY JOHN THOMPSON

PHIL 'GRABS' ANOTHER ONE

Phil Granderson of Portland, Oregon, repeated as the winner of AMA Combat's most coveted prize June 30-July 1 by capturing the pewter mug that goes to the top gun at the Bladder Grabber.

Phil emerged from a field of 53 of the sport's top competitors at Harvey Field in Snohomish, Washington. In addition to the mug, Phil took home several thousand dollars worth of Carver stereo equipment. The first five fliers, in fact, collected some $15,000 worth of stereo gear donated by Bob Carver in this 15th running of the Bladder Grabber.

Pete Athans of Los Angeles, was second and Mel Lyne of Vancouver, B.C., was third. Fourth place went to past winner Mike Petri, and Page Peterson of Utah was fifth. The contest took place in warm, windless weather, with some 165 matches needed over the two days to determine the champions.

Two-time Nats winner Norm McFadden was the contest director and circle event director, running a smooth, trouble-free contest. Norm instituted the use of a center circle marshal whose job it was to keep the pilots together and to otherwise regulate their conduct in the center circle. Dave McFadden performed that service with the result that there were no significant flyaways and fewer planes lost due to collisions, because the event director outside the circle was able to watch the planes and instantly declare matches over when kills occurred.

In fact, about 80 percent of the matches ended in clean kills. It was a contest with relatively few collisions and crashes, with a high level of combat skill displayed throughout.

Equipment was similar to that used in recent years, with the Fox Combat Special Mk VI remaining as the engine of choice and the arrow-shaft boom airplanes predominant. However, several designs without the arrow shafts, using older boom or fuselage configurations, appeared to remain at the state of the art in terms of flying quality.

In the realm of safety, a few more fliers were noted using the .021 lines which have been suggested to reduce the chance of flyaways, though the legal .018 still remained most common.

A major advance in safety was heralded by the first efforts at designing a flyaway shutoff. Kelly Crozier of Vancouver, B.C., displayed a prototype shutoff triggered by loss of centrifugal force. Crozier's design, which was admittedly in the early design stages, used a tip weight to hold the fuel tubing pinch-off open. The shutoff was armed by the airspeed's removal of a clip which held the tip weight out on takeoff. Though a bit complex, it showed the feasibility of some kind of shutoff.

Some further design work by Will Naemura after the contest has resulted in another, much simpler centrifugal shutoff. Will is devoting considerable effort in the direction of prototype design with the idea of manufacturing it for use by control line combat fliers sometime in 1991.

The Naemura shutoff would bolt onto existing airplane designs and requires no significant airplane modifications. Working somewhat like a reverse racing shutoff, it would be armed by centrifugal force (with a weight swinging the pinch-off wire out of a notch) and would be triggered by the loss of centrifugal force.

We'll include a diagram or a photo in the column, along with information about the progress of design and manufacture, as soon as it is available.

The Bladder Grabber always is a model of combat contest organization and officiation. Naturally, a cadre of top-quality officials and helpers always is a key to that success. However, an organized approach to the paperwork also contributes.

Thanks to *MB* engine columnist Stu Richmond, the photos this month have an international flavor. Stu provided photos sent to hi m by modeling friends in Czechoslovakia and Poland. Shown here is the "Delfin 19," the 1989 precision aerobatics model of Vladaslav Trnka, who lives in Liberec, Czechoslovakia, and is that country's leading stunt flier.

Piotr Zawada is one of Poland's top C/L stunt pilots and also works with a group of young stunt fliers in Poznan. Pictured here are the three Kozlowski brothers (from left: Woytek, Jan, and Stach), who flew in the Polish Nats selection contest in May. Woytek finished 3rd with his Su-26 and Stach was 6th with his Spinks. Jan is a rocket builder.

While at the contest last year, we picked up a copy of the score sheet used to keep track of the results.

The scoreboard always has the usual multi-elimination index cards showing each flier's name and those of his opponents and the win or loss result.

Before the results get to the index cards, that and additional information about each match is ferried to the 5c0reboard-keepers on the ingenious score sheet.

There is one of the sheets—actually large cards—for each match. It shows the contestants' names and their streamer colors, who was first up, the air time in seconds, the cut score, the total score, a mark for a kill or forfeit, a mark for the winner and a space for comments or noteworthy anomalies.

• • •

You think you've got it bad, having to drive 15 minutes across town to your nearest hobby shop? Consider the plight of Ron Fredericks of Flyers Rock, N.T., Australia (great name for a model airplane flier's town!):

"I would appreciate your assistance on a couple of matters. First, to put you in the picture, I live in a small tourist resort (population 500) in the middle of the Outback and the nearest hobby shop is 1,000 miles away."

OK, everyone will quit complaining now about having to drive across town to the hobby shop. But Ron continues:

"1) I have been trying to locate plans or a kit for an old C/L stunter called the Thunderbird.

"2) I am contemplating attempting to break the world record for nonstop C/L flying and would like to know just what the record stands at and just how many fliers are allowed to share the flying.

"I figure on using a C/L version of the Multiplese `Big Lift' with Webra power and 100-foot lines for the record attempt. *(We're not sure of the spelling of the word Multiplese; had a little trouble with the handwriting—jt).*

"One advantage of living out here is the perfect year-round flying weather and no need for mufflers, although during summer with 120 degrees F and 2,000-foot height above sea level, recommended engine sizes have to be doubled to achieve respectable performances."

We'll try to at least partially answer Ron's questions.

1) It is a happy coincidence that we can supply the name of an excellent source of a number of fine C/L kits, including the Thunderbird. Tom Dixon, Suite 401, 1938 Peachtree Road, Atlanta, GA 30309, U.S.A., manufactures a replica of the old Veco kit, except that the differential flaps are omitted and a dural landing gear is added. The plans also contain notations for updating the plans to modern performance. The Thunderbird won the 1959 U.S. Nats! (By the way, thanks to Dennis Coleman of Covina, California, for pointing out that Tom Dixon has plans for the Smoothie, as well as the Thunderbird. Greg Smith of Salt Lake City had asked, as we reported in an earlier column, for sources of these old classic stunter plans.)

Tom Dixon also has kits for the Skylark, Dolphin, Ruffy and the 1952 Aldrich Nobler, along with Tom's modern Charisma stunter and others. He also has numerous plans, Bolly props, carbon fiber tuned pipes, Royal, Magnum and Fox engines, SST mufflers, and other items.

2) We're not sure whether there is an official record for the longest flight, but the longest documented single flight we are

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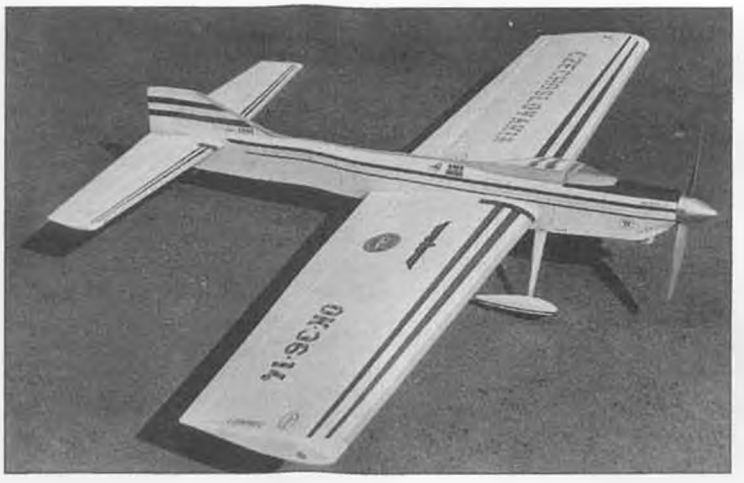
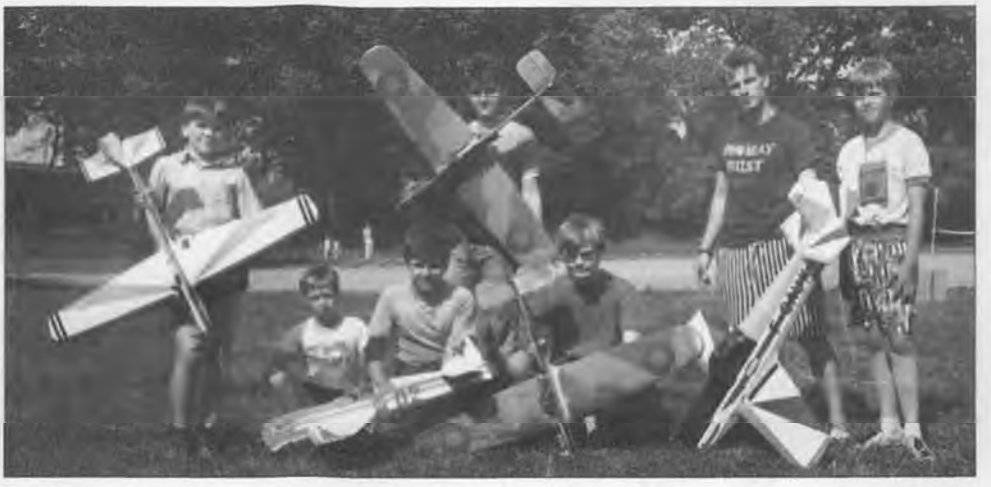


(Left) Vladaslav's 1990 P.A. model, the "Delfin 22," powered by a Merco .61. (Below) Here's Piotr's team in Wroclaw, Poland in May of 1990. They placed 1st as a team, 1st in juniors, and made a clean sweep of 1st through 4th in the boys division! Lots of talent here!



Here's one from the U.S.: Frank Macy, the head man at American Junior Manufacturing, Inc. in Portland, Oregon, is planning a big cel ebration in 1991 commemorating the approximate 50th anniversary of the blossoming of C/L flying. More details will be coming in a future column. Here's Frank at the 1989 Nats with a prototype of his Jim Walker Firecat kit, to be released soon.

CONTROL LINE *Continued from page 9*

stalled for clamping to your battery, and a machined aluminum cup with a groove for a starting belt as commonly used on inboard-engined boats and on some other models. Both of these new Hobbico starters are now available at your local hobby shop or through Great Planes Model Distributors, 1608 Interstate Dr., Champaign, IL 61820.

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In last month's issue, "All About Arts" columnist Art Steinberg talked about the "CoroStar 40," a low-wing sport RC model produced by a new company called U.S. AirCore. Art mentioned that in the CoroStar 40's case, ARF stands for Almost Ready to *Fold*, as the entire model is built of "AirCore," a sort of corrugated polypropylene plastic, a novel material that is supplied in flat, pre-cut sheets . . . all you have to do is bend and fold where indicated, and glue the seams.

Much of what Art had to say about the CoroStar 40 also applies to U.S. AirCore's second model, the "AirCore 40," a .40-.50 size high-wing trainer made of the same material and employing the company's exclusive "Power Cartridge" concept, whereby the engine, tank and radio are all mounted on a removable tray that can be quickly switched from one model to another. All parts for the AirCore 40 come predecorated, and since the Aircore material is naturally fuel-proof, no additional painting is necessary.

AirCore 40 kits are priced at $119.95, with shipments to hobby shops and major distributors due to start in October. For an information package ($3.00) and/or a VHS video describing their products, contact U.S. AirCore, 4576 Claire Chennault, Hangar 7, Dallas, TX 75248, or call them toll-free at 1-800-336-0602.

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One nifty new item that deserves a place in every tool box is the "SealSyringe" lubricant dispenser/applicator being marketed for modelers by the Southworth Corporation. What makes SealSyringes unique is their method of sealing; rather than just plug the applicator tip with a cap that can easily leak or fall off and get lost, the SealSyringe instead uses a two-piece body design with the applicator tube molded off-center in the end cap, which can rotate 180° on the syringe body. In the open position, the applicator tube lines up with an O-ringed hole in the syringe body, and the oil or whatever you have the syringe loaded with is free to flow. In the closed position, the hole and the tube no longer line up, and the rubber O-ring creates a 100% effective and reliable seal against air and dirt contamination. Simple, huh? A reusable storage package is also provided to keep the syringe clean while being stored in your tool box.

SealSyringes are available in 5cc and 12cc sizes, both with and without lubricants. The initial marketing emphasis is in the RC model car field, so look for them in that section of your local hobby shop. Right now, SealSyringes can be purchased empty or with either light oil or silicone grease; future plans include offering them filled with CA glue, anti-seize gun grease, caulking compounds, seal ants, dry lubricants, pipe joint compound, etc.

Empty SealSyringes list at only $1.99 and $2.29 for the 5cc and 12cc sizes respectively. Check them out at your local hobby shop. From the Southworth Corp., 1621 Collingwood Dr., San Diego, CA 92109; (619) 273-3844.

• • •

Last year's introduction of the fully assembled electric powered Honda VFR750R RC motorcycle by Royal Products proved to be such a hit that they've just released another, a Honda VFR400R, this one being offered as an unassembled kit but with the fairings and all exterior parts pre-painted in a striking silver/black/red scheme . . . all you need do is put it all together. The bike even comes with its own steering servo and an electronic speed control with brake, prewired for a Futaba J-Series receiver. Power is supplied by a geared Mabuchi motor with a final toothed belt drive to the rear wheel; optional hop-up parts are also available for those who want to go even faster.

We'd assume that both of Royal's bikes are basically the same, and if that's indeed the case, you can find out more about the mechanics of the new VFR400R and how it works by reviewing the articles on the VFR750R that appeared in the March and June 1990 issues of *MB's* sister publication, *R/C Model Cars*.

From Royal Products Corp., 790 W. Tennessee Ave., Denver, CO 80223-2875. ***MB***

RC SOARING *Continued from page 13*

what's good and what works, and he is not prone to exaggeration. He tends to be an objective observer. So, when he told me a lot of pilots were winning contests with a fantastic new sailplane called a "Phoenix" and that he owned one himself, I asked him to send me pictures.

Woody makes some pretty bold statements in his letter (so I hope I don't catch heat by repeating them here). "Bill, Here are several photos of my EZ Lota 1700 electric, along with two photos of my new Phoenix unlimited class sailplane. It spans 132 inches, weighs about 70 ounces. I believe it is a better airplane than the Windsong, Lovesong, or Falcon 880 (just to name a few). Now, if I can just learn to fly it as well as Agnew and others fly it . . .

"The designer of the Phoenix is Ed Berton, c/o Competition Products, 921 Birdie Way, Apollo Beach, Florida 33572, (813) 645-5171. The kit, incidentally, is very high quality, and includes full-size foam wing core saddles to accommodate trailing edge sheet overhang. . . . Regards W. S. Blanchard, Jr."

"Note: the Lota performed very satisfactorily with an 8X4.5 Graupner folding prop turned by the `kit' motor on seven cells."

Woody also enclosed several photos of his six-engined French Latecoere 631 flying boat from the mid-forties, which he modeled as an electric and flew in the AMA '90 Nats.

In a trio of previous conversations I had with Woody, Tom Gressman of Wisconsin, and Mark Nankivil of Missouri, I had heard how much they all liked the Phoenix and thought it was a HOT contest ship.

Woody's comments on the Lota were along the lines that it climbed out beautifully, thermalled very well, and handled great. Having flown one myself, I would agree. And it sure is nice to see another ARF that allows you to trim it in your favorite colors as Woody has done (compare the Phoenix colors to the Lota).

NATS REPORT '90 ALA NANKIVIL

Mark Nankivil of St. Louis sends us a glimpse or two into the goings-on at this year's AMA Nationals. Mark is an enthusiast of the first degree and has literally travelled the world in his enjoyment of our hobby.

Mark writes, ". . .The Nats were really quite good this year, thanks to the locals who made it happen, particularly Gilbert Gauger who was the C.D. for the soaring events. The AMA let him do his thing and pretty much stayed out of the way. The weather was fabulous until Friday and the Unlimited Class when a T-storm passed through the area and limited the day to two rounds.

"Dave Thornburg made it up from Albuquerque, New Mexico, and flew in the traditional events and in Hand Launch. In the HL event he flew a 50% reduction of the Bird of Time called the Birdy (no, not a BODST), and in Unlimited he flew a, you guessed it, Bird of Time with which he placed eighth. A most enjoyable man!

