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MODEL BUILDER

FEBRUARY 1989
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WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

CONSTRUCTION
Radio Control French Trainer NORD 3202
Old Timer ALERT

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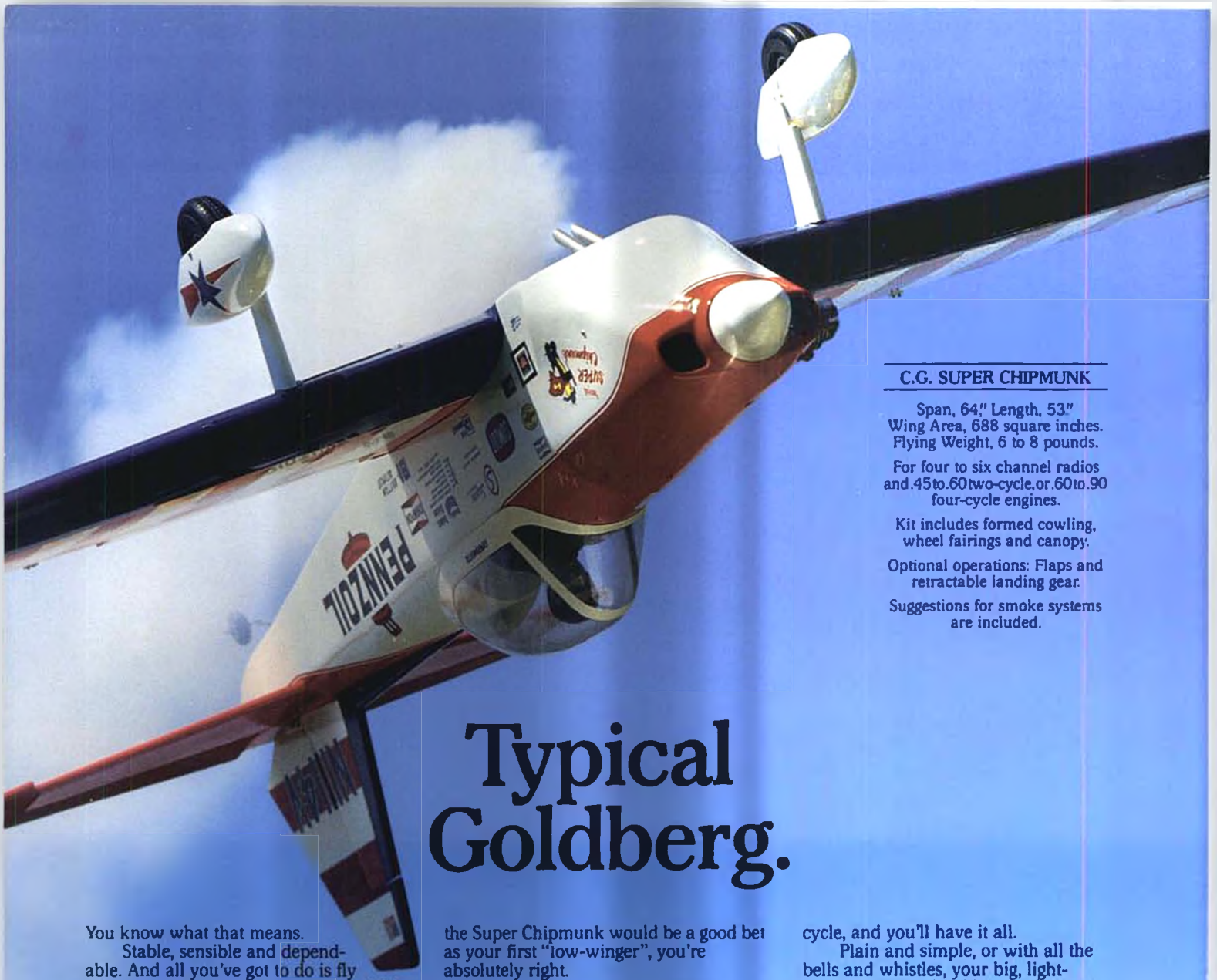

C.G. SUPER CHIPMUNK

Span, 64." Length, 53."
Wing Area, 688 square inches.
Flying Weight, 6 to 8 pounds.

For four to six channel radios and .45 to .60 two-cycle, or .60 to .90 four-cycle engines.

Kit includes formed cowling, wheel fairings and canopy.

Optional operations: Flaps and retractable landing gear.

Suggestions for smoke systems are included.

Typical Goldberg.

You know what that means.

Stable, sensible and dependable. And all you've got to do is fly your new C.G. Super Chipmunk straight and level for a few minutes and you'll discover that it *is* "Typical Goldberg".

But it's Goldberg with a difference.

Just turn it loose, and this easy-to-handle Sunday flyer will put on an airshow with all the flash and flair of its full-size cousin.

All the thrills without the chills.

Oh sure, you've heard that one before. But here's one model that's really been engineered to live up to the promise. So while it delivers the kind of sparkling aerobatic performance that's sure to keep the experts interested, the Super Chipmunk's super-stable low speed manners are something we can *all* appreciate.

Fly it at a crawl, and it simply won't quit. Bring it in a little nose-high, and you'll still have a solid feeling of control all the way to a perfect touch-down.

Fact is, if it's beginning to sound like the Super Chipmunk would be a good bet as your first "low-winger", you're absolutely right.

The options you choose set the pace.

If you're a more experienced flyer, The Super Chipmunk's well-designed flap and retract options offer an added dimension of realism.

And when it comes to power, a .45 to .51 two-cycle, or a .60 four-cycle are just right for solid sport flying. If high performance is your thing, bolt in a .60 two-cycle, or an .80 to .90 four-cycle, and you'll have it all.

Plain and simple, or with all the bells and whistles, your big, lightweight Chipmunk will come through with flying colors.

The kit and the value are "Typical Goldberg", too.

If you liked our Anniversary Edition Cub, you're going to love the C.G. Super Chipmunk.

Its beautifully formed molded parts, full color peel-off decals and complete hardware package are the kind of deluxe accessories you'd only expect to find in kits costing a lot more.

Plus you'll find the same kind of high-quality materials, precision cutting, straight-forward construction planning and superbly illustrated instructions that have made all of our other kits so popular.

CARL GOLDBERG MODELS INC.

Typical Goldberg? You bet.

But with the Super Chipmunk, the phrase takes on a whole new meaning.

Excitement!

The Super Chipmunk! From Carl Goldberg Models.

New book "briefings" from H.A.

BEECHCRAFT: STAGGERWING TO STARSHIP. Ed Phillips, Staggerwing, Twin Beech, Bonanza . . . every production and experimental Beech airplane ever flown is documented. Complete warbird coverage of UC-43, GB-1, AT-7, AT-11, C-45, the mighty XA-38 Grizzly. Postwar years including Model 35 Bonanza, Travel Air, military and export models, T-34 Mentors, Barons, Dukes and the legendary King Airs; they're all here plus much, much more. With 245 photos, including many never published before, 343-view drawings, technical specifications . 96 pages, 8½" x 11", sfbd. **2012A $14.95**

THE PIPER CLASSICS, Christy. The fun "Cubs"—simple tube and fabric aircraft. Discusses the evolution of Piper lightplanes—J-3 Cub, J-4 Coupes, J-5 Cruiser, PA-11, PA-18, Vagabonds, Colts, Pacer/Tri-Pacer, even Wag-Aero's CUBy. Also covereds: Availability, problems, SPECS, rebuilding, maintaining and operating. 101 illus. 160 pgs, 5" x 8", sfbd. **4208B $13.95**

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FROM THE GROUND UP, Welck and Hansen. Autobiography of aeronautical engineer Fred Welck, designer of the Ercoupe, Ag-1 Piper Pawnee ag plane and the Piper Cherokee. Welck made a significant contribution to the advancement of aeronautical technology, including development of the steerable tricycle landing gear. Covers history of ERCO and the Ercoupe, development of the Ag-1 Pawnee and the Cherokees. 109 photos, drawings, 556 pgs, 6" x 9", hdbd. **4351C $39.95**

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MODEL BUILDER

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CONTENTS

FEATURES

CONSTRUCTION

COVER Benny Howard's DGA-6 Mister Mulligan was a lot more than just a slick-looking race plane. The Mulligan, a four-place cabin job designed to use a Pratt & Whitney Wasp engine booster to produce up to 830 hp, won both the Bendix (cross-country) and the Thompson (closed course) races in 1935 and was the only one of the custom-built racers of its day to be developed into a successful commercial design. As seen here, designer-builder-pilot Benny Howard has just made good use of his airline pilot training to bring Mr. Mulligan through several hundred miles of foul weather to break out of the dark, rainy sky over the Cleveland airport, rapidly grabbing the attention of the rain-soaked race officials and fans waiting below.
The original painting, by Bob Benjamin, is available for sale, and is offered as well as a collector print, as are all of the previous classic air race cover paintings. Please write or call Robert A. Benjamin Aviation Art, 1222 26th Ave., NE, Olympia, Washington 98506. (206) 352-2602 for a free, illustrated print catalog.

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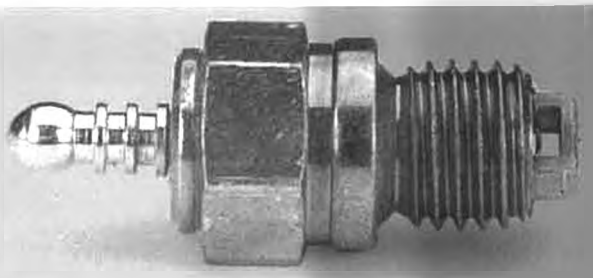
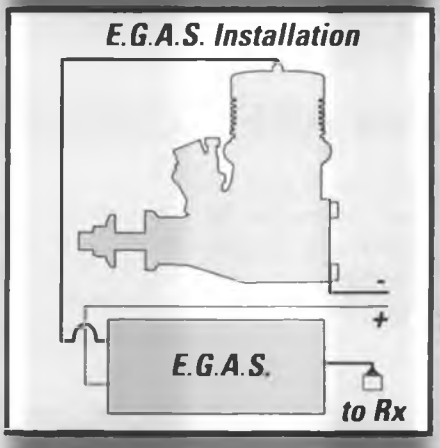


If your engine uses these, help is on the way.

NEW E.G.A.S. (Electron[illegible]witch) & MULTI-CYLINDER GLOW DRIVER

Has this ever happened to you? You bench run an engine and have it set up perfectly. After you install the engine in your model, it doesn't run quite the same as it did. The idle is a bit rougher than it was. Sometimes the transition from low to high throttle makes the engine skip a beat or two. Maybe one or two of the cylinders in your four stroke engine seem to have a mind of their own. Well, cheer up. Help has arrived. Here are two brand new products to put you and your engine back on speaking terms.

E.G.A.S. is a totally electronic glow assist system which requires no mechanical actuation or in-line switches. It works right off the receiver, just like a servo. It has it's own separate power source for the glow plug. It is installed in parallel with the throttle servo via a 'Y' harness. The advantage of the E.G.A.S. is that when the flight pack is turned off, so is the power to the glow plug. The point where it switches off power to the glow plug can be changed by turning the neutral adjustment on the front of the case. Current drain from the receiver flight pack is less than that of an idling servo. The glow plug power source is a 1.2V NiCad battery. Most applications will use a single 1200 mAh cell. This will last for 12-15 minutes of continuous operation. Larger capacity cells may be required. It will handle up to 6 amps without a heat sink.



The **Multi-Cylinder Glow Driver** works on basically the same principle with just a few exceptions. It is designed to power one to five glow plugs. Glow plug leads are attached to the terminal strip. This system works with the throttle servo via a 'Y' connector. It has a remote LED indicator which has 5 LEDs. There is one LED per cylinder which light when the glow plug lights. If the LED does not light, it tells the operator which plug has burned out. Also, a push button switch can be added to give a boost when starting flooded engines. Its current drain from the receiver flight pack is less than that of an idling servo. The glow plug power source is 2.4V. Most typical applications use two 1200 mAh cells. They generally last around 10-15 minutes of continuous operation. Larger capacity cells may be required. It will handle up to 4.8 amps per plug without a heat sink.

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7UAP PCM 1024 transmitter with trainer system and RF module.

COMPUTER CONTROL

Precision, fully electronic, computer programming is at your finger tips with Futaba's new Seven Series systems.

With the 7UAP/7UAF 7 channel aircraft systems you have accurate computer control for ATV, dual rate, exponential and mixing. Using data input keys, all programming settings are made in 1% increments and are displayed on the LCD screen.

For the serious flyer, the benefits of computer programming is obvious. Flaperon and aileron differential, snap roll (4), programmable mixing, fail safe and other settings are made, displayed and stored in memory for flawless performances time after time.

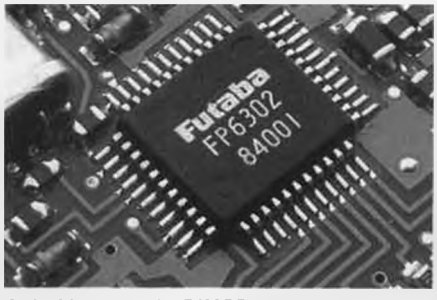
SCREENING OUT ERRORS

In addition to programming functions, the big LCD screen also provides information for servo reversing, PCM/PPM switching, transmitter battery voltage and elapsed time of operation. Everything you need to know for a perfect flight is there, in easy to read numbers, at the touch of a button. Even a low battery warning signal is included.

Large LCD indicator screen monitors all programming functions.

NARROW MINDED 1991 RECEIVERS

Both the 7UAP and 7UAF systems include narrow band receivers that meet the 1991 standards. The 7UAP uses the same R129DP/9 Channel PCM 1024 receiver as our 9VA professional model,



An inside look at the R129DP shows the exclusive Futaba PCM 1024 microprocessor and surface mount construction (SMT).

while the 7UAF is equipped with an R128DF/8 Channel, dual conversion FM unit.

The R129DP and R128DF are assembled using the latest, SMT construction for super reliability, efficiency and compact size.

ERGONOMIC ENGINEERING

The stunning electronics of the Futaba Seven Series are encased in an all-new transmitter case, ergonomically designed for comfort and optimum control access.

The contoured back gives you a more stable grip. Mix, rate and auxiliary channel controls are slanted for easier reach. And the open gimbal control sticks are adjustable for length.

CHOPPER COMPUTER

There are Futaba Seven Series for helicopters, too, but you won't see the usual difference in the transmitter cases. Because of the many functions of the computer system, it was unnecessary to reposition many of the controls. What is different in the 7UHP/7UHF systems are five S5101 servos and 1000mAh NiCd packs.

Join the computer age. The new Seven Series from Futaba are the systems advanced airplane and helicopter pilots can count on.

7UHP PCM1024 Transmitter.

1024

20KHz

1991

Futaba

Futaba Corporation of America
555 West Victoria Street, Compton, CA 90220

OVER THE COUNTER

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Graupner electric sailplane from Hobby Lobby.

"Aero-Lectric" R/C trainer from Midwest.

Tx for Futaba's 5UAF FM sport system.

• Here are a couple of interesting new electric aircraft we've just received word on: the Aero-Lectric, from Midwest Products is an electric-powered R/C trainer designed for the beginning R/C flier. The kit features micro-cut wood products, rolled plans, bagged parts, and a construction manual. Like the Midwest gas-powered Aerostar, the Aero-Lectric will recover itself to a normal glide simply by closing the throttle and letting go of the control sticks. Wingspan of the Aero-Lectric is 50 inches, and a three-channel radio with standard servos is required. For more information, contact Midwest Products, 400 S. Indiana St., Box 564, Hobart, Indiana 46342.

The Electro-UHU is a new electric-powered sailplane from Graupner. The Quickie kit has a preformed fuselage and an easily constructed 2-piece rib and spar wing, which spans 66 inches, with an area of 450 sq. in. A Speed 600 motor and a Scimitar folding prop are available, Performance is versatile, with the double-sweep

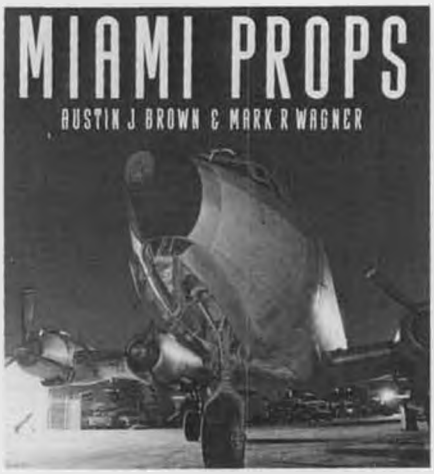


Photo book from Zenith, "Miami Props".

Sig's new extra-large tailwheel assembly.

wings allowing the UHU to land at a low speed, and soar in thermals at varying speeds, with a flat and wind-penetrating glide thrown in for good measure. A free

New Focke-Wulf history book from Zenith.

catalog of this and other models is available from Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, Tennessee 37027.

* * *

For the sport flier, Futaba has come out with a new five-channel FM radio system, the Futaba 5UAF with features like transmitter RF module, ATV, dual rate, and FM. The 5UAF provides ATV adjusters for aileron, elevator, and servo reversing on all channels. With an optional trainer cord, you can use the 5UAF to train a novice, allowing control to be instantly switched from trainer to student. The 5UAF system comes equipped with four S148 servos. For more informa-

Collection of jet 3-views, vol. II, from Zenith.

tion, contact Futaba Corp., 555 W. Victoria St., Compton, California 90220.

* * *

Sig Manufacturing Co. has developed a super-strong tailwheel assembly for giant-sized models weighing over 15 pounds. It features a molded nylon tailwheel bearing with scale-like appearance, hardened spring-steel leaf springs, complete hard-

Continued on page 106

Here's something different for L.A. modelers who want to take in a local R.O.W. fun-fly (see text). Non-scale Navy flying boat, MB plan No. 11751, designed by George Clapp.

from Bill Northrop's workbench

• We have just recently returned from the ninth Tournament of Champions in Las Vegas, as put on by Bill Bennett, Chairman of the Board of Circus Circus Enterprises. Most significant is the fact that the T.O.C. has been reactivated after a four-year hiatus and is back on a two-year schedule, with Number 10 coming up in 1990.

To relieve the suspense, if you don't already know, Hanno Prettner, of Austria, was again the winner, having won every T.O.C. except the eighth, in 1984. However, it was not the usual shoo-in, as 16-year-old Gordon "Chip" Hyde, from Yuma, Arizona, dogged Hanno's heels right down to the wire, winning two out of the four final round schedules, and only coming up 1534.52 points short of Hanno's 170,432.27 total!

Next month we'll have a complete story, with photos, of this world-class, precedent-setting tournament.

WET R/C IN L.A.

The Los Angeles area R/C modelers will have their first opportunity to participate in a local R/C R.O.W. Fun Fly on February 18 and 19, 1989, which it is hoped will become an annual affair. The site is Castaic Lower Lake, just off Interstate 5, north of Los Angeles. The lake offers beach launching and taxi-return. During the scheduled dates, the entire Lower Lake complex will be dedicated to the fun-fly. This will include overnight RV parking.

The event will be sponsored by the Canyon Crosswinds MAC and The Friends of Castaic, with approval of the LA County Dept. of Parks and Recreation. For further information and advance registration, send a legal size S.A.S.E. to Bruce Chandler, C.D., 7858 Farralone Ave., Canoga Park, California 91304.

Hanno wins again, but just barely. Miss T.O.C. Katherine Romano, Circus Circus Chief Operating Officer Richard Banis, Mrs. Bill (Sam) Bennett, Hanno, and Mel Larson of Circus Circus.

Like the song lyrics say, "This could be the start of something BIG!" You can bet it will be on our 1989 calender!

TRADE SHOW TIME

The trade show season is getting into full swing as this issue appears. Leading off the series is the twelfth year of the IMS Pasadena Show, January 13 (trade only), 14, and 15, 1989. Next in line is the Eighth Annual Northwest Model Exposition in Puyallup, Washington, on February 4 and 5. The Twenty-First Annual Eastern States R/C Jamboree, more familiarly known as the WRAM's Show, is, as usual, the last weekend in February, or the 24th, 25th, and 26th, with Friday being for trade-only. The granddaddy of them all, the Toledo Radio Control Exposition, opens for the 35th consecutive year (how long have you been in R/C?) on April 7 through 9. At this time, no word on Baltimore, but the final show of the season will be the Second Annual IMS Atlanta, on May 12 (trade-only), 13, and 14. (Stop Press: Just received notification that the Fifth Annual MARC show in Baltimore is on for June 3 and 4.)

As many of you know, the Radio Control Hobby Trade Association, an organization that was formed for the purpose of promoting and improving the radio control hobby industry, has also stepped into the trade show business, with its Chicago Model & Hobby Show in mid-October. The aims of the privately and club-owned shows differ in some respects from those of the RCHTA organization.

The private and club-owned shows have always been intended to bring the manufacturers and the ultimate consumers of their products together, under the same roof. This has been going on for many years, as the record indicates, and those of us who have been personally involved in these shows as organizers, exhibitors, or spectators (some of us have been all three!) feel that the private and club shows have been very effective in promoting and improving the R/C hobby industry.

To add interest to the shows and attract the type of public that is most interested in the products on display, the private and club shows offer static model competition, swap shops, and also allow optional selling of products directly from the exhibitors' booths. The philosophy behind the latter is that it provides the opportunity for the new and/or small companies to create a demand for their products by putting these products directly into the hands of the public. If the product is good, it will begin to sell itself, and the manufacturer is off and running.

In contrast to the private and club-owned shows, the all-industry show as presented by RCHTA is not consumer/public oriented; no static model display or competition, no swap shop, and if at all, only token selling of selected products through a full retail store at the show. Selling by exhibitors to the public directly from their booths is strictly prohibited. These were the rules administered for many years by the Hobby Industries of America (HIA) in its once-a-year trade show. In fact, until recent years, when it gave in to requests from many of its exhibitors who had experienced the advantages of public exposure at the privately owned shows, the

HIA show had been completely closed to the public.

During the last 10 or so years, the HIA show became so craft, game, and railroad oriented that the model industry found it unprofitable to attend and/or continue membership. This was the main reason for the founding of the Radio Control Hobby Trade Association, and for its establishing the annual trade show in Chicago four years ago.

While the private and club-owned shows continue as before. . . except for the addition of trade-only days at Pasadena, New York, and Atlanta. . . .the RCHTA show, on the other hand, is going through some changes that are less than satisfactory to an increasing number of its member and non-member exhibitors. The accelerated addition of non-R/C exhibitors in the last three years seems to be an all too familiar trend previously experienced by R/C model oriented exhibitors in the HIA shows. While these non-R/C factions increase the physical size of the show, some look on it as symptoms of another HIA happening. Now RCHTA has joined forces with the Model Railroad Industry Association (MRIA), which has resulted in roughly one-quarter or more of its show floor space being occupied by model railroad exhibitors. Less than five percent of these *may* have any R/C connection. In addition, major static plastic companies, such as Revell and Monogram, have taken over huge centralized areas of the exhibition floor, and in 1988 there were approximately 25 to 30 games exhibitors. The total amount of floor space occupied by these non-R/C exhibitors must be at least one-third of the total. Some R/C companies, especially those taking only one or two booths, feel they are being pushed aside by the larger, big-buck, non-R/C exhibitors. Although small exhibitors with higher priority have earlier choice of space, the locations of larger, strategically centralized exhibit spaces are already established by the show organizers prior to selection time, so "yer pays yer money and takes yer cherce" of what's left.

Further unsettling decisions by RCHTA, to start up additional trade shows in areas and time slots already occupied by the long-established private and club-owned shows, have also brought about concern from members of the R/C model hobby industry. As this area of discussion is too close to this writer's interests, it could be difficult for us to appear objective in any discussion about it, so it is best at this point to move on to other subjects.

BACK TO PASCO

When we read about the locale for the 1989 AMA Nationals, we did the old comedy double-take routine. The Nationals is actually to be in Richland, but that's just one-third of a Tri-Cities area in southeastern Washington state which includes the towns of Kennewick and Pasco.

This writer had never been farther west in the US than Chicago up until the time the Navy decided it wanted me in Pasco, Washington, instead of Lakehurst NAS, New Jersey. I was shipped to Sand Point NAS in Seattle, and from there, boarded a Navy DC-3 for Pasco. The Seattle area is sorta like New England; rich green foliage, lots of evergreens, small lakes, rocky soil . . . only it doesn't rain as much, at least not in Braintree, where I'm originally from.

Whatta surprise on landing in Pasco. . .What in hell is a Naval Air Station doing out in the middle of a desert!? I soon found out all the fighter, dive bomber, and torpedo bomber pilots who normally operated off carriers, were out here to learn how to ground strafe sagebrush and practice bombing techniques without the danger of hurting anyone. . . for miles around! I spent ten months in Pasco (working in the control tower as a meteorologist, the Navy called it aerologist), and visited Kennewick, Richland, Yakima, Walla Walla, etc., even Hanford, where we only knew at the time that something top secret was going on (like the first atomic bomb development).

Well, free flighters, that tri-cities area has flying space out the gazoo! I recall the weather as hot and dry in the summer, and the winds were normally out of the southwest, and seldom over 10 knots. Of course, that was for Pasco, but it's not that far to Richland. Really sounds like a winner for a Nats site for all categories, especially free flight! I assume there must be some motel accommodations there now, there sure weren't any when I was there back in '43'44.

PLEASE READ

All sorts of pro and con verbiage has been published in club newsletters and hobby

Continued on page 107

ADVICE FOR THE PROPWORN
—By Jake

• In an attempt to show that Jake can do more than just answer letters from misguided modelers, *Model Builder* sent this intrepid reporter to the Tournament of Champions in Las Vegas, Nevada, November 10 through 13, 1988. Rather than cover the outcome (Hanno Prettner won), I thought I would try to relate the overall T.O.C. experience from the viewpoint of the average spectator/modeler.

To be a competitor at the T.O.C., you must be one of the twenty best radio-controlled model airplane fliers in the world. Invitations are sent out to ten American and ten international competitors based on their performance and placing in a series of major competitions the previous year. My exclusion this year was obviously an oversight and will no doubt be corrected in 1990.

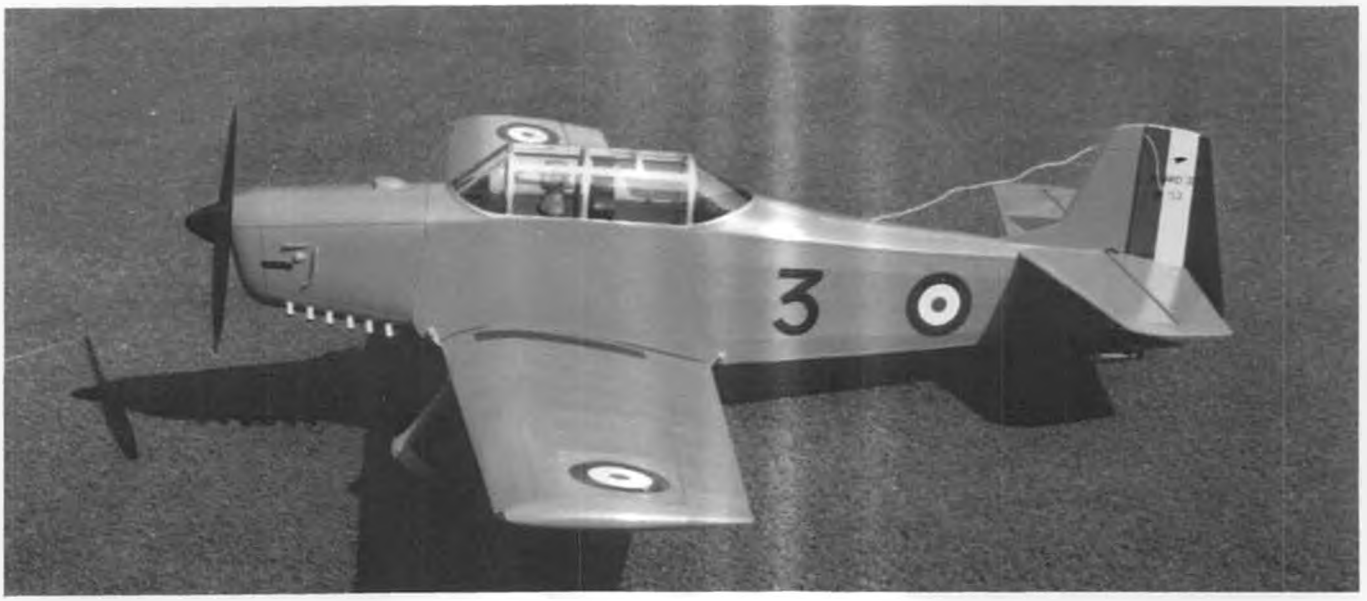
The aircraft flown must be scale replicas of full-scale aerobatic aircraft. Four years ago Hanno Prettner entered a biplane that looked somewhat like a Winnebago and was disqualified. This time he entered a Winnebago that looked somewhat like a Skybolt and was allowed to fly. Biplanes were given a six-percent scoring bonus. Alfredo Gianncarlo of Italy entered a Fokker Triplane and asked for nine percent, but his request was denied.

The flight programs flown were identical to those flown in full-scale international aerobatic competitions. All flights were performed in a "turnaround" format. This means that after each maneuver the pilot turns around and asks the judge what he got. Four sequences were flown by each pilot; the known, free, unknown, and three-minute free. The known was a pre-established sequence provided by the contest committee. The free was a homemade sequence submitted in advance by each pilot. The unknowns were kept secret from the pilots and were not handed out until the night before they were flown. The three-minute free refers to the parking situation in downtown Vegas.

The maneuvers and flight sequences taken together are known as Aresti aerobatics. The Aresti system includes a list of symbols which represent each maneuver. An entire twenty-maneuver sequence can be drawn on one sheet of paper using these symbols which consist of arrows, triangles, squares, arcs, etc. representing snap rolls, spins, loops, humpty-bumps, and bunts. A common misconception is that the Aresti system is named after Count Aresti, who developed it. This is not true. The Aresti system was actually invented by a Mr. Bertram Edgebrooke of England, and was so named because Mr. Edgebrooke was frequently *arrested* in London parks after asking young

Continued on page 106

NORD 3202



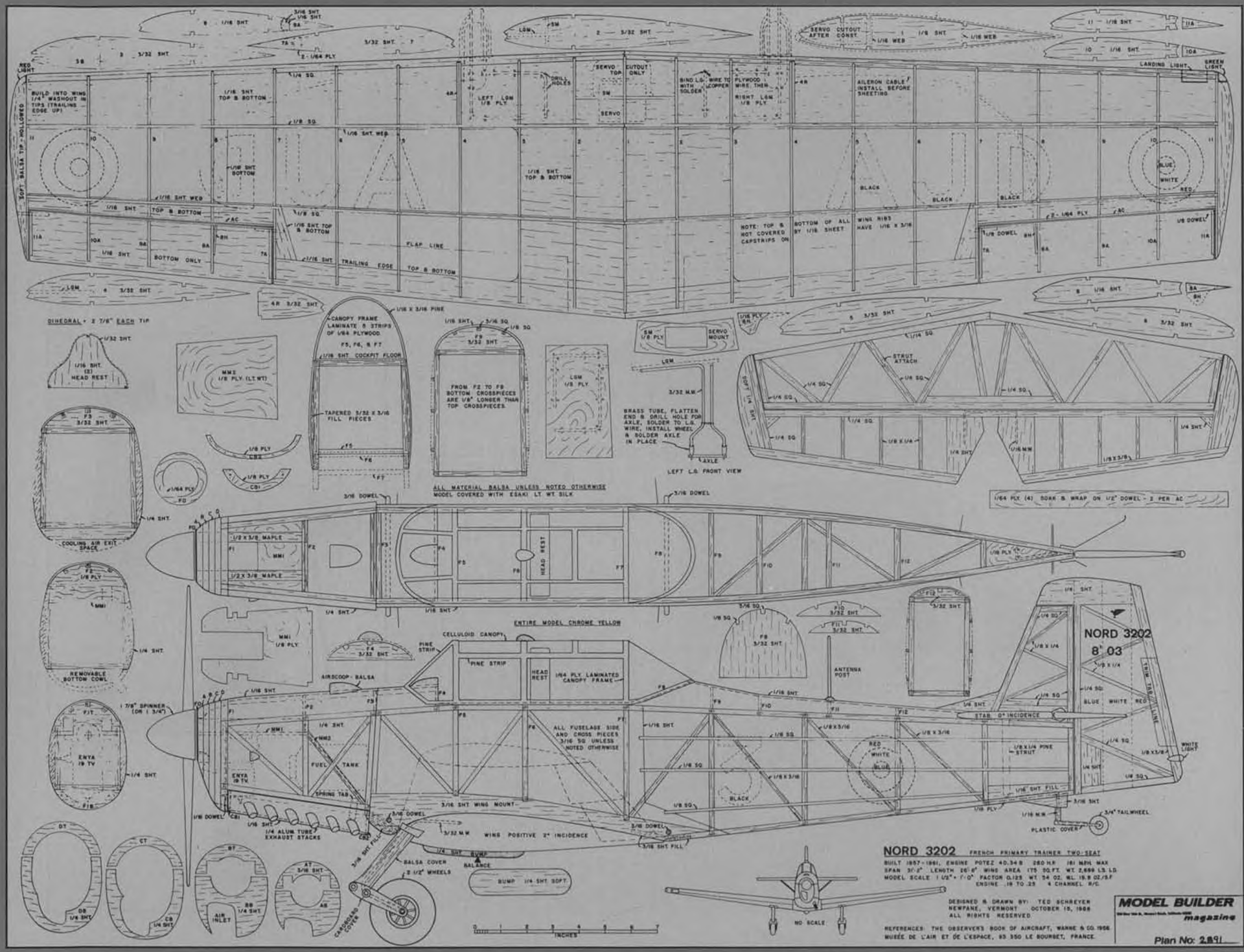
By TED SCHREYER. . . Our author has discovered an unusual and attractive subject in this French primary trainer. Presented here in 1/8 scale, for .19 to .25 size engines.

The pretty young lady posing with the NORD is Lee Anderberg, a high school junior at Leland & Gray Union High School in Vermont. Photo taken at The Country Inn farm in Williamsville.

• Challenge is the common theme among modelers. To make a model that looks better; flies faster, higher, longer, more reliable, more realistically, or more aerobatically; builds easier; is stronger; has more scale detail; or whatever it is that is desired in the model, represents the challenge to the modeler. In the 30s and 40s when Megow, Guillow, Comet, and other kit producers were putting out hundreds of kits in the 10- to 50-cent price range, this author built Nieuports, Spads, Fokkers, Aeroncas, Stukas, Spitfires, Fairchilds, Grummans, Ryans, and most every model kitted. These were scale models. After considerable years of practice, the models looked somewhat presentable, but they flew about as far as a strong arm could throw them, and with about as much realism. The psychological implications of this "scale model/no fly" syndrome has probably prompted me to concentrate on designing scale models meant for flying.

As the model industry progressed to glow plug engines, which eliminated the bulk and weight of the coil, condenser, batteries, points, and accompanying electrical problems of the ignition engine. Then radio control equipment became available with reliability, small size, and reasonable prices, the second and final step in the miracle that allows us to design, build, and fly a scale model of any aircraft, including the jets with ducted-fan engines.

Fifty years ago the idea of being able to let



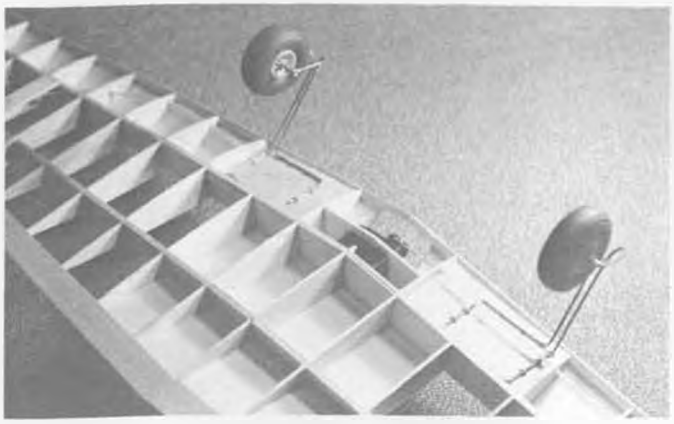
NORD 3202 FRENCH PRIMARY TRAINER TWO-SEAT

BUILT 1957-1961. ENGINE POTEZ 4D.34 B 280 H.P. 181 M.P.H. MAX
SPAN 30'-2" LENGTH 26'-8" WING AREA 175 SQ.FT. WT. 2,689 LB. L.D.
MODEL SCALE 1 1/2" = 1'-0" FACTOR 0.125 WT 34 OZ. WL. 15.8 OZ/SF
ENGINE .19 TO .25 4 CHANNEL R/C

DESIGNED & DRAWN BY: TED SCHREYER
NEWFANE, VERMONT OCTOBER 15, 1968

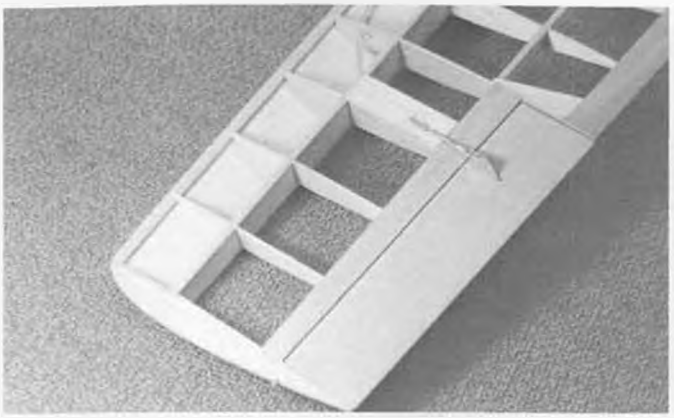
REFERENCES: THE OBSERVER'S BOOK OF AIRCRAFT, WARNE & CO. 1956
MUSÉE DE L'AIR ET DE L'ESPACE, 93 350 LE BOURGET, FRANCE.

MODEL BUILDER magazine
Plan No: 2891

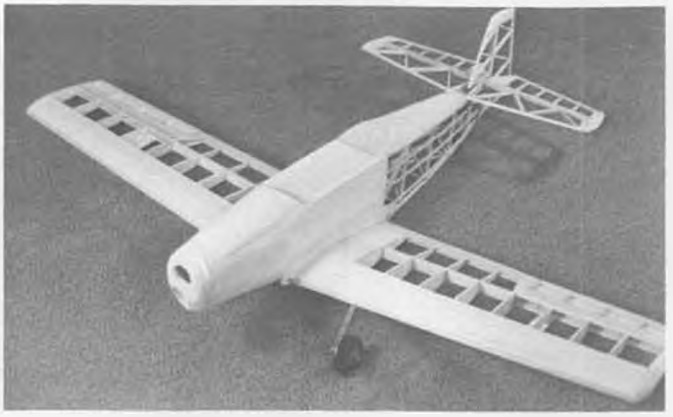


Bottom of wing before sheeting. Landing gear struts are bound with copper wire to plywood mounts, soldered, then epoxied in place.

The NORD ready for covering. Note how realistic the landing gear struts look when faired in with balsa and cardboard.



Ailerons pivot on 1/8-inch birch dowels. Outer dowel is removable, allows close-fitting ailerons to be installed after finishing.



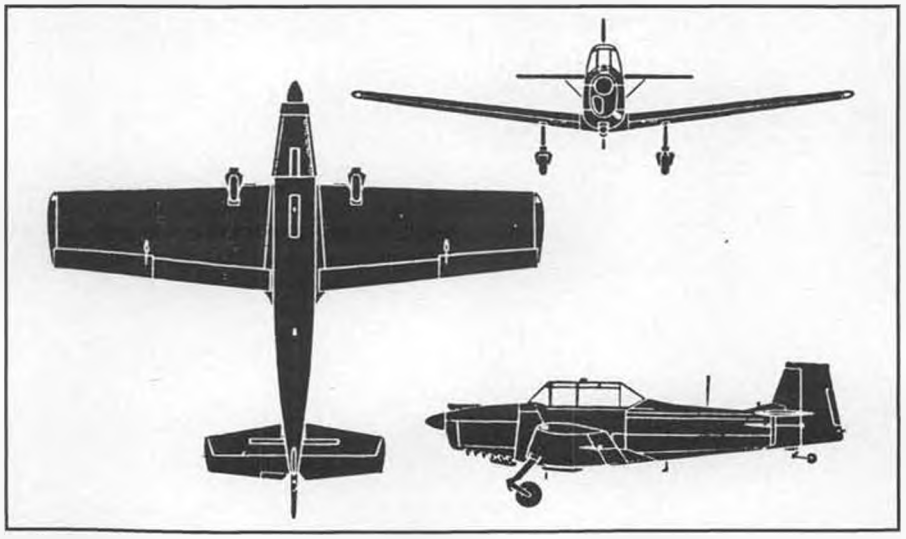
The completed framework without the "greenhouse" canopy frame or landing gear strut fairings installed.

a model fly out and then have it come back and land where it took off was just a dream. Now we can control our models so they takeoff, climb out, perform aerobatics, throttle down, glide in, and land. Absolutely amazing.

While browsing through the 1958 edition of *The Observer's Book of Aircraft* a three-view caught my eye, and the more it was examined, the better it looked for an R/C scale model. The Nord 3202 has a planform that approaches the classic pattern model, an in-line engine with neat cowl and a grasshopper-leg landing gear that is short but allows plenty of prop clearance because of the high thrust line. The model Nord 3202 is easily constructed, lightweight but strong enough for everyday flying, looks good, and flies as well as any model yet built by the author. The model presented here is a 1-1/2-inch to 1-foot scale, being 0.125 of the original aircraft.

Scale 1-1/2 in. = 1 ft. = 0 in. Factor = .125	Wingspan (Linear)	Wing Area (Square)	Weight (Cube)	Power (Cube)	Speed (Linear)	Power Loading
Nord 3202	31.17 ft.	175 sq. ft.	2,689 lb.	260 hp	161 mph	16.7 lb/hp
Nord 3202 x Factor	F x 31.17 = 3.896 ft.	F^2 x 175 = 2.73 sq. ft.	F^3 x 2689 = 5.25 lb.	F^3 x 260 = 0.51 hp	F x 161 = 20 mph	N/A
Model	3.896 ft.	2.73 sq. ft.	3.38 lb.	0.34 hp	45 mph	9.9 lb/hp

The Nord 3202 is a two-seat primary trainer designed and built for the French Army during 1957 to 1961 and developed from the NORD 3200 and 3201. These Nords were the modern-day replacements for the Stampe S.V.4 biplanes and have a resemblance to the Fairchild PT-19 and Cornell, the DeHavilland "Chipmunk," Zlin, Lampich Pajtas, and the Toyo TT-10, all of which are great flying machines. The Nord 3202 is used for aerobatics and navigation training, has a maximum speed of 161 mph, cruises at 155, and a loaded weight of 2,689 pounds.



Three-view of the full-size NORD 3202, courtesy of the 1958 edition of *The Observer's Book of Aircraft.* Used a 260-hp Potez 4 D. 32, four-cylinder in-line. . . so why the six pipes?

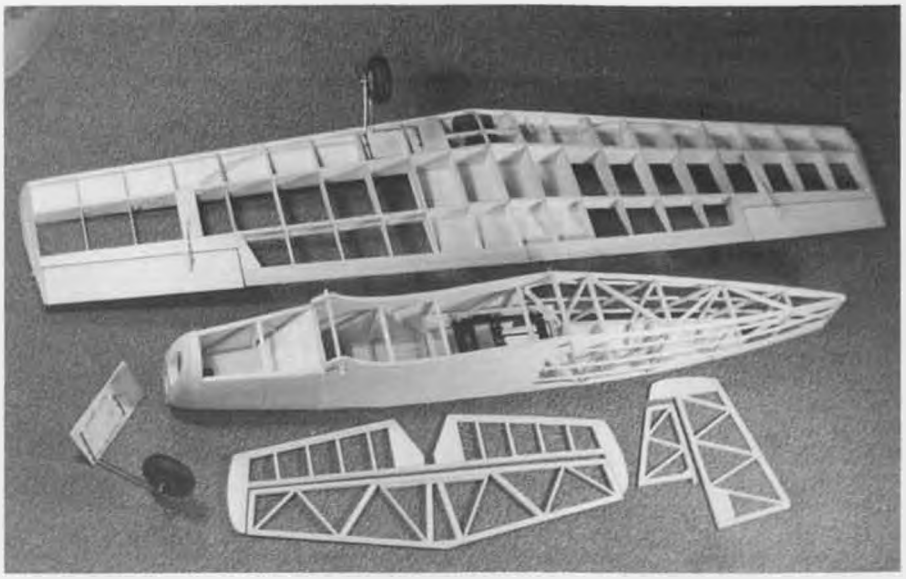
Most scale models are linear scale; that is, the lengths and areas and cross-sections are to scale. But how about the rest of it—weight, power, and speed, for instance? Included here is a chart comparing the model with the full-sized aircraft.

Assuming that my factoring is correct, this model is lighter, less powerful, and faster than an exact-scale representation would be. However, another factor to consider is that the air the model flies through is full-sized; the air molecules are eight times (diameter) larger in relation to the model than to the real aircraft. Although it would be possible to make a 5.25-pound model and power it with a 0.51 hp engine, it certainly wouldn't fly at 20 mph. Rubber-powered scale models might fly near scale speed, but they are tremendously lighter and lower powered.

FUSELAGE

The fuselage is built along the conventional box-type method, with two sides built on the plan, then crosspieces are added to form the basic fuselage structure. Formers, plywood pieces, nose pieces, stringers, and planking are added. The fuselage provides the strength and platform for the flying surfaces, so build it true and sturdy, choosing balsa for the job it has to do. Keep in mind that the model has to balance, so keep the tail light. Before drilling the engine mounting holes, put engine, prop, and spinner together and site-mount it so there is adequate space between spinner and fuselage front. The engine is mounted with 0 to 0 thrust alignment. The photos show pipes coming out of the cowl for a metal tank, which was removed because it sucked air when the model was turned over to start the inverted engine. A regular plastic clunk-tank was installed by cutting a hole in firewall MM2. Depending upon the size and shape of the tank, you will have to cut and fit it into MM2 and provide a sturdy mounting, including padding for vibration reduction to prevent the fuel from frothing. Since an inverted engine starts much easier when the model is turned over (so the engine is upright), a simple plywood box was put together to caddy the starting battery, fuel, tools, etc. and a cradle cut into the top so the model can be turned upside down and held for starting.

Another problem in operation is that the engine is enclosed by the cowl; good for looks, but bad for cooling. The Nord has a nice opening for air to enter, but this air needs to go around the engine cylinder and make its way out the rear cowl exit. With the cowl shown on the plan the model flies, but the cooling is marginal, so any extra exit space would be a plus, even if it were to be non-scale to some extent. The removable bottom cowl piece goes on by slipping it on the front dowel keys, then compressing the brass clip strips and pushing the rear down into place. The brass strips are epoxied to the bottom cowl and have a crimp bent to hold onto the 3/16 sq. longeron above. With tight fits, the cowl will stay in place without any extra hold-downs. Another area of concern is the exhaust. The model has an open exhaust which is simple but noisy; however, where we fly only the woodchucks and porcupines might be inclined to grouse. If you plan to fly near people or at a club site, please use a muffler. The Peace-pipe-type could be kept within the cowl, or a metalworker could possibly rig up a muffler that exhausted out of the six exhaust stacks (shown on the three-view, but the engine is a four-cylinder?) like the real Nord. Probably my old Enya muffler will be used by simply cutting a large hole in the cowl side, even though this looks gross. Always a battle between scale looks and practicality.



The NORD employs simple, conventional construction throughout. Scale purists may balk at the use of rubber bands to attach the wing, but after seeing the damage that screws can do in the event of a crash, our author feels that rubber bands are the way to go. Build it either way.

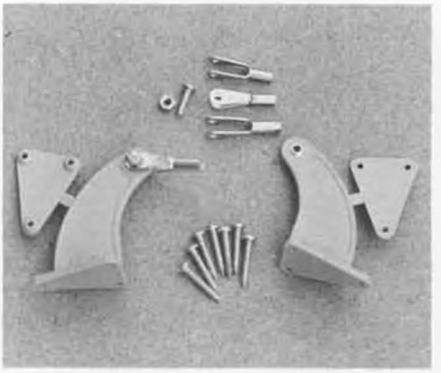
The servos for engine, rudder, and elevator were mounted on a plastic tray furnished with the R/C set; the tray being screwed onto 1/4 x 3/4 x 7 balsa strips glued and braced to the fuselage structure, and the servo mass being low and roughly over the rear 1/3 of the wing. The receiver is wrapped in foam rubber and located in front of the servos, and the battery pack is wrapped and put in front of the receiver, with these weights also being kept low. The original model had balsa and wire pushrods to the tail, but cable pushrods would probably be better and more aesthetic. Make sure all servos, pushrods, and control surfaces as well as the throttle arm move in freely and the full extent of the servo rotation. Also make sure that the controls move the correct direction. The wing is mounted by the time-honored method of

Continued on page 76

Photo of the full-size NORD 3202, courtesy of the Musée de L'Air in France.

BIG BIRDS

By AL ALMAN



The largest (1-1/4") of the new control horns from Robart. Text has details.

WHERE CREDIT IS DUE

While your erstwhile columnist was laid up, his good buddy Bruce Edwards leapt into the breach and produced a stellar column for the November issue. Unfortunately, we didn't note Bruce's contribution in that issue. To Bruce, our thanks for a job well done!

To most folks the name "Roadrunner" brings to mind Wiley Coyote's never-ending quest for breakfast, lunch, and supper.

No matter how zany Wiley's attempts to snare the Roadrunner are, and even though some of us might be routing for Mr. Coyote (who's the underdog here?), we're always entertained by the inevitable pickle that he gets himself into.

Well, there's another Roadrunner you can also enjoy. True, this one hasn't been around nearly as long as our cartoon friend, but it has endeared itself to many in a relatively short period of time.

Y'see, about 12 years ago Bill Carpenter decided to manufacture spark ignition systems under the name C. H. Electronics. There was one helluva lot of flight testing to do in order to design the best "black box," so Bill slapped together a simple, strong, and functional testbed he named the Roadrunner, and it served admirably for years with many different sizes and brands of engines providing the power.

Then, along comes Frank Gunsaullus who moved to the wilds of Wyoming after retiring from the furniture business. But Gonzie soon found he was getting bored being away from and out of the mainstream of business. So, even though he'd never been involved in model airplane kit manufacturing, but because he was so impressed with the Roadrunner, Frank formed Fun Fly and began to produce Roadrunner kits.

So, what's the big deal? After all, one glance at this bird is enough to tell you that it's just another Ugly Stick look-a-like, bigger than most of its namesakes, but still a "Stick." Well, I'm certainly not about to poo-poo Sticks of any size 'cause this ubiquitous airplane can't be beat for everyday, knock-around fun; they usually build easily, fly great, and fill a need.

However, there's something about the Roadrunner that gives it an edge over your basic Stick. I don't know if it's the semi-symmetrical airfoil, the slightly different nose and tail moments, the wing and stab area, the incidence, or "E" all of the above. But in any case, the end result is an outstanding flying machine.

I am aware that Bill has flown his Roadrunners with everything from 90s to Big Tigres up front, and the ideal combo, at his altitude of 5,000 feet, seems to be a 1.2 four-stroker with CH Spark Advance. A Super Tigre 2500 was originally slated for the Roadrunner in the photo, but because the note about shortening the nose moment a couple of inches to accommodate a heavier engine was overlooked, an O.S. 120 was used instead, which eliminated the need for any ballast.

Subsequent flight testing proved how well this 120/Roadrunner marriage works at sea level. At 12.5 pounds and a l-o-w wing loading of 22 oz/sq ft, the Roadrunner is agile, and vertical performance is an eye-opener with a 16x6. She'll do just about any maneuver you can think of, but transforms into a surprisingly docile and forgiving pussycat at half throttle and reduced control surface throw (dual rates are handy).

If you're thinking about trying a BIG Bird, the Roadrunner would be an excellent choice because she's robust, predictable, and has no bad habits.

Contact Gonzie; he may already have a Roadrunner with your name on it (Fun Fly, Box 1686, Lander, Wyoming 82520; 307/332-7630).

SCALE PLANS & PHOTO SERVICE

Just got word from Scale Plans & Photo Service headmaster Jim Pepino that their new 66-page catalog is ready. He also mentioned that:

"1. We are into video sales (VHS only).

"2. Plan miniatures are included; what you see is what you get!

"3. Plan reviews are included.

Gorgeous Fokker D-VIII seen at last summer's IMAA Festival. Builder's identity unknown.

Irv Solberg uses this Fokker DR-1 in his airshow routine, which includes oompah music.

"4. Our documentation section is bigger and better and easy to understand.

"5. We are catering to our overseas customers (metric dimensions and postal costs shown)." SP&PS is one of the companies scale modelers depend on for excellent scale documentation, photo packs, plans and three-views for an almost unlimited number of aircraft. And in addition to all his other special services, Mr. Pepino also does a first-class job of enlarging plans.

If Jim can help you, drop him a line or give him a buzz (Scale Planes & Photo Service, 3209 Madison Avenue, Greensboro, North Carolina 27403; 919/292-5239).

ROBART INCIDENCE METER

This is a great tool! I can't understand why anyone would try to guess at incidence, decalage, thrust angles, and alignment when this Model Incidence Meter (MIM) can do the job so quickly and accurately.

I've had my MIM for years and always use it. However, recently I discovered that the needle had warped and was rubbing against the face of the meter, causing erratic readings, and I let Robart know about it.

Their prompt answer was reassuring:

"We received your letter today about the trouble you experienced with your (our?) Model Incidence Meter. We knew of the problem and corrected it many years ago.

"In fact, a lot of improvements have been made to the MIM over the years, as you will see in the new meter supplied. The meter housing is now screwed together for durability when dropped. In addition, we changed the way the needle is pivoted by placing the jeweled bearings (rubies) in the front and back half of the case supporting a centerless ground and polished pivot pin pressed through the pointer. As you will see, pointer movement is very accurate without any binding. Also enclosed is a 36-inch meter bar for use with your BIG Birds.

"We're sorry but a MIM update package is not available; it would be as cheap for modelers to just buy a new one. In fact, two MIMs are better than one. When I use them I always 'bump' the airplane (too big of an airplane for too small of a workshop) and find myself realigning things again. With two MIMs (I use an old sticky one too), I place one on the wing close to the root and use the other to check all my other measurements. If you build a biplane, two meters are a must. Anyway, other tips are noted in the enclosed How-To brochures.

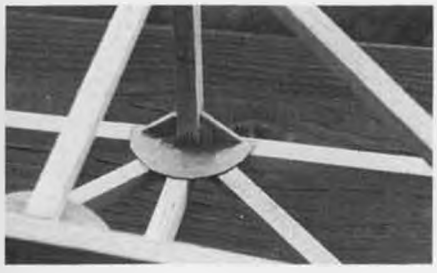
"Thanks for bringing your system to our attention. We pride ourselves in producing quality products that work well for every R/C modeler.

"Best Regards, Tom Walker, Robart Mfg., Inc." It's comforting to know that manufacturers like Robart are trying hard to market top-quality products and are not just after a fast buck. Unfortunately, not all the poorly designed/made items have weeded themselves out (yet), but we're slowly but surely seeing less of them.

If you do have a problem with a product, don't go off half-cocked and start badmouthing the manufacturer without giving him a chance to correct the situation. Let him know about the trouble ASAP and then give him a fair amount of time to address your grievance. Folks like Robart don't want to lose you as a customer.