"Leon Kinckaid of Scooter fame was also there, as was a large Florida contingent. Ed Burton and Competition Models were very well represented with many Mariahs and a few Phoenixes flying. Enclosed are a variety of pix from the Nats which you can sort out as you see fit.

"I am going slope soaring in Kansas (I wouldn't have thought that was possible! bf) over the Labor Day weekend and bought a Sig Ninja to take with me. I've never really been true slope soaring, so I'm really looking forward to it.

"Enclosed are photos of my Silver Lining 2M which uses the SD7037. This airfoil performs extremely well with an excellent L/D and thermalling performance. This is easily the most accurate wing I've ever built, construction being of built-up type and fully sheeted. It was put together in a full size foam core bed.

"The first fuselage I built was not too hot when it came to proper moments and areas, but this second fuselage seems to be `spot on.' I'm going to build a second model with a polyhedral wing and spoilers for comparison, and then go on developing from there. I really loves (sic) this model!

"The Silver Lining 2M specs are: 78.75 in wingspan; 629 sq. in. wing area; flat center section with plug-in wing tips set at 14 degrees dihedral; 69.4 sq. in. stab area (11% of wing area); 48.5 sq. in. vertical stab area (7.7%); 27.5 inch tail moment (1/4 chord of wing to 1/4 chord of stab); 37 oz. flying weight; and rudder, elevator, flap control functions.

"Also included is a photo of Art and Dale Frost with their Allusion Standard Class ships. Art designed this `beaut' which uses a built-up and sheeted S3021 wing and a home brew 'glass fuselage. Nice!

". . . Take care and keep smiling! Good health and good lift, Mark."

I really appreciate editorial contributions like these; not just from Mark, but from anyone. No one person (namely me) can be everywhere and see everything there is in model soaring. When you share information like Mark and Woody have just done, the whole soaring community benefits. Thanks guys!

The airfoils Mark and Woody have mentioned are all found in Soartech No. 8: "Airfoils at Low Speeds," edited and published by Herk Stokely. It is available for $15 from Stokely, 1504 North Horseshoe Circle, Virginia Beach, VA 23451. Include $20 if you also wish Soartech 9 when it becomes available. If you have back issues of *Model Builder*, you could also look up these airfoils in my column as all of them have been featured over the years.

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Send information to Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330, (714) 245-1702 after 7 p.m. PST. ***MB***

AUTOGYRO *Continued from page 17*

The model is now ready to fly, and you should have no problems if you've followed directions. I recommend using a 9x6 propeller. The higher pitched propellers seem to give the desired thrust easier than the low-pitch propellers. Start the engine and adjust the needle valve to give a slightly rich top end. A super-low idle is not required because the model will descend at anything less than half power. Make all takeoffs and landings directly into the wind to insure that both rotors reach flying speed at the same time. Taxi downwind, turn around, and head the ship directly into the wind. Slowly advance the throttle and taxi until the rotors begin to turn quite rapidly . . . it won't take long. Now, open the throttle all the way and feed in some up. The model should rise off the ground and climb away smoothly. If one rotor seems to lift more than the other, and the model crabs slightly, reduce the amount of negative pitch in the weak rotor blades until the model flies on an even keel. Mine has flown so far out of trim that it appeared to be flying in a 10 mph crosswind all the time. Yet it was still manageable.

You will be surprised at the stability of this strange craft. It banks as if it has ailerons, yet returns to level flight as soon as the rudder is neutralized. It will fly rock-steady hands off.

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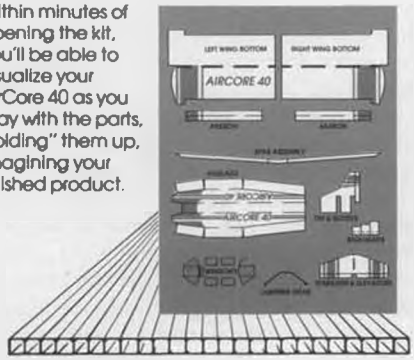

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It can be landed simply by reducing power and steering to the desired location, descending near vertically. It will fly along at a near 45 degree angle of attack at 10 mph It doesn't have the power to stunt, but it can make a 360 degree turn in almost its own length, while descending, and with practice you will be able to land it on the proverbial dime.

Now a word of caution. You will want to make all landings under power. If the engine quits, the model will autorotate down, however, forward speed is nil and it descends fairly rapidly. No damage will result unless, of course, the model lands on somebody or something. In this respect, it is very much like a helicopter and should be handled with respect when flown over and around crowds.

I hope that you have as much fun with your autogyro as I have had with mine. My dad and I have quite a time chasing each other through the sky with our two machines. They never cease to amaze new onlookers as to their flying ability.

I would appreciate hearing from others who have experimented with autogyros and would like pictures of this machine and other designs built by modelers. I will try to answer all questions. Write to me at 128 Lexington St., Taft, CA 93268, or in care of *Model Builder*.

FIRST ADDENDUM, NOV. 1977

The following is a list of changes and recommendations for the F-A 61 autogyro. The latest model I built used the specifications listed here, and the model "flew off the board," so I highly recommend their use. No structural changes are needed.

First, use the building sequence and especially the method of rotor adjustment, except as noted below.

Adjust the cone angle to give 2-1/4 inches of dihedral of each rotor blade tip. The pitch remains at -3 degrees. Now mount the rotors on the booms and shim the Cox cases to give a difference in height at the tips of the blades of 7-1/4 inches in the fore-aft position and 5-1/4 inches in the left-right position. Use the same method of adjustment as outlined in the original article, making sure that the centerline of the fuselage is parallel to the surface you're measuring from. Block up the wheels if necessary. The center of gravity is 1/4 inch behind that shown on the plans with the fuel tank empty. I use an O.S. .35 turning a Top-Flite 9x6 wood prop. The engine has 5 degrees down and 4 degrees right thrust.

If your model has a tipping tendency when on the ground, bend the main gear forward until there is very little weight on the nose wheel. Do all your test flying in dead-calm air, if possible, and make all takeoffs and landings straight into the wind. Once the rotors are set properly, don't be afraid to fiddle with the C.G., thrustline, or elevator incidence, as you would a conventional model when making final trim adjustments. Most importantly, keep it light. Mine weighs 3 lbs., 6 ozs. ready to fly.

SECOND ADDENDUM, MAY 1981

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Over the 10 years that Model Builder *has been published, one of the most popular construction articles presented, if full-size plans sales are any indication, was the thin-rotor autogyro based on the Focke-Achgelis F-A 61, as designed by Skip Ruff, of Taft, California. This unusual RC aircraft, which is quite easily built and uncomplicated to fly, has turned Skip into somewhat of an international figure. Modelers from all parts of the world have written to him to seek help in trimming the model and/or to relate their flying experiences.*

*Skip has some added notes:**

Dear Bill,

I have received letters from England, Ecuador, France, Germany, Canada, and Romania, plus all over the U.S. The letter from Germany was from Hanna Reitsch, the famed German test pilot of WW-II, who flew the real F-A 61. I sent her the issue with the construction article and she wrote to thank me and to say that she had sent the magazine on to Professor Focke, who was still alive at the time. I believe both are now dead.

Enclosed is a short article on what seems to be the most common problems builders are having with their gyros, as described in their letters, with what I believe to be possible solutions.

THE F-A 61 IN REVIEW

It has been just over six years since the article on the F-A 61 autogyro was published, and I still occasionally receive letters from builders who have constructed the model and are having problems with it. From all the mail I've received, I would have to say that the models all appear to be pretty much individualistic and require slightly different adjustments to make them fly properly. It is difficult to diagnose problems without actually observing them, but I have listed what seem to be the most numerous, according to my mail, with my recommendations.

1. Model will not takeoff. That is a simple problem, with several possible causes, but it has been a common one in my correspondence and usually there has not been much else included to provide a clue as to why. My first guess would be a lack of thrust, but any .29-.40 engine should fly the model if it is not overweight. An extremely nose-heavy model will certainly not leave the ground, but I believe most of the problem would lie with incorrect rotor angles. These should be checked and rechecked to make sure they correspond with the specifications shown in the follow-up article in the November 1977 issue of *Model Builder* and included with all plans sold since then. If any of the angles are incorrect, this may prevent the rotors from achieving the proper rpm.

2. Model lifts off, appears to stall, and descends tail-first to the ground. Clearly, this is an indication of tail-heaviness. When a model is tail-heavy, the elevator is required to carry part of the load. The autogyro will fly so slowly and at such a high angle of attack that, if tail-heavy, the elevator can actually stall and allow the tail to drop rapidly. If low, the model may not recover

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3/4" OLEO TRAVEL
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before striking the ground. If in doubt about your model, add noseweight. I might add that my latest gyro exhibited these same symptoms and required a C/G move approximately 1/2-inch ahead of that shown on the plans. Like I said, individualistic!

3. Tipsy ground handling. If field limitations or other reasons prevent you from taking off DIRECTLY into the wind, even the slightest breeze, I recommend waiting until conditions are better. Any crosswind will cause one rotor to speed up much sooner than the other, ending in a possible rollover. A good modification is to remove the nose gear, add a tail wheel, and move the main gear about 7 inches forward. In other words, make a tail-dragger out of it. This lowers the model and makes it much less tipsy, while increasing the ground angle for a faster rotor spin-up. Since it is only semi-scale, I don't think it will hurt the appearance too much.

4. I've had several reports, and a firsthand experience with another builder's model, of the rotor blades striking the booms while in flight. This usually happens in turbulence when the blades flex up and down. After making sure that the rotor hubs are not made out of material that is too thin or too soft, simply bend more cone angle into the blades. The cone angle is not critical to stability and is there mainly for clearance.

As I mentioned in the follow-up article, after checking to make sure that the rotors are adjusted as per the plans, don't be afraid to use the good old free-flight methods of altering the thrustline, C/G, and elevator incidence to achieve the proper flight trim.

The model flies pretty much like a 3-channel trainer (although slower), with one exception. Climbs and descents are controlled much more with throttle than elevator. Elevator control doesn't do much more than change the angle of attack, making the model fly somewhat slower or faster. In this respect, it is more akin to a helicopter. Also try to limit rudder throw to 3/4 inch or less (total) to prevent over-control.

My latest gyro has a K&B 40, conventional gear, and constant 2-inch chord rotor blades. It required the previously mentioned C/G change and a bit more side-thrust to fly properly.

RC PYLON *Continued from page 21*

year, probably because there was a World Championship coming up in Italy, and with the AMA Team Selection Race being scheduled for September, many of the fliers used the Nationals for a place to test out engines, planes, and theories.

Racing started early the next morning and once again, had to keep moving because this event also had only one day on the schedule. We had an international flavor added with three entries from Japan; Junichi Fujimoto, Yasuo Nomura, and Yoshikazu Sakurai, all from Osaka. None of them could speak English, but they did have an interpreter with them who could understand some of our language and they got by OK.

Heat one saw Jim Young, Jim Katz, and Fujimoto on the line with Katz the fastest in this heat. FAI utilizes a different scoring system than our other racing events as it is a race against the clock. Each contestant is timed individually and points are earned by converting seconds into points. For example; in heat one, Katz turned a 1:24.4 which converts to 84.4 points. The entire race is an accumulation of these points, with the worst score being dropped after four rounds and the winner being the flier accumulating the least number of points.

At the end of Round One, perennial FAI Champ, Dub Jett, was on top with 77.5 points and closely followed by the current FAI World Champ, Dave Shadel, with 78.2 points. Rounding out the top five were Rich Verano, Clark Wade, and Jim Katz.

Rich Verano moved into first after Round Two with a tight score of 155.6 points over Dub Jett's 155.7. Dave Shadel didn't finish his heat so he dropped to 11th place with Dave Doyle and Duane Gall, moving into the top five along with Verano, Jett, and Katz.

After Round Four, where the worst score is dropped, Shadel jumped back up to the top with a score of 225.9 points over Verano's 226.3, a difference of four tenths of a second!! Becoming obvious at this point was that no one was running away from the others, because the top five were only separated by 10.2 points and the top four by 3.5!

As the entries were lower in this event, we had time for a full seven rounds. Rich Verano moved back into first place after Round Five and stayed there the rest of the way. In the last round, Verano turned a new World Record time of 1:11 flat, bettering Dave Shadel's time by a few tenths of a second.

After the racing was completed, Rich Verano was declared the winner, with Dave Shadel second, Jim Katz third, Dub Jett fourth, and Mike Langlois fifth.

One more time we raced off to processing for the final racing event, Formula I. Entered were 49 entries, including the three guys from Japan who flew FAI along with another Japanese entry, Sadami Hara.

Since Form I was allocated two days, and we weren't sure of the weather outlook, racing started the same way as the other events with a pilots' meeting at 6 a.m. The first heat was off at 6:35 and racing moved along very well for the final two days. The dreaded first heat of Round One was staffed by Dave Martinelli, Dave Doyle, and Gary Schmidt with Doyle the winner. Unfortunately, Martinelli crashed and was out of the contest as he didn't have a back-up.

At the end of the round, the leader was (who else?), Dave Shadel, with Clark Wade, Bill Hager, Norm Johnson, Dave Layman, Fred French, Mike Langlois, Dickie Ritch, Dave Doyle, Chuck Wahl, Red Cranfil, Chip Hyde (Yup, the same guy who flies Pattern), and Japan's Sakurai, all winners in Round One. This number was soon greatly reduced because several of these people lost heats and at the end of Round Two there were only six people tied for first: Shadel, Hager, Wade,

Johnson, Doyle, and Hyde. Dave Shadel was continuing with his usual mastery by turning in heats of 1:14, 1:13, 1:10, and 1:14.

Dave Layman was also sticking with the leaders, being only two points down, and broke the kiss-of-death stigma usually attached to the "Best Finish" airplane by finishing the entire meet without any damage.

We completed four rounds on the first day and at the top was Dave Shadel, Clark Wade, and Chip Hyde, all with perfect scores. Day two started at 7 a.m. (the workers got to sleep in an hour), with Freddie French, Fog Tanner, and Jim Young on the line and Tanner the winner with French having bad luck by not starting.

At the round's end, the top changed considerably, with Dave Shadel not finishing (with a flameout), and Hyde losing to Bill Hager. This left Clark "Buckwheat" Wade all alone at the top and now it was time for nervous city, because there were still three rounds to complete. However, Clark, with Shadel calling, did what he had to do and finished strong.

In Rounds Five through Seven, Chip Hyde

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'90 DAYTON SPRING MASTERS CONTEST
1st FAI - Wayne Mann - X-Cell Long Ranger .60
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'90 MICHIGAN FAI CHAMPIONSHIPS
1st FAI - Wayne Mann - X-Cell Long Ranger .60
4th FAI - Doug Law - X-Cell .60
1st Intermediate - Mike Bantz - X-Cell
2nd Intermediate - Tom Erb - X-Cell
X-Cell dominates other makes by 2 to 1

'90 KINGS COMPETITION AND FUN FLY
1st Expert - Wayne Mann - X-Cell .60
2nd Expert - X-Cell .60
3rd Expert - X-Cell .60
1st Intermediate - X-Cell .60

'90 MICHIGAN FUN FLY
X-Cell dominates other makes by 2 to 1

'90 BURLINGTON, **NC** CONTEST
1st FAI - Wayne Mann - X-Cell Long Ranger .60
1st Intermediate - Jack Koontz - X-Cell .60
1st Novice - Steve Hodges - X-Cell
2nd Novice - Gary Whitford - X-Cell

'90 GREENWOOD, SC CHAMPIONSHIPS
1st FAI - Wayne Mann - X-Cell Long Ranger .60
4th FAI - Wes Suggs - X-Cell Long Ranger .60
1st Novice - Richard Mann - X-Cell .60
2nd Novice - X-Cell .60
3rd Novice - X-Cell .60

'90 1ST KYOSHO CHALLENGE - .30 SIZE HELIS
1st FAI - Cliff Hiatt - X-Cell .30
2nd FAI - Wayne Mann - X-Cell .30
4th FAI - Tim Schoonard - X-Cell .30
X-Cell dominates FAI class – even against Japanese factory teams!