Our columnist has plenty to say about the 90-inch Roadrunner, which he feels is an excellent choice for a first BIG bird. Shown here with builders Ken Rowe (left) and Hank Downer.

Note that a l-o-n-g (36-inch) meter bar is available from Robart so you can accommodate wings with those 20-inch-plus chords. Also, they have well-made brochures with very practical "How-To" tips for most of their products.



For maximum strength and minimum weight in built-up structures, corner gussets are a must. Make from 1/64 ply. and 1/8 balsa.

Their address is: Robart, 310 N. 5th St., P. O. Box 12447, St. Charles, Illinois 60174.

ALSO FROM ROBART. . .

Have you seen their new line of control horns? I like 'em.

They appear to be well thought out and well made. Their bases, for instance, are triangular-shaped and anchored with three bolts and nuts (most other horns use only two bolts).

Eight of these nine horns have some other great features that make them extremely modeler-friendly, like the built-in ball links that allow a pushrod to move in both the vertical and horizontal planes, eliminating

Continued on page 62

That's Crash Evanson's twin-finned "Bubbles" in the foreground. He's in love with the thing and says it's the best flying BIG bird he's got.

Byron Originals Downunder

By TONY STINSON. . . To celebrate Australia's recent Bicentennial, 42 nations helped put on a massive airshow. The Byron Originals team, flying their huge "Striking Back" replicas, were the hit of the show.

• When the United States celebrated its Bicentennial in 1976, the event was also widely celebrated in Australia. It was thus fitting that the U.S. Government and the American people should help Australia celebrate its Bicentennial in 1988.

One of the main events scheduled for celebration of the Australian Bicentennial was a massive airshow, the likes of which had never been seen in the Southern Hemisphere.

In recent years, model aviation has had an increasingly important part in Australian aviation events, so the Australian Radio Controlled Aircraft Society was asked to do "something outstanding" for this largest of all Downunder airshows. Forty-two nations had signaled their willingness to participate in the show.

During early discussions by the planning team, the name "Byron" was most frequently mentioned. Australian modelers had heard much about Byron's products and had seen tapes of their "Striking Back" airshow, but few had made the journey to

Byron B-25, engines running, is moved into takeoff position by Byron team pilot Ken Bryan. Ken Bundt (left) acts as caller.

Ross Woodcock's AVRO 504, complete with hangar. Ross works for QANTAS, was commissioned to build two 504's for public display.

Sachs-Dolmar powers this 1/4-scale Hawker Hurricane flown by Ian McLeay, retired QANTAS 747 captain. Ship has electric retracts.

Unusual 1/4-scale CAC Winjeel in foreground built by Ian Watts, John Marquette's Webra powered Tiger Moth in back.

Ken Bryan getting ready to fire up the S.T. 2500 in the Byron CAP 21. Ken's snap rolls on takeoff were a real crowd pleaser.

remote Iowa (Well, Iowa *is* remote from Australia) to see the great event.

RCAS President, Bob Carpenter, and his team believed that if they could bring a group from Byron Originals with some of their exciting scale models to the Bicentennial airshow, we would indeed have something outstanding.

Byron Godberson also saw participation by his company in the Australian Bicentennial as being worthwhile, and it would be the first time the "Striking Back" team had operated outside the United States.

Also agreeing on the Byron team being a good choice were the United States Government and the Royal Australian Air Force. The Byron team's visit to Australia thus became part of the U.S. Government's official involvement in the Australian Bicentennial program.

Now, Byron Originals is very strong on ducted-fan technology. The RAAF has standardized its fighter force on the Australian-built McDonnell Douglas FA-18, but Byron did not have an F-18 in its lineup. So, an F-18 model was especially developed and produced for the Downunder exercise, to be powered by a single Rossi 90 engine.

The airplane was painted in RAAF colors and was planned to be the centerpiece of the Byron effort at the show.

By early 1988, arrangements had been made for an RAAF C-130 to stop off at Sioux City, Iowa, during a regular mission in the U.S. and collect the Byron models and equipment and deliver everything into Richmond Airforce Base, Australia, site of the great airshow.

Yours truly belongs to the same club in Sydney as Bob Carpenter, and as the excitement mounted, all Bob could talk about at the field was Byron.

I had planned a return visit to Oshkosh and the EAA convention, so I determined to go to Ida Grove following Oshkosh and see this famous "Striking Back" show for myself.

I called Al Tuttle at Byron and he said he would be glad to show me around. "I can't remember ever seeing another Aussie at the "Striking Back" show, said Al, "So I sure hope you don't get lonely without lots of your fellow countrymen around you!" Al Tuttle's infectious sense of humor was to pervade everything for the next few months.

If you have ever been to Iowa for the Byron show, it will be impossible to understand the scale of the operation and the professionalism evident in everything they do. It is like trying to explain the EAA convention at Oshkosh to anyone contemplating a visit there for the first time.

Even though it was my first visit to Byron, the show had all the marks of a special event which has developed over a number of years. The thousands of people attending are looked after by a well-oiled organiza-

Guido Zacholi taxis by in his Hawker Sea Fury after performing at the Bicentennial airshow. Sea Fury is just one of a large collection of warbirds owned by Guido in Australia.

The Byron B-25 being gingerly loaded onto the flatbed at Richmond for transport to the flight line. Transport for the larger models was via a furniture transporter.

Ken Bryan poses with the Byron F-18 in front of top Australian scale modeler Ross Woodcock's QANTAS hangar and model of the AVRO 504 originally flown by QANTAS.

Russia participated in the Australian Bicentennial airshow with a dazzling display by one of its Sukhoi SU-26M aerobatic aircraft. This airplane has a roll rate that has to be seen to be believed. Someone must have a kit of this machine in the works.

Unlike most Aussie modelers, 10-year-old Adam Cummings flies mode 2. . . the way God intended. Seen here with dad's ship.

tion, and the whole town of Ida grove (population 2500) turns its efforts towards involvement in the week of model aviation activity. Even so, one evening yours truly became lost driving around town. Al Tuttle's favorite joke in Australia was to tell everyone about the guy from Sydney (population 3-1/2 million) who got lost in Ida Grove, Iowa!

The official estimate of the number of models brought to the show was 300. I would have said it was closer to 500. Even so, all had the opportunity to fly from the magnificent model airport with its choice of runways (concrete, grass, or water).

I flew Byron's new Husky model and can report it to be a docile performer and a real joy to fly.

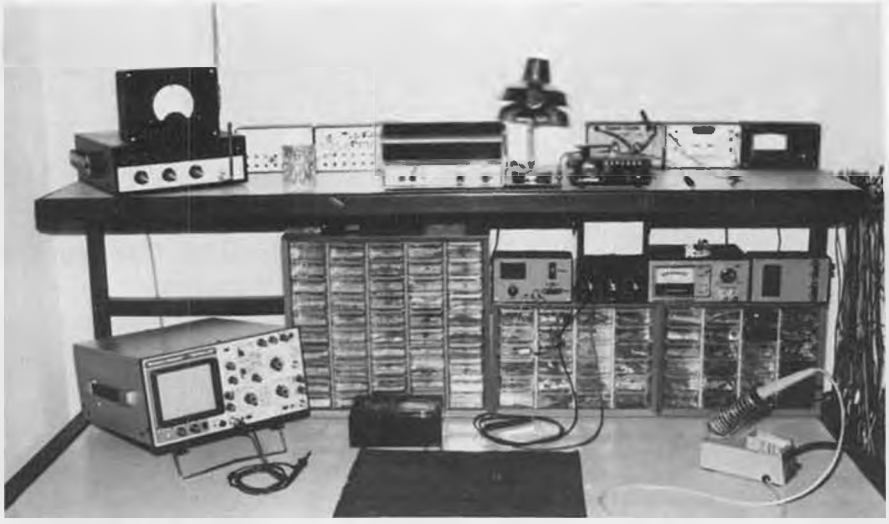
We have all read about the realism of the "Striking Back" show, and I can attest to the effect it has on the models used. I think we spent until well after midnight every night in Byron's development lab repairing and recovering scale models which had flown through fireballs and flack during the afternoon show and had the covering burnt off them.

Early in the program I met Ken Bryan and Ken Bundt, the two "Striking Back" pilots who, along with Al Tuttle, would make up the Byron team for Australia.

We talked extensively about the planned program for the Downunder effort. Looking at the "Striking Back" show, it became clear to me that it was the really large models which grabbed the crowd's attention. I knew we could expect a crowd of at least 200,000 people at Richmond AFB for the Bicentennial airshow, that factor, plus constant attention from the television cameras which would be broadcasting our model flying efforts to the whole nation. The time allocation for model flying at the Downunder show was a generous 20 minutes on each day of the show.

Clearly, in that atmosphere, something the size of the jet models, while their performance might be spectacular, would

Continued on page 83



Electronics Corner

By ELOY MAREZ

• One for our side! The Tournament of Champions is now history and I'm sure you will have read all about it in various publications. It is always interesting to know what the elite use for equipment, and since you may not have read that elsewhere, I will try to fill you in.

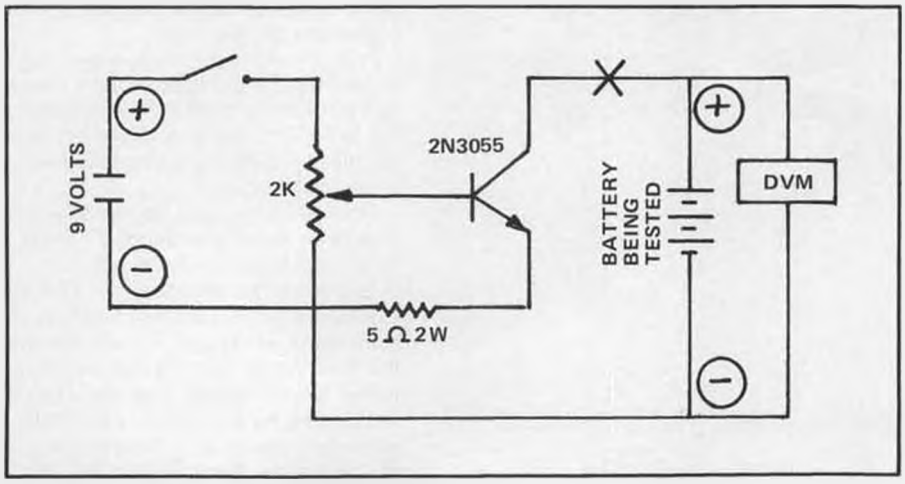
First, the first-place winner flew, you guessed it, *Mode One*! So did 7 others, out of 20, being 40 percent. Not bad. Seems the minority gets smaller every year; doesn't it? At least it does in the world-class category; the Ugly Stik fliers are still going along telling themselves about Mode Two that "that's the way you fly *real* airplanes." As for the brand of equipment, 12 out of the 20, 60 percent that is, chose the new Futaba 1024 PCM equipment. Sure can't argue with success; can you?

SPEAKING OF MODE ONE

I recently had an interesting phone conversation with one Chuck Lawson, of Walnut Creek, California. Chuck informs me that he is a member of the Diablo Valley R/C Club, about 180 strong, and that some 80 percent of them fly Mode One. Maybe we are finally working ourselves out of the minority class. Now, if we could also manage to abolish Ugly Stiks and other flying things without any semblance of a canopy or cockpit, and with a bare engine hanging out in front of the firewall, with a spinner yet, to make it look even more ridiculous, we will really have performed a Hall of Fame type of service.

CHARGERS

Probably next in popularity only to batteries themselves here in the pages of EC are chargers. The 12-volt battery charger circuit I offered you back in the December issue has brought in a steady flow of requests and another interesting circuit from reader Jim Norcutt, of Dublin, California. It too is designed for reviving 12-volt batteries and has an adjustment for setting the cutoff voltage. Copies of Jim's information are also available to you charger builders; one SASE please!



Eloy's fully adjustable solid state variable load circuit for Ni-Cd battery testing. Circuit description and suggested uses are fully described in text.

The Futaba 7UAP 7-channel 1024 PCM Tx. Enough bells and whistles for you?

FUTABA

The 1024 system, you probably already know, is the latest PCM system from the company that first introduced it to R/C. The top of the line 1024 is a 9-channel system, 9VAP/9VHP available as airplane or helicopter versions, with all of the features that world-class and serious fliers need and can make full use of. Of more interest to those of us not quite there yet are two other 1024 systems more in our class, a seven-channel system for airplanes or helicopters and a five-channel system available in an airplane version only. The latter replaces the popular Conquest five-channel PCM which is no longer being produced but which is still available and is still an excellent R/C bargain.

The seven-channel system, known as the 7UAP and 7UHP, airplanes and helicopters respectively, uses the same second-generation PCM technology as does the big brother nine, but having less of the purely competition features that not all of us need or that our airplanes can't use. It includes a smaller top-mounted LCD screen which tells all about the operation of the transmitter that you program in as your needs dictate.

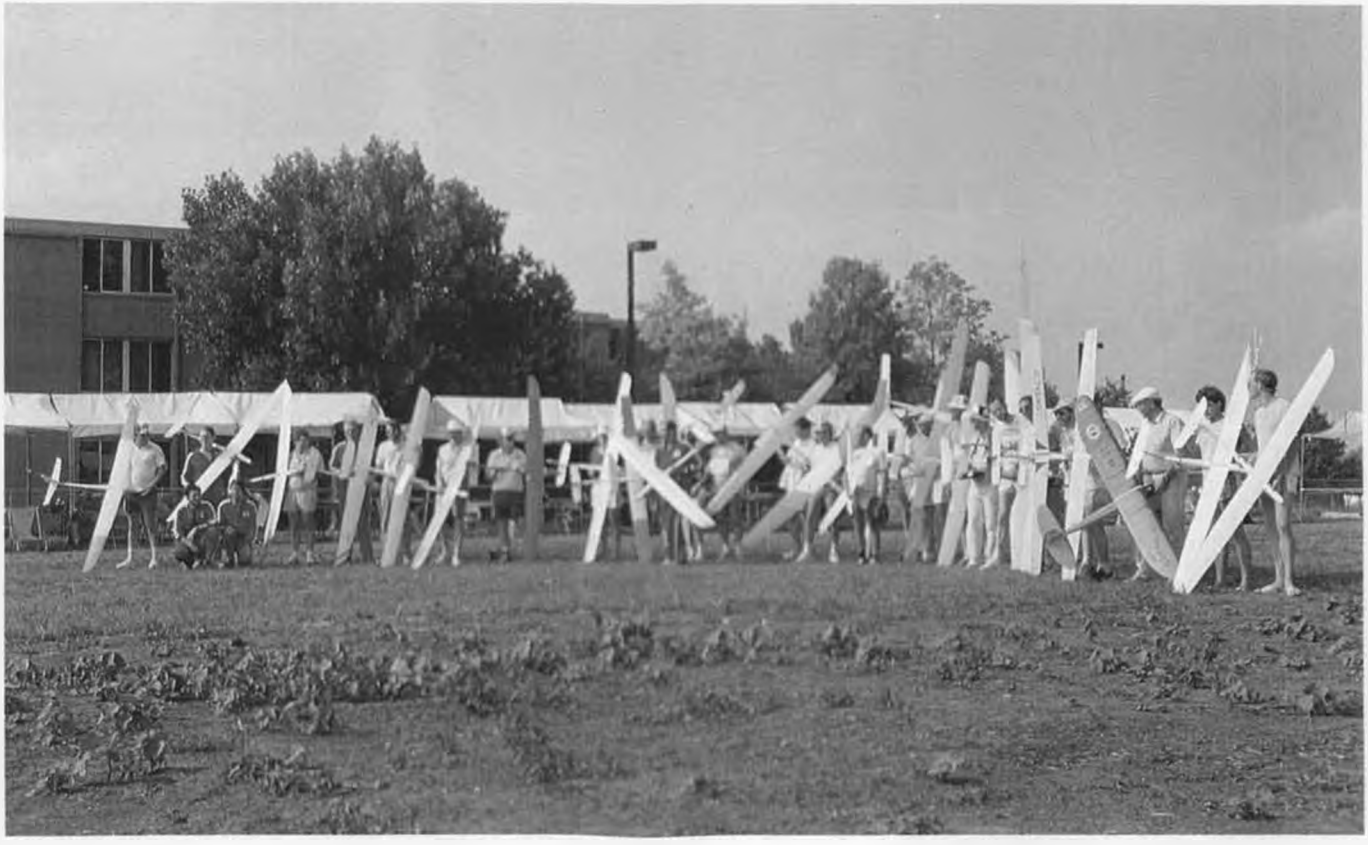
The five-channel system has even less features, getting down more to the basics. As stated, it is a replacement for the Conquest PCM, improved to include servo reversing and dual rates as did the Conquest, but also servo throws and, in both the five- and the seven-channel systems, the much requested trainer system. Both systems use plug-in modules for frequency control, and both are advertised as being fully 1991 legal, transmitter and receiver.

Back to the LCD screen on the seven-channel transmitter and actually also on the nine-channel 9VA series. I know such things can be a bit intimidating at first, especially if you don't have any computer experience to back you up. But it all becomes simple and easy to understand as soon as you have one in front of you, and as the old saying goes: If all else fails, follow the instructions! The screen merely tells you in complete detail everything that up to now you have

Continued on page 92

The F3E Championships in St. Louis

By FELIX VIVAS. . . Eleven countries participated in the 1988 F3E World Championships. Our author was there as a member of the U.S. team and has much to say about the current state of the sport.



The Italian team in the ready box. Italians as a team placed 4th, just ahead of the U.S. Individually they placed 4th (Pagliano), 8th (Rizzo), and 24th (Ceccarelli).

• Just across the Mississippi River from St. Louis, Missouri, at Parks Air College in Cahokia, Illinois, August 16 through 20, the Second FAI F3E (R/C Electric Sailplanes) World Championship was held. It was organized by Cal Ettel and run by volunteers from the Mississippi Valley Soaring Association and Electric Aircraft Association in the teeth of extreme adverse weather conditions, a 101- to 103-degree hot spell with high humidity every day.

Parks Air College is approximately 100 miles from the old headquarters cave used by the notorious Jesse and Frank James after the Civil War. The James brothers became infamous robbing trains and banks in Missouri and Illinois.

I thought it was very appropriate that the American team got "robbed" again, this time in Jesse James's backyard!

Two years ago I attended the First World Championship in Lommel, Belgium, as the team manager of the U.S. Team. The rules at that time stated "30 cells maximum" for the motor power source, but the Europeans were using 60 (800 mA) cells. At the first managers' meeting, in the presence of all the managers, Peter Frehand of England, the head FAI Juror, ruled he would not allow

Franz Weissgerber (right), W. Germany, 7th place. Outstanding builder and flier.

Our reporter, Felix Vivas, 20th place, with helper Matt Polking. U.S. team was 5th overall. Felix feels a lack of W/C competition experience was to blame for U.S not placing higher.

Austria's Rudolf Freudenthaler (kneeling) successfully defended his title as F3E World Champ with only a six-point lead over Urs Leodolter of Switzerland.

me to protest and stated, "cells were a unit or two or more batteries comprise a unit." This time the FAI rules for the Second World FAI F3E Championship stated "one powered climb only" for the beginning of the distance part of the task. The distance task of F3E gives the contestant 180 seconds (3 minutes) to climb and enter the course, without power, and flying between two gates 150 meters apart, attempting to get as many laps as possible before he runs out of altitude or time.

This was the same rule as in the first World Championship with the Europeans "sandbagging" us by greatly outclimbing us with 60 cells.

The FAI rules had changed concerning power source, too, "not to exceed 1.1 kilo including wiring and connectors." Hence, the Europeans were downscaling their aircraft somewhat along with their U.S. counterparts.

Because of technology advances in composites in airframe and wings, making the aircraft lighter and smaller, and advances in props and motors, the European F3E sailplane was climbing at approximately 4,000 feet per minute and super fast in the distance task.

The one drawback was you lost sight of this "bird" very easily at high altitude in the climbout. Hence, a new FAI rule to the distance task became effective January 1, 1989: "The distance task is to be carried out with at least two climbs with motor running." From day one arrival in St. Louis, the U.S. team manager, Dave Brown was under heavy pressure by all the 11 European managers and the FAI Jury to allow multi climbouts. As the Europeans practiced, once in a while they'd lose an airplane. The U.S. team all had special orange glow painted wings on top and black underside both wing and airframe. The Europeans showed up with some of their planes painted baby blue or white. The timers referred to them as Stealth Bombers.

It stated in the rules, *"All competitors*, the organizer, and the International Jury must be in agreement" to allow multi climbs under special circumstances; i.e., low overcast or fog and by unanimous vote. My fellow team members, Jerry Bridgeman, Steve Neu, and myself, along with Dave Brown, our manager, came to a sure four votes against multi climbs.

But we had forgotten the Jesse James's factor. After a German team member lost his sky blue-colored aircraft at high altitude during the first official round, the International Jury changed the rules to multi climbs. The second round was changed to a practice round to allow the "Americans a learning round." The American team flew to a credible fifth place in team standings out of 12 countries competing. Austria was first; Germany, second; and Switzerland, third. Rudolf Freudenthaler made it two World Championships in a row, taking first again in individual standings, but only by six points over second place winner Urs Leodolter of Switzerland.

The American team all flew aircraft designed from many long hours by Mike Charles and his computer and built and modified by Jerry Bridgeman using composites of fiberglass, kevlar, and carbon spars. The planes fly beautifully in distance (speed) and duration (thermaling) with no

Continued on page 63

U.S. team consisted of Jerry Bridgeman, Steve Neu, and Felix Vivas. Dave Brown, manager.

ELECTRIC POWER

By MITCH POLING

• As most of you know, I am an enthusiastic float plane flier and have been for many years. In the last year the interest in float flying has definitely been on the rise, as shown by the many articles about it. All of these deal with gas flying, with the exception of one article by Stephen Brahm in the August '88 issue of *Model Aviation*. Stephen wrote about how well his electric flies at 6700 feet altitude at Big Bear Lake. His plane is the Carl Goldberg Eaglet 50 with a 66-inch wingspan powered by the Astro cobalt 15 on twelve 800 mAh cells. He uses a gear drive and an 11x8 Top Flight prop; flying weight is 53 ounces. The floats were 26 inches, built according to the plans for the Aqua Sport.

Well, the article was very pleasing; Stephen used my floats, followed my advice from a previous article, and had great success. Great ROW, touch and goes, and ten-minute or better flights at 6700 feet is nothing to sneeze at. Then I got a phone call from Jon Svendsen, who flies 727s for a living. How about great float flying at 9000 feet? Wow! I asked for photos and details, and John was happy to oblige. Here is his report:

"Enclosed are pictures of my Aqua Sport. Yes, it takes off and lands successfully among the whitecaps of Lake Dillon, Colorado, at 9000 feet MSL. Wind in these photos was estimated at 20 knots. Later in near calm conditions we continued easy quick ROW at this lake. I found suitable spaces for the wings and fuselage aboard my 22-foot Hunter sailboat, and it added a new dimension to sailing! The 80 amp-hour boat battery gives many good charges. The Aqua Sport was built with extended wings (*John did not say, but it looks like about a 62-inch span—mp*) with two extra bays each side plus a flat center section. The spars are double 1/4- x 1/8-inch spruce with shear webs plus a double 2mm birch ply dihedral brace. The covering is Micafilm on the flying surfaces. The fuselage and floats are according to your plans and covered with dope and tissue, which I find to be tough, sagproof, and 100-percent watertight. Flying weight is 70 ounces with a 12-cell 1800 mAh SR Batteries pack, a Jomar SC-4, Astro 15 cobalt, and Futaba micro radio gear. It was initially flown with an 8x4 Master Airscrew; now I am using an 8x4 Kavan. Performance with the Kavan is so good I have not been motivated to try another prop. I find the Aqua Sport easy to ROW; it practically flies off by itself. Also no stability problems; it grooves very nicely. As suggested in your flying instructions, rolls have been tried and it snaps crisply and smartly. My touchdowns need work, but water landings in the Aqua Sport are very forgiving. Note: I have only flown floater-type gliders and an Electra prior to this!

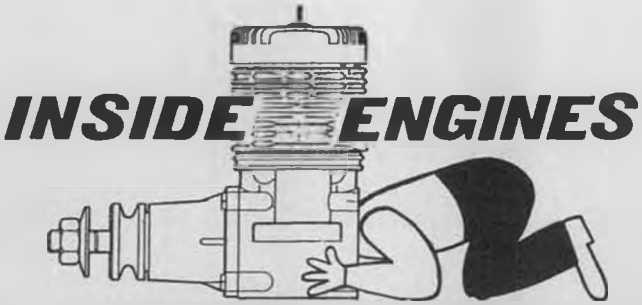
"Two problems did come up. I fried one MOSFET in the throttle because I painted the heatsink black (*I leave mine unpainted—mp*). I am now using a finned heat sink from SR Batteries under the cowling. I also have overheated the motor to the point that the capacitor wires melted! I took the motor apart and found one magnet had come loose. Which came first, the overheating or the lost magnet, I don't know. I will try 10 or 11 cells, but also provide airflow to cool the motor. (*I agree. Cooling air is necessary for the Astro cobalt 15 on direct drive. It runs much hotter on direct drive compared to geared drive. For a while you could get the marine version of the cobalt 15, which had 13 turns per pole and ran much cooler, but only the 11-turn version is now available. It would be great to have a sport winding, but since there is only the competition wind, I also advise 11 or 10 cells to keep the heat down. Write Astro to let them know a cooler wind armature*

Continued on page 62

A record for high-altitude electric float flying? Jon Svendsen flies this Aqua Sport regularly from a 9000-foot MSL mountain lake in Colorado. Gets off quickly even in calm conditions.

The Aqua Sport on board Jon's 22-foot Hunter sailboat. Photo was taken at Lake Dillon, Colorado, elevation 9000 feet MSL.

Jon Svendsen getting ready for another flight. Note the choppy water; wind was blowing 20 knots when this photo was taken.



WITH **STU RICHMOND**

ARI 0155 .45 R/C

The Aristo-Craft/Polk's .45 R/C engine made in Taiwan is representative of the current crop of fine non-Japanese high-performance engines. This one, as shown, turned a 10x6 at 15,400 rpm.

• Polk's Hobbies is a worldwide legend. Brothers Irwin and Nat Polk have spent a lifetime in the model business. In the late forties and fifties I passed through New York City twice a year and walked between Grand Central (train) Station and Penn (train) Station to make connections. I *always* stopped in Polk's at 314-5th Avenue, at 32nd Street, where their retail store still is today. The window was full of models hanging on display; it was the world's biggest store of its kind.

Today the business has spread from retail-only to wholesale and direct sales by mail under a second generation of the family, and it's still among the biggest in the world and still fun to visit in NYC. Like today's other hobby retailers, many of the products are imported from the Orient and sold under Polk's "Aristo-Craft" brand name. These products are now appearing in many local hobby shops too.

The world news said today that the U.S. dollar has reached a four-year low point against the Japanese yen. Whatinell's that got to do with model engines? Please read on! If you've recently bought a replacement piston/cylinder set, a replacement carburetor body, a new four-cycle head, or similar parts for your Enya, O.S., or Saito Japanese engine, I'm sure you've experienced wild "sticker shock" at the parts cost. I heard last week of $22 being paid for an O.S. drive washer. As the U.S. dollar drifts continually lower against the Japanese yen, it simply takes *more* dollars to buy Japanese machine tool industry products and their replacement parts. Wisely, Taiwan, Republic of China (where this month's engine is made), has geared their currency to the U.S. dollar, so remakable price stability exists for made-in-Taiwan model engines and related products. Mainland (Red) China is seeking more trade with the U.S.A. so they too have "free trade" programs that result in the fine performing A.S.P. engines coming here with favorable pricing, and now I hear rumors that Red China's prestigious "CS" .15 engine may be coming here for Quarter Midget and FAI events.

Unless the U.S.A. hobby industry soon makes some Detroit-type price concessions on Japanese model engines and their repair parts the reign of made-in-Japan model engines may/will be history. A slightly damaged/worn Japanese engine will be NWATTTT (not worth a trip to the toilet)! Enough soap box.

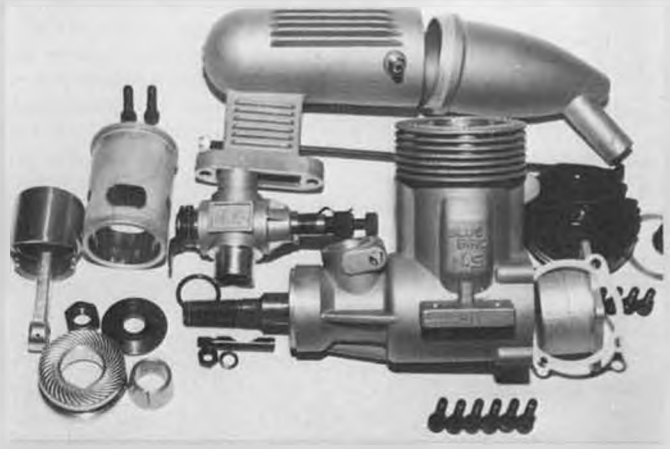
This Aristo-Craft/Polk's .45 R/C engine is made in Taichung, Taiwan by Blue Bird Model Mfg. Co. and their engines, like

Continued on page 77

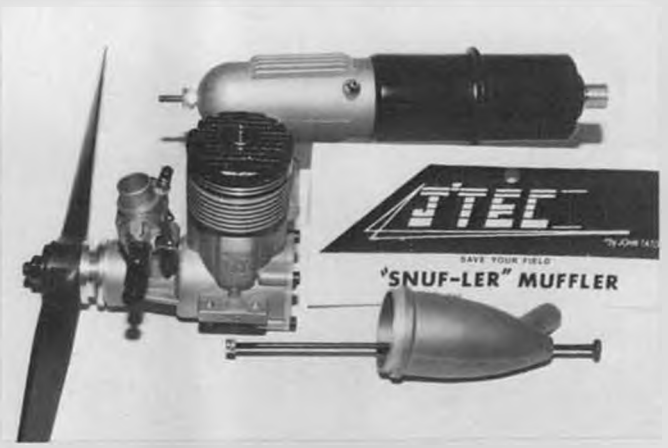
Head on the left is from this month's engine; one on the right is from a Magnum Pro .45.

Front ball bearing is shielded. Note the "wrap around" prop driver, helps keep dirt out.

Ringless aluminum piston rides in a chromed aluminum liner. Piston cutout saves weight.

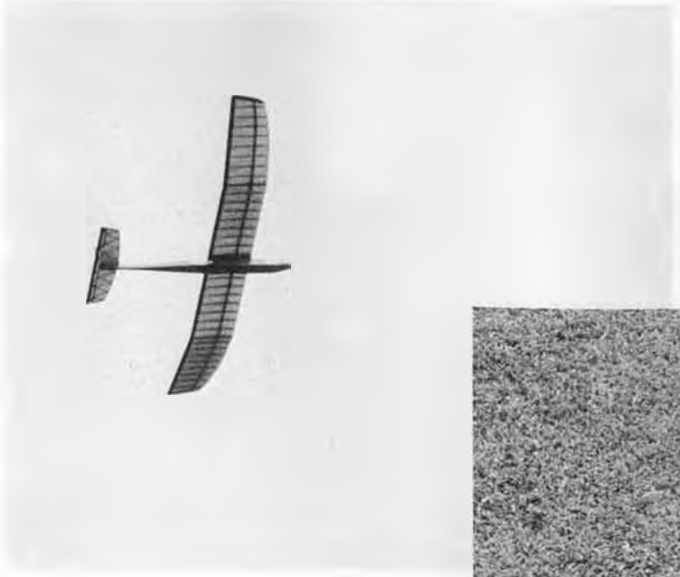


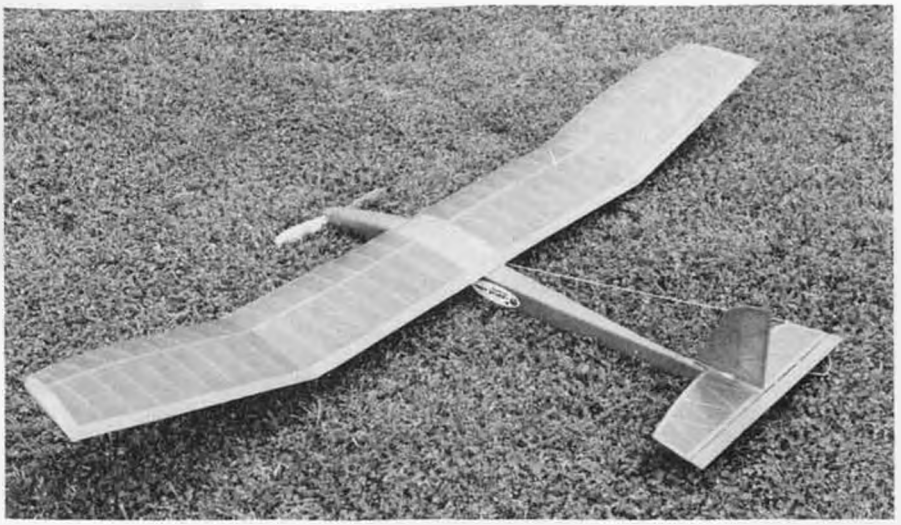
Here's the disassembled Aristo-Craft ARI 0155, made by Blue Bird in Taiwan. Externally similar to O.S., inside it's quite different.



The Aristo-Craft .45 had its best test performance using a 10x6 prop and a new J'TEC "Snuf-ler" muffler. See text for test data.

Astro Challenger





By BOB BENJAMIN. . .Our cover artist put down his palette long enough to review a fine new electric R/C model with a folding propeller to aid its efficiency.

• During the last few years I often found myself on the scene when one of the local R/C fliers was trying to get an electric job going. Too many times the results were far from satisfying. Although I got to fly electric airplanes on several occasions by being asked to do test flight honors, I wasn't convinced that I wanted to get involved. Then last summer I had the chance to meet Mitch Poling and watch him and several other experienced Seattle area modelers make their electric airplanes perform the way they were supposed to. I was impressed! As the year progressed, other local fliers kept coming to me for help with their electrics because they saw me having success with other types of models, and I began to see that a lot of the bad experiences resulted from a poor choice of equipment. I had read enough to know that Astro Flight has earned a solid reputation as a pioneer in electric flight and as a producer of consistently high quality equipment, so I got in touch with Bob Boucher, explained my situation as a modeler with lots of experience in other areas who wanted to get started right in electric, and asked him what he would recommend. The result was my highly rewarding relationship with the Astro Challenger and the Astro Cobalt 05 system.

Although I have done a fair bit of flying of slope and thermal sailplanes and was quite active a few years ago in SAM R/C Oldtimer competition, this is the first electric sailplane of any type that I have built. I suspect that it is one of the very best electric-powered sailplanes currently on the market. I can report without reservation that the Challenger met or exceeded every expectation that I had and confirmed my suspicion that the lack of success a lot of my friends experienced was due to a bad choice of equipment. There is a lot of low-priced stuff on the market that looks tempting to a modeler just getting into electric. Unfortunately, that low-priced gear leads to a lot of the marginal performance that turns people off.

The airplane and power system I brought home consists of an all-balsa, 72-inch span sailplane of deceptively simple appearance and very sophisticated design; the Astro Cobalt 05-geared motor system, which includes a wiring harness with an on-off toggle switch and an on-off micro switch (an alternative to an electronic on-off control); a seven-cell, 800 mAh power pack made up using the new Sanyo red cells; and the Astro AC/DC Auto Charger (model 4005B). The overwhelming impression I got on my first inspection of the Cobalt system was of well engineered precision. This is the good stuff! At Bob Boucher's suggestion I ordered the Midway Model Company's folding propeller, designed especially for electric systems, from Hobby Horn. I also special-ordered three yards of Sig's Silray (silk-rayon covering); unfortunately, this superior covering material isn't as common in hobby shops as it used to be.

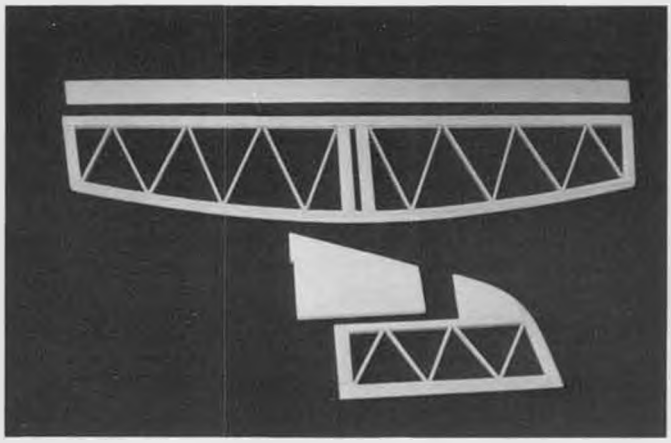
The Challenger is not a difficult airplane to build if you pay attention to the plans and to what you are doing. The material selection and attention to quality are outstanding. The instructions are minimal, and there

Author tosses the Astro Challenger on its initial flight. Actual climb angle that the Challenger will maintain is significantly greater than what you see here.

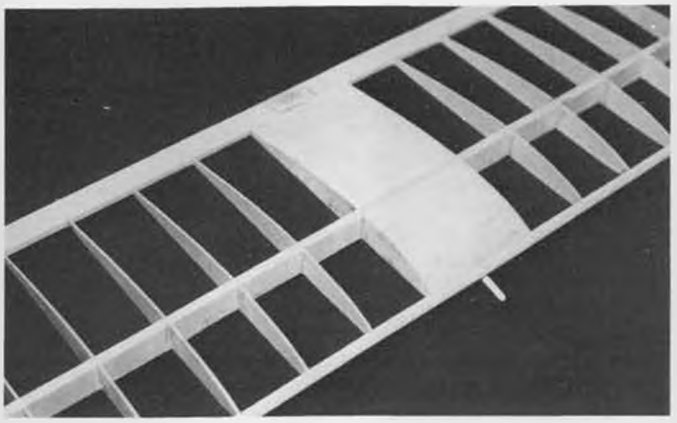
Continued on page 100

All the components necessary, including the AC/DC charger and geared cobalt 05 system wiring harness.

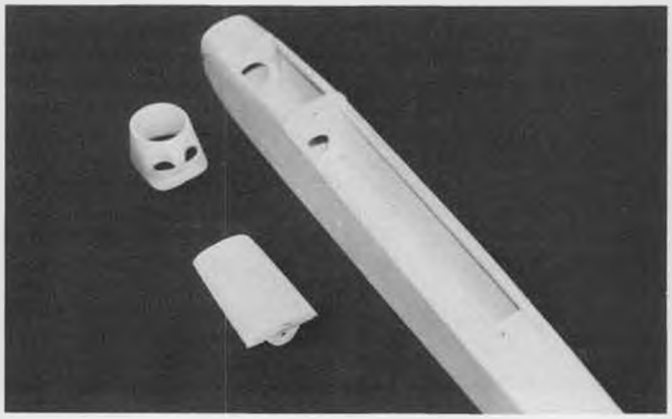
Underside of the nose on the completed model, showing flush intakes. Bump on left is cowl attachment screw.



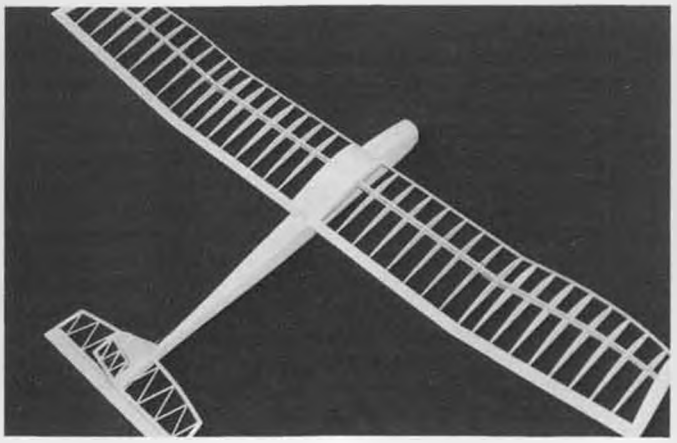
Tail surfaces built up, sanded, and ready to cover.



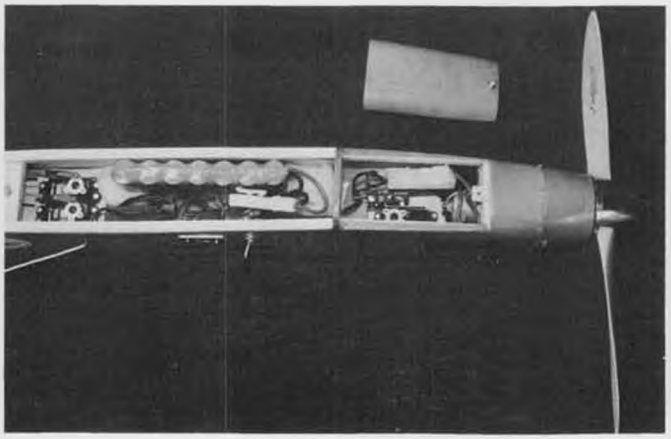
Wing center section ready to cover. There is no dihedral break at the fuselage.



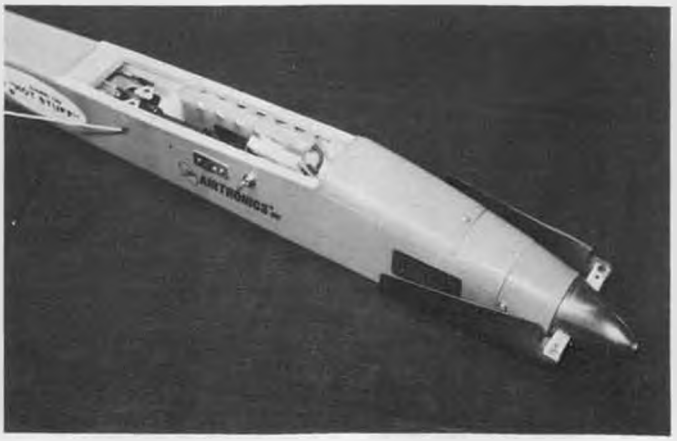
Fuselage and removable cowl components ready to cover. The front cowl is an option necessary only with the geared motor.



All framed up and assembled for a test fit.



The on-off microswitch provided is ahead of the leading edge former mounted on a plate with the throttle servo.



Side shot of the nose with the Hobby Horn folder. Compare to previous shot to get idea of tremendous cleanup when using folder.

GREAT PLANES

Super Sportster

By AL ALMAN. . . Our Big Birds columnist has lots of good things to say about this new Great Planes kit, the latest and largest in their popular Sportster series. A real brute designed for .90 to 1.20 size engines.

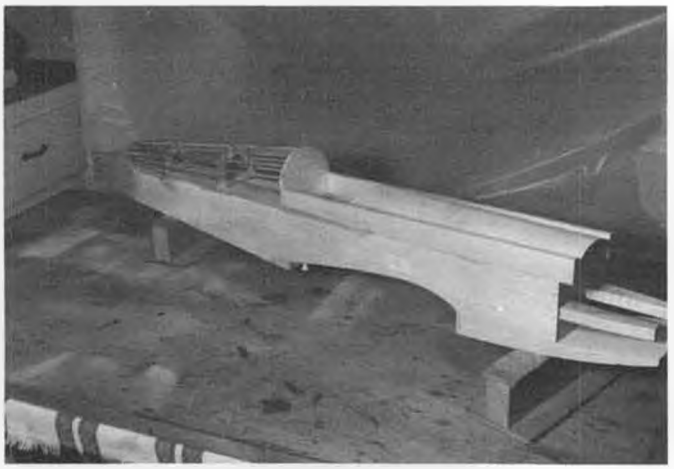
• I have trouble understanding some things.

Like why the Heathkit folks realized decades ago that simple, step-by-step instructions were absolutely vital to the success of any kit and why model airplane manufacturers worked equally hard to remain ignorant of this fact for so many years.

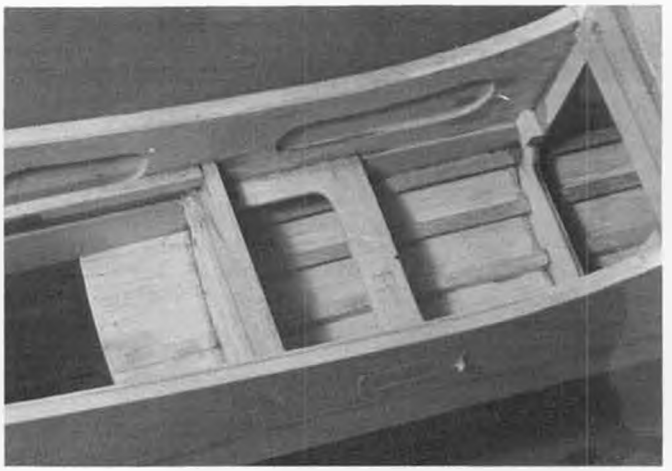
Even the few kits that had good wood and decent plans rarely had suitable instructions. It finally came to pass, however, that much of this teeth gnashing was eliminated when the needed effort was put into improving instructions.

A good example of this change is the booklet included with the new Great Planes Super Sportster 90/120; it not only tells and shows in easy-to-understand steps how to build this plane, but it neatly dovetails with the info on the plans and includes a parts list, important and accurate information on choosing an engine, installing the

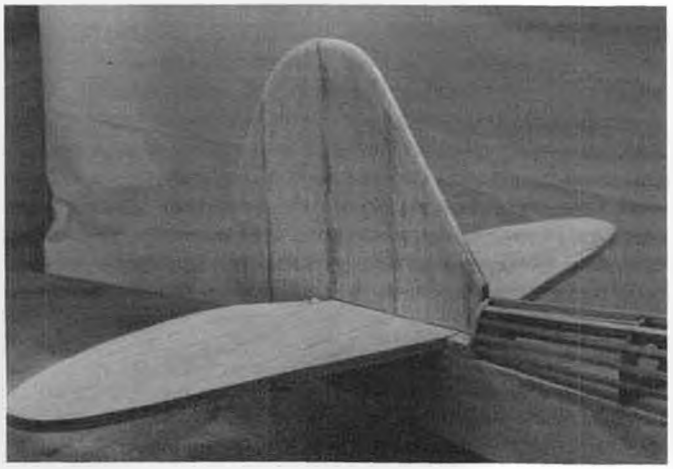
Wish you could see this in color! Al did the whole ship in pink Monokote, with Coverite stars and striping thrown in for good measure. Power is a Magnum .91 four-stroke.



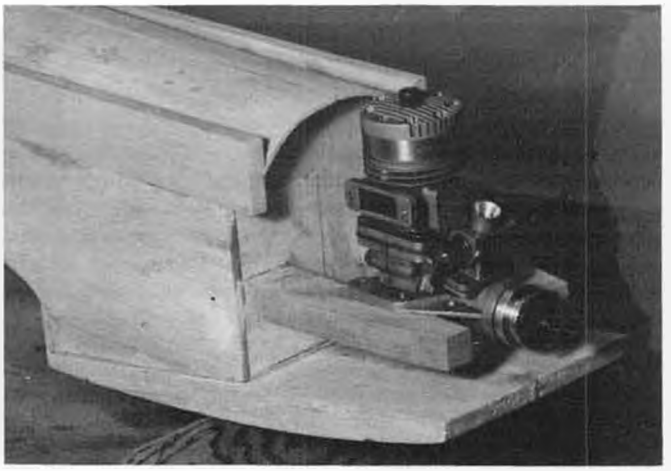
The basic Super Sportster fuselage before carving and sanding. Plans show both radial and hardwood beam mounts; Al chose the latter.



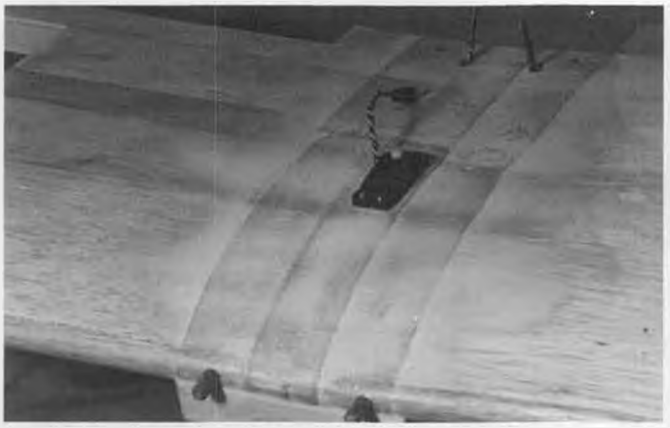
A view inside the radio compartment. Note the Lite-Ply doublers laminated to the inside of the balsa fuselage sides.



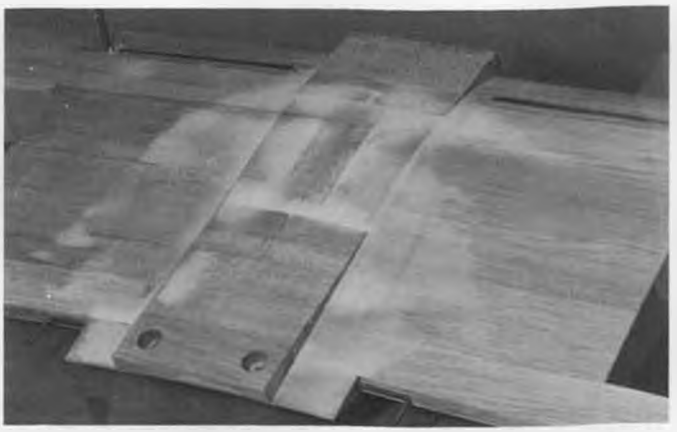
Balsa tail surfaces make for quick, easy construction. Al used Hot Stuff Special T for most of the assembly.



This Davis dieselized Fox Eagle III was used for fitting the engine mounts.



Wing center section is beefed up with two layers of glass cloth, then filled and sanded to make it fair in with the balsa sheeting.



Bottom of wing with fairing blocks in place. See text for Al's suggestions on strengthening the landing gear assembly.

radio, balancing, and safety. Sure, I ran across some mistakes, but you'll find "typos" in most any publication.

It seems that Great Planes just couldn't resist the temptation to exploit their popular Sportster series by coming out with a 90/120 version. And why not? The 20-, 40-, and 60-sized Sportsters have been so well received that adding a 72-incher to the lineup made sense; and the inescapable fact is that BIG Birds do fly better.

My overall impression of the kit was quite favorable. Of course, packaging is important, and Great Planes knows how to make the box look so attractive that you're feeling good about the kit even before it's disemboweled.

Along with the good plans and building instructions, I found the balsa die-cutting to be topnotch. And, as expected in quality kits, the hardware/accessory package was complete and included ABS plastic wheel pants.

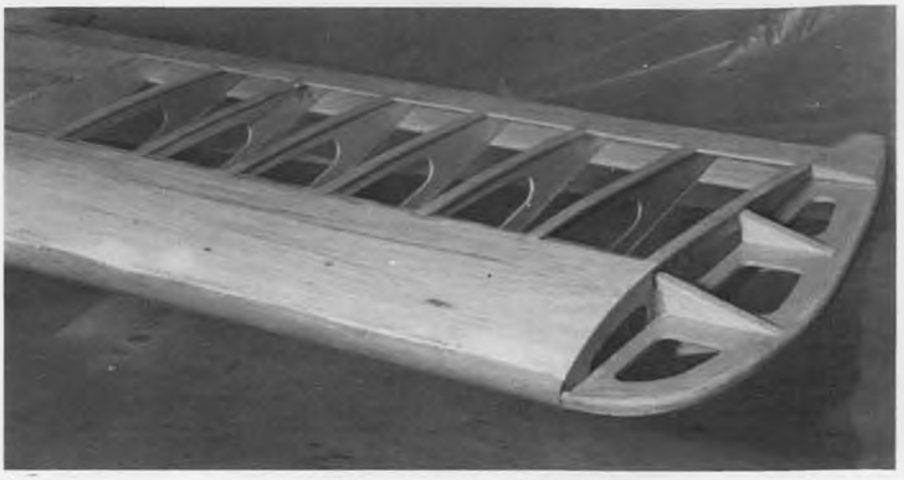
There are some choices to make, like whether to use "training wheels" or make her into a taildragger, and deciding between a two-stroke or a four-stroke engine. The type of engine mounts is also up for grabs. Hardwood (maple) mounting rails are shown on the plans, although a firewall mount is mentioned as an option. But no matter which way you go, the basic parts needed are there.

This BIG Super Sportster frames up surprisingly fast, and there's nothing really unusual about her construction. But although she's a relatively easy-to-handle project, the 90/120 is definitely not a good choice for a first airplane, mainly because a beginner needs a slower and more stable craft to build up confidence with. Hot Stuff's (Satellite City) Special T was used almost entirely for piecing her together, except for a wee bit of epoxy here and there.

I just happened to have enough pink MonoKote on hand, so that ended up being her basic color, with Coverite's white stars and yellow stripes sprinkled on for contrast.

A Magnum 91 four-stroker was installed up front. This engine isn't the most powerful in its class, but it does have a lot of torque and performed well with both a Graupner 14x7 and Master Airscrew 14x8.

My seven-channel Airtronics single-stick FM rig provided the necessary flawless link between ground and airplane with five (# 94732) servos (two on elevator) working the control surfaces and throttle. A personal aside here; if Mode II ain't doing it for you anymore because of aging reflexes and coordination, you might want to seriously consider going to single stick. I'm glad that I switched over 'cause my flying has improved, although there are a lot of people who'll swear that I'm beyond any kind of help.

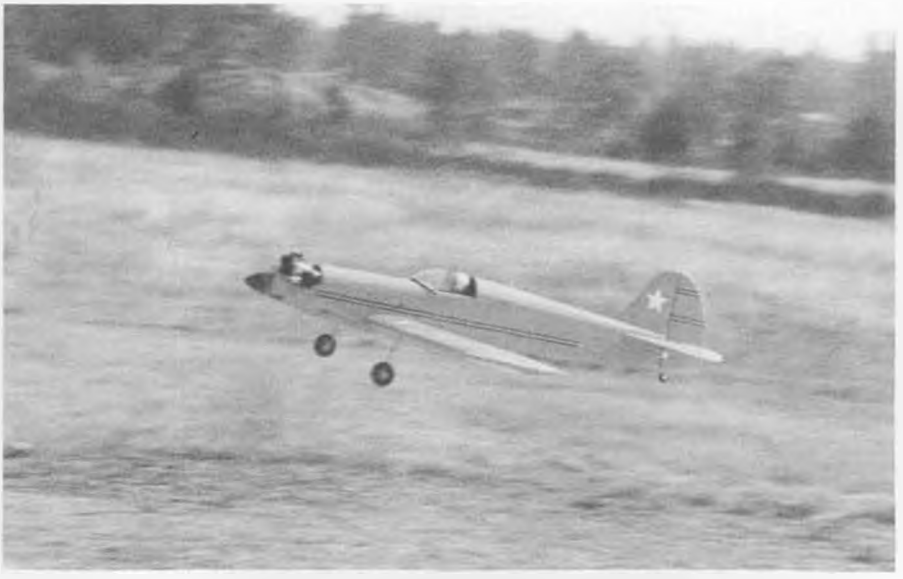


Wing construction is totally conventional throughout. Note the extensive use of lightening holes. Finished ready-to-fly weight came out at something over ten pounds.