FLASH! X-CELL SWEEPS '90 NATS

1st FAI - Cliff Hiatt
X-Cell .60

2nd FAI - Wayne Mann
X-Cell Long Ranger .60

4th FAI - Curtis Youngblood
X-Cell .60

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paid some of his dues by finishing second, third, and last with a double cut however, young Chip is a natural, and I'm certain his time will come if he sticks with it.

In the same rounds, Dave Layman, along with some consistent flying by Lyle Larson, Mike Helsel, Bill Hager, Mike Langlois, and Rich Verano, were all within striking distance. However, Clark Wade won all his heats but one, and finished the contest only one point down, which was better than any other entry . . . which was especially nice as he didn't have to flyoff with anyone.

There was a flyoff for second and third between Dave Layman and Lyle Larson, which Layman won after Larson cut, so the top three were finalized. Shadel and Helsel were tied for fourth and fifth but decided to forego flying off, so Shadel was put in fourth with a faster time. The final flyoff was for sixth and seventh between Bill Hager and Rich Verano, which Hager won, and the 1990 Nationals were completed for R/C Pylon.

At the end, during the trophy presentation, we finally got some rain, which only lasted a short time, however, there was no sign of any up until then. Racing went very well, with the wind out of the south for six straight days of racing (no course changes). The workers, many who had never even seen a pylon race before the Nats, did an outstanding job, with the proof being the last four straight days without one re-fly.

By the number of compliments received, and from a personal point, this was one of the best Nationals ever for entry numbers, least number of problems, very stiff competition, and weather. The site was excellent and the contestants' manners were exemplary. There is always a complaint about something, but with the level of competition, we expect it and do not take anything personally. The starter and I have met some great people around the world, all who are into racing those funny little airplanes and can't wait to do it again.

Congratulations again, to the 1990 AMA

Nationals Champions: Craig Grunkemeyer in Quickie 500; Paul Benezra in Quarter Midget; Rich Verano in F3D; and Clark Wade in Form I. ***MB***

BIG BIRDS *Continued from page 23*

do not support other fly-ins.

On August 11-12 the Oregon State Miniature Aircraft Squadron #1 hosted their 9th Annual Fly-in. It's always a pleasure to visit the folks at O.M.A.S. They have an outstanding flying site in an orchard next to an irrigation lake, so you can fly from the paved runway or from the water. And the shady area around the clubhouse is most welcome when the temperature soars into the 100s.

Bill Ensley had the most airplanes this year. His fleet included a Storch, a P-6E, a Bristol Bulldog, and a Stuka. Bill is a dentist and he must have some very happy patients because his bridges receive the same care and attention that his planes do.

Unfortunately, Bill lost his P-6E when the nylon bolts securing the upper wing failed. Bill's pilot, Jim Sharp, managed to kill the engine before the fuselage plunged into the lake, so the engine suffered little damage. A couple of trout, however, weren't so lucky.

On August 18 the Lesser Seattle Giant Aero Squadron held Part II of their fly-in season. This group has their first one-day fly-in in April and then hosts another one-day affair in August. Everyone seems to have bad a great time and, best of all, 30 Big Birds flew hard all day with nary a crash or even a broken prop.

Len Bosman came down from Canada to fly his 32-pound Lancaster bomber. He flew this Quadra-powered bird a number of times and put on a fine show. He has engines in the inboard nacelles only; the two outboard props just freewheel.

Over the years Len has been a very prolific designer and builder. He also has plans for a Westland Lysander in 1/5 and 1/7 scale, an Interstate Cadet, Fleet Pinch (my favorite), WACO YMP-3, Ryan PT-16, Smith Miniplane, and Boeing F4B-3. These were all designed for the Quadra or equivalent. I've seen all these birds fly and they're pilot friendly. If you'd like a set of his plans for a winter project, write to: Len Bosman, 193 Baltic Street, Coquitlam, B.C., Canada V3K 5G9. Tell the old Dutchman that Bruce Edwards says he does good work.

Every plane was safety inspected and out of 30 aircraft, eight were found to have no keepers on their clevises. Nobody grumbled about having to put keepers on and most of the pilots realized that the inspection was helping to keep their birds in one piece.

BIG BIRD MISCELLANEA

Al and I have received some good reviews about our Humongous Sage Hen trainer that was presented in the May '89 issue of *MB*. Several fellows just couldn't stand the Hen's squareness and spent some time rounding off corners and dressing her up. As we pointed out in the construction article, we left her a "Plane Jane" so beginners would have a quick and easier time building. If your current trainer has proven to be less than satisfactory, try a Sage Hen. Plans #5891 are available from *MB* Plans Service.

• • •

I use soft mounts in my Big Bee and I believe that they're particularly good for multi-cylinder engines. Full-scale aircraft use a system called "Dyna-Focal" mount-

ing. This system points the center line of the mounts at the center of gravity of the engine. There's no doubt that my Saito runs smoother when soft-mounted.

I also like the Lord type mounts where the bolts are separately vulcanized into the rubber.

I use six one-inch diameter mounts with 1/4-20 threads on my Saito 270 and 300 twins, and eight mounts on my Zenoah G-38. I'm convinced that soft mounts help reduce the noise level and also protect the airframe and radio from vibration.

Here's the rule of thumb I use: Six mounts on twins up to 3 cubic inches and at least eight mounts on single cylinder engines up to 3 cubic inches. Anything larger would require more mounts.

• • •

Traveling around the Northwest to various fly-ins enables me to meet many other fliers, share ideas and to observe the progress of Giant Scale in our area.

It seems that although we don't have the number of Big models found in the midwest and in California, we do have good quality planes and pilots. Some fly-ins don't have airworthiness inspections, but where these inspections are performed regularly, there definitely seems to be fewer crashes and accidents.

If you haven't done so, why not attend a Big Bird Fly-In or two next summer? You're in for a great experience and the chance to meet some mighty friendly folks who are more than happy to share their ideas with you.

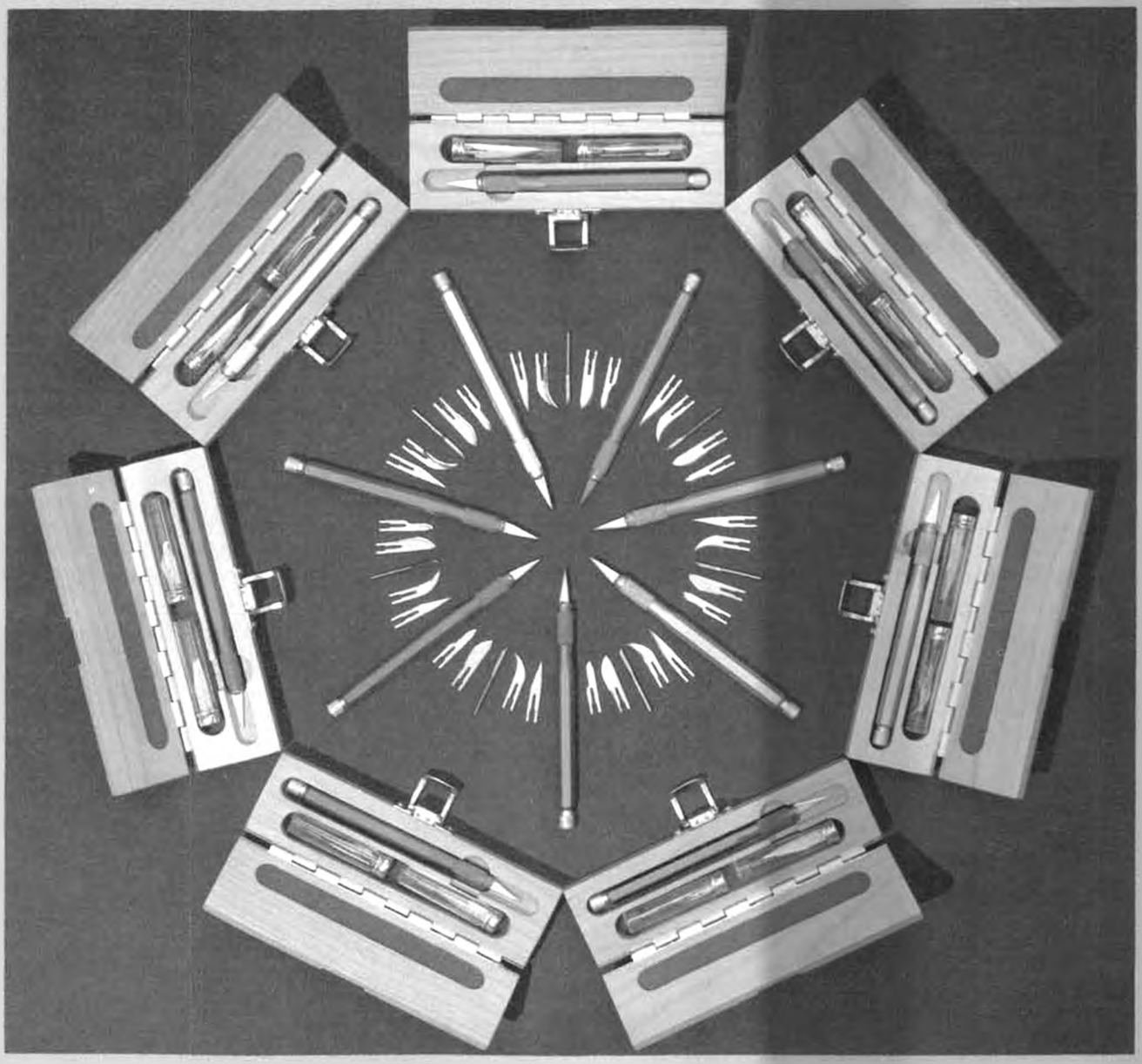
And finally, till Big Al asks for some more paper and ink from me, *fly safely!* ***MB***

POWER *Continued from page 25*

only turns quite easy. The turns with this type of wing are very flat—an advantage with solar models, where you want to keep the wings to the sun. The wing contains 1000 single crystal silicon solar cells, at a cost of about $1200. Again, Erich's skill showed; all those cells were wired together so well that they looked like a continuous sheet. The plane weighed 5.8 lbs. ready to fly. The wing is 1440 sq. in., span 100 inches. The motor is a Geist 30 with a Geist gearbox and Geist folding prop. The power at maximum sunlight is 12 volts at 10 amps (120 watts), which is about equivalent to seven cells at 20 amperes if using NiCds. Congratulations, Erich, for a very fine solar plane. Its performance is very convincing proof that pure solar flies very well and is indeed quite practical.

The more I look at this plane, the more I'm convinced that the Olympic II kitted by Airtronics would make a good solar design. I would lighten the Oly. This can be done by using one size smaller square stock for the stabilizer and fin, and using a 3/32 sheet balsa fuselage or doing the "Swiss cheese" routine on the ply fuselage supplied. I would reduce the dihedral to almost flat, and use angled tips.

IN THE BEST CIRCLES, IT'S **über skiver**



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The part that does the most to discourage solar flight is the cost; not many of us are ready to spend $1200 on solar cells. However, the June 1990 issue of *Popular Science* describes polycrystalline cells for $4 for a 4x4-inch cell which is claimed to produce .46 volt at 2 amperes in full sunlight. I have ordered one to see if these claims hold up. The company is Integral Energy Systems, 105B Argail Way, Nevada City, CA 95959; (916) 265-8441. They also sell a booklet, "Build Your Own Solar-Electric Panel," for $3.95, which is well worth purchasing according to the *Popular Science* article. At any rate, it would take 130 of these cells to produce 120 watts, at a total cost of $520. That is still a lot of money, but within reach. Now that I have seen the Solarmax perform, my feeling is that 120 watts will give you very solid performance under a wide variety of weather conditions.

Solar cells come in two types, as you may have already guessed. The older style is the single crystal type, sliced from a silicon block. This makes it expensive. It is also the more efficient type. These cells are fragile, like thin glass, and are usually interconnected by thin wires. The newer type of solar cell is the polycrystalline (sometimes called "amorphous," though that is not really correct). With these, the silicon layer is grown on a conductive sheet. I do not know what the sheet is made of; Ovonics markets these cells grown on stainless steel, I believe. These cells are tougher and take more abuse. They have been steadily improving in efficiency, and are now closer to the level of the single crystal solar cells. They are also cheaper—roughly half the price of single crystal. Another nice feature is that they are easily interconnected by flat ribbon wire, which makes wiring much easier. They are popular in portable panels sold for RVs and boats for charging 12-volt batteries. They sure make nice looking panels. The local RV store here in Wiesbaden, Germany has them. They get expensive when the labor, frame, and glass are added; 55 watts costs about $550. My ultimate dream would be a man carrying (me!) solar powered cub style ultralight plane on floats. Crazy, right?

Well, enough of being sunstruck, there was also an electric pattern event at Weilmunster. There were seven tasks for the pattern planes: 1) Two-loops; 2) Cuban Eight; 3) Square Loop; 4) Two Fast Rolls; 5) Double Immelmann; 6) Slow Roll; 7) Four-Second Inverted Flight. There were no landing points. Three flights were allowed, the two best counted. There were nine entries. Two planes impressed me as being outstanding. The "Pink Panther," designed and built by Jens Bartels, was lovely to look at on the ground and in the air. It did all the maneuvers with ease, fast and smoothly. I was startled when Jens told me it uses only 14 sub-C cells. It flew so well in the windy conditions that I had assumed it was in the 18-21 cell bracket (Astro 40 size). The Graupner 1600 motor turns a 10x8 prop at 10,000 rpm, drawing 33 amperes. The flying weight is 5.3 lbs. It is all balsa, with a styrofoam top deck. I forgot to ask the span or area—I think it is about 52-inch span. There are no plans available; I strongly suggested that Jens publish it. Jens placed third in the competition.

The other plane that really impressedme is the "Firefly." There were several entered and they turned in excellent performances. Herr Schussler placed second with his, using a Geist 6.28 cobalt motor turning a 10x6 prop on 21 sub-C cells. The Firefly is commercially available from SN-Models, Serge Natanek, Nettegasse 44, 5024 Pulheim 3, Germany. The price is 235 DM (about $145). Span is 57 inches, flying weight 4.4-5.5 lbs. The fuselage is fiberglass, the wing is obechi covered foam. This plane likes power; I have seen it fly with both 14 cells and with 21 cells. With 21 cells it is a very capable and strong pattern flier. With 14 cells it is a reasonable sport plane, but not at the pattern level of performance. The Firefly is new on the market. I expect to see it become quite popular here, especially for pattern competition.

Last, but not least, I wish to say that I appreciate the Weilmunster Club. They sponsor and encourage some really unique electric events. Their hospitality and friendliness was outstanding, and so was the great food and goodies at the refreshment stand!

Many of us camped overnight at the field; it is a lovely place to stay, on a hilltop with lush forests and pasture all around. My little boy, Andrew (four years old), had a ball playing with the other kids, flying paper airplanes and his mini-kite. He loves camping!

Mitch Poling, 7100 CSW/MC, Box 734 PSC 2, APO NY 09220-5300, or if in Europe: Normannenweg 20, 6200 Wiesbaden-Biebrich, Germany. Fly with the sun, fly electric! ***MB***

JET TRAILS *Continued from page 29*

Jean-Guy Rochefort, of Hawksebury, Ontario, brought two scratch-built planes. Jean's language is French, and he did not speak very good English, so a friend translated for him. Using plastic model kits for measurement, he produced an F-104 Starfighter and an F9F Panther. Both planes featured fixed gear, wood and foam construction, power by Rossi 81 fans, and MonoKote covering. The F-104 weighs 11 lbs., is 84 inches long and has a 42-inch wing span, while the F9F weighs in at 9 lbs. Jean used a very unique method of attaching the wing tip tanks. A wooden tongue is mounted on the tank and slips into a grooved cut in the wingtip. The tank is held in place by a velcro strap which is attached to the bottom of the wing tip. When I first saw the F-104, I thought, "No way is that skinny little wing going to lift that plane!" To my amazement it flew quite well. After the day's flying, both planes were broken down into several pieces and carefully packed into a small station wagon for the trip home. A very neat operation.