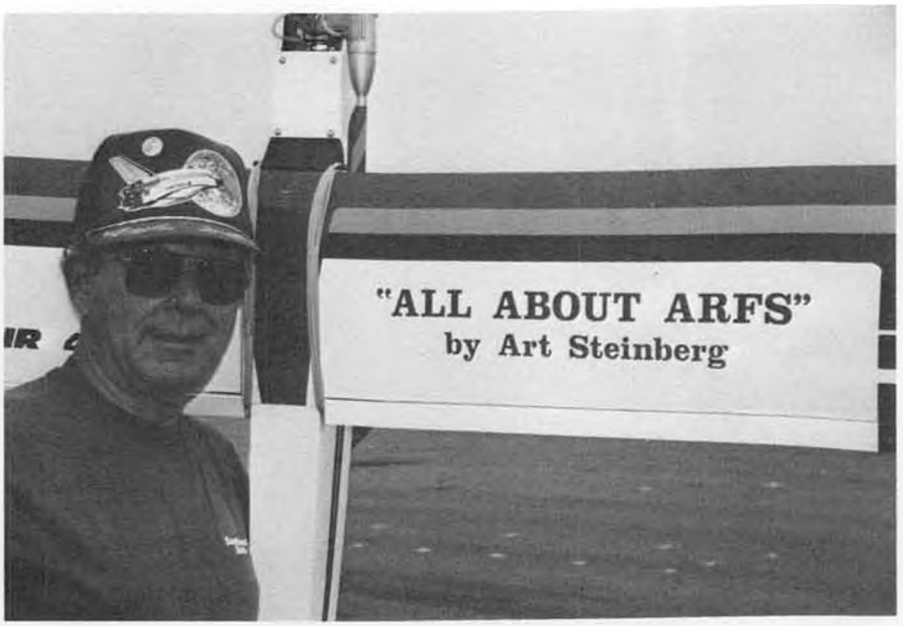
As good as this kit is, it's not perfect. The ply die-cutting is not as clean as it should have been, and she's much too heavy for a 950-square inch six-footer. At her size she should be about nine pounds, but certainly not the 10.7 pounds that mine came out to be. According to Great Planes, their prototypes also came out well over ten pounds.

I replaced the nylon snap-links and nylon landing gear straps with metal links and straps because I felt that nylon hardware

Continued on page 68



Al's Super Sportster coming by for a low, slow pass. Thick symmetrical airfoil keeps the airspeed more or less constant through maneuvers, makes for slow, easy landings.



• While browsing around one of the local hobby shops recently, my eyes lit on a most interesting-looking box which displayed an attractive color picture of a trainer-type ARF. As I am always on the lookout for a really good trainer because there are very few decent ones around, be they ARFs or built-up from a kit, I just couldn't help but get excited over what I saw. There it was, in big bold writing right on the boxtop, "Wingspan 68.6 inches, Wing Area 736 square inches, Weight 5 to 6 lbs." This was downright promising, as no other ARF trainer I had ever seen offered so large a wing nor such a generous wing area at so light an overall weight! A quick calculation indicated that the wing loading would come in at anywhere from a minimum of 15.65 to a maximum of 18.78 ounces per square foot, well within the requirements of a basic trainer. The name of this intriguing ARF is the Royal-Air 40T by that venerable old firm, Royal Products, a company that has a top reputation. Royal has been a first-rate manufacturer for a good many years, and their products have always merited the highest respect in the modeling world. While their mainstay has always been a magnificent line of built-up scale models, recently the Royal folks have been diversifying into the ARF field. Some of these ARFs are semi-scale types aimed at the experienced R/C flier, but recently they have introduced a trainer-type ARF intended for the novice market, the Royal-Air 40T.

Soon after my encounter with this model at the hobby shop, I decided that I just had to obtain one for evaluation. It wasn't very long before a 40T kit reposed on my workbench, and I immediately opened the box and checked out the contents. I just couldn't help but like almost everything I saw. The first thing I noticed was the completely finished fuselage. I lifted it from its resting place where it was securely protected and held in place by a cardboard framework, and I could hardly believe how light it felt in my hands. The two wing halves came out next, also securely protected in a large plastic bag, likewise weighing very little. Then I brought out the tailfeathers, the two wire halves of the torsion-bar landing gear, a hefty bag of hardware, three beautiful sponge rubber wheels, a set of light balsa push rods, an excellent quality fuel tank with all needed fittings, and a handsome white spinner. I've seen a lot of ARFs, but the color scheme on this one was really impressive. It consisted of five colors, a basic white airplane trimmed in blue, yellow, red, and black. The covering material was one of the ubiquitous plastic shrink films, and the quality of workmanship was absolutely outstanding.

The Royal-Air 40T, selected by our author as the best ARF trainer of 1988. Manufacturer recommends .35 to .45 two-cycle or .45 to .60 size four-cycle engines.

It was quite obvious why the specifications listed such a low wing loading, as the entire model was constructed of what seemed to be a light but strong grade of balsa and light ply. The only plastic used anywhere is found in the wingtips, otherwise the entire model is built up exactly as though it were done by a meticulous model builder on his own workbench. At this point I turned my attention to the eleven-page instruction book, and immediately noticed what I thought was a serious discrepancy. The cover of the instructions listed the specifications of the 40T, and the wingspan was shown as 64 inches, not the 68.6 inches shown on the box! I took a careful measurement of the wing sections and found that the actual wingspan was truly 64 inches. Now I questioned the wing area, so I measured the chord and found it to be a constant 11.5 inches, resulting in 736 square inches as specified on the box and in the instructions. Obviously there had been a slipup somewhere, but I was gratified when I realized that the wingspan and area still exceeded any ARF trainer I have yet encountered.

Of course, the configuration of the 40T followed the lines of a typical trainer, with a flat-bottomed airfoil and a high wing location. The cabin interior was spacious and afforded easy access to all radio equipment, and servos could be mounted with no crowding whatsoever. The same spacious was apparent in the fuel tank compartment, and the tank which I judged to be about ten ounces in size slipped easily into place. The tank can be serviced easily because a removable hatch has been provided. The hatch is held in place by four sturdy screws, and, should it prove necessary, the tank can be removed and replaced in just a couple of minutes.

As I examined the wing more closely, I saw that the ailerons seemed to be prehinged, so I worked them up and down a few times to check them for binding. Imagine my surprise when the ailerons came loose in my hands! I then realized that they were only temporarily joined together and would require glue at all hinge points. This was also true of the rudder and elevator, but it turned out to be only a slight disappointment, as the whole job took very little time. The instructions did refer to the fact that the hinges would require epoxy, so there was no defect in the kit. The constant chord wing is of conventional D tube construction. The reason it is so strong is because the center section is sheeted for a *full 15 inches*! Furthermore, the leading edges are

Even a strong crosswind proves to be no big deal for the 40T, seems immune to gusts.

sheeted for 4-1/4 inches on both the top and bottom! In order to join the two wing sections, a heavy plywood spar joiner is provided, and when this is done, you have about as sturdy a wing as you could wish for and the correct dihedral is automatically built in.

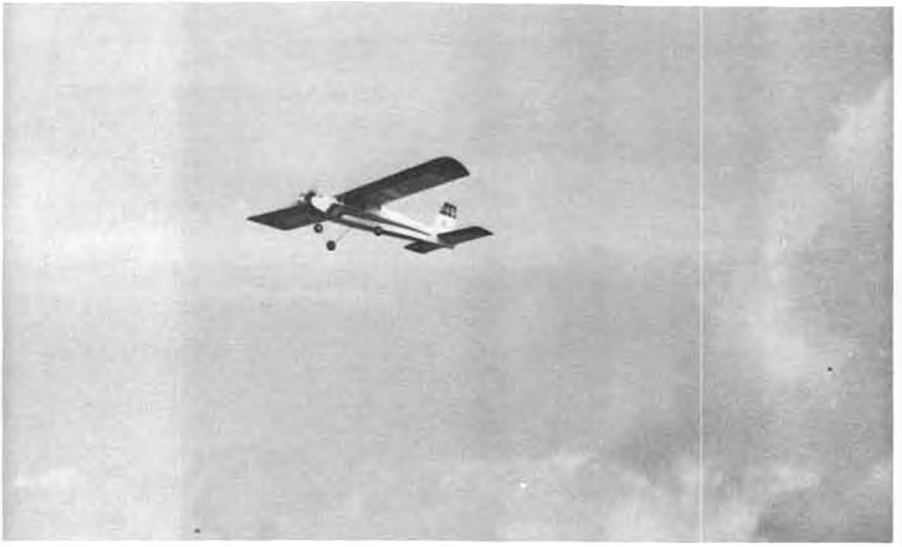
The fuselage is nicely built of light ply and balsa sheeting, and open bays have been designed aft of the cabin area to lessen weight. The landing gear is of the wire torsion bar type, extremely strong, but perhaps a bit on the bouncy side when landings are too hot. Already mounted to the firewall is a really unique motor mount, one that I wish could be bought separately. The mount is cast aluminum, and the engine is dropped into position, then secured in place by screwing down two metal clamps over the mounting lugs. The motor mount holes are not used at all. There are a number of advantages in this mounting method. By just loosening a couple of screws the engine may be slid forward or backward for slight changes in the CG or to provide more or less prop clearance or bulkhead clearance. Also, right or left thrust can be cranked in anytime with just a few moment's effort. This cannot be easily done with conventionally mounted engines, as after the mounting holes are drilled you are fairly committed to what you have. Another advantage is that the engine can be removed very quickly and it is usually not required to detach the muffler to get at the mounting bolts. The bolts which clamp the engine to the mount are spaced so as to be easily accessible even with the muffler in place. Also, if you wish to experiment with different engines, it is possible to switch powerplants in about five minutes. So here we have a really remarkable engine mount which accepts about any engine suitable for this airplane, and extensive flying has proven it to be absolutely reliable in use. Not once in over a hundred flights have I had to tighten any mounting screws!

One little job not done by the factory is drilling of the firewall for the throttle cable, and this is quite understandable, as different engines will require different installations. Pushrods are already assembled, but I found the rudder pushrod too long for my servo location, so I had to cut it down an inch or two.

The tailfeathers were beautifully made, with a built-up horizontal stabilizer and a solid sheet vertical stabilizer. These needed

Continued on page 81

Patty Hines holding Lance Biddle's Super Stick 40, built from a Balsa USA kit. Lance uses the model to demonstrate his company's computer-cut cast vinyl graphics.



Here the 40T looks as though it has just broken out of the clouds. Art says the bumpy air doesn't seem to interfere with its rock-steady flying characteristics.

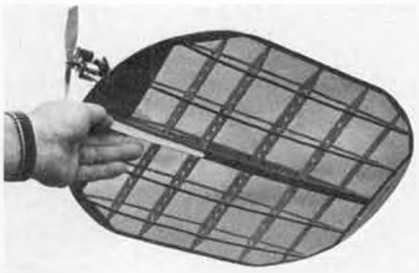
On the left is Col. Leon Friedman, USAF, Ret., our columnist in the middle, and Jerry Bomgarden, first student pilot to receive instruction on the 40T after flight testing was done.

Boeing Hawks Electric Fly

By BEN ALMOJUELA. . . Come along as our reporter gives an account of the annual electric fly-in held in Kent, Washington.

• A total of 20 fliers and 35 airplanes participated in the Boeing Hawks/PSEMF Electric Fly-In at the Hawks' Kent field on June 25 and 26, 1988. Although the weather was sunny on Saturday, the wind was just strong enough to keep the small and light airplanes on the ground. On Sunday, the sun disappeared, but the wind dropped to a manageable level. Turnout was quite good, considering that the AMA National Fun-Fly, and the Astro Flight Electric Championships were being held on the same weekend. Most of the contestants were local.

Mike Kometz demonstrated the current state-of-the-art electronic flight when he flew his slightly modified Warlord with an Astro Cobalt 40 motor and 18 cells. It performed as well as any Warlord with a normal .40-size engine, and Mike knows how to make it perform smoothly. He won the Most Impressive, Prettiest, and Most Aerobatic awards on Saturday with the airplane, causing some good-natured grumbling among the other participants. Mike also had his Ace 4-20, powered by an Astro Cobalt 15 and 12 cells, which flies better than any .20 four-stroke powered 4-20 (really!).



Gordon Millikan's F/F flying saucer. Uses a Hytork III AR motor and two 80 mAh cells. Weighs only 2.5 ounces ready to fly.

Our reporter took the Ugliest Airplane award with his cobalt 15 powered Prairie Bird 50.

Some of you may recall that I have been flying an Astro Cobalt 60-powered Skybolt biplane. Well, Saturday was not too good to me, as I experienced a radio failure (cause unknown) during the downward leg of a square loop and pulverized the front end of the airplane. It will fly again, though. Sympathy points got the Skybolt second place in Most Impressive and Best Scale, even though it only flew for about a minute.

Gordon Millikan won the "most planes" prize by bringing a total of six airplanes to the meet. Of these, the most interesting was his model of a Pou de Ciel (Flying Flea), which just barely decided to get into the air. It flew just long enough for a bonafide

Continued on page 69

Neat Davey Systems Eindecker built by Bernard Cawley and shown here with his son Darrell. Davey 075 on seven 900 mAh cells.

Dave Nofziger came all the way from Lebanon, Oregon to fly his Electrostreak. Very aerobatic with a cobalt 05, weighs 38 oz.

Bernard Cawley (left) and Bill Weed check out Bill's SE-5 prior to making a flight. Used a cobalt 05 and seven 1200 mAh cells. At 41 ounces it was a bit marginal, but sure looked good in the pits.

Scale Flying Flea by Gordon Millikan flew pretty well once the wind died down. Astro ferrite 25, 6 pounds, 1225 sq. in. total.

Making an Economy Electronic Throttle

By HOWARD W. CANO. . . Electronic speed controls for electric powered models need not be expensive or overly complicated. Here's one you can build yourself that will handle up to 24 cells.

• I guarantee this is the simplest electronic throttle you'll find! Because it's so simple, it's also very reliable, small, light, and easy to build (if you have a good working knowledge of electronics). Other features of the Econo Flight Throttle include separate adjustments for neutral and sensitivity, operation with 3 to 24 cells, and a fuse and holder mounted on the PC board for convenience and space savings.

Let me address a few myths and rumors regarding electronic throttles and electric motors before we get to the goodies. First, the MOSFETs in this design have a combined "on" resistance of about nine milliohms. Why do I mention this? Because this is about the same as the internal impedance of *one* sub-C Ni-Cd. In other words, ignoring losses in connectors and wiring, you'll lose six times as much power in a six-cell motor pack than you'll lose in the throttle! So, let's not spend too much money trying to lower the "on" resistance a few more milliohms, okay?

This unit pulses the motor at the frame rate of the radio (about 50 Hz). Rumors have it that this will demagnetize the motor, is less efficient than higher rates, makes motors run hotter, will cause you to want to fly Ugly Stiks, etc. If anyone tells you these things, ask them if they know the coercive force of the magnet in their motor, the inductance of the armature, and the Curie temperature of the magnets. (Just so you can be a kick at the next club meeting, the coercive force is the value of magnetic field necessary to magnetize or demagnetize a magnet. You can't pump enough current through the windings in your motor to reach this value unless you fly in thunderstorms, looking for a lightning strike. The inductance of the armature is important because if it were large enough, you could make the throttle more efficient by running a higher pulse rate. It isn't, so you can't. How about the Curie temperature, you ask? This is the temperature at which the magnets will permanently demagnetize; lower temperatures won't do it. How hot? Well, let's say you could see those magnets in a

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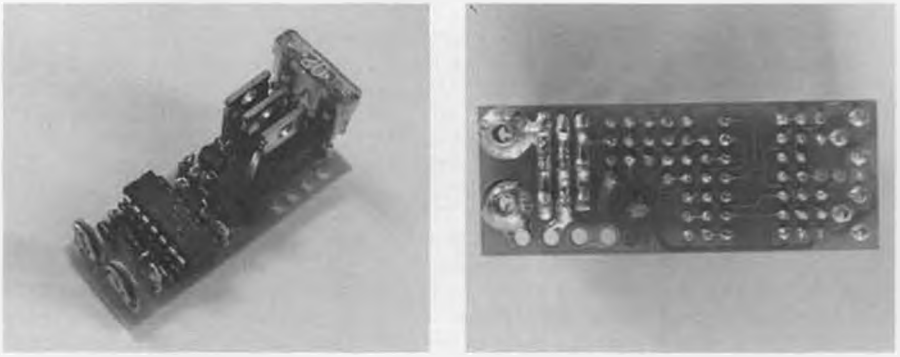
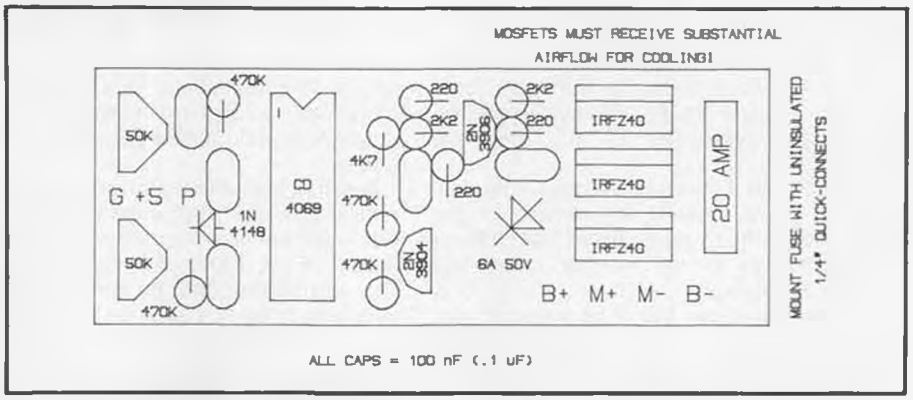
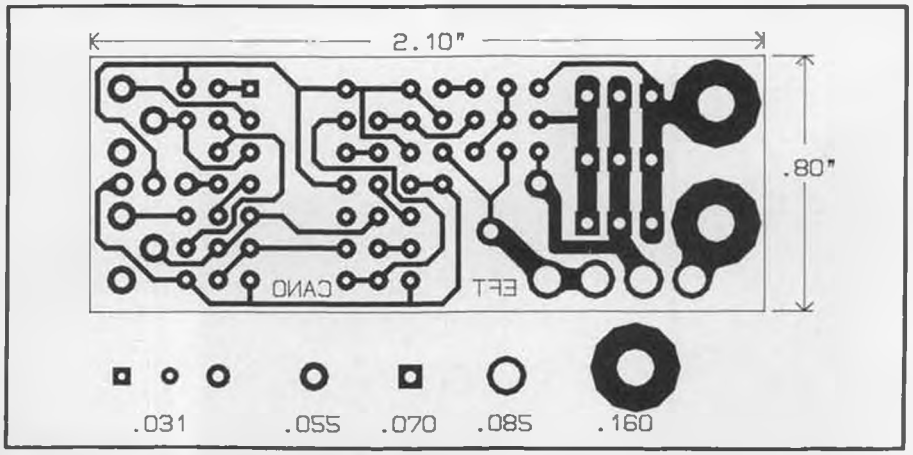


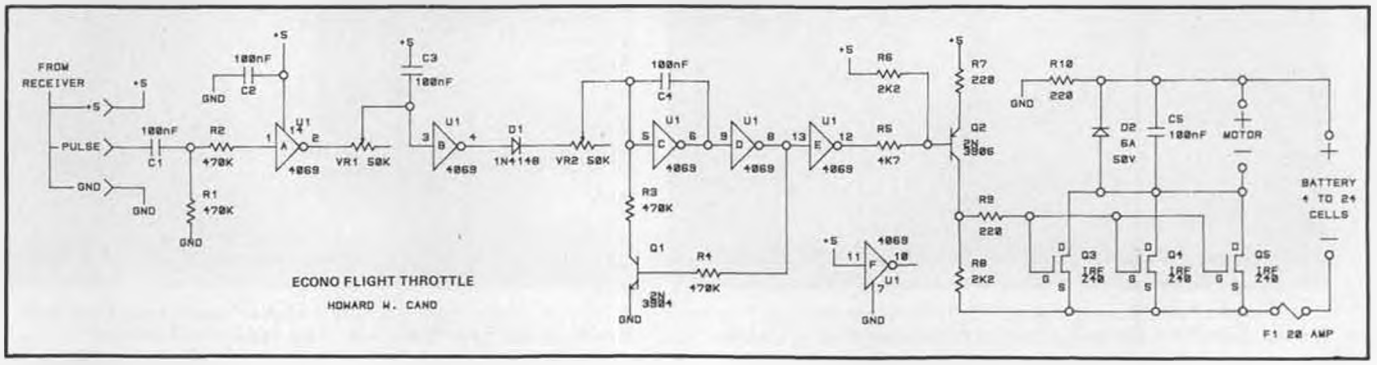
Top and bottom views of the finished throttle. Author has kits and even finished throttles available; see text for details.



Econo flight throttle parts placement.



Circuit board layout showing the various size holes required.



PLUG SPARKS

By JOHN POND

• For this month's lead article, we really don't have one. In its place, this columnist is acknowledging the reports of many SAM Chapters and what their activities are. Although the meets, fly-ins, and other types of model competition may be on the small side compared to the big annuals, nonetheless the smaller meets are of interest.

Several issues ago, we ran a notice that the Eastern Canadian Open, as sponsored by the Montreal Flying Club, would include a 50th Anniversary Contest for Roy Nelder's Moffett Winner, much on the order of the New Zealand Vernon Grey 50th Anniversary meet.

Peter Mann, the sparkplug behind this meet, writes to say the meet was not attended as well as hoped. Despite adequate coverage in announcing the meet, only three models made an appearance on Saturday, September 17, at Gananoque Airport.

Photo No. 1 shows Peter Mann, complete with beard, holding his version of the Nelder Moffett winner. Beard and clothing were strictly for the weather, which was cold and damp!

Saturday turned out to be a terrible day, so flying was set over to Sunday. The big competition was between Peter Mann and Dick ("Old Goat") Shurman up from New Hampshire. These models can be seen in Photo No. 2, the boys coming back from retrieval flights.

I might also mention Roy Nelder and his wife turned up on Saturday along with other former Wakefield winners Jack McGillivray, Gerry McGlashan, and Barre Condon. A first-class session of reminiscing going on!

The Moffett rules in 1938 selected the winner by taking the one best flight out of three ROG flights. Sherman had a good flight but Mann topped him on his last flight with 6:33. This model enjoyed a very short lift; flown and lost on its first day. The model was built to plans; *no dethermalizer*!

Completely undiscouraged, Mann is planning a 50th Anniversary contest for replicas of Fred Bowers's 1939 Wakefield, which came in second behind Korda's spectacular 54-minute flight. This meet will be scheduled for September 1989 at Gananoque Airport during the Eastern Canadian Open.

Pete had hoped to have Fred Bowers present at this meet, but unfortunately, Fred was killed in December, 1944, while ferrying a B-25 out of Doroal Airport, Montreal. One engine quit and the entire crew lost their lives in the St. Lawrence River. Hence, this meet will have the added significance of a Bowers Memorial 50th Anniversary.

COMPRESSED AIR EVENT

At Lawrenceville, Bert Pond again showed up with his "Bottle Baby" design. We did run a photo of this at the Lincoln Nationals where O/T Events were featured.

Tim Nielsen sent in Photo No. 3 showing much more clearly the arrangement of this design. Bert reports the "Seven-Up'type bottles will hold better than 100 p.s.i., more than adequate to fly the model.

SCAMPS TWIN PUSHER EVENT

Here is an event that Gene Wallock, Contest Director, has been promoting for years as part of the SAM 13 (SCAMPS) flying schedule at the Mile Square Flying site near Westminster, California.

Ed Wallenhorst is still using the Simmon's stagger-frame Twin Pusher he has been so successful with for the past three years. A good flight of 5:09 won.

Although six other rubber events were held, the Twin Pusher and Wakefield Mass-Launch Events were the highlights of the day. Eight Wakefields were entered with C. J. Gordon emerging as the winner using a Cleveland Gull. Strictly a fun meet!

MISS AMERICA FOLLOW-UP

Since this columnist wrote up the building and flying of Miss America No. 3, Carl Schmaedig received an advance copy of the column. Carl immediately replied stating I misunderstood how they got too much gas into the tank.

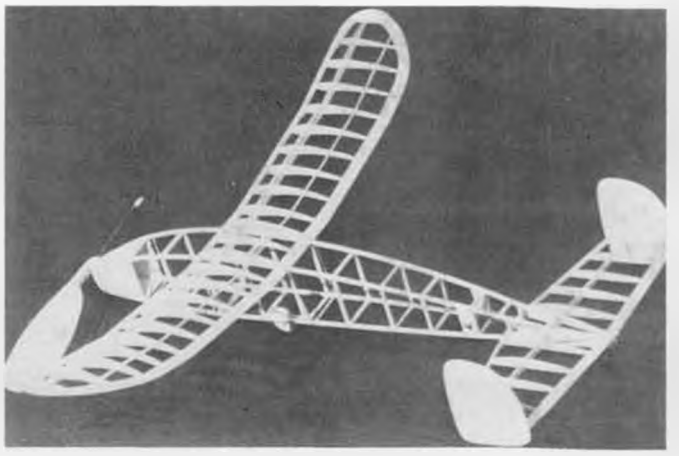
Turns out the model was set up to accept the complete Brown Jr. mount as manufactured by Junior Motors Co; same for the Baby Cyclone mount. The engine mounts were held by screws in the side of the fuselage (the Brooklyn boys adopted this system but with one screw being replaced with a wooden peg).

Anyway, Carl started with three eye droppers of fuel in the tank. Motor stops before becoming airborne. Three more eyedroppers are added and needle valve adjusted. That did it! The engine ran beautifully with all those "eyedroppers" of fuel. Never did

1. A bearded Peter Mann shows off his 1938 Nelder Moffett Trophy Winner, built for a one-design contest he sponsored up in Canada.

2. Another photo from the Nelder Moffett meet shows Dick Sherman (left) and Peter Mann with their ships. Nice field, eh?

3. Genial Bert Pond caught at Lawrenceville with his "Bottle Baby" compressed air design. Note plastic soft drink bottle. Nielsen pic.



4. Chicago Aeronut member Otto Curth's "Super Stuff" ought to be a terrific flier with its one-bladed prop and retracting gear.

find it.

CHICAGO CAPERS

Quite some time ago, we received photos from Otto Curth featuring his "Super Stuff" rubber model. No one can seem to remember if we used a pic or not, but Photo No. 4 showing the bare bones framework should do it. For those who don't know, the model is an impressive flyer.

BURBANK 1937

When one looks through the "Gas Lines" column appearing in *Model Airplane News* during the period of 1937 to '38, one is struck by the smart-looking scale-like models flown at the various California contests.

We are lucky that Cedric Galloway took some pictures of the model activity of the Southern California Gas Model Association who held many a big meet at the Western and Rosecran field (now town of Gardena).

Seen in Photo No. 5 is a well done Stinson SM-1 fitted with an NACA ring cowl. No builder is given of this 1937 design. Typical model of the Los Angeles area.

RUBBER MODELS

Seen at the Lawrenceville Airport SAM Champs were some excellent flying rubber models. We would like to run a few of the lesser-seen designs.

Photo No. 6 depicts Jim O'Reilly with a Best-By-Test "Altimeter," a series of designs originated by Ed Schlosser. Other kits included such names as "Stratometer," "Enduro," "Soarer," etc. Ed had a full line of cabin, rubber, and soaring glider kits.

5. Cedric Galloway supplied this photo, taken in 1937 at the fabled Rosecrans and Western field in Los Angeles, showing this snappy looking Stinson SM-1, builder unknown.

Another Photo (No. 7) gives an excellent view of Ernie Linn's "Kansas Wakefield." This design, approved by the SAM Board of Directors several years ago, has since shown it can compete with the best of them on the field.

Ernest can be reached at 3505 E. Mt. Vernon, Wichita, Kansas 67218, for plans to construct this model. Cost is $5 (we think).

Probably the best climbing stick model in this writer's humble opinion is the Ed Lamb "Climber" as seen in Photo No. 8 with Guy Scott of Albany, Indiana, holding. Guy has no excuses except to say it is hard to get them out of the cornfields for three flights!

ENGINE OF THE MONTH

Again, we owe a debt of gratitude to MECA Secretary-Treasurer Bob McClelland

6. Seen at the 1988 SAM Champs, Jim O'Reilly ready to launch his Best-By-Test "Altimeter". Johnson photo.

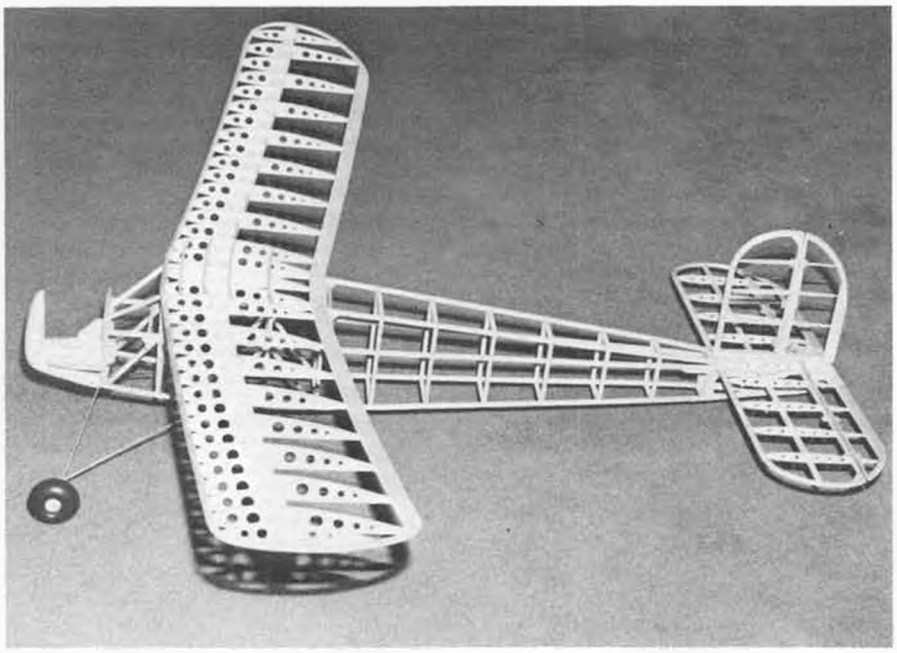
7. Ernie Linn, newsletter editor for SAM 56, shows us his original design "Kansas Wakefield. Excellent all-weather flyer. Johnson pic.

8. Best climbing O.T. Stick model of all, says Guy Scott of Albany, Indiana. Aptly named the "Climber". Johnson photo.

9. Neat Ohlsson 23 powered Buccaneer 48 flown at Bong in 1984 by Jim Alaback, editor for SAM 41 in San Diego, CA. Johnson pic.

10. Newly approved Chet Lanzo design, the 12-foot "Racer" as built by Dick Bringgold of Phoenix, Arizona. Looks sort of like a Record Breaker without the wire cabane. O.S. 60 4/c on ignition.

11. SAM 39's Stu Warner entered this beautifully built Schumacher "Hoiman" in the O.T. category at Toledo '88, but the judges were looking more for shiny finishes than expert craftsmanship, and Stu didn't place. Model is covered in pink silk with maroon trim.



12. Framework shot of Stu Warner's "Hoiman". Model features a hollow box spar, wing sweepback, and elliptical dihedral. Requires a special building jig to build.

for the use of this month's engine, the Herkimer OK Mohawk Chief, as manufactured by Herkimer Tool and Model Works in Herkimer, New York.

The .29 cu. in. series of Herkimer OK engines were all basically the same with a bore of .760 and stroke of .660 giving a displacement of .299 cu. in. This gave an interchangeability that defies the average modeler to correctly identify.

OK 29 engines first made their appearance in 1946 known as the B-29 and sale priced at $18.50. In 1947, a revised engine known as the Super 29 was introduced featuring a finned aluminum head secured by five screws to the cylinder case. The "hang"-type tank was abandoned in favor of a bolt-on-type tank so successfully used by the Torpedo 29.

Both of the previous engines were priced competitively with the K&B, Delong, and other 29 engines. Competition was very stiff and Brebeck decided to market an engine that would compete with the "cheap" or "slag"-type engines. Not wanting to injure the reputation OK engines had built up for durability over the years, Brebeck resorted to a subterfuge and created a fictitious company known as the Mohawk Engineering Co., 252 Michigan St., Mohawk, rather than Herkimer, New York.

To make a different-looking engine, the dies were modified to include an Indian Chief emblem on the side of the crankcase. The cylinder flange shape was changed while the metal between the case and the intake was not neatly removed as in the more expensive engines.

Actually, all B-29 parts were used in the production of the Mohawk Chief with the exception of the timer which was changed to look like the Rocket timer allowing for cheaper production.

An ignition version was first advertised in the June 1948 issue of *Flying Models* at the attractive price of $8.95. This compared favorably with the new Genie engine being marketed at $6.95 by another fictional company, an offshoot of American Hobby Center who was also producing the "Thor" engine.

To keep costs down, the old B-29 hang tank was used in place of the bolt-on tank of the "Super 29." In addition, to help augment sales, dealers received the Mohawk Chief engines in an eye-catching multicolored box using blue and yellow as the primary colors. Of course, the engine was

13. A Ray Heit "Scram" being attended to by Basil Healy (left) and builder Gordon Tidey, president and secretary respectively of SAM 1788 (Australia). Scene is the Aussie SAM Champs at Canowindra.

14. Here's a rare one for you: a Jack Finneran Flyer of 1935 vintage as built by Bill Gordon of Australia. Enya 40 four-stroke power.

sold without spark coil, which was offered for $1.95 extra.

It was not long before the glow plug made its presence felt in sales; hence, in the December 1948 issue of *Flying Models*, Mohawk announced a glow plug version price at $7.50. The first model came with a blue nose cover replacing the timer parts and, to finish it off properly, with a rounded blue-colored bolt-on tank. This was later changed to a gold color to differentiate model years.

For the technically minded, the Mohawk Chief featured a one-piece steel cylinder and aluminum crankcase. The one-piece crankshaft was "hogged" out from steel, hardened, and ground to size. The piston was standard hardened steel lapped to the cylinder. The surprise was the aluminum connecting rod, heat-treated for strength.

All Mohawk engines were block-tested and guaranteed for a 60-day period against defects in workmanship and materials. Of interest was the all-up weight of seven ounces of the ignition version, which included tank.

Manufacturer performance figures claimed rpm figures of 2,000 to a top of 12,000. Strobatic tests run by the *Air Trails* engine test gang gave figures of 6,900 rpm with 11-8 Power prop; 8,450 rpm using a 10-inch Testor's prop (pitch not specified); 9,100 rpm with a 9-8 Testor's prop; and 11,400 rpm using a 9-6 pitch Testor's propeller.

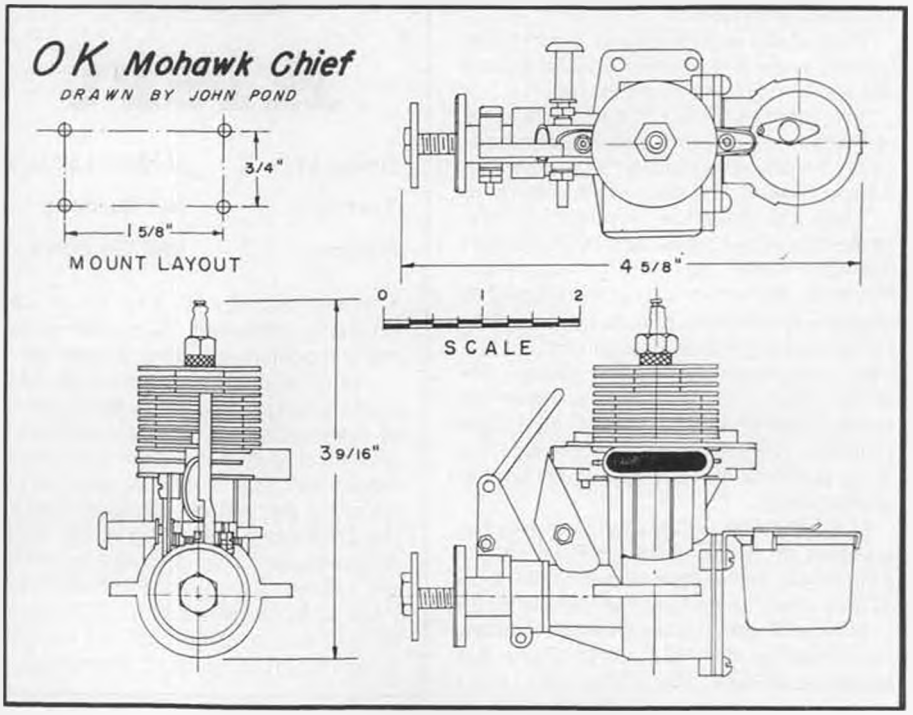
It is interesting to note late in 1948 the Mohawk Chief was finally acknowledged as a product of the Herkimer Engine line just about the same time as the Genie and Thor were acknowledged as productions of American Hobby Center.

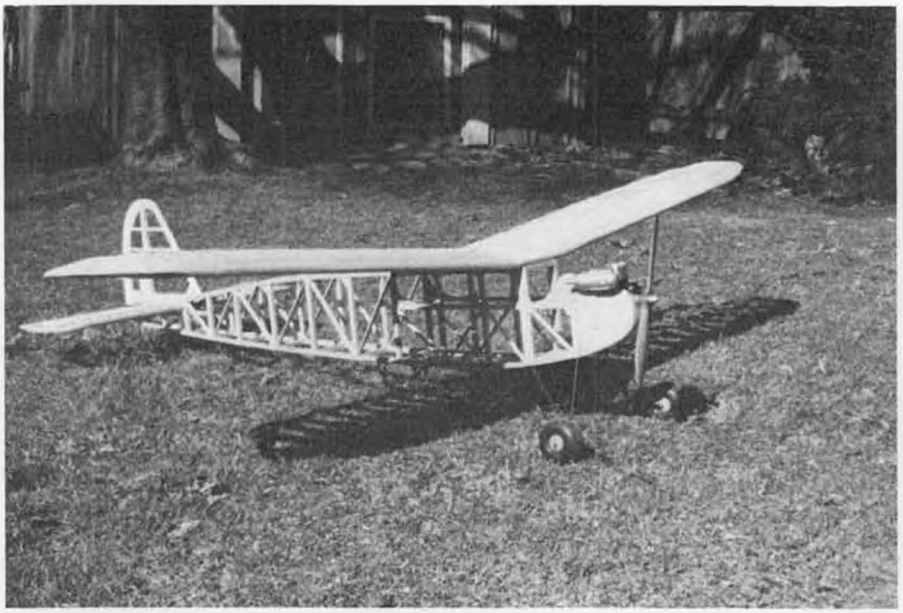
TRUE SPIRIT OF SAM

As taken from the SAM 100 newsletter so ably edited by John Delagrange, 1822 Longview Drive, Lancaster, Pennsylvania 17601, the following is what this writer thinks the old timer movement is all about:

"Believe it or not, Dick Shiffer and his Flying Quaker have been flying in the skies at Ephrata, Pennsylvania, for the past 52 years! The Quaker, built in 1936, is still going strong as is its builder, Shiffer, who is 74 years young. Dick has been a model builder since he was 20 years old but not a contest flier! He loves to build and fly oldies.

15. Ed Lamb displays a couple of 1927 vintage indoor models in the hopes of starting a new SAM event. Sound like fun? Text has more details.





16. Nicely built R/C Miss America belonging to Patrick Blanco of Westbury, New York. Pond's text mentions the model being fitted with a Wahl Brown, looks like a modern glow engine to us.

17. The late John Drobshoff with a "Little Diamond" designed by his brother Alex.

"Recently, he flew the Quaker in competition for the first time at a SAM 76 meet in Hatsfield, Pennsylvania. Despite the weight acquired from many rebuilds and repairs, the model turned in a 5-1/2-minute flight.

"Originally powered by an OK 60 in a free flight mode, the Quaker now boasts of a Saito 45 4/C for power. This switch was made in 1980.

"1941 saw Shiffer going off to war. The Quaker was stored in the garage rafters to collect dust. Returning home in 1945, he married Alice and raised three daughters and a son. This pretty well took care of model building and flying until 1960.

'Dick decided to get his son interested in model building, putting a Super Sniffer together. Naturally, the son wasn't overly impressed, but Dick was 'hooked' again. The old Quaker was dusted off, old dope and bamboo paper covering carefully removed. A new fabric, for that time, Silron, was used to recover the Quaker.

"Now, about every weekend, Dick can be spotted at the Brownstown Vo-Tech School just south of Ephrata flying for fun.

"Like all of us, Dick has his favorite story of flying his Quaker in 1936-37 at the Lancaster Airport. His model came down on the roof of a tobacco shed on a nearby farm.

"Little did he know a portion of the farmer's land had been taken by the Airport Authority under eminent domain. Needless to say, the farmer was not too friendly to anything that had to do with aviation. The Quaker sat in the tree through rain and sun until a strong wind blew it down. The farmer finally allowed Dick to enter his property and retrieve the model." Free flight problems haven't changed much over the years, particularly in the East where land is at a premium.

As editor, John Delagrange now asks the question of "What is the spirit of SAM?" John says it was written all over Dick's face as they drove home from the meet at Hatsfield. In addition, it is the smile on my face as I finish writing this article about the hobby we all love.

SPIRIT OF SAM CONCOURS

While on this line of thought, SAM 41 of San Diego put on a new event in their Annual known as "Spirit of SAM Concours." Rather surprisingly, this event drew as many entrants as the more popular ones.

According to Jim Alaback, newsletter editor of San Diego Aeroneers *Also News*, Bob Munn proposed and sponsored this event. As a side note, he also *won* with a silk-covered Super Buccaneer. Bob has always wanted to build this model for 50 years; that's long enough time!

Not enough can be said for Jim Alaback, the enthusiastic newsletter editor. He has single-handedly put this Aeroneer club in the limelight with his interesting club paper.

Photo No. 9 shows Jim Alaback in his days when he lived in the Chicago suburbs. Jim is holding an Ohlsson 23-powered Buccaneer 48.

This photo was taken at the 1984 Bong SAM Champs on June 28 by Harold Johnson. Jim moved to San Diego shortly thereafter.

Might also mention that Alaback entered a Cleveland Viking in the "Spirit" Event. This model was built recently, still good craftsmanship!

Continued on page 84

Old Timer of the Month

The Alert

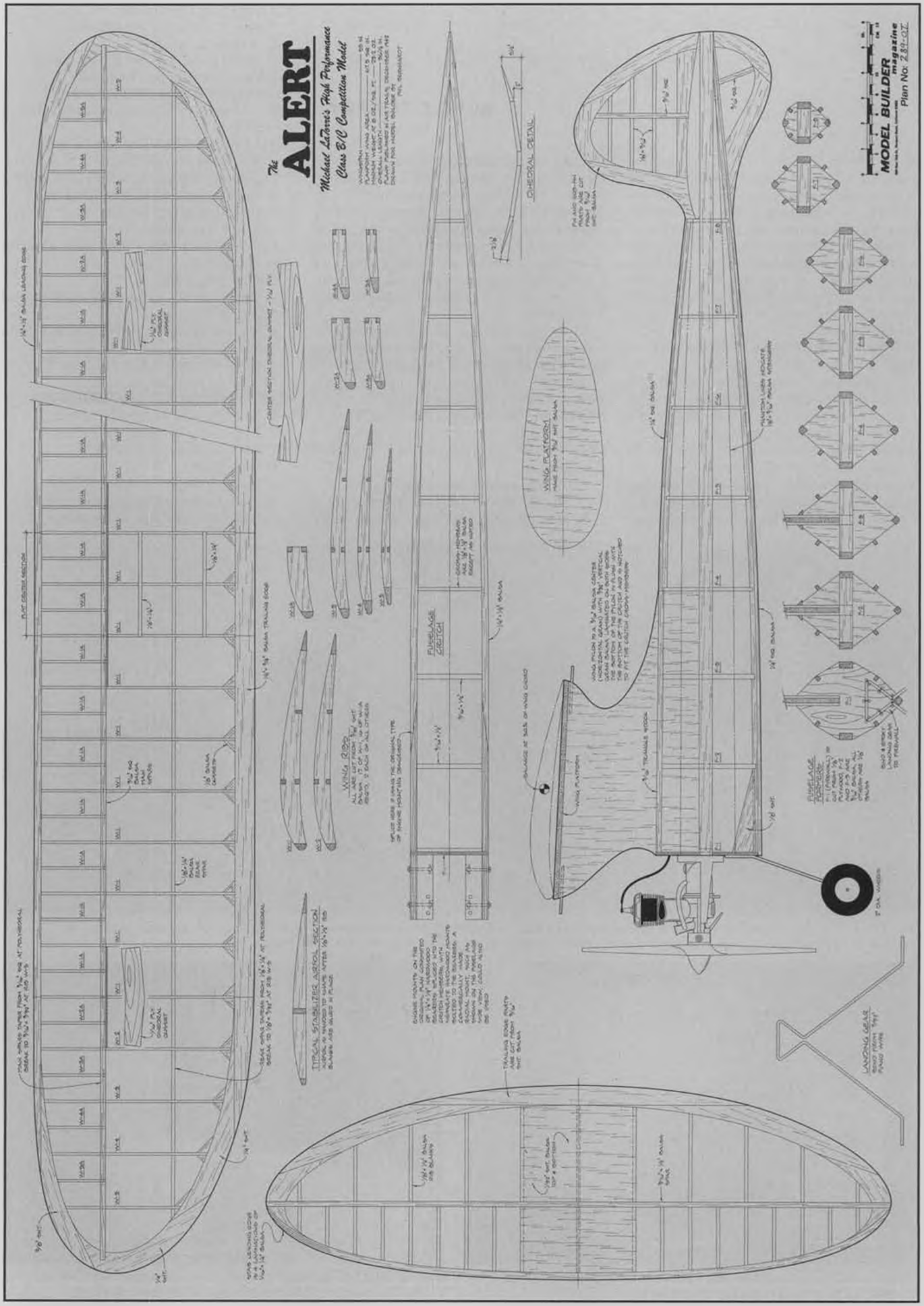
Design by: Michael LaTorre

Text by: Bill Northrop

Plan by: Phil Bernhardt

• When this month's Old Timer was originally published, there weren't too many modelers around to appreciate it . . . most of them had joined the U.S. military forces, and those who hadn't, for one reason or another, were finding it difficult to obtain the main ingredient, balsawood. The "Alert," an appropriate name for the period, was published in the December 1942 issue of *Air Trails* magazine, and was designed by Michael LaTorre, a well-known East Coast (New York) modeler. Like his "C-Raider," which was a simplified version of Schoenbrun's "Gladiator," the Alert is a greatly simplified Goldberg "Zipper" or "Mercury."

Our plans were drawn by Phil Bernhardt, and the model shown was built by Phil's father, the late Otto Bernhardt, about 18 years ago. It has always been an excellent flier in free flight events. After reading the construction portion of the article, we've decided to let Phil's plans talk for themselves; the article is somewhat confusing. Flight pattern of the original model was left power, left glide, with a bit of wash-in applied to the left wing panels to prevent any power spirals. •



FULL–SIZE PLAN AVAILABLE – SEE PAGE 106

R/C SOARING

By BILL FORREY

• As *Model Builder*'s R/C Soaring Contributing Editor, my job is to keep this column as interesting as possible. Your contributions of construction tips, discoveries, new designs, contest reports, and technical information help keep this column from becoming just one person's views and opinions. Together we can use this magazine space to further the hobby/sport of model soaring. Thank you in advance for your valuable input!

NATIONAL SAILPLANE SYMPOSIUM 1987

The edited transcripts of the 1987 MARCS National Sailplane Symposium are now available. As in the past, this annual symposium was recorded on audio tape and converted to print in the year following by Proceedings Editor Al Scidmore and a team of "very busy working people." The finished book is 8.5 x 11 inches and is almost 3/8 of an inch thick. I don't know how many pages it contains, but each page is loaded with information that can enhance your enjoyment of this hobby. If you love model soaring and all of the infinite subtopics that go along with it, I highly recommend that you invest in your own personal copy. If you are interested in having a thorough library of soaring information, then by all means invest in all the annual proceedings (1983-1987).

To let you have an idea of the various topics covered in the five proceedings books that are available, the following list of "contents" should help you decide which ones are most interesting to you.

1983 SYMPOSIUM PROCEEDINGS

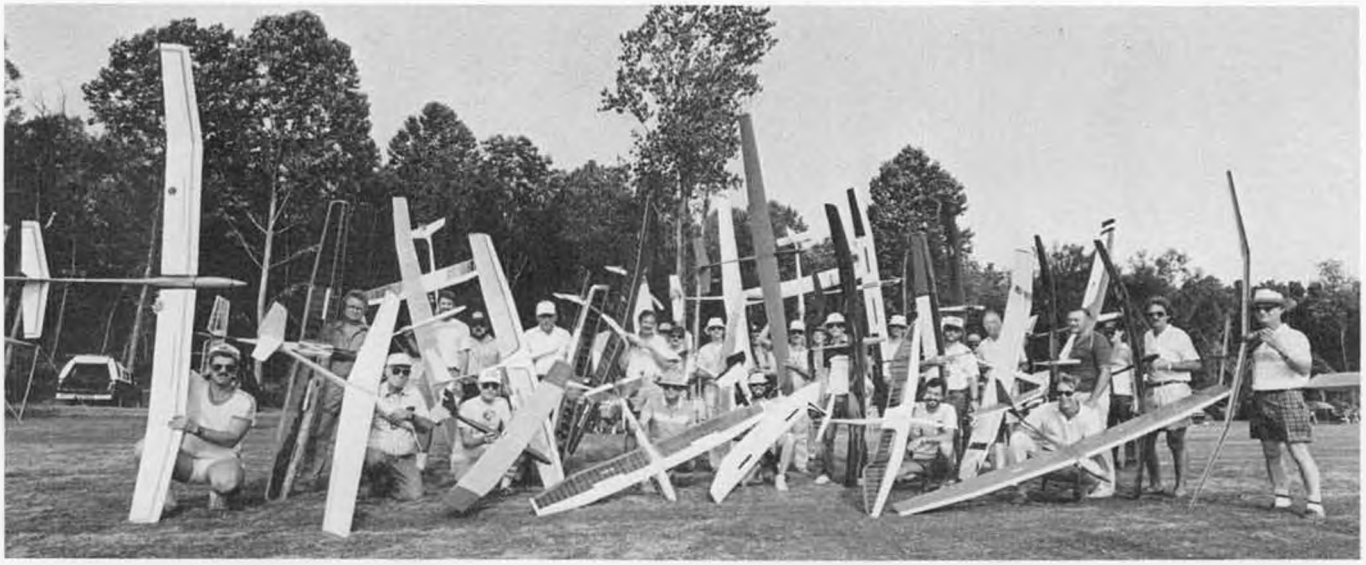
A. Design Criteria and Airfoil Selection
B. Panel Discussion on Contest Competition
C. Winch and Retrieval Systems
D. Hand-Launched R/C Sailplanes
E. Record Attempts and Cross-Country Soaring Panel Discussion
F. Laser-Cut Airfoil Templates
G. Kitting Sailplanes
H. R/C Electronics: Where To Now?
I. New Construction Materials

1984 SYMPOSIUM PROCEEDINGS

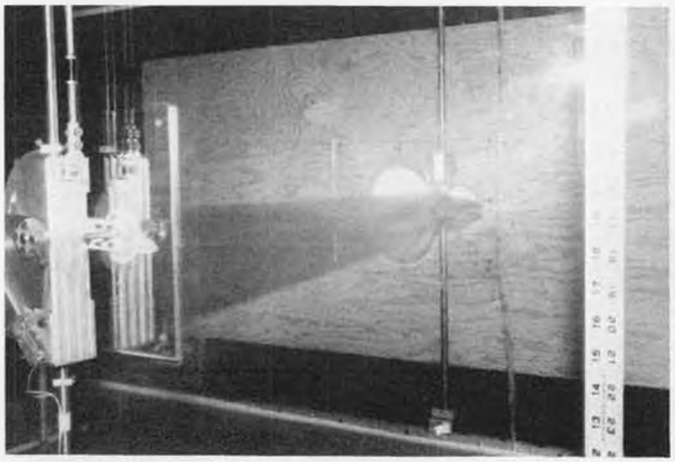
A. American, Canadian, and British Nationals
B. Oly 650: A One-Design Contest
C. Hundred-Minute Club
D. Your Flying Site as a Tool for Growth
E. Meteorology of Thermal Soaring
F. Hand-Launched Gliders
G. Club Newsletters
H. Stability Factors, Computers, and The Model Sailplane
I. Why Not Scale?
J. Basic Foam Core Preparation and Techniques
K. Radio Equipment, What's New, What's Ahead
L. Cross-Country Support Equipment
M. F3B Discussion Panel

1985 SYMPOSIUM PROCEEDINGS

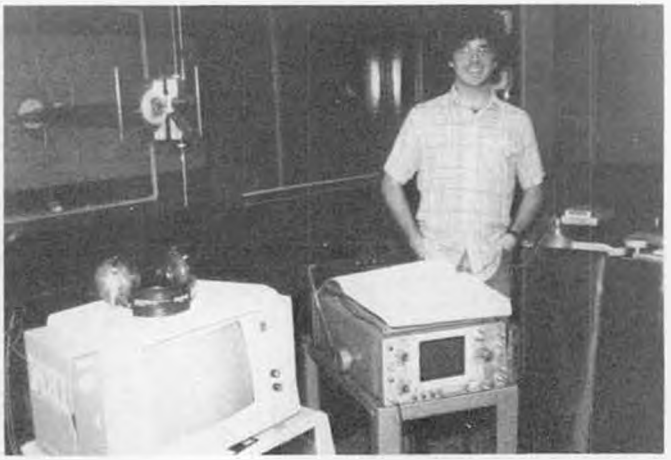
A. Introduction to Aerodynamics
B. F3B World Champs Australia
C. Meteorology for Soaring
D. Adhesives
E. Flying Wings
F. Cross-Country Discussion Panel
G. Variometers (Thermal Sniffers)



The North Alabama Silent Flyers hosted the Southeastern LSF Tournament at a Huntsville sod farm in August of last year. Most of the 39 contestants are gathered here for the obligatory group photo. Sod farm proved to be an excellent site for the event.



The heart of Princeton's low Reynolds number (low speed) wind tunnel. E-214 section undergoing tests here.



Michael Selig and the wind tunnel's computer equipment. Absent is John Donovan, who is also involved in the research work.

H. Fiberglass Fuselages
I. Flight Path for the F3B Speed Run
J. Contest Strategies Discussion Panel

1986 SYMPOSIUM PROCEEDINGS

A. The First R/C Sailplane
B. The US F3B Team Selection Finals
C. The AMA, F3B, and Where Are We Headed?
D. Contest Organization Panel
E. R/C Frequency Mythology
F. Electrostatic Stabilizers for R/C
G. German R/C Sailplane Experiments
H. Flying Multi-Channel Straight Wing Sailplanes
I. Vacuum-Bagged Glass Wing Technology and Techniques

1987 NATIONAL SAILPLANE SYMPOSIUM PROCEEDINGS

The proceedings can't come close to duplicating the fun, comradery, and social contact of attending these gatherings, but they come very close to giving you all of the technical aspects. All that was recorded on the audio tapes (that's fit to print) is transcribed. Added to the text are all of the important graphics available from the speakers, plus a few photos of the speakers themselves. Contents as follows:

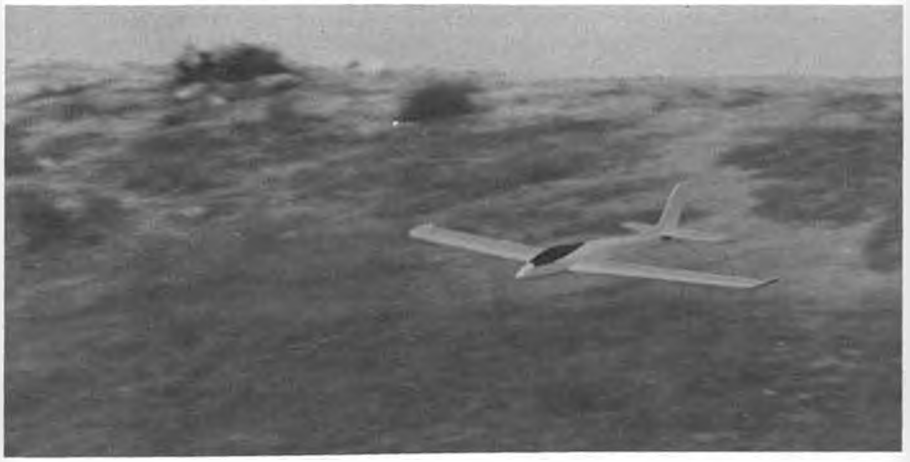
A. Walt Good: "The Battle for Frequencies." AMA's dealings with the FCC to procure space in the frequency spectrum.