Another very nice scratch-built plane with an interesting solution to a perplexing problem, was brought by Martin Lefebure, of Quebec City, Canada. (Again, he did not speak English so his buddy translated.) His Canadian Snowbirds CT-114 Tutor was fantastic. Because the scale intakes of the Tutor are very small, it is difficult to provide the fan with sufficient air for proper operation. Martin got around this by installing blow-in doors. The cockpit wind screens are spring loaded to blow in upon demand for additional air input to the fan. They snap shut when not needed.

The fuselage is fiberglass and the wing is balsa covered foam core. It uses a single Byron/Rossi 81 fan and weighs 11-1/4 pounds. With the advent of the blow-in doors, grass field operation is possible. The plane flew quite well and was stable and responsive. Martin plans to make it a kit in the future. As nice as it flies, he should sell a lot of them.

Also scheduled to become a kit next year, is John Carlson's huge Mig 29 Fulcrum. This menacing looking monster has a projected weight of 31 pounds. It uses a pair of Byron/O.S. 91 fans and is of fiberglass and foam construction. It is eight feet three inches long and has a seven-foot wing span. The estimated cost of the kit is between $500 and $700. Another of John's projects is a Saab J-29 "Tunnan," which is Swedish for 'barrel.' Look at the picture, guys. The name fits! This stubby little plane is only 51 inches long with a 56 inch wingspan. It is also one of those planes that makes you wonder if it can possibly fly. Although it has not flown yet, it should be interesting in the air. After seeing some strange things fly at this show, I have no doubt that it will.

Rounding out the scratch-built planes is Ken Rawlins HE-162 Heinkle. Built from plans, it uses a Turbax 1 and a Supertiger X-40 engine with Mac Wizzard pipe. I hadn't seen one of these planes in years and I was pleased to see it fly. It handled quite well in spite of weighing 8-3/4 pounds. The generous wing area is the reason it flies so well. Although the Supertiger X-40 is not considered a ducted fan engine, it obviously can do the job. One of my first jets years ago used this same system.

Because there were so many kit-built planes, I will only mention some of the more interesting ones. One of the nicest and most scale looking Reagle Eagles I have ever seen belonged to Rich Eggleston, of Battle Creek, Michigan (Yes, where they make all the breakfast cereal). This is one plane I'd like to find in my box of cereal! Rich extensively modified his kit with lots of scale detailing,

to produce a very scale Reagle Eagle. Despite this, it only weighs 10 pounds. Using a Vyron/O.S.77 fan it flew very well. Rich used a two-tone paint scheme just like the real F-15s stationed at Bitburg Airbase in Germany. Nice job, Rich!

I have seen several Byron F-18s fly and their performance was just average. This was not the case, however, with Marcel Lahaie's Byron Hornet. He performed an extensive weight reduction campaign on his black and gold NASA Hornet, which included a set of modified Spring Air retracts instead of the Byron scale units. This all added up to a plane that weighed only 15 pounds and flew very well. It must have been his pride and joy, because all weekend long, when he was not flying, he was polishing it!

There were three Yellow F-14 Tomcats at the show, two were brought by Jack Tse and one belonged to Dennis Crooks, of Big Rock, Illinois. These large complex machines were very impressive to watch and always pleased the crowd. The thing that impressed me the most were the takeoffs. Many times they would eat up about 400 feet of runway and then majestically lift off. But Dennis decided to show that it could take off quickly. He taxied into position, locked the brakes and began to run up the power. Once both engines were screaming, he released the brakes, and the plane only rolled about 150 feet and lifted off. I was surprised to see such a large beast take off in such a short distance.

By mid-afternoon on Sunday, a lot of the participants had opted to beat the heat and traffic by heading for home. So the flying schedule became more open and relaxed. This produced some really great flying. Dan Fish and Bob Fiorenze put on a fabulous show. Dan was flying a gray Starfire and Bob was flying a camouflaged Yellow F-4. When an impromptu catch-me-if-you-can broke out, Dan's Starfire lead the charge, playing the part of a Mig, followed by Bob's F-4 maneuvering for position to get a shot in. This lead to some casual formation style flying with high speed, low, side-by-side flybys as well as close proximity acrobatics. They really had a ball.

Shortly after Dan and Bob finished flying, it was time for us to leave for home. On our way, we stopped for customs. The inspector took one look at the planes in the back and said, "Let me guess, you were at the Quinte fan fly." He was a fellow flyer! Small world!

So, when the cool north winds start to blow and your thumbs start twitching, do what I do, head for the great white north.

Till next time, keep your gear up, your burners lit, and watch your six. ***MB***

STRATUS *Continued from page 31*

a flat sheet. The cut line is about an eighth of an inch above the flat (if you can find it), and difficult to cut straight. They then slip over the ends of the surfaces, which have been covered with a narrow strip of double-stick film. The darn film grabs the tip as soon as you try to slip it into place . . . glue would actually serve better, but quick and . . er . . easy is the name of the game. And when they're installed, they don't blend into the surface, but stick out all around . . . like a cap. For such a nice looking aircraft that it is, a little extra time gluing, shaping, and painting balsa tips on the Stratus would be a very satisfying improvement.

Ream out the holes in the control horns just a little. The clevis pins fit, but are very tight and will bind just enough to slow servo movement and increase battery drain.

Once the canopy is trimmed to fit, you are instructed to apply decal material around the edge. The pattern is printed on the decal sheet. You cut it out, apply it, and trim off the excess. But this stuff is real tacky, and it just ain't that easy to get it on right the first time. The following trick works well for any trim installation, gets it on reasonably straight, and helps to avoid bubbles that get trapped in the wider areas. When you're ready to apply the decal, make a fold about in the middle of the long dimension of the decal, with the backing on the outside. When you open it out again, you'll find the film has separated from the backing along the fold. Insert a scissor blade at this point and cut the backing in half. MAKE SURE THE SCISSORS CUT THE BACKING, NOT THE FILM! Now locate the decal exactly where you want it, hold one half from the cut firmly in place, and start peeling and sticking the other half. As you rub the strip down with your finger, you'll find the backing peeling off automatically as you go along. Holding your tongue in exactly the right spot in your cheek while doing this is a great help! Once the first half is down, go back to the middle and start peeling and rubbing the other half into place. Believe it or not, we learned this trick years ago from reading the instructions on the back of a sheet of Contact shelf paper, before MonoKote came along!

The balance point specified has a range limit of 5mm, or less than a 1/4 inch. Mark these limits on the outside of the fuselage sides just down from the wing saddle and cover them with clear tape so they won't rub off. Having your model balance properly cannot be overemphasized. It amazes this writer how many seemingly experienced radio modelers ignore this cardinal rule and blame poor model performance on the radio. A little time learning to trim a free flight model should be an essential part of every RCer's flying experience.

That concludes our notes on the assembly of the Stratus 2000. As we said at the outset, this is a fine aircraft for an RCer's first try at electric powered flying, but not for a raw beginner to modeling. It is a high performance sailplane, and with its thin airfoil and high wing loading resulting from the electric

power system, it has a faster flying speed than the average novice RC flier can safely handle. At this point in time, we have only had the opportunity for a few evening test flights at a local high school athletic field in a heavily congested residential area (which would be totally off limits to glow engine powered aircraft). Consequently, we can't really comment on the aircraft's true performance in daytime air with more possibilities of available lift. Watch our "Workbench" column for a follow-up report. **MB**

ECLIPSE *Continued from page 33*

fuselage formers are furnished for use of either the Leisure or an AL-TEC gearbox—your choice if you opt for the Standard kit. For battery power, Airtronics recommends a seven-cell 800 mAH pack.

The removable wing outer sections are attached with the time proven rod-and-tube arrangement at the front spar, and an aligning dowel at the back. The whole assembly is easy to install and align, following the instructions included in the manual. Subsequent assembly is easy and positive and completely problem-free during flight.

The instructions also lead you to the proper point at which to install the outer sleeves for the plastic pushrods, the time being when the fuselage rear top balsa covering has not yet been added. I prefer to run my receiver antennas internally, at least as long as the fuselage length will permit, and this is also the proper point at which to install an antenna tube. Any lightweight plastic tubing will do. You can even CA enough small drinking straws together to do the job, or use the inner portion from a plastic pushrod, such as the one marketed by Su-Pr-Line Products as its "An-Tenna-Tube." On my Eclipse, it runs along the left bottom corner of the fuselage, from the point of the suggested location for the receiver, exiting at the rear at the bottom of the fuselage and subsequently right under the rudder. There is about a foot of receiver antenna trailing along back of the airplane, but it is less bothersome and less liable to get in the way during a launch than an external antenna back to the top of the rudder.

If you have any doubts about the radio system operating properly with such an antenna installation, forget them. Forget them, that is, unless you are one of those diehards who insists on flying with twenty-year-old or $59 radios. All modern quality radios will work fine in this and similar installations. In actuality, the non-conductive materials from which the fuselage is assembled do not even exist as far as the radio signal is concerned.

The only other deviation I made from the plans or instructions was in the cooling opening on the top hatch, as suggested by Airtronics in an addendum. Originally, it is an inverted triangular shape, being made of three 1/2-inch holes which are then joined by knife cuts. Now, the top hatch is made of 1/2-inch balsa, which is impossible to drill

clean. The answer is hole saws, which are available from 1/2-inch up—my largest one is four inches. Anyway, in this case, I made a 1/2-inch opening at the front, a one-incher at the back, and cut between them for a clean, neat opening without any rough edges at all. These hole saws are not expensive, have many uses and are a worthwhile addition to anyone's model tool collection.

The radio equipment requirements of the Airtronics Eclipse are not critical; any common three (or more) channel system will do the job fine. The only consideration is the normal one of weight; any model of this type is going to perform better at less gross weight. My choice was my much flown, 100% reliable Airtronics Module Series, now updated with a 92784 (53MHz) receiver. My servos of choice were Novak Electronics' latest NES-1A, being the smallest that I owned not already in use in something else, and also proven completely dependable. Having had no servos at all on hand, I would have chosen the Airtronics No. 94831 Ball Bearing Mini Servo, though I know of an Eclipse locally that is flying on the even smaller No. 94501 Microlite Servo. A good companion power source is the No. 95006 425 mAH capacity battery.

Assuming that you follow instructions and build a properly aligned airplane, and have adjusted the control throws as instructed, flying the Airtronics Eclipse will present absolutely no surprises. It is perfectly stable, both in straight flight and in the turns, requiring no more than normal glider techniques for the graceful flight to be expected from a design of this type. No tricks, no high pressure; simply flight for the sake of flight. Love it!

The rather tame Mabuchi motor furnished with the Deluxe Eclipse kit is adequate to power it to thermal seeking altitude, though naturally, the flight time after that depends on the experience and skill of the flyer, conditions at the time, and let's be honest, a little luck. The first improvement to be considered to the Eclipse is a better motor, such as the Cobalt 05 Geared Motor, No. 6605G, from Astro Flight, Inc. With the additional available power in the nose, it'll take a lot less time to reach thermal altitude, thus leaving enough battery time for another climb to altitude when it becomes necessary.

Additional Astro Flight products to consider for future high performance updates is the 4032 Micro Switch Motor On-Off Control, and the all-electronic No.4023 On-Off Control. This latter servo-sized device is simply plugged into the receiver and between the battery and motor; providing fully automatic nonproportional motor control without any mechanical adjustments. The power handling capacity of this control is rated by Astro Flight to be 30 amperes—certainly more than enough for this application and even for up to 40 size cobalt motors. There are certainly many proportional electronic speed controls available capable of handling the power requirements, but I really don't see any advantage to one in

this or any similar applications. The concept of the Eclipse and all models of this type is to get to altitude as soon as possible and hunt up some thermal activity—there will seldom come a time when you'll want to cruise around at reduced power. Stick to the On-Off type of control.

One newly available item definitely worth looking for use in your Eclipse, instead of the 800 mAH capacity cells mentioned earlier, are Sanyo's AE cells—the same size as the older 800 mAH ARs, but now boasting an increased 1200 mAH capacity. Just what the doctor ordered, and nothing different required in the way of charging equipment. These cells are available individually, at $4.10 each, and probably in seven cell packs by the time you are reading this, from: Cermark Electronic & Model Supply, 107 Edward Ave., Fullerton, CA 92633; (714)680-5888.

The RC hobby is now definitely divided into two classes of folks: those who enjoy the building, and those who see it only as a necessary evil so they can fly. As I mentioned, I thoroughly enjoyed this building project; if you are one of us, and also enjoy the flying, why, the Airtronics Eclipse is simply going to double your pleasure! **MB**

INSIDE *Continued from page 35*

styles of construction are simply the *best in the world*! When one doesn't seem to work to my satisfaction in a particular engine, the other one *always* does!

As this month's engine came without a glow plug, I installed a K&B #4520 with the welded-on idle bar. It's lasted through all the break-in and testing and is still running while the engine sport flies in a Great Planes PT-20.

The O.S. Max 25SF's steel cylinder is electroless nickel plated. Its cylinder walls are .042-inch thick and the cylinder is an easy no-heat slip fit into the crankcase. The cylinder's bottom inside diameter measures .707 inch and the top measures .705 inch; this indicates the modern slight internal taper that's usually found only in today's ABC engines. You cannot push this engine's piston up and out the top of its cylinder like in the old days. The cold piston gently starts to bind in its cold cylinder just after the normal top dead center position. This fit maximizes the piston-to-cylinder fit as combustion starts, to minimize leakage and enhance power.

Exhaust timing measured 143 degrees; not pipe timed but good on fuel economy. The stroke measured .630 inch and the displacement computed to be .247 cubic inch. The compression ratio calculated to 10.2:1 (on the high side) and this showed up as the engine tended to kick back a lot during initial break-in starts. The rubber hose I use for a chicken stick was cut a bit by the 8x4 break-in prop! The wrist pin is .155 inch outside diameter, is hollow, and carries two Teflon anti-scuff pads. The cast iron piston is machined on *every* surface . . . its skirt or lower section is only .015 inch thick. The piston's outer walls are ground so well and so shiny that it's hard to believe it is a cast iron surface.

Quite cleverly, the connecting rod is cut or sliced from an aluminum extrusion bushed at both ends, and the bottom socket that gets so very much motion usage has two .050-inch drilled lubrication holes; one is a bit forward and the other is a bit rearward. In short, this rod is essentially made from barstock and no cast rod normally can be as strong. The rod's minimum cross section measures .120x.235 inch near the top socket. Alsop the finished rod is mirror-buffed like a fine piece of sterling jewelry. The combined weight of the .25's piston/rod assembly is 12 grams (28 grams = 1 ounce).

The front ball bearing is shielded against dirt entry and is lubed by a tiny channel that shows in one of the photos. The crankcase casting has the bottom of the mounting lugs lightly milled to trueness. The crankcase is a terrific example of premier die casting quality.

The crankshaft's journal is .468 inch outside diameter and the hollow fuel/air passage is .330 inch inside diameter. The shaft is all one piece and weighs 43-1/2 grams . . . about 20 percent of the engine's total. Twin opposed flats on the shaft accept the prop driver. A small hardened steel washer fits on the shaft between the prop driver's rear surface and the inner race of the front ball bearing. The shaft's intake window is a big .470 inch front-to-back and .300 inch wide . . . huge compared to the throughput area of the 2F carburetor. Prop threads are standard 1/4-28. The crank's disc follows the "thicker is better" modern trend; it's .255 inch thick, symmetrically cut away for balancing, and I judge this engine's vibration level to be *below* average.

For years, many of us have slipped a short piece of silicone fuel line over a needle valve, sized in length to seal between the needle valve and the carburetor, to inhibit any airflow between the needle's external threads and the body's internal threads. Unwanted airflow here always gives erratic fuel draw. This 2F carb comes with a 1/4-inch length of silicone *already* in place! This is smart attention to a small detail that's most welcomed. Our test engine's carb had a slight bind at the low speed travel end that disappeared during break-in. The fuel line nipple was also a bit loose against its white sealing gasket. All nonmetallic gaskets compress a bit with time; this is normal. It's a very simple carburetor to clean. Remove the near-vertical idle set screw and its spring. The barrel will then slide out. Watch for the coiled spring behind the barrel to come out too. The large diameter end of the spring pushes against the barrel. Then remove only the grey high speed needle, remove the tank's fuel line from the fuel nipple, and back flush openings with squirts of WD-4O.