B. Lee Murray: In-depth article comparing the weight, strength, puncture resistance, shrinkage, etc. of the various plastic coverings.

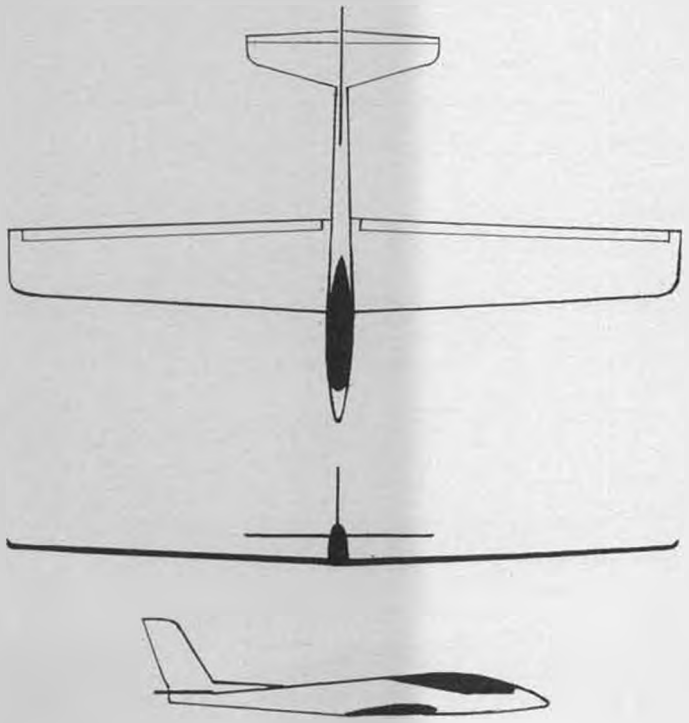
C. Rolund Stull: A meteorologist specializing in thermal mixing in the lower boundary layer talks about thermals. Contains many graphics.

D. Pete Waters: Discussion on 1991 ra-

Southeastern LSF Tourney winners, from left: Bob Sowder, Paul Behr, Loren Banco, Dick Renskers, Tom Killough, Wayne Blankenship, and Ken McDonald.



Mike Reed's "Slopar" cruising the hills of Riverside, CA. Ship was designed for light lift conditions.



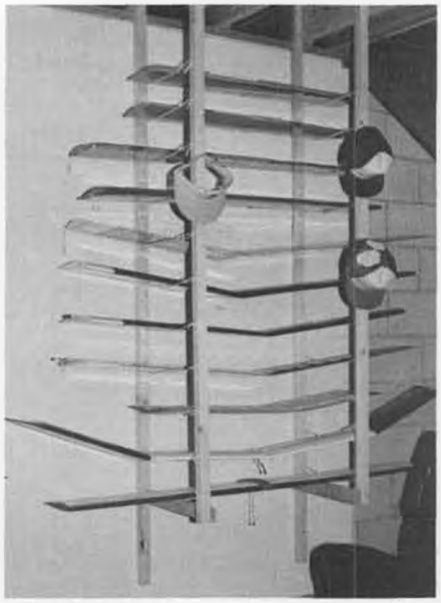
Mike Reed's

SLOPAR

Slope Glider

Span . . . . . 52 Inches
Area . . . . . 330 Square Inches
Airfoil. . . . . Selig 3021
Weight . . . . . 14 to 21 Oz.
Length . . . . . 32 Inches
Controls . . . . . Aileron & Elevator

Well-thought-out fuselage and transmitter storage rack as concocted by Jim Clark. Makes use of pre-fab shelving available at most hardware stores. Mount next to an AC outlet for charging.



Simple rack keeps wings protected from accidental damage. Also from Jim Clark.

dios: "1991 And All That Jazz." E. Leon Kincaid: Designing sailplanes for competition.

F. Paul Carlson: Report on Michael Selig and John Donovan's progress in the wind tunnel experiments at Princeton.

G. Gary Tschautscher: Highlights and gleanings from the German soaring publications for the past year (1987).

H. Paul Carlson: Design factors for competitive sailplanes.

I. Ken Bates: Flying wing design. His latest field trials and results.

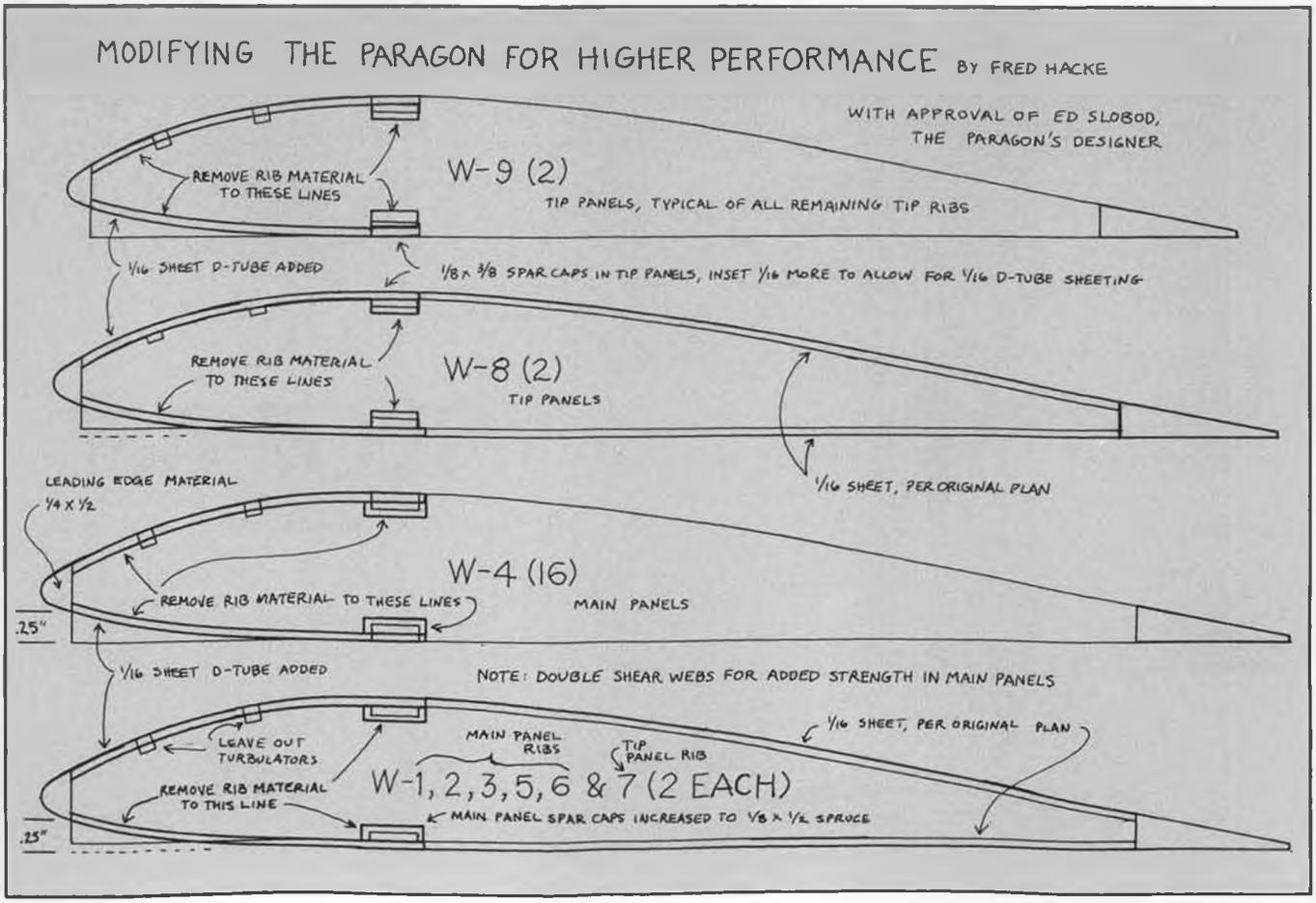
J. Joe Wurts: Composite technology in cross-country soaring and slope racing: latest construction ideas, techniques, and design ideas.

As you can see, there have been lots of subjects covered over the years. Most of this information is timeless and still of value today. If you would like to order any of the proceedings, here is the price schedule: 1987 Proceedings, $10.00; 1986 Proceedings, $10.00; 1985 Proceedings, $10.00; 1984 Proceedings, $ 9.00; 1983 Proceedings, $ 9.00.

Add one dollar for each copy ordered for first-class shipping. Also, if you desire, you may place an advance order for the 1988 National Sailplane Symposium Proceedings which should become available mid-1989. The cost is at 1987 issue prices $10.00 (plus one dollar for first-class mail). Be sure to include your return address. Send your check to: Walt Seaborg, 1517 Forest Glen Road, Oregon, Wisconsin 53575.

5TH ANNUAL WINTER BUILDING SEMINAR

LeRoy Satterlee, Publicity Chairman, asked me to mention this event in this col-



Ten LSF Level V's, from left: Skip Schow, Guy Dickes, Tom Dickey, Don Clark, Pat Flynn, unidentified West Coast flier, Jerry Zegenfuse, Terry Luckenbach, Don Goughnor, and Bob Champine.

The winning X/C team at CASA '88, team captain Pat Flynn in the middle. Sorry, no names given for the other fellows.

umn. Since we are on the subject of seminars and the like, now seems a good place to insert the info:

"Gentlemen: The Eastern Iowa Soaring Society is pleased to announce the 5th Annual Winter Building Seminar. This year the seminar will be held at the Long Branch Hotel in Cedar Rapids, Iowa, on February 11, 1989, from 8:30 a.m. to 5:00 p.m.

"The final agenda is still being worked on by the seminar committee, but a possible list of subjects is as follows: fiberglassing and vacuum bagging of wings, covering with the new crop of covering materials, fiberglass repair, scale detailing of sailplanes, winch modifications for safety and performance, all about electrics, publishing your designs and ideas in the magazines, and photography of models for publication and fun.

"You can bet that whatever the final agenda is, it will be interesting to all soaring enthusiasts.

"This has been a very popular seminar in the past, and well attended, so advance registration is a good idea. If you are interested, contact: Paul Jones, Committee Chairman, 3700 Emerson Avenue NE, Cedar Rapids, Iowa 52402, (319)393-6777."

PIERCE AERO "PARAGON" MODS FOR INCREASED PERFORMANCE

The following input is provided by Fred Hacke of Bethalto, Illinois. His letter briefly hits on an idea that has been successfully tried many times by modelers over the years. The idea is to give the flat-bottom airfoil Paragon sailplane (a kit from Pierce Aero Co.) a boost in performance by decreasing its mean camber line to a more modern Eppler-like airfoil. This improves top speed, ground covering ability in wind, and perhaps even improves maximum L/D or glide ratio.

"I have enjoyed your articles for some time regarding airfoils and interpretation of data. Your efforts provide a means of education for people like me.

"I know you cannot afford to invest much time in the various questions that people contact you about, but hopefully you will be able to take a couple of minutes and make a comment on the following using the SASE enclosed.

"A couple of years ago, I discussed a modification to the Paragon wing with Ed Slobod (*the Paragon's designer.—wrf*). At his suggestion, I built a modified Paragon wing. The leading edge is sheeted, and the bottom airfoil is curved up from the bottom main spar to the leading edge—Phillips entry. The modified wing has a thinner leading edge than the standard Paragon. I enjoy the way it flies. It has good penetration on windy days and still retains good lift on calm days.

"I am enclosing a copy of the typical cross section of the airfoil. What is your opinion regarding the modified airfoil? Does it relate to any current wing section that is being reported on at present?

"Thank you for your time and continued effort on the articles you write." My thoughts about this modification are mostly positive. I have seen many thermal competitors use this type of modification to good effect here in California. The Paragon in its stock form in my opinion is the best trainer, best-handling sailplane, best all-around light air thermal ship ever designed. It has a name that really fits. Ed Slobod has been trying for years to come up with a thermal design that he likes better than the Paragon, but he has not yet found it.

The reason so many guys like to modify the Paragon is they like the way it flies, but they need a sailplane that is more aggressive in searching for lift. The stock Paragon is not a very fast ship. The Phillips entry approach cuts down the lift and the drag that the wing produces making it faster. Most flat bottom designs are producing much more lift than is really necessary anyway, so the decreased total lifting power of the resultant semi-symmetrical airfoil is not really missed, but the decreased drag re-

Continued on page 86

Josh Glaab has sold more Windsongs on the East Coast than anyone, is currently in 1st place in Eastern Soaring League standings.

Overall winner at two-day meet hosted by the Long Island Silent Flyers, Terry Luckenbach accepts award from CD Bob Teseo.

MODEL DESIGN & TECHNICAL STUFF

By FRANCIS REYNOLDS

• One of these photos shows the best wing core I ever cut and the best fuselage foam core I ever cut. Their quality, however, is just the beginning of the story. Both of them were cut by a new process. Only a single template was used for each, and I had no helper in either case. (My wife, who usually helps me with core cutting, doesn't know whether to feel rejected or relieved.)

Figure 1 will illustrate "pivot-point cutting." Note that we don't use a cutting bow. One end of the hot wire is attached to a fixed pivot point, and the other end is hand held by means of a handle. The single hand provides the wire tension (which can be varied at will), and follows the template. My experience shows this to be much easier than manhandling a big clumsy bow, therefore there is less jerking, and the cuts come out smoother. They are also smoother because there are only half as many templates to hang up on, and half as many people to make mistakes.

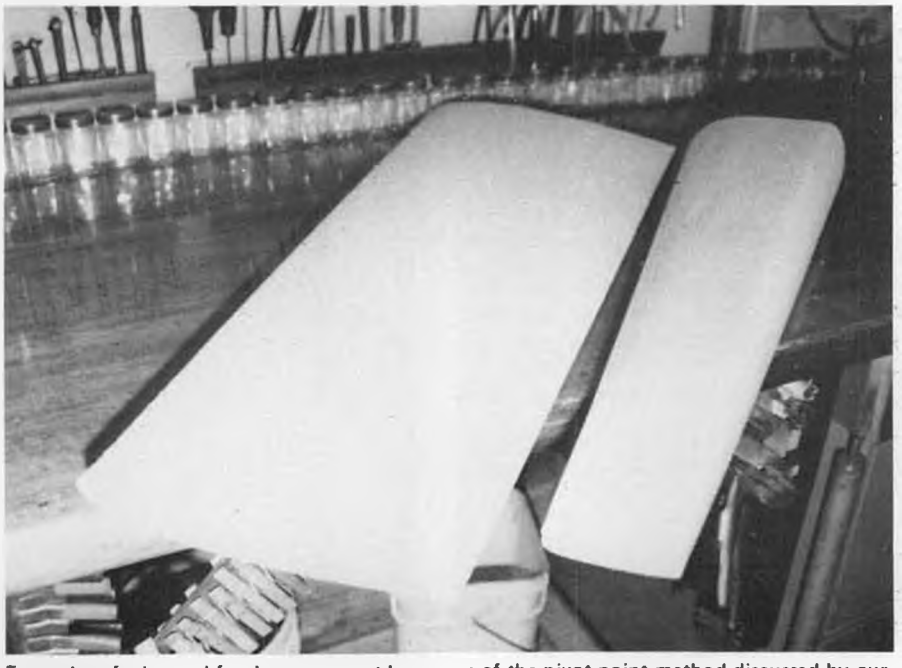
The theory behind pivot-point foam cutting is based on the fact that all right-angle cross sections of any regular or irregular shaped cone are always exactly the same shape throughout the length of the cone. A panel of a tapered wing is part of an irregular cone. So is the aft section of most fuselages. To wire cut any cone we only need a base template and a pivot point at the vertex of the cone. Note that unless we are cutting a pure delta wing, this vertex or pivot point is beyond the tip of the wing panel. We are cutting what my old geometry teacher would call a truncated irregular cone.

After years of making two templates before cutting a core, it seems very strange (and fast) to make only one template now. Also, the first time I made a wing core this way, it was almost hard to believe that the perfect tip airfoil section that resulted had been cut automatically without a template. Perhaps I should qualify that "perfect" with the adjective, "theoretically." The tip will be exactly the shape of the root if the wire is stretched perfectly straight with no lag of the wire due to cutting drag. In practice, fortunately, I find that moderate and comfortable tension on the handle, and our usual cutting speeds, produce tip airfoils that look perfect to my eye. Furthermore, the "hollowness" that I used to get with bow cutting is completely absent here, making for much straighter panels.

The pivot-point foam cutting method can be used for cutting wing and fuselage cores of any taper ratio, but obviously it can't be used for rectangular wings. This isn't a serious limitation, since taper wings are better anyway. They look better, they can be built lighter, and they are aerodynamically more efficient. For scale models, those with rectangular wings are usually older planes like Cubs, and should have built up wings rather than foam cored anyway. There would be a lot fewer rectangular wings in the world if taper wings weren't usually harder to design and build. With pivot-point foam cores, taper wings are now easier than rectangular.

You can see that with a delta wing, the pivot point will be at or close to the wing tip. The lower the taper ratio, the farther away from the wing tip the pivot point moves out. For very low taper ratios the method would become impractical because one might have to set up the pivot point on the neighbor's property. Very low taper ratios are practically never used, however, so no problem.

The easiest way to find the proper distance for the pivot point is to make a scale layout, similar to Figure 2, and measure it. If you must do it mathematically, however, the formula seems to be X=P/(R/T−1) where X,



Examples of wing and fuselage cores cut by means of the pivot-point method discussed by our author this month. Easier and gives better results than the more commonly used cutting bow.

A bent paper clip makes a handy soldering gun grooving tool for Nyrod installation in foam wing cores.

the distance from the anchor point to the wing tip end of the blank, equals P, the Panel length, divided by the entire quantity of the Root chord R, divided by the Tip chord T, minus one.

We of course don't need to heat the entire length of the wire. Make your connections with alligator clips to the cutting wire near both ends of the foam block. Having placed the clips, hold the wire off to the side, fire it up, make test cuts on scraps of foam, and set the voltage for the proper cutting speed. Changing the length of the heated section of the wire significantly will, of course, require a change in the power supply setting. More wire, more volts. If the pivot point distance is long, the section of wire between the small end of the cut and the pivot can be replaced by any kind of cord that is strong enough. The lead wires to the cutting wire should be suspended freely from overhead. Check to assure that these leads won't come tight and distort a cut.

Swing the wire back and forth and up and down to check and adjust the alignment of the foam blank with respect to the pivot point, and adjust the height of the pivot. Then stick the blank to the bench with double-back tape so it won't slip while you are cutting. You don't even need to precut foam blanks. You may save time and can save foam by cutting cores directly from the big block of foam.

The airfoil will be the same and have the same thickness ratio throughout the length of the panel. There will be no twist to the cut panel since there is no second template to be misaligned to produce a twist. To build washout into a wing, my modeling buddy Paul Weston points out, we can pretwist the blank the right amount, but in the opposite direction, and hold it in that stressed position during cutting. After the panel is cut it will return to its unstressed condition, putting in the desired washout.

To make hollow foam cores for fuselages etc., use a centerless ring-type template, drill a small hole lengthways through the blank, thread the wire through the hole, and cut. An easy way to put in the hole is to grind a point on a 3-foot length of 1/8 music wire, chuck it in an electric drill, and "drill." It will make no chips, but will leave a clean, smooth hole. To give yourself more tolerance for misalignment, start the hole at the small end of the part.

First cut the center out of sections to be hollowed, then cut the outside without changing the setup, assuring perfect alignment of the inside and outside cuts. Truncated hollow parts will obviously have a thinner wall at the small end. On the outside, you must cut the upper portions first, separating the part from the blank at the bottom with the last cut.

For aft fuselage sections, there is an additional trick which is useful. Most fuselages pinch in to a narrow vertical section aft at the rudder hinge line. This can be cut with the pivot method by sticking short straightedges to the back of the blank vertically, parallel with each other, and with their inner edges separated by the desired fuselage width at the end. The wire will be guided between the straightedges, defining the aft sides, but the wire will move vertically to cut the top and bottom of the fuselage as defined by the front template and the pivot point. But first, for cutting the inside or core, out of the section, place the aft straightedges slightly more than the wire diameter apart, and align them on the centerline between the center of the front template and the pivot. The resulting narrow vertical opening at the rear of the fuselage will be later covered by the rudder post, or plugged.

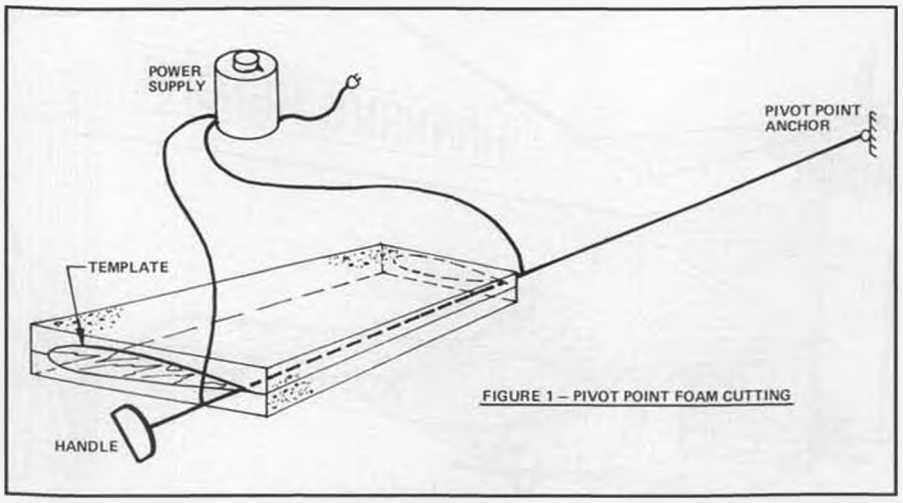


FIGURE 1 – PIVOT POINT FOAM CUTTING

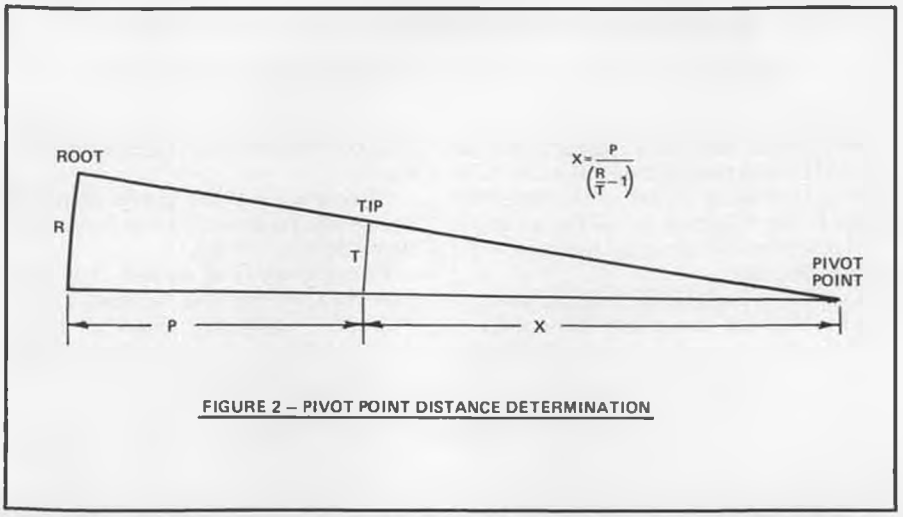


FIGURE 2 – PIVOT POINT DISTANCE DETERMINATION

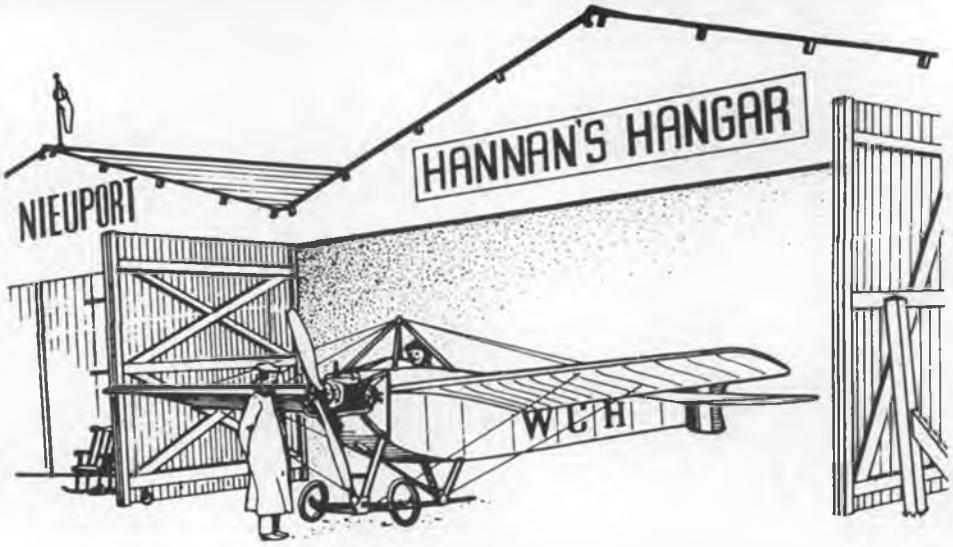

Another soldering gun tool, this one for hogging out large sections of foam. Easily bent from 12-gage copper wire.

When I wrote all of this yesterday, I thought I was the sole inventor of this beautiful process, but I just had a phone conversation with Bob Florence, and he tells me that Bert Baker has been using pivot-point foam cutting to make cores for his commercial kits for 2-1/2 years! But I reinvented it!

TAPERED CUTTING WIRE

With either pivot point or bow cutting, the greater the taper ratio, the more trouble we will have with excess melting at the

Continued on page 94



"Orville and Wilbur indeed used up 90 percent of the magic."

"Magic, incidentally, is one of the most important laws of physics."

• There are two separate lead-in lines this month which lined up so perfectly that we couldn't resist pairing them. The first is by Richard L. Collins, writing in the December 1986 *Flying* magazine, while the second is by Dick Johnson, of Small Airborne Vehicles in Texas.

Our little philosophical quotations attract numerous comments from readers, and contributions of more. Certainly our audience includes many "sorters, classifiers, and tabulators" (Glen Seibels's description) who keep track of such items, and we are pleased to share them. Since these tidbits arrive faster than they can be employed at one-per-month, we sometimes offer them in batches, in what may be a meaningful order. What do all these thoughts have to do with model building? Perhaps nothing, but maybe everything. Life itself, like model aircraft, must be carefully balanced for best results. So try these ideas on for size:

"If you think about it, human beings never invented anything. Those who are commonly called inventors actually adapted what already existed in nature." Joe Klause.

"If America was the cradle of aviation, France was the progressive nursery school." Henry Serrano Villard.

"Opportunity is never lost; it is simply found by someone else." Randall.

"Truth is obligatory under all circumstances; it is never optional." Igor Sikorsky.

"Truth is being demonstrated on every hand." Charles Hampson Grant.

"Quality is never an accident; it is *always* the result of intelligent effort." John Ruskin.