O.S. is doing progressive work on effective sound control for their mufflers. The picture shows the 25SF muffler has a small conical insert (with a .310-inch hole through

it) that fits between the front and back muffler castings. The muffler's exit hole is .275 inch. This muffler design allows you to do some interesting and simple experimenting, like removing the insert and measuring rpm gain and judging sound increase. Also, it's easy to omit the conical insert and small rear casting and bolt on to the front casting one of the Davis Diesel Development mufflers made for the smaller size four-cycle engines. This small DDD unit's chamber is 2-1/4 inches long and 1-1/4 inches in diameter . . . in effect it doubles the volume of the front original chamber, costs no rpm and adds a meager single ounce for *much* quietude. An SASE to DDD, Box 141, Milford, CT 06460 will get you details.

Our O.S. Max 25SF was carefully broken in with the new Golden Break-In Fuel blended by Powermaster Products, 7807-H Telegraph Road, Montebello, CA 90640; (213)887-0801, using the directions attached to the jug. This new product should be available everywhere as you read this. The K&B #4520 plug lasted through all testing. All rpm figures are with Master Airscrew props and are read using the GBI fuel.

PERFORMANCE

Prop Size	High RPM	Low RPM	Richmond Speed Ratio
8x4	15,300***	2,800	5.46:1
9x4	14,750*	2,500	5.90:1
9x6	12,400	2,300	5.39:1
9-1/2x6	12,600**	2,250	5.60:1

A speed ratio below 4:1 is unsatisfactory.
A speed ratio of 4:1 is barely satisfactory.
A speed ratio of 5:1 is average performance.
A speed ratio of 6:1 is superb performance.

*With the muffler off (open exhaust) this figure became 15,850 rpm, indicating the stock muffler cost 1,100 rpm.
**The 9-1/2x6 high rpm figure represents an anomaly in that the 12,600 figure should be *below* that of the 9x6's high speed. This test engine was not comfortable with the 9-1/2x6 . . . seemed to strain and act over-propped. Best performance was with the 9x4 ideal for the PT-20.
***With the muffler off, this figure, towards the end of the break-in, readily surpassed 18,000 rpm as the fuel line was briefly pinched.

It was very interesting to observe that the acceleration from idle was significantly improved when the round conical insert was removed from between the muffler's front and rear castings. The sound change was insignificantly higher.

Retail price of the O.S. Max 25SF at testing was $134.95. Imported by Great Planes Model Distributors, Champaign, Illinois, and generally available from your favorite hobby supplier with a two-year guarantee. ***MB***

CHATTER *Continued from page 38*

coming out of the differential amplifier is fed through a low-pass filter to reduce the noise. The voltage then goes through an adjustable non-inverting amplifier. The voltage amplification at this stage determines the gain of this rate gyro. The output voltage from the non-inverting amplifier is then subtracted from the voltage coming from the center tap of the tail rotor servo's potentiometer. The output is fed through a buffer, then it is connected to the wire that was originally connected to the center tap of the servo's potentiometer. The circuit will work with almost all modern three-wire servos on the market, such as the Futaba, JR, and Sanwa/Airtronics. If you do not understand the circuit, then I suggest you leave this project to more insane modelers. ***MB***

SHUTTLE *Continued from page 41*

mounting point, or flybar axis, the paddle is aeroelastically stable. This means it will not want to rotate by itself, thus there is less force transmitted from the flybar to the seesaw, and to the sawshplate, and back to the cyclic control servos. This is the benefit of adding weight to the paddle leading edge, instead of just adding flybar weight.

For adventurous fliers who like to do inverted flying, you will be glad that Hirobo has enlarged the slot in the side frames where the collective pitch swing arm swings up and down. This allows the ZX a collective pitch range of plus and minus 10 degrees. I am only using plus and minus 9 degrees on my Shuttle. The ZX is a perfect pint-size helicopter for the hot dog pilot who pushes to the edge of the flying envelope. It rolls superbly. The old Shuttles had a very soft aluminum main rotor blade pitch control arm that distorted under heavy aerobatics, which led to blades going out of track. The new FZ pitch control arm is stronger. The Enya 35H powered Shuttle is about as fast as the ZX belonging to Andrew Sutton of Copter Corner. His is powered by an O.S. 32 engine with modified timing plus an ABC piston and sleeve. Both move at 60 mph. That is fast for a little thing. Of course the blades are screaming at 1700 rpm. For average flying, I use 5 degree pitch for hover. It gives 1500 to 1600 rpm on the FZ. Top end is set at 9 degrees. For autorotation, the bottom is set at -4 degrees. For beginners, set the bottom at -1 degree.

Make sure the tail boom is pulled back far enough so there is plenty of tension on the tail drive belt. When properly set, you should be able to squeeze the tail drive belt inward by no more than an 1/8 inch. OK folks, fire up your Shuttle and get ready for outer orbit excitement. Next month we will be examining Schluter's new autogyro called the Whopper (without cheese). We will also explain the theory behind autogyro dynamics and aerodynamics. So relax for a month before the heavy duty lecture. ***MB***

PRECISION *Continued from page 43*

rounds for everyone would not be possible. For awhile, it appeared as if the F3A pilots would do most of the suffering and fly only three rounds of qualifying. At the 11th hour,

after much head scratching and creative shuffling of paper, Greg opted for the greatest good for the greatest number.

The result: F3A split among four flight lines on three sites, with Advanced and Masters occupying the remaining two lines. This was a first, with one site hosting two lines of turnaround flying in overlapping boxes. As the sites were obviously unequal as far as flying conditions were concerned, it was decided that for the four F3A qualifying rounds, the judges would remain stationary while the pilots rotated. This meant that after each round, it would be necessary to move self, aircraft, transmitter, car, potato chips, cooler, field box, et al, to the next site. In other words, at the end of each round, the world's largest pattern meet would become the world's largest circular fire drill!

Now, anybody with any imagination and half a sense of humor should be able to conjure up all sorts of potential problems with this arrangement . . . like accidental transmitter turn-ons, no-shows in the flight order, people going to the wrong line, endless delays, fender benders in the parking lot, massive mid airs on the site with two lines of turnaround, scoresheets arriving at the wrong line, etc. I mean, the setup looked like a natural for the filming of *The Marx Brothers Go To The Nationals.* Surprise, surprise. Zero personnel transfer problems, zero transmitter and score sheet problems, and only one midair. The lone midair occurred on a line with mixed AMA and F3A flying. Obviously, only extremely intelligent and competent people fly pattern, and the most intelligent and competent of this select group compete in F3A. (Biased? Me?)

The extra round gained by F3A meant just four rounds of flying for the Advanced and Master classes, with no finals flown. Not everybody was happy with this, but most accepted it gracefully.

Barry Brunson, of Florence, South Carolina, nailed down a solid victory in Advanced, winning two rounds out of the four flown. Nipping at his heels were another pair of Seniors; Jason Shulman of Piscataway, New Jersey was second and John Sellinger of Alpharetta, Georgia was a tight third. This class had five pilots who were either Junior or Senior members, and none placed lower than 11th! These youngsters are serious competitors, and not much inclined to take prisoners. . . .

In Masters, we saw some very solid and tight flying at the top. James McMasters, of Texarkana, Texas, took the marbles with a very consistent job of flying; he won no rounds, but was always among the top two or three. Tony Stillman, of Pensacola, Florida, was second, barely six points behind. Wayne Apostolico, of Arlington, Texas, checked into the third spot behind Tony just ten points back. Wayne put in a gutsy performance with a borrowed airplane after totaling his bird in a first round midair with Chip Hyde.

In FAI F3A, the story just has to be about the Raiders From The Great White North. Last year's Canadian World's team blew

into town, calmly selected the first, third, and fifth place trophies, exited stage right, turned left, and disappeared over the border carrying hardware and waving maple leaves. The Immigration and Naturalization Service says that they can't do a thing about this. Guys, this practically demands a visit to the Canadian Nats by the U.S. Team next year, doesn't it? Heh?

Because of the previously mentioned time constraints, the finals format for F3A was shortened from the usual three rounds to two, with the top 20 pilots to take the average of their two best qualifying rounds into the finals to be counted as a single score, and the winner to be determined by the best two out of three scores.

Perennial Canadian team member and several times former Nationals winner, Ivan Kristensen, scored a much deserved victory with a masterful display of model airmanship in the finals. In third place after the qualifying rounds, Ivan moved into first with two great flights in the wind and chop. Bill Cunningham, of Broken Arrow, Oklahoma, came into the finals in second and put in a last round "keeper" to hold on, while Canadian team member Greg Marsden moved up a whopping 11 places from 14th to third with two excellent finals flights in the blustery conditions.

Defending National Champ Chip Hyde, of Yuma, Arizona, who had overcome his first round midair to place first in the qualifying, moved down to fourth place after failing to win a round in the finals. In Chip's defense, it should be said that he was also getting up at 4 a.m. each day to compete in Formula One Pylon. One may doubt his wisdom in attempting this (especially with the present half-day format), but not his enthusiasm. It looked to me like Chip simply ran out of gas. Canadian team member Colin Campbell pulled off a move similar to Marsden's, coming up from 13th to fifth in the rough weather.

Thus ends the obligatory play-by-play. Howsomever, the Nats is more than just a big contest. It is a gathering of the clans, a meeting of the minds of modeldom, and a celebration of the long enduring marriage of summer and balsa wood. The Nats provides a chance to check out new trends and new designs, and to talk with old friends. For the special interest groups associated with many of the events, the Nats provides a yearly chance to meet and discuss pending rules and format changes. To crib a line from my old buddy Voltaire, if the Nats did not exist, it would certainly be necessary to invent it!

Most of the technical hangar chitchat at this Nats centered around four-stroke vs. two-stroke powerplants. Although two-stroke powerplants remain the overwhelming choice in most classes, there were lots of four-stroke ships entered in F3A, and a good many made the finals. The smallish Silent STs flown by Steve Helms and Shunichi Suzuki had incredible vertical performance, unreal flight speeds, and generally gave the impression that someone had shoehorned a small block Chevy V-8 into a .40 sized Kaos

and managed to muffle it extremely well. The downside? Well, to me, the pattern loses a little something in smoothness and gracefulness when presented at Warp 9, even by a highly skilled pilot.

Geoff Combs showed up with what appeared to be a 1.20 sized LA-1, dubbed the SL-1. At 960 squares and 9.6 lbs., it flew well enough to get Geoff into the finals, although it lacked the blistering vertical capability of the Silents. Bill Cunningham had what looked to be a reworked and re-engined version of his Malibu design which worked very nicely and was good enough for second place overall. Steve Rojecki and George Manning campaigned a pair of Dick Hanson Runarounds which flew well, and Ron Chidgey's large (1000 sq. in.) and light (8.3 lbs.) Vortex looked to be a solid performer. Back in the pack, Jerry Budd was flying a brand new (and only partially trimmed) Conquest 120 that seemed to show promise. The engine of choice for all of these birds was the YS 1.20.

Just to keep things exotic, Dean Koger showed up with his two-stroke powered gear-drive Vortex. This animal spins a 15-inch prop, and while it sounds a little like a runaway ceiling fan, it performs extremely well, giving up nothing to the four-strokes. Dean finished seventh overall with this machine.

Did these monsters win? No, but most made it into the finals. Did they run the two-strokes out of the place? No, not even close. Is the two-stroke dead meat in the future? Not hardly. Will there be more four-strokes next year? Yep, bet the family farm on it. Will your columnist build one himself? Hmmm. Maybe. Could be. Is flying skill still more important than the technology used? Absolutely, and beyond the tiniest shadow of a doubt.

The new NSRCA pattern rules proposals for the 1992-93 rulebook were aired at the Nats NSRCA General Meeting. The proposed changes are extensive, including a rewritten rulebook judge's guide, a noise limit for all classes, all turnaround patterns for the Advanced and Masters classes, the elimination of the Expert Turnaround class, and the elimination of calling individual maneuvers in Sportsman and Novice. The proposals call for Advanced to fly the present Canadian (MAAC) Advanced schedule, and Masters to fly the present F3A schedule when the FAI changes to a new schedule in '92.

It appeared to me (and in my capacity as Chairman of the NSRCA Rules Committee, I had the task of presenting these changes to the membership at the meeting) that these proposals were well received. That is, about 99% of the comments were positive and nobody mentioned tar, feathers, and free transportation to the city limits. What the RC Aerobatics Contest Board will make of all this remains to be seen. The address of your District Contest Board rep is printed in *Model Aviation* (Right. I just got back from the powder room . . .). Do yourself a favor and write him a little note outlining your opinions.

What else did we learn at this Nats? Well, as far as the contest itself goes, we learned that sharing a site with pylon racing and flying half-days is an idea that has run its course. Given the huge numbers of contestants we now have, the half-day plan is simply unworkable and unacceptable. One possible suggestion that was advanced calls for extending the Nats several days and flying pylon and pattern consecutively instead of concurrently. This sounds good to me, and is certainly preferable to the other solution, which is separating our National Championship from the main body of the Nats altogether, as the free flight folks have done.

Another item which is fast becoming obvious is that manpower to run these ever larger contests is becoming critically short, both in officials and judges. This means that the contestants are going to have to pick up the slack in the future in both categories. Through the foresight, efforts and innovation of Event Director Greg Frohreich, we have come a fair distance in that direction over the last several Nats. We need to go further, perhaps even to a mandatory (if you fly, you work, period) system. The event will need to be reorganized slightly to accommodate this.

We learned that flying two lines of turnaround on a single site is not only possible, but maybe even preferable to flying a line of AMA and a line of turnaround at the same site. This is important, because with as many as three out of four classes using the turnaround format in '92, sites will need to be shared as was done this year.

Another fact which presented itself is that we have no "youth problem" in pattern. In every class except Masters (which had no Junior or Senior contestants), Juniors or Seniors placed in the top five. Luke Christian in Expert and Ron Segura in Sportsman became National Champions. The future looks good.

The "Nats Judging Seminar," which has been held by Chief Judge Darlene Fredricks and Event Director Greg Frohreich the last two years on the day before the contest, is really starting to pay off. I thought the judging was much improved at this Nats over recent years, especially in respect to the judges mostly "being on the same page." There were exceptions, true. There will always be, as judging is an extremely subjective activity, and one guy's 5 is always going to be somebody else's 8. What is more important than the actual numbers is the concept of judging the maneuver flown, and not the plane or the pilot. This aspect appeared much improved this year. Good job, with kudos and much appreciation all around.

Lastly, I thought the crew of officials and workers at this year's Nats did an excellent job. The Nats is invented from nearly the ground up each year. There are always a million opportunities for disaster and chaos lurks constantly in the wings. Beating back these forces of darkness is a giant job. This year's crew, from Greg on down to the

"kiddie corps" who scribed for hours on end in the sun, did it with style and grace.

How did I do? Well, ah . . . 37th in F3A, I think. Not too bad, thank you, but a lot of guys flew really well. Wait until next year. I'll get 'em then. Further practice is indicated. I might even buy a new glow plug. See ya at the field. Rick Allison, 15618 N.E. 56th Way, Redmond, WA 98052; (206) 883-3047. ***MB***

SPARKS *Continued from page 46*

produced quite a few interesting photos, one of which is of Bob Moulton, of Orland Park, Illinois, seen in Photo No. 5 with his rubber-powered Cessna C-34 as designed by Dick Korda and appearing in *Model Airplane News*.

How about Photo No. 6 showing John Lessig, of Philadelphia, Pennsylvania, with Frank Fay holding a Megow "Super Quaker." This Ohlsson .60 powered model was a good performer but the wind was a great equalizing factor. This design has been touted in the past by this writer as a good competitive model that the boys will eventually notice.

Another cabin design worth its salt is the cabin version of the "Playboy Senior." This model (Photo No. 7) won Class C Cabin for Bud Romak. Most modelers will remember Bud for his intensive efforts in Indoor competition. Good to see Bud has taken up O.T. flying. He has discovered what the fun is all about!

We dearly love to feature models that are not often seen. We admire Mal MacLean, of E. Northport, New York, as he builds models we like to see. Photo No. 8 shows what we mean, a Bob Meuser 1940 Hydro Record Holder, the "Cloud Chopper," seen with MacLean. To top it off, Mal employs a rare diesel, an Italian OSAM (the forerunner of Super Tigre). This 5.5cc diesel starts easily despite its large size and intimidating compression. Hats off to Mal!

Another rare one is seen in Photo No. 9 showing Larry Nigh, of Cedar Rapids, Iowa, with a Scientific "Larkey" powered by a Bantam .19. Too bad the wind interfered as we would have liked to see this one fly!

It's kinda neat to meet one of your correspondents back East. Morton Ross has been attending O.T. contests ever since this writer used to stage the unofficial Old Timer events at the AMA Nationals. That's a lotta water under the bridge. Mort is just getting into RC as the small fields in his area prohibit free flight flying. Photo No. 10 depicts Morton Ross with a "Topper B" powered by an Ohlsson .23. This design by Scotty Murray of the pre-WWII Skyscrapers was kitted by Bay Ridge and later by Art Hasselback's Consolidated Models. Consolidated was brought about by the advent of WWII where the model airplane industry was the first to feel the crunch. Jerry's Hobby Shop, Bay Ridge, and Burkhard Models joined forces to form Consolidated. Under the directorship of Hasselback, Consolidated lasted quite some time, taking in the control line craze of the late forties.

Taking a look at the rubber power boys, Photo No. 11 shows Dick "Old Goat" Sherman putting the finishing winds to his very successful Bowers Wakefield. Fred Bowers, the Canadian team member, will be remembered as the one who placed second behind Dick Korda and his sensational 39-minute

flight. Bowers barely missed the major thermal but still registered twelve minutes to finish second in the finals. Sherman also flew this model in the Canadian recreation of the Bowers Wakefield event.

Another rubber-powered model is seen in Photo No. 12, showing Bill Bell, of Baltimore, with his creation of a Megow Monocoupe 90A. Fred Megow was a very prolific producer of various size kits, especially the popular ones such as the Monocoupe. Megow produced this model in 16, 24, and 30-inch wingspans. A 50-inch version of the Lambert powered Monocoupe was also kitted.

Photo No. 13 is proof that Herb Wahl uses what he manufactures. Herb's Motors puts out museum-like quality engines, in this case a Bunch Tiger. Herb prides himself on testing all engines before they leave the shop. In short, Herb is one of those great guys who can be depended on to back up his word on anything he promises. Hard to find them like that anymore.

One of the SAM stalwarts is Jack Whittles, one of the main elements that form the foundation for a rock-solid club like SAM 7. As we get older, we appreciate the past efforts of fellows like Jack all too late.

Jack is seen in Photo No. 14 holding his latest, a "Spook 48" with an Ohlsson .23 for power. Although the 48 size Spook is basically a scaled-down Spook 72, there seems to be a world of difference in performance as the larger model clearly outperforms the smaller. Is this what they call "scale effect"?

Getting or with the tail end of good Johnson photos, Hans Ochsner, of Matamorra, Michigan, always attends the big SAM meets. As seen in Photo No. 15, Hans is tuning an Ohlsson .60 in an Eastern States Gas Champ as designed by Russell Simmons. This design really terrorized the competition in the 1940 era. Sal Taibi never gets tired of telling how the Simmons brothers always wore their Sunday best to the contests. Seems like they were first required to go to church, leaving no time to get changed before leaving for the contest. The tough Brooklyn boys would needle Russell mercilessly. However, when the contest ended, Russell generally walked off with the top trophy in his event. After awhile, the boys found out their teasing didn't bother Russell, and he delighted in winning. Dressed as he was, he never took a bum photo, either!

Photo No. 16 seems to exemplify the weather conditions over the four-day meet. Pictured is John Bortnak, from Calgary, Canada, all buttoned up to keep the cold wind off. Bortnak has been winning Free Flight Grand Champion so often, it was quite a surprise to hear Bob Edelstein called up to receive the F/F Sweepstakes Trophy.

We might as well close off the photo parade with the same model we started with, a Scientific "Red Zephyr" as seen in Photo No. 17. This free flight version was produced by Ted Lewis of Chelmsford, Massachusetts. Ted uses a Herb Wahl reproduction of the Brown Jr. that run so fine. There is absolutely no other sound like a Brown Jr. when it springs to life with that long stroke making a staccato noise. Still there wasn't anything better in those early thirties.

ANOTHER CONTEST VIEWPOINT

It remained for Bucky Walters to send this columnist the latest SAM 39 newsletter, wherein he describes the various contests of the Ohio area and the accompanying bad weather. He also made quite a few pertinent remarks about the SAM Champs.

As Bucky said, "The wind blew but the C-5A planes flew. The free flighters had to fight all four days. One day's flying was cancelled as the C-5As were practicing touch-and-goes. Nice to watch but they flew all day. Our taxpayer money in action. Nobody really wanted to fly due to the wind. It was not a good flying SAM Champs."

Bucky goes on to say there were quite a few with engine problems—Murphy's Law at its best. I guess you could say the highlights of the meet featured C-5As flying, wind blowing, models shedding wings, Eut Tileston customizing his arm on a prop as did Jim Reynolds and of course, the "no-switch" maneuver by Walt Geary. Everyone will remember that pink silked Flamingo.

Because of the wind, a lot of time was spent visiting and talking. Bucky sez he enjoyed swapping lies with Pond, Adams, Grosheider, Granieri, Woodman, and a host of others. It was simply great to see how the other half lives! This is the great part of the SAM Champs!

FINAL NOTES

At the SAM Business Meeting, copies of the "Approved Design List, Gas Models" was issued by President Adams. Ernie Linn and Jim Adams are to be commended for completing a long needed item for contest directors.

In wrapping up, the 1991 SAM Champs

will again be held at Jean, Nevada (probably in October), while the 1992 SAM Champs will no doubt be at Great American Airport, Lawrenceville, Illinois. Try to be there! ***MB***

CONTROLS *Continued from page 49*

the switch is closed and no current or zero amps flows when the switch is open. A typical current waveform is shown in Figure 5.

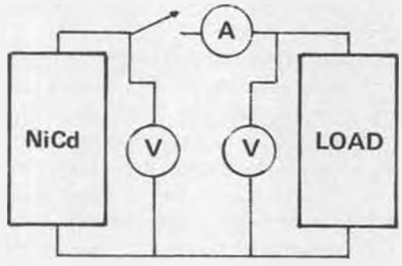

Fig. 4. The Frame Rate Control

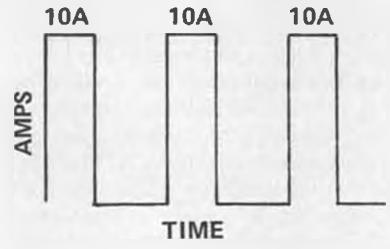

Fig. 5. Current Wave Form

Since no power is lost in the switch, the control should be 100% efficient. Well, maybe so and maybe not. Let's see what really happens to the power transfer when we operate the switch at various duty cycles to control the current flowing to the load. Table 3 shows the results.

The DC voltage across the load is proportional to the duty cycle of the switch, so the DC voltage will vary linearly with throttle stick position. Very nice. But let's look at the power transfer. At 90% throttle, the load sees 9 volts DC and 9 amps DC so the total DC power delivered to the load is 9x9 = 81 watts. The total power drained from the battery is 10 volts time 9 amps = 90 watts. Hey, what goes on here? Somebody stole 9 watts of battery power. There are 9 watts missing and we want to know where it went! OK, let's look at this circuit in a different way. When the switch is closed 10 volts and 10 amps and 100 watts are delivered to the load. When the switch is open zero volts, zero amps, and zero watts are delivered to the load. If the switch is closed 90% of the time and open 10% of the time, the power delivered will be 90%x100 watts = 90 watts. OK, the switch is 100% efficient at transferring raw battery power, but it does not convert all DC battery power to DC load power.

Some of the power going to the load is AC power. This would be just fine if our load

were a light bulb and we were only interested in the heat generated. But we intend to use this control with a DC permanent magnet motor. The DC permanent magnet motor converts direct current (DC) into useful rpm but just sits there and gets hot when supplied with alternating current (AC). The AC component of the current pulses reaching the motor just gets the motor hot and does no useful work. So even though the switch itself absorbs no power, our control system is not 100% efficient. At 90% duty cycle it is 90% efficient. At 50% duty cycle it is 50% efficient. Hey, this is no better than the resistor control and what is even worse this control gets our motors very HOT, especially at low throttle settings! There has just got to be a better way.

THE HIGH-RATE CONTROL

The High-Rate Control has the same basic circuitry as the frame rate control except that it switches at a much higher frequency, usually between 2500 and 5000 cycles per second. All DC motors have inductance in the windings and it is this inductance that causes all that nasty brush sparking. At the speeds our motors turn, say between 12,000 rpm and 24,000 rpm, the inductance causes the current to lag the voltage by from 10 to 20 degrees. Motor manufacturers compensate for this lag by advancing the brush position by 10 to 20 degrees. At 12,000 rpm the motor windings are being switched by the commutator at 200 cycles per second. If we were to run our speed control switch at a much higher frequency, say 2500 cycles per second so as not to interfere with proper motor commutation, there just might be enough inductance in the motor windings to make the scheme work. Well, we all tried it and it works great! We had to make sure to use a MOSFET switch to handle the high switching speeds and we had to add a Shotky flyback diode to snub the inductive spike when the switch opens.

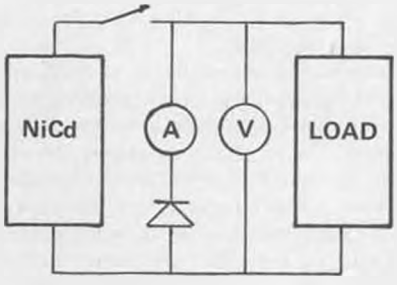

Fig. 6. The High Rate Control

The circuit shown in Figure 5 and its performance is documented in Table 4.

This circuit has all the right stuff, a 100% efficiency and a linear throttle response. Well, not quite. There is no such thing as a perfect switch or a perfect diode, but the losses from these two circuit elements are very small. We can expect a 98% efficiency from any well made commercial hi-frequency control. If you are running any cobalt motor or any high performance ferrite motor

you should seriously consider using a hi-frequency control. If you are flying high power cobalt motors you should use a control with opto-coupling. Opto-coupling eliminates any electrical connection between the radio receiver and the motor circuit so that motor noise and inductive spikes are prevented from getting into your radio and causing glitches. ***MB***

CORNER *Continued from page 51*

the average home electronics workshop. They come in all classes of sophistication and complexity, though most of us casual users cannot justify too much of an oscilloscope investment, and wind up with a rather humble model. This month I am sharing a circuit that can be used to add a valuable feature to the more basic scope, something seen on the better ones as a "component tester" or "curve tracer." Same thing!

Though simple, this add-on tester does a creditable job of go-no/go testing of most components, and is faster to read than a meter, especially a digital meter, for continuity tests. Circuit assembly is self explanatory; adjustments being made to the scope to display a half-screen trace centered vertically. The use is equally simple; apply one probe to one side of the component, the other one to the other side, the display will vary from no change with an open circuit, to fully vertical for a dead short. Resistors will show an angled trace, the degree of the angle being determined by the resistance. Capacitors will display an oval, again the exact trace determined by the actual capacitance.

The most useful information is obtained in testing diode and transistor junctions, which will be displayed as a sharp right angle for most good components, the polarity of the probes will determine whether you will see a trace as shown, or an exact inverted one. The information is valid either way, what you are looking for is the angle, not the orientation.

When doing in-circuit testing, the display will be affected by other components in parallel with whatever you are testing. However, most shorts or opens are definitely defined, and if you are doing repetitious service on a certain item, you quickly learn what waveforms are to be expected at all critical points. This test device is especially useful when working on a piece of equipment with which you have no experience or documentation and have to resort simply to trying to spot a defective part. Naturally, it helps if you have another similar part in working order against which you can make comparison tests.

If you have an older, or inexpensive scope, try this circuit, you'll learn to love it.

THE 1991 RADIO SHACK catalog is out. It gets to be more of a disappointment every year, as fewer components and more electronic gadgets appear. I know—business is business, and while the limited line of bits and pieces listed are somewhat overpriced,

you can't beat the convenience. Oh, well...

Back in September we discussed a letter from a reader who had run across some interesting features on some consumer electronic products, and wondered why we weren't seeing similar items on RC products. Well, the electronics field grows daily, with a lot of current emphasis on voice chip ICs that are or can be programmed to reproduce human voice. This last catalog from the Shack includes a talking multitester, one that tells you the test value upon pressing a button on the probe. Only $100, certainly within range for those that like to have the latest!

A similar talking, but much more sophisticated multimeter, more in the serious technician class of equipment, is also available from another maker, Omega Engineering. It has more and wider ranges, but can be configured to tell its tale not only in English, but in Spanish, French, German, and Italian, and with added plug-in chips, also Russian, Mandarin Chinese, and Japanese.

I can foresee it in RC equipment, if nothing else at least for a verbal checklist similar to that used in full scale aviation, that would prevent takeoffs with reversed ailerons and similar dumb mistakes. Let us hope that when such is being considered by our equipment manufacturers, the design is done by one who is an active hands-on builder/flier, or at least with much input from such a person, and not fully by computer designers and self-appointed "expert" plastic airplane fliers. It would also be nice if when we meet and turn on this electronic wonder, it doesn't greet us with, "Herro, wercome to Toredo!"

CQ RC! One of the most active clubs in the Southern California area, the SGVRCL, pronounced San Gabriel Valley Radio Control League, flatly admits in its last newsletter what not all groups are as honest about . . . that a large part of our hobby is plainly the "bullslinging." And they are doing it on the air; they have a large number of ham RCers who meet every Thursday night at 1900 hours on 146.085, a frequency locally known as "The Model Aircraft Repeater." Anyone within range is invited to check in, I guess without being able to "show," we have to call it "tell and tell." Info from Mike Brehm, N6SVU, (818) 335-0683. I don't have a transmitter guys, but I can and will listen from time to time. 73!

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

HANNAN'S *Continued from page 53*

MORE LETTER EXTRACTS

Many of the messages received here at the hangar dwell upon the satisfactions to be gained in modeling, particularly the nostalgic and simple pleasures. For example, James Madill, of Alberta, Canada, notes : "What's nicer than a delicate stick-and-tissue model gliding in over tall grass of a summer's morning? That's the poetry of model aviation."

And from Grey Hays, of West Memphis,

Arkansas: "After years of model building and flying, I'm completely full-circle, back to an interest in stick-and-tissue rubber power. It was great when Comet kits were 10¢, and it's even better now."

Bob Abernathy of Sayville, New York, echos that thought: "When the spirit moves me, I do build simple, rubber powered birds; only criteria—they must be light, fly low, slow and above all, *quietly*."

HOW'S THAT AGAIN?

Dissatisfaction with modern "high-tech" advances is another recurring theme in our readers' letters, such as this one from Dick Johnson, of Texas: "Wouldn't it be super if they re-invented the man-powered drafting table? Imagine the things that might show up on the board. And might there be calculating devices that did not require batteries or solar cells? (Fingers don't count.) Could there even be tools that humans could use to make things? Foolish? Noah didn't think so!"

HIGH AS A KITE

This hackneyed old expression may have gained new meaning at the posh Hermes store in New York City. Are you prepared for a kite priced at over a *thousand dollars?* According to Ed Whitten, it is one in a series of string-flyers marketed by the firm, and apparently some are being bought. Ed also shared a report about kite-flyers who seriously expect their sport to become as popular as ice skating, complete with professional flyers and televised coverage. Wonder what the most famous kite-flyer of all, Ben Franklin, would think about all of this?

LADYBUG,LADYBUG, FLY AWAY HOME

Ed Whitten also favored us with an article from the *Wall Street Journal* telling more than we ever really wanted to know about ladybugs. Still, reporter James P. Sterba did reveal some remarkable facts about the little creatures. It seems as though they can fly straight up to an altitude of as much as a mile and cover vast distances to other locales. As Ed Whitten remarked, ladybugs are *really* free flighters! He also raised a question for the performance-minded in our audience: What do you suppose the wing-loading of a ladybug might be?

IT'S A BURD, IT'S A PLANE . . .

Danny Sheelds, who markets three different model plans from the old BURD company kit line (Rearwin Speedster, Professor, and King Burd), would very much like to obtain two others, the Fairchild 24 and Curtiss Robin. If any reader can help, Danny can be reached at 2318 Noonham Rd., Woodlawn, MD 21207.

AUTOGIROS, ANYONE?

Bill Pinkston, who created the Autogiro models displayed in the Seattle, Washington Museum of Flight, is offering 1"=1' size drawings for the Cierva C-19 Mk III, Pitcairn PAA-1, and the Pitcairn PA-18. Bill feels that these unusual rotorcraft deserve more attention from model builders, since they are mechanically simpler than helicopters (although perhaps even more complex aerodynamically) and represent many unsolved challenges. In other words, they can be fun

but frustrating! A plans price list is avialable for a stamped, pre-addressed envelope from: Bill Pinkston, 103-1/2 Milwaukee, Mt. Vernon, WA 98273.

SPEAKING OF PLANS

We understand that some exciting new full-size Golden Age racers are in the works. One, a Gee Bee R-2, is actually under construction (the second one we've heard about), while one and possibly two of the sensuous Hall Springfield Bulldog racers are in the planning stages. The projects are in the hush-hush category just now, to avoid progress interruptions. More news when we have it. . . .

NEW DEALS FROM DIELS

Dave Diels has released two more rubber-powered model kits in his World War II series, the Vought F4U Corsair, and the Grumman F6F Hellcat. Both offerings are to the high Diels Engineering standard, and feature full-size plans, detailed instructions, selected quality printwood sheets and strips, Japanese tissue in appropriate colors, full-color decals, vacuum-formed canopies, a plastic propeller and thrust bearing, rubber strip, and proof-of-scale documentation. In short, it appears everything needed to complete these kits is furnished except your choice of glue! (Plus patience and skill, of course.) Each kit is priced at $20, plus $2.50 shipping from: Diels Engineering, Inc., P.O. Box 101, Woodville, OH 43469.

DOYEN OF DOCUMENTATION

Bob Banka, of Scale Model Research, now offers more than 70,000 aircraft color photos plus numerous three-view drawings! Included are aircraft of most eras and types, such as sailplanes, helicopters, seaplanes, jets, military and civilian machines, and even many of their engines. Certainly Bob must be considerably better organized than most of us, and one can only imagine trying to keep up with his inventory! The samples we've seen are of high quality, and his service is rapid. Shouldn't you have one of his catalogs? Three dollars will gain a copy for you from: Scale Model Research, 2334 Ticonderoga, Costa Mesa, CA 92626. When responding to any of these product mentions, we'd appreciate a mention of *Model Builder*.

MOONEY MEMORIAL PROPOSED

Roald Tweet, of Rock Island, Illinois wrote in to suggest a contest honoring the memory of Walt Mooney, to be conducted next spring or summer. He envisions it as a two-part event, one category devoted to a single Mooney-designed Peanut, the second category for any published Mooney Peanut, with plans to be handed out either on a first-come-first-served basis or by lottery. ("Think of what a mass-launch would look like!")

Roald also assumes that such a contest would be at least partly by proxy, in order to give more builders a chance. He thinks the optimum location would be on the Mall in Washington, D.C., in front of the National Air and Space Museum, where kites are presently flown, and sums up his feelings this way: "The world misses each of its modelers who die, but I have never been into contests. It's more of a fun-fly—just a way of celebrating the life of someo£ie who gave so much to all of us modelers, and to do it in a way that I think he would enjoy." Any volunteers?

SIGN-OFF

We close this column in the same vein in which it began, with a quotation from a poet, this time an Italian, Francesco Petrarca (1304-1374): "Sameness is the mother of disgust, variety the cure." ***MB***

FREE FLIGHT *Continued from page 55*

contemporary use, but even at 9.36%, it is not too thick for AMA gas models. I think that this airfoil would be very useful for lightweight ships that are VIT equipped. The stab airfoil should have a more rounded leading edge in order to decrease critical trim factors that would affect a model using this wing section. Since the trailing edge retains some thickness, standard built-up structure could be used to advantage on wings using this section.

TIMERS TAKE A HIKE

It appears as though the availability of clockwork timers of the KSB and related type are now a thing of the past. According to all of the suppliers that I have talked to lately, these items are no longer being produced. If you have a camera shop in your city that has some of these clockwork timers left, it would be a good idea to buy all of the ones they have in stock, as no more appear to be coming across the ocean. This also means that your own supply of timers will need to have some special TLC to make them last into the future. Next month, I will do a little feature in this column about the care and feeding of your remaining timers.

In the meantime, if you are hunting for replacements, you will want to contact a couple of sources for other types of timers. One such supplier is Doug Galbreath, who sells Seelig timers from Germany. The Seelig is a precision piece of equipment, consequently it takes more care than many free flighters typically give. Doug can be contacted at 2810 Chiles Rd., Suite B, Davis, CA 95616. The AMA gas timer, which does engine shutoff as well as D.T. and two other functions, sells for $35.00.

Another source for timers is Starline International. Sal Fruciano is the proprietor and sells a number of timers. The Starline timer is imported from Poland. Features are similar to the Seelig, but the timers are lighter and a bit less expensive. They range in weight from 14 grams (less than the KSB engine timer) to 39 grams (about the same as the big Seelig). All have D.T. and from two to four added functions. Costs run from $22.00 each to $35.00. Contact Starline at 6146 Cactus Wren Rd., Scottsdale, AZ 85253.

Of course, you could trade in your gas powered models and take up rubber power . . . then, you wouldn't need to worry about timers at all.

VERN CLEMENTS' "BI-GONE"

Some months ago, I featured a picture of a cute biplane designed by Vern Clements. The picture elicited a few letters, and it seemed that a belated follow-up is in order. For those of you who don't know, Vern is a longtime modeler from Idaho. The "Bi-Gone," as you can see from another picture in this issue, is a biplane free flight. It has a sheet balsa fuselage and stabilizer with built-up wings. Perhaps the most surprising thing about this ship is that it won the Northwest Free Flight Championships at Ft. Lewis, Washington in 1954. Powered by a Torpedo .049, the ship has the appearance of a "real" airplane (full-sized people carrying type).

The Bi-Gone should legitimately qualify as a Nostalgia model, however, it has yet to be approved by the NFFS Nostalgia eligibility committee of Bob Larsh and Ralph Prey. I am certain that it will be. It does meet all of the specifications of Pee Wee 30 and would make a neat addition to this lineup. If you have a copy of the May 1955 *Model Airplane News*, you can see a construction article, or you might also contact Vern for full-size plans and a construction article on Bi-Gone. By the way, Vern offers a very comprehensive and descriptive plans catalog with 19 pages of information about his plans—featuring many scale ships. The plans catalog is $3.00, which is refundable with your first order. The plans and construction article for the Bi-Gone are $7.50. Send to Vern Clements, 308 Palo Alto Dr., Caldwell, ID 83605.

LEE CAMPBELL'S KITS

Lee Campbell has been doing business as Campbell's Custom Kits for the better part of a decade now, and he has developed an extensive inventory of quality free flight merchandise to accompany his expanding line of kits. As usually happens each summer, I obtain some of Lee's kits for review. Recently, I had the chance to look over three of his latest offerings, one of which is a new A-1 glider, the "Jessie James," which was designed around some of the aerodynamic concepts used by Jim Baguley and the construction techniques used in the JetStream A-1 of 20+ years ago. This ship looks like a winner! Lee also sent along a kit of the 80% T-Bird, a Russ Hansen design from the 1950s. The standard T-Bird was one of the first competitive high thrust models and preceded the Starduster by several years. Lee's 80% version is intended to be used with the Tee Dee .020 in Nostalgia events. With a wing area under 200 square inches, the combination of this model with a hot .020 should be as much a winning combination as the bigger version is with a Hornet .049. And finally, Dick Mathis has reared his head again in the form of the Fast Richard Glider. This HLG has been kitted by Lee and joins the large number of other gliders he has in the inventory.

All of Campbell's kits feature machine cut parts, rolled plans, and the necessary hooks, wires, tubes and the like. The wood is hand selected to do the best job at the best weight. Campbell's products are quality items. If you haven't seen a Campbell kit, drop Lee a line for his catalog. Oh, by the way, the Jessie James A-1 kit sells for $29.98, the 80% T-Bird goes for $19.98, and the Fast Richard Glider is $8.98. Add postage for any item ordered. Lee also has a new address and a new bride. The address is 401 Executive Center Drive, Suite H-108, West Palm Beach, FL 33401. Lee's new helpmate is the former Eve Lynn Mahaney.

REPAIRING WORN-OUT HOLLAND HORNET HEADS

Jim Summersett has developed a system for replacing or repairing those old Holland Hornet glow heads. Since these items are no longer available on the market, and since the Phil Hainer replacement plug has been delayed, some solution to the problem was bound to occur. Jim Summersett has developed one, and it has met with the approval of the NFFS Nostalgia committee.

You will find a sketch herein that explains exactly how to do the task yourself. If you are not a machinist or do not know a machinist, Jim will do the job for you for $8.00 plus parts.

The drawing shows a method of putting a worn-out Holland Hornet head back into operation by using a modified Cox head installed inside the Hornet head. Simply drilling out and tapping the old Hornet head and putting in a standard glow plug results in a loss of about 3,000 rpm, but the modification shown produces the same power as the original. Directions:

1. Chuck the Holland Hornet head very carefully on the threads and make a slight square cut to square off the top fin so that it can be used to chuck in the lathe.

2. Chuck on the top fin and cut the shoulder from the base of the head.

3. Bore out the head using a .265 or 17/64 drill. If you bore out much more, the top fin will come off. Chamfer the head to accept the modified Cox head.

Use the old style Cox head. The high compression heads are not eligible in Nostalgia competition. The following test results show some comparisons. Tests were run using a 5-1/4x3 Top Flite prop and Super Sonic 1000 fuel:

Holland Hornet head (red)	19,100 rpm
Holland Hornet head (blue)	20,800 "
Holland Hornet head (white)	20,600 "
Cox head w/ 2 Cox gaskets	19,700 "
K&B long plug (tapped head)	17,600 "
Glow Bee w/ 4 Cox washers	20,500 "

Note: the Glow Bee plug is not eligible for Nostalgia competition. It was used in this test for comparison purposes only. Also, the Cox washers have slightly less outside diameter than the Hornet cylinder and will need to be carefully centered.

If you are interested in having Jim do the machine work, send $8.00 plus your old Hornet head and a new Cox low compression head to him at 418 Redcliff, San Antonio, TX 78216.

SCATTER BIDS FAREWELL

Craig Cusick recently sent letters to all subscribers of the Southern California Aero Team newsletter, *Scatter*, informing us that he was discontinuing publication of this informative and high quality newsletter. Craig has been the editor of the publication since its rebirth as a national FAI free flight newsletter several years ago. It is another loss to the sharing of information for all of us who live and breathe free flight. Just a year ago, the *Okie Free Flight Flier* disappeared from my mailbox. Now, this! All of us owe Craig a hearty thank-you for the good news and information that he cranked out regularly in *Scatter*. I will miss it.

ROZELLE'S BUILDING TIPS

Not many months ago, Ralph Prey asked his readers to respond to this question: "How do you rig your D.T. systems?" Walt Rozelle, who once-upon-a-time was editor of the NFFS newsletter, *Free Flight*, sent in the following text and sketches that can be found elsewhere in this column. Ralph printed them in the *Satellite* newsletter, and here they are for your consideration:

"After reading your request for some stab hold-down/D.T. ideas, I thought I would pass along some of the elements that I use.

"1. On all rubber models and on power models of .09 displacement and under, I use braided .008 C/L cable for the D.T. limit if the fuse is rear mounted. I make the limit line by first cutting two short (1/8-3/16-inch) lengths of 1/16-inch O.D. aluminum tubing. After deburring the ends, run the cable through a piece of tubing and double it back. Cinch the loop until it is snug on a straight pin and crimp the tubing firmly.

Bend the pin into a U-shape. Push it into the fuselage, but don't glue it in place—yet.

"Measure the required D.T. limit length and form a similar loop on the other end of the cable. Make the loop a snug fit on the stab's D.T. wire. If you are concerned about the limit slipping off the wire, run a rubber band from the wire to the front of the stab before you attach the D.T. band. When you are satisfied with everything, then glue into place with CA.

"For larger power models with rear-mounted fuses, I just increase the size (diameter) of the braided cable and use aluminum tubing with the smallest I.D. that will accept the two lengths of cable to form the loop. If you are concerned about the U-shaped pin pulling loose from the fuselage due to D.T. deployment shock, you can wrap and solder a short length of small diameter music wire onto the lower D.T. wire, allowing for a small 'hump' in the wire to accept the cable loop.

"2. For installations that call for a forward mounted fuse or D.T. timer, I locate the tubing for the D.T. limit line (I prefer braided Dacron polyester for smaller and/or lighter models and steel cable of some sort for the larger ones) so that the line exits the fuselage at midpoint of the stab trailing edge chord. I have found that the stab center section requires minimal beefing up: gussets at the rib/L.E. and rib/T.E. joints are usually sufficient for the basic structure. I glue a rectangular piece of thin plywood (1/64 or 1/32, depending on the model) on the top center of the T.E.

"Cut a length of aluminum tubing about 3/4-inch long. Use tubing with an I.D. that will easily accept the diameter of your D.T. line. Using a #11 blade, drill a hole on one side of the tubing, at its center, to accept the D.T. line. Push the line into this hole and out one end of the tubing. Secure by knotting the end of the line.

"Drill a hole through the stab T.E. and the plywood plate to accept the tubing when the line is running parallel along the tubing. To mount the stab, push the tubing through the stab hole from the bottom and use conventional rubber bands at the L.E. When the line is under tension the tubing will lie flat against the plywood plate and hold the stab T.E. snug against its rear mount.

"3. I have incorporated the following hints from time to time on models with forward mounted fuses/D.T. timers. On more than one occasion I experienced a D.T. band that did not burn because it got up against the snuffer tube, which apparently wicked the heat from the fuse. Install a couple of small pieces of T.E. stock fore and aft of the snuffer tube, and just far enough apart to prevent the fuse from charring them. The thicker ends of the T.E. stock should be near the tube. This little setup will hold the D.T. band away from the snuffer tube by the thickness of the T.E. stock.

"4. If you run your D.T. line along the bottom of the fuselage, cumulative line tension will tend to reduce incidence—much easier to correct than changing rudder

settings to compensate for the fin being pulled to the side by a side-mounted line. Insert a dowel on the fuselage bottom immediately below the snuffer tube. This allows the rubber band to make the necessary turns. Again, a couple of pieces of T.E. stock will position the band properly at the snuffer tube."

Thanks, Walt and Ralph, for helping those of us who are working on improving the systems we use.

THAT'S IT DEPARTMENT

For us in the Northwest, the summer has been extremely dry and hot. The effect is that our flying fields are ready tinder for any fires, and flying has become both difficult and uncomfortable. I hope that your flying has been excellent and that both competition and camaraderie are strong. Until next month, catch a thermal for me. ***MB***

PEANUT *Continued from page 57*

firm stock that will notch nicely. DO NOT NOTCH THEM YET—EXCEPT FOR THE NOTCHES THAT WILL ALLOW THEM TO FIT ON THE TOP AND BOTTOM CRUTCHES. Now, pin the top and bottom crutch pieces in place on the plans. You can also pin the side crutch pieces down to the top view of the fuselage shown at the bottom of the plans to prebend the pieces. Add the wing saddle as shown on the plans. CUT TWO EXTRA SADDLE PIECES AND RESERVE THEM FOR A LATER STEP. Let the assembly dry completely. When the crutches are dry, glue each half-former in place between the top and bottom crutches. Let them dry. Then, stick a pin in the building board about two inches in front of the nose of the airplane. Tie a piece of carpet thread to the pin. Lay the thread along the formers where the side-crutch should go, and mark the nice, straight line thus determined by the threadwith a fine tip marker. Then, using a NEW and SHARP DOUBLE-EDGED RAZOR BLADE, cut notches in the marked formers to receive the pre-bent side crutch. Again, let the assembly dry completely. When dry, use the thread again to determine the locations of the smaller 1/32 stringers, and INSTALL THEM WET—WITH TITEBOND. Let everything dry. Then, remove the half shell from the board, add the other halves of the formers, and after they've dried, add the stringers, WET, to the other side, using thread as you did before. This rather cumbersome procedure is the only way I've been able to keep my stringers straight, and to avoid adding bends and wigglesto the fuselage as I add stringers to the structure. If you have a better system, by all means use it. Next, you'll want to sheet the fuselage as indicated on the plans. I sheeted the airplane using five pieces of 1/64 balsa: cowl/turt ledeck, upper right nose, lower right nose, upper left nose, lower left nose. Incidentally, the sheeted portions shown follow closely those portions of the prototypesheeted with aluminum.

PROPELLER

A 4-3/4 inch Peck plastic prop will work fine on your Pete. I chose to hack my own out of some hard balsa. Using a block 4.75 long x .65 wide x .62 deep, I carved a 4.75 inch diameter by roughly 7 inch pitch prop.

MISCELLANEOUS

The cowl is carved from block. The spinner is made from a bunch of cross-grained laminations of 1/32 that were glued to a mandrel and spun to shape on a Dremel Moto Tool. The wheels were made from two cross-grained laminations of 1/16, and bushed with small pieces of 1/16 dowel. I think pilots are a must in open cockpit airplanes. Your first attempt may look a bit like Frankenstein, but keep at it, it's a skill well worth developing. All my pilots have mustaches, for two crucial reasons: because I have one, and because then I don't have to paint an upper lip. . . .

LANDING GEAR

The "real" gear is bent from .020 music wire, and glued carefully to the bottom of the fuselage with five minute epoxy. Then the 1/2 0 balsa legs are mounted over the wire. You'll note two odd things about the wheels: the "hub caps" don't exhibit the conic section common to many fabric covered wire wheels, and it appears that the hubs protrude through the caps. This is per the drawings. In the prototype, wing bracing wires connected to the landing gear at the center of the wheels.

COVERING AND FINISHING

Cover the flight surfaces in the usual manner. AFTER the wing is covered, and BEFORE you cover the fuselage, you need to fit the wing to the fuselage. It is done thus: Match the wing to the curved saddle piece. No, it won't fit, because there are stringers in the way. CAREFULLY cut them out BETWEEN THE BULKHEADS WHERE THE WING WILL FIT in such a fashion as to permit the wing to mate to the saddle (I needed to remove the two lower stringers on each side of the fuselage). Then after checking alignment in every way you know how, TACK glue the wing in place, and permit to dry. When dry, glue those extra saddle pieces (remember them?) in place between the

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bulkheads where the stringers were removed, mating them tightly to the wing's upper surface. Then cut the wing free, and cover the fuselage. For the fuselage, stick with Titebond as a covering adhesive. There are a wealth of curves on the fuselage, and to get a relatively wrinkle-free covering, I applied the tissue wet, covered the fuselage with six long pieces, and relied on the superior holding abili ty of Titebond to keep things in place. The control surfaces are drawn on with a *Sharpy* fine tip marker . . . the only brand I've found that won't bleed through dope.

The racing numbers were applied with an airbrush, using frisket paper stencils . . . I used *Floquil Engine Black*. The registration numbers are gold, with thin black outlines. The gold Floquil goes on using frisket paper and an airbrush again. The black outlines are CAREFULLY painted on by hand with a TINY brush. The irregular smudge shown below the exhaust stacks is my attempt to duplicate a hole that was cut in Pete's cowl for extra cooling.

Now, the hole shows every sign of being a quick fix for an overheating problem . . . I doubt seriously that Pete started its life with a nasty hole cut in the cowl. I chose to show the hole; you may choose otherwise.

FLIGHT SETTINGS

Peanuts require very subtle flight adjustments . . . fractions of an inch make a BIG difference. Therefore, I think it's futile to try to exactly describe the flight settings used in a particular aircraft . . . the odds that you and I will build identical airplane s begin to approach zero. However, here are some general guidelines. My Pete was about as cranky as most Peanut low wings usually are . . . but no worse, either. Because of Benny's great choice of moments, mine needed no ballast when a 12 inch loop of .100 FAI rub ber was used (I balanced the ship at 25% of the wing chord). I always fly left, why fight city hall? To do so, I use right-and-down thrust, left rudder, washin on the left panel and washout on the right panel. Good luck with your Pete! ***MB***

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CONTROL LINE *Continued from page 61*

aware of occurred right here in Eugene, Oregon, in 1957.

At that time, the Eugene Prop Spinners club kept a single airplane aloft for 64 hours, 33 minutes and 14 seconds. This was accomplished by use of a system that fed fuel from a gallon can carried by the pilot through tubing that ran down the lines to twin on-board tanks, and the day and night needle valve setting was adjusted by means of an electric servo controlled by the pilot using the wires to conduct electricity. The airplane, which was a marvel of engineering for the time, still hangs in a Eugene hobby shop.

The power was supplied by a double-glow-plug custom K&B Allyn Torpedo engine. The late Oba St. Clair, one of control line modeling's pioneers, designed the fuel and needle valve servo systems. Morris Gilbert, a member of the ground crew for the historic flight, is the Prop Spinners president today.

The flight was several months in the planning and involved industry sponsorship. It took two attempts to make the historic flight. Several pilots did the flying in shifts, handing off the handle and associated equipment at intervals.

The Eugene flight was covered in the modeling press at the time as well as in the local newspaper, the Eugene Register-Guard. K&B made it the basis for an advertising campaign. A historical look back at that flight was the subject of an article in *Model Airplane News* in the August, 1979 edition.

The current U.S. Academy of Model Aeronautics rules for endurance competition limit the fuel capacity of the airplane to four ounces. The current AMA record is held by J.R. Hubele, who made a flight of 2 hours, 4 minutes and 34 seconds on March 17, 1985.

I do not have reference materials to indicate whether there is a single-flight FAI record. Maybe a reader will be able to help out. Readers also may be able to tell us about other significant single-flight records.

3) I would in general question the practicality of using 100-foot lines unless they are particularly small. A few years back, just for fun, Mike Hazel had a plane set up for 100-foot lines—a Ringmaster powered by a rat race .40, using .014 single-strand lines. We found that the plane flew relatively well under power. However, the drag of the lines made itself evident when the engine quit—the plane dropped to the ground quickly with very little glide.

That would suggest that it would be wise to use more standard-length lines, so that the engine's power could be put to use keeping the plane aloft rather than fighting drag. A less powerful engine that burns less fuel could be used. Most endurance flights under the AMA rules that I've heard of have used quite small diesel engines.

• • •

Here's another question that our readers may be able to help answer. It comes from Sam Bocchieri of 44 Worrell Road, Antioch, CA 94509. People interested in the topic may want to correspond directly with Sam—but make sure to send a copy to *Model Builder's* control line column so that we can share the information.

Sam says:

"I am looking for information in how to get started in electric-powered control line. I have been modeling off and on since the early thirties and have tried just about everything in the airplane modeling field. My models are far from being contest types. I just build and fly for my own amusement. When the children were home I built them and they wrecked them, and we had lots of fun. But time marches on, as they say, and now I am on my own for both building and flying.

"I fly in my own back yard. I have a half-acre lot and plenty of room for control line if I limit myself to about 30-foot lines. I have been flying 1/2A models but of late have been getting mild complaints from my neighbors about too much noise.

"If you can give me some ideas on models and motors I would certainly appreciate it, or if you know of anyone involved with this type of flying I could certainly write them for information.

"I do not want to fly the AMA pattern or do anything really aerobatic; I just kind of fly 'around the pole,' so to speak. Scale types interest me the most."

I am aware that there are some motors and airplanes suited for electric control line flying but have no first-hand experience. Let's hear from somebody who can fill us all in! (Sounds like a great idea for winter weather: Control line fun flying in the local gym!)

• • •

Newsletters are the lifeblood of communication in model aviation, and one of the best control line publications for the past decade or so has been *The Skywriter,* the newsletter of the Seattle Skyraiders.

For all that time—and an uncounted number of issues—the editor was the amiable Dave Mullens, who kept Northwest fliers informed and entertained through his tireless work.

Dave has stepped down from the editor's position to spend more time on personal and modeling matters. His replacements are Bob Parker and Randy Schultz, who put out their first edition in July.

Congratulations and thanks to Dave for a job well done. We're looking forward with eager anticipation to receiving the "new look" *Skywriter* on a regular basis.

By the way, Northwest fliers interested in receiving the newsletter can do so by joining the Skyraiders. Send your dues to Seattle Skyraiders, 15828 S.E. 184th St., Renton, WA 98058. Dues are $20 for initiation and $15 a year thereafter (seniors $10 initiation/ $5 dues, juniors $5 initiation/no annual dues).

Speaking of newsletters, here's a new one: It's called *Round and Round,* and it comes from the control line section of the Tulsa Glue Dobbers.

It's an informative newsletter about doings in Oklahoma and the surrounding region, full of contest reports, club fun-fly news, contest flyers, etc. The editor is De. Hill.

To get on the mailing list, send a $6 subscription price to De. Hill, 5811 S. Utica, Tulsa, OK 74105.

One more bit of organizational news: There's a new address for the Miniature Aircraft Combat Association. For membership matters, write MACA, c/o Chip Giordano, Box 100, Toms River, NJ 08754. Annual dues for the national combat special interest group are $15 for U.S. residents, $18 for Canada and Mexico, and $25 for other countries (all in U.S. funds). The fine newsletter, *MACA News,* comes from Larry Driskill, 4916 Chagar Court, Las Cruces, NM 88005.

• • •

Not to rake an old issue over the coals, so to speak, but we continue to receive excellent feedback on the subject of line rake from people who have read a couple of previous articles in this column mentioning its importance in the search for optimum line tension.

Lou Crane sent us some good information which was published in the July/August edition. Lou is an experienced stunt flier who was able to provide a bit more technical slant on the subject than I had in the previous discussion.

Lou is back with more to say about line tension—and it's just too good to pass up:

"On leadout location—a bit more: Angle and separation *do* matter.

"I've found `rake' angle is usually 3-5 degrees, from CG through the leadouts. Nagio (Forbes)'s 10-12 degrees is more than my program comes up with, and its numbers work well for stunters. *(Forbes also was quoted in the second line rake article—jt)* I agree that for AMA, slow or 1/2A combat, extra works better. No draggy side areas when the `fuselage' yaws, and a violent flight requirement suits some excess pull.

"My first note mentions moments that appear when CF (centrifugal force) pull aims away from the CG (center of gravity). I use this to cancel gyro problems on stunt models. The prop-crankshaft-spinner system is a gyroscope. Precession is a weird thing that gyroscopes do. Check it out on a toy-store gyro some time. Visualize one set up shaft-horizontal, and wheel turning counterclockwise as you view it. It is how a model looks when you flip the prop, right?

"Push the frame at the 12 o'clock point, and precession turns the gyro `right' as if you had pushed the 9 o'clock point. That is, it `recesses' 90 degrees `later' in the direction of rotation.

"Prove it by pushing the 6 o'clock point: It turns `left' as if you pushed the 3 o'clock point. Still 90 degrees `later.'

"For C/L models, insides are like pushing the 12 o'clock point on the toy gyro frame. The nose wants to turn to the pilot's right. Outsides try to go toward the pilot's left. By `pilot,' I mean the imaginary guy sitting in the model, not you 60-plus feet away. Precession forces can be calculated. They form moments like those caused by badly placed leadouts. Leadout moments can balance precession moments.

"Insides cause `nose-out' yaw. The up line causes insides. Control surface air loads resist, so more of the pull shifts to the up line. If the up leadout guide is in the right place it aims some pull forward of the CG. You get a line-pull moment trying to yaw the model `nose in,' opposite the precession moment's `nose out.' This means up line forward for normal engines and flight direction." *(Lou includes a computer printout generated by a program that calculates exact locations for a particular airplane's specific characteristics. It looks like it would be a useful program for serious fliers; those interested may wish to write to Lou for more information than I am able to include here. The program is called STUNT.IIC. It is available on CompuServe's ModelNet, in DL5. For more information, write Lou at 2163 Sonoita Drive, Sierra Vista, AZ 85653—jt).*

"STUNT.IIC finds the minimum leadout separation to cancel precession for a stunter's (5-foot theoretical) corners. Down leadout aft does the same for outsides' `nose in' gyro yaw. The computed separation is not very much; most I've seen is from 3/8 to 1 inch. My calculated leadout position is the midpoint between up and down leadout guides, and needs 1/4 inch more if the line clips are out in the leads. Using the same leadout

hole sacrifices this effect.

"The stuff above suggests that over and under leadouts might not be best. Another point is the yaw-roll effect. When a wing flies faster, it makes more lift—all else equal, right? Slower? Vice versa. If precession causes a sudden sharp yaw, rotating the model around the CG, one wing suddenly goes faster and the other suddenly goes slower. Let's talk it through for an outside:

"Sharp down pushes our toy gyro at 6 o'clock, agreed? It precesses our model `nose left.' The right wing speeds up and the left wing slows down. Lift on each panel changes: Outboard wing rises and inboard wing drops. (This changes control input, too, with over and under leadouts; see it?) So the model tries to steer itself straight up your nose, while it changes what you tell it to do! (Extreme overstatement, of course, but isn't it just a matter of degree?) Down is good to study: it tries to slack the lines. Up causes a draggy outward crab and the same kind of roll effect on control input. Leadout position can prevent this, so why not? For maneuvering models, up line forward, minimum horizontal separation around 1 inch. Speed and racing can ignore this: Maneuver `g' forces don't apply.

(Lou has above better explained the reference I made in a previous column to the advantage of having the up line in front; there is a demonstrated advantage in turning characteristics both in slow stunters and fast combat planes. At the same time, planes that do not have to turn maneuvers—such as racing planes—are perfectly happy using the same leadout hole—jt)

"Also gotta quibble with Nagio about the fuselage weight on the All Americans being offset, not on the wing. The only way I was able to analyze C/L models was in terms of the CG and forces that act on it, or around it. CG should be right on the fuselage center line or thrust line—when we include half the weight of the lines. (The flier carries the other half.) Hal DeBolt just overdid the area offset—and guess what? STUNT.IIC also calculates optimum panel offset, and it works for all C/L models, not just my stunters. If the panel offset is about right, we can build in very close to the needed tip weight by a very simple trick.

"Get an empty line reel identical to the one with the flying lines. Flip the model over on a table or whatever. Put the full reel on the inboard wing, halfway from the fuse center line to the tip guides, and the empty reel on the outboard wing the same distance out. Add tipweight until she balances. The weights of the reels cancel out. Using full line weight at half the distance is the same as using half the weight at the full distance, so we are pretty accurately balancing half the weight of the lines. It works.

"If we can cluster all forces close to the CG, we can reduce a lot of stray unpleasant problems. As you said, we're all saying about the same thing in slightly different words.

"I have included a printout for a Sterling S-1 kit Ringmaster, a typical sport setup. (Yes, it is possible to backtrack from kits or plans into the program.) Leadout centerpoint comes out as 3.783 inches (after tip leading edge), or a bit over 3-3/4 inches, and needs the extra 1/4 inch for lineclip drag, so call it 4 inches. It only needs a bit over 5/32 inch separation to kill precession, so do what's comfortable. Line rake is a whopping 6.1 degrees. Some terms could use a lot of explanation, but I won't burden you with that—this time.

"Let me know if you'd like more."

Yes, indeed, Lou, this is a topic that could stand more discussion.

After reading your letter, I ran right out to the workshop and measured one of the several Ringmasters (a whole stack of retired sport racers!) to determine the kit leading edge center. It's around 3-1/4 inches after the tip leading edge. Your calculations put the leadout center just about where my "guesswork" design method would have put it for best stunt performance.

Thank you for clearing up several mysteries about forces that are evident to any experienced flier. We'd bet that a lot of fliers will be thinking about precession and putting the up lines in front after your explanation.

Comments, questions, photos, club news, contest information and any other control line news is welcomed. Send it to John Thompson, 1520 Anthony Ave., Cottage Grove, OR 97424. **MB**

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