"Quality is timeless." Dinah Shore.

"The real world is just a special case of the theoretical." Don Smith, via Richard Miller.

"Several times the mists of reality were stripped away to reveal the truths of fantasy." Frank Scott.

"Most cure-seekers are using the wrong optics. Instead of a microscope, they should be using a mirror!" Anonymous.

"The only dragon you will have to fight is the one you see in the mirror." Red Skelton.

"As long as people imagine that someone is doing something to them and that they have no control, then they have no control." John Lennon.

"Books are like vitamins; you don't miss them until it is too late!" Frank Zaic.

"To teach is to learn twice." Anonymous.

"Sit down some Friday night and work until Tuesday morning when you have the answer." George Townson, Autogiro specialist.

"An analysis which shows an optimum that lies outside the range of experience is

Rubber powered 1/20th scale Arsennal VG-39C1 by Peter Koutny regularly turns in flights of over 80 seconds. Photo by Lubomir Koutny.

Neat Renard R-17 by Jiro Sugimoto of Japan. Plans, by Walt Mooney, appeared in MB some years ago. Suitable for the Alfred Renard Memorial event described in the text. Photo by Ichiro Yamada.

Allen Schanzle (left) explains to Rolf Gregory that his Culver Dart needed "a little extra tail area" to fly well. Tom Schmitt photo.

Pseudo-scale Aeronca C-3 by Ken Gubbs sports whimsical N-numbers. Linstrum pic.

Smithsonian NASM tribute to simple model gliders. Photo via curator Robert Mikesh.

Magnificent rubber powered Short Scion by Doug McHard, of England. Photo by Bob Jones.

invaluable." Herb Weiss.

"The best-laid plans of mice and men are filed away somewhere." *Impressions West* newsletter.

And finally, just in case none of the above thoughts meant anything to you, how about this one:

"It's my view that each person is born with a fixed number of heartbeats assigned to him. Don't waste them." Gary North, quoting a physician.

A ROSE BY ANOTHER NAME

How did the word "aeroplane" as employed by the French and English during the 1800s transition into "airplane" in the United States? We know that Octave Chanute used "aeroplane" in his classic book *Progress in Flying Machines* during 1894. Samuel Langley preferred to call his aircraft "aerodromes," while Wilbur and Orville referred to theirs simply as "flyers." Perhaps we may have uncovered a clue in the January 1911 issue of *Aircraft* magazine in a letter to the editor, written by Henry A. Wise Wood, from which we have extracted the following:

"Sir, it has occurred to the writer that while the language of flying is still in flux, an effort should be made to provide the art with a native nomenclature of concise and pertinent terms. While all that led to successful flights by no means was done by Americans, still because the Wrights were the first actually to stay in the air upon a power-lifted and driven device, the first mechanical bird may properly be classed as an American fowl. Therefore, as well as for the more practical reason of economy in speech-effort, the introduction and acceptance of a foreign terminology should be resisted, and the language of flight set upon an all-English-American basis.

"In order that the subject may be opened for discussion, the following glossary is offered; in which, also is suggested the substitution of what is believed to be better and simpler English terms for many now struggling into use:

"Aeroplane—*Airplane* (Could this be the earliest usage of the word in the media?)

"Aileron—Independent Stabilizer; Stabilizer.

"Alighting—Grounding; to Ground.

"Altitude—Height.

"Aviation—Flying.

"Aviation Tournament—Flying Meet; A Fly.

"Aviator—Airman; Flier.

"Vertical or Direction Rudder—Director.

"Horizontal or Elevating Rudder—Elevator.

"Epinage (sic!)—Tail.

"Fuselage—Body.

"Hangar—Shed.

"That portion of the start which is upon the ground—The Run.

"That portion of the start which is between the run and the height sought—The Rise.

"Failure to rise after a run—A Misup."

So, there you have it. Mr. Wise Wood's batting average seems mixed,otherwise, this column might be Hannan's Shed?

ALFRED RENARD

We regret to report the passing of Belgian aircraft engineer Alfred Renard, the victim of an automobile accident.

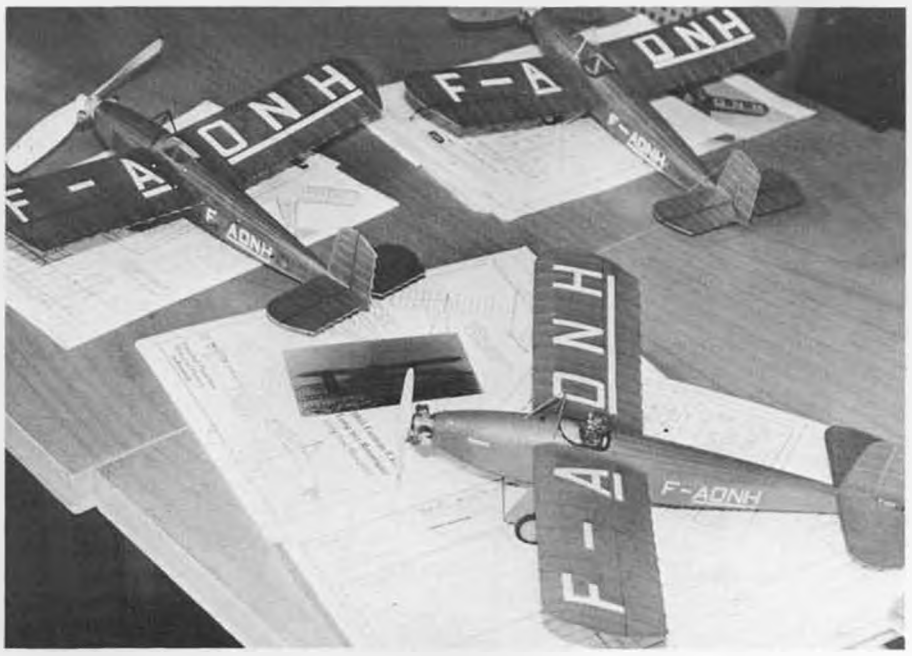
Renard, aged 93, had a long series of design credits in both engines and aircraft dating back to the 1920s. One of his engines powered the first Belgian helicopter, and the variety of his airframes was remarkable, including biplanes, parasols, cabin monoplanes, trimotors, and low-wing pursuits. He was closely afilliated with the late Jean Stampe in the production of the well-known aerobatic Stampe biplanes and the SR-7B monoplane.

During 1987 a special event for models of Renard design was organized; it was intended that Mr. Renard would present the awards in 1988. Sadly, this was not to be. The "Challenge Renard" will, however, continue in his memory at the annual international indoor contest of Flemalle, Belgium.

SIMPLE MODELS RECOGNIZED

One of our photos this month, courtesy of Bob Mikesh, Senior Curator at the Aeronautics Department of the National Air

Continued on page 72



Quick, the Flit gun! Mosquitoes are multiplying in Czechoslovakia. Farman Mosquitoes, that is, according to photographer Lubomir Koutny.

Free Flight

By BOB STALICK

Bruce Kimball shows off his Batiri, built in less than 10 days. It's this month's 3-view.

• It is not too late to be informed about some of the rules that we are proposing to "help" ourselves enjoy our favorite hobby—free flight. I would like to take you on a brief trip through the proposals that will, if enacted, change the way in which you fly some or all of your favorite events. Now, by the time you read this, the initial vote on the rules changes will have already occurred, so some of these proposals will have deservedly bitten the dust. However, some will remain. If you have concerns about them, let your free flight contest board member know soon, or all of us could be stuck. I have shared my own opinions, which can be found in the parentheses.

Additional details can be found in various editions of the *Competition Newsletter*, carried in *Model Aviation* magazine; dates and pages that follow each proposal reference the month and page where the proposal can be found. Want to know what the proposals are in brief? Well, read on.

FF-90-1: Establishes a uniform set of rules for Mulvihill, limiting models to exclude external bracing and requiring enclosed rubber motor. (Seems reasonable to me!) See July, page 114.

FF-90-2: New event "HiFlier" for single flight, daybreak rubber. Requires certain weight restrictions. (Nice idea, but rules are not required, in my opinion.) December, page 134.

FF-90-3: New event "Big E" for outdoor rubber. Requires minimum wing area of 300 square inches. (Needless event addition in my opinion.) October, page 124.

FF-90-4: Eliminates Builder of Model rule except for scale events. (In my opinion, this proposal is unacceptable, as the hobby is more than just flying. Here is where the rich can be more competitive just by using their bucks to buy their models.) December, page 134.

FF-90-5: Increases displacement for D gas to 11cc (.670 cu. in.). (Why not? The increase is nearly academic. Besides, this event is only flown in a couple of places in the country anyhow.) December, page 134.

FF-90-6: Prohibits multi-category meets/record trials at the same site on the same day. (I don't understand the problem nor the proposed solution.) December, page 134.

FF-90-7: Changes CO_2 to resemble other FF Power events. Establishes seven classes. (Idea seems sound, but the number of classes is beyond excessive.) December, page 134.

FF-90-8: Upgrades "Rocket" event from supplemental to official status. (Why not? Few fly the event anyhow. What difference does it make?) December, page 134.

FF-90-9: Eliminates timing category distinctions for rocket power and changes flyoff times. (Why not? Who really cares?) December, page 134.

FF-90-10: Changes wording affecting power plant for rockets. (No comment, no effect.) December, page 134.

FF-90-11: Allows three classes of rocket power using model rocket engines as well as Jetex type. (See above three comments.) December, page 134.

FF-90-12: Reduces number of flyoff flights in rocket. (See above four comments.) December, page 134.

FF-90-13: Add CO_2 to outdoor helicopter event. (This allows more power plant options to helicopters, so why not? Then again, no one flies Helicopters, either.) December, page 134.

FF-90-14: Sets standard catapult for catapult glider. (Makes sense, but who enforces this rule?) December, page 134.

FF-90-15: Changes Mulvihill specifications to allow unlimited size and weight. Changes rules regarding timing flights. (Specifications change makes more sense than FF-90-3 above. Timing changes unnecessarily complicate the event and may reduce competition by requiring first flight to be of unlimited duration.) December,

The free-flighter's nightmare! Clarence Bull's Buzzard Bombshell drifted upwind and landed in the only small grove of trees anywhere near the WMC field. Photo by Max Bowman.

Another Bowman shot of Clarence's stuck Buzzard. Hope he got it down OK.

page 134.

FF-90-16: Redesigns the FF gas classes by combining events to form three new categories: .01 cu. in. to .10 cu. in. would be Class A, etc. (This would make the 1/2A event as we know it virtually extinct in my opinion. Not a desirable change.) December, page 134.

FF-90-17: Changes timing rules for outdoor gas requiring first flight to be of unlimited duration. (This change would serve to reduce competition in these events; an undesirable outcome and an undesirable change.) December, page 134.

FF-90-18: Eliminates Payload, AMA Cub, and FAI A-1 Events. (Well, there's no doubt we have too many events, even though a number of this year's proposals would add some. The A-1 event is flown regularly in our area, so I would question eliminating it. I have no opinion about the others.) December, page 135.

FF-90-19: Does to P-30 what FF-90-16 does for Mulvihill timing and what FF-90-17 does for gas classes. (Unnecessarily complicated and will serve to reduce competition; an undesirable change.) December, page 135.

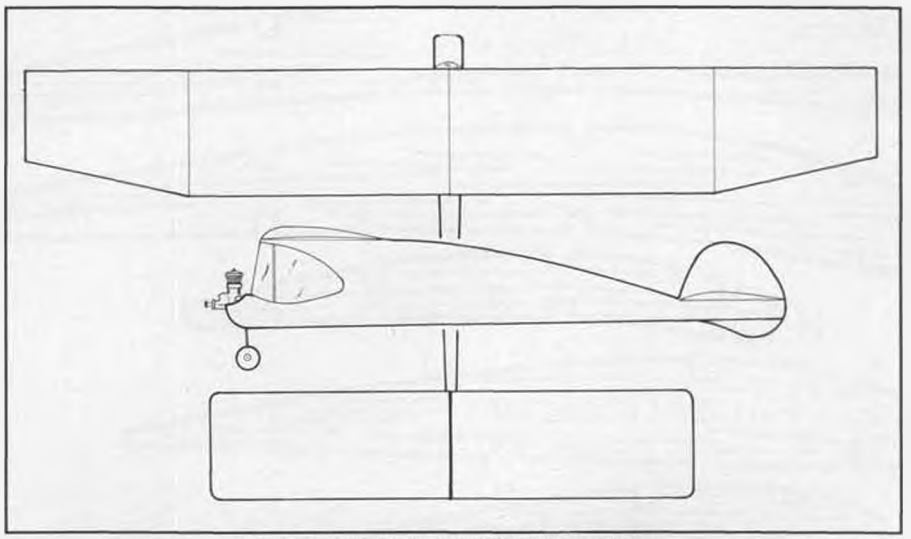
FF-90-20: Allows no models to be launched within 200 feet of spectators, vehicles, or other obstacles. (Good idea for safety. Question: What constitutes a spectator? Another question: What are other obstacles? What are the penalties for breaking the rule? Can a flier lose his AMA license? Too many questions to pass at this stage.) December, page 135.

FF-90-21: Does to Hand Launch Glider what FF-90-19 does to P-30. (Once again, unnecessary complication and will reduce competition.) December, page 135.

FF-90-22: Requires 1/10-second stopwatches for official timing and requires use of split function for engine times. (Probably a good idea, but since the flight times are rounded down to the nearest second, it's unnecessary, except for timing engine runs.) December, page 135.

Now, in addition to the above Outdoor Free Flight rules, there are 11 rules proposals in the works for indoor. However, there is a rules proposal that might be overlooked by myopic free flighters. It is in the December issue as well and appears on page 137 under General Proposals. It is GEN-90-8. It requires silencers for all engines over .051 cu. in. displacement except for FAI events and ignition engines. This proposal was promoted during the last round and was defeated. It should be defeated again. If this problem exists in your area, then you should require mufflers. If it doesn't, then the AMA shouldn't require mufflers for all. Since I pitched such a fit about this stupid proposal last time, I hereby propose that if a site requires muffler use, then a separate category of free flight be established that sets the definition for mufflers. Don't shackle all of us because of the problems of a few.

As I stated at the outset of this column, most of the proposals are generally useless, a few are interesting, a couple might be worthwhile, and at least one is downright objectionable. Whether you agree with me or not is not the point. I am not a member of the free flight contest board, so I don't vote. However, your contest board member can be found in the *Competition Newsletter*. Call him, write him, harass him or whatever, but don't ignore the proposed rules changes if what you see either thrills or angers you. Let the man know. Now, on to the regular features.



FEBRUARY MYSTERY MODEL

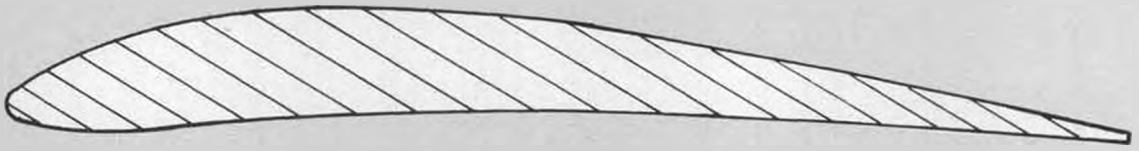
FEBRUARY THREE-VIEW—BATIRI
by Jose Tellez

This was the Mystery Model for August 1988. As a consequence of that little feature, I have received several requests for a regular three-view from which modelers might construct this little Nostalgia-eligible ship. So, here is is. The Batiri appeared in the February 1952 edition of *Air Trails* and was accompanied by a sizeable article describing its development. The author,

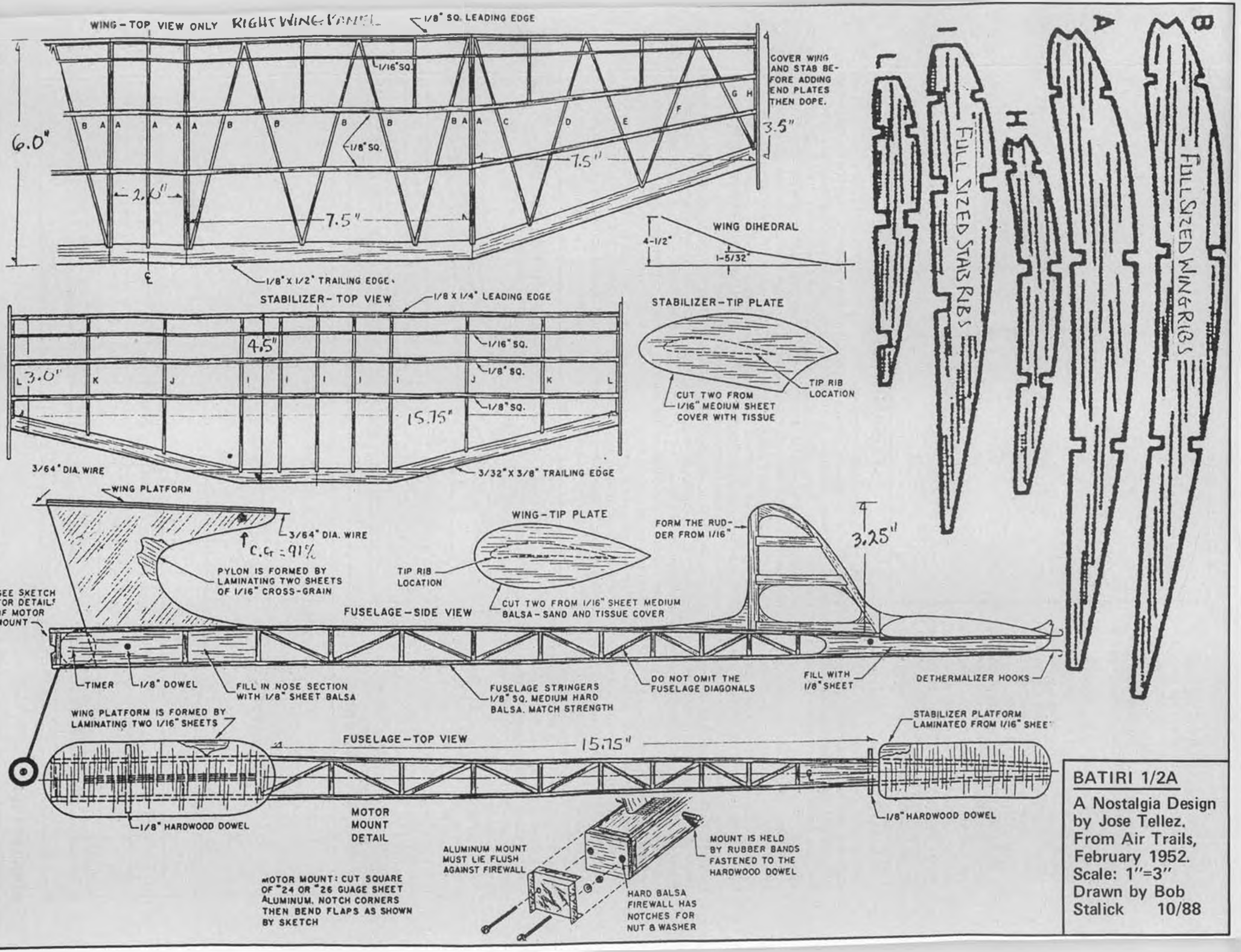
DARNED GOOD AIRFOIL — EIFFEL 431, 85%

STA.	0	1.25	2.5	5	7.5	10	15	20	25	30	40	50	60	70	80	90	95	100
UPR.	2.55	4.25	4.91	6.04	6.89	7.56	8.88	9.69	—	10.45	10.37	9.77	8.5	6.8	4.84	2.55	1.29	0
LWR.	2.55	0.97	0.48	0.12	0	0.25	0.70	1.28	—	2.12	2.38	2.13	1.53	1.02	0.68	0.34	0.12	0

DARNED GOOD AIRFOIL — EIFFEL 431

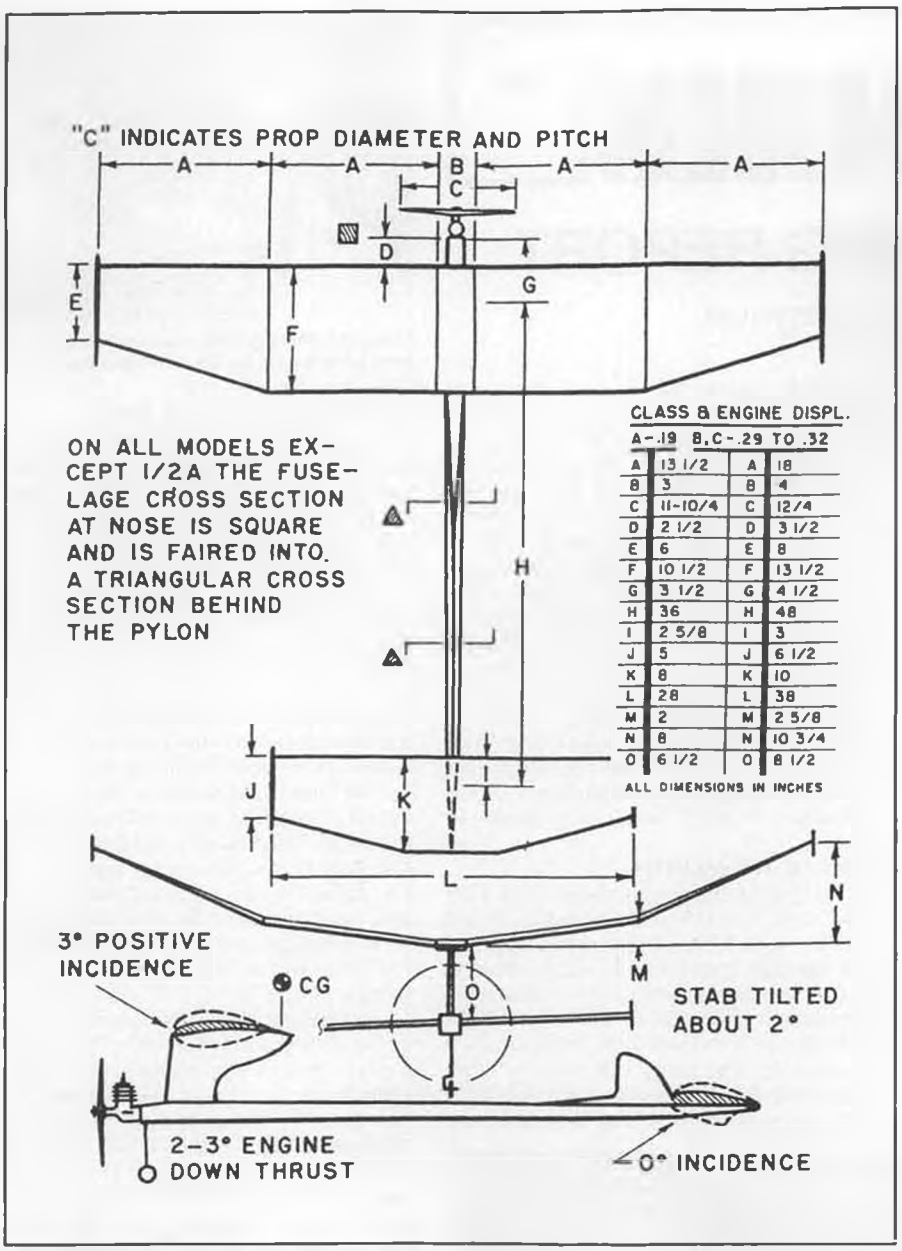


STA.	0	1.25	2.5	5	7.5	10	15	20	25	30	40	50	60	70	80	90	95	100
UPR.	3.0	5.0	5.78	7.1	8.11	8.9	10.45	11.4	—	12.3	12.2	11.5	10.0	8.0	5.7	3.0	1.52	0
LWR.	3.0	1.16	0.56	0.14	0	0.3	0.82	1.5	—	2.5	2.8	2.5	1.8	1.2	0.8	0.4	0.14	0



BATIRI 1/2A

A Nostalgia Design by Jose Tellez. From Air Trails, February 1952. Scale: 1"=3" Drawn by Bob Stalick 10/88



CLASS B ENGINE DISPL. A-.19		B,C-.29 TO .32	
A	13 1/2	A	18
B	3	B	4
C	11-10/4	C	12/4
D	2 1/2	D	3 1/2
E	6	E	8
F	10 1/2	F	13 1/2
G	3 1/2	G	4 1/2
H	36	H	48
I	2 5/8	I	3
J	5	J	6 1/2
K	8	K	10
L	28	L	38
M	2	M	2 5/8
N	8	N	10 3/4
O	6 1/2	O	8 1/2

ALL DIMENSIONS IN INCHES

Bill Fletcher and Top Kick A-1 glider. New rules proposal would eliminate this event.

possible, and the wings were designed in such a way as to use tip plates to increase the effective aspect ratio of the wing. His choice of wing airfoils was an 85-percent version of the Eiffel 431 (See the Darned Good Airfoil for this issue). The incidence of the wing was set at a low angle of attack (for 1952), and the CG was placed near the trailing edge of the wing.

Well, these are the details of the design parameters in brief.

Bruce Kimball, of Seattle, was one of the folks who pestered me for a copy of the plans to this ship. So, Bruce and I entered into a sizeable bet. I would send him the three-views with full-sized airfoils if he could complete the model and attend our Fall Annual FF Contest with a completed airplane that he would fly in the meet. If he did, I owed him a buck. If he didn't, he would pay up the same amount. As you can see from the pictures in this month's column, Bruce came through. Bruce's model is powered by a Baby Bee engine, which is much heavier and more powerful than the Wasp that Tellez had in his original; however, Bruce's model flies according to Tellez's specifications.

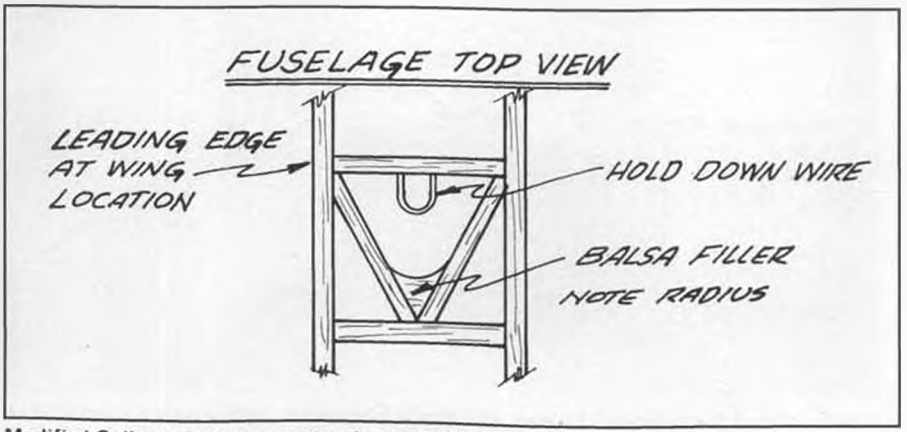
Bruce's intent is to work to lighten up the engine, or to replace it with a lighter one; part of the reason is that the model balances slightly ahead of the recommended center of gravity. Even so, the model weighs in at just over five ounces.

The three-view is very straight forward. The wing and stab ribs are presented in full size. The A rib is the straight rib for the root. The B rib is the diagonal for the main panels. The H rib is the wing tip straight rib.

Continued on page 97

Novel Pee Wee 30 canard pusher designed and built by Harry Griffin. Good flier.

Tellez, detailed his scientific calculations and choices for design parameters which included a vertical power pattern with no turn, but with some banking allowed. To do this, Tellez opined, the surfaces needed to be located in such a way as to not interfere with the climb of the model. To aid in the glide, the ship was designed to be as light as



Modified Gollywock wing mount as devised by Mark Sexton. Details in text.

the INSIDERS

INDOOR FLYING REPORT

By DAVE "VTO" LINSTRUM

• When he was writing the indoor column for *Model Builder,* Ken Johnson would often publish his own drawings of small indoor models, including several Pistachios. These tiny scale models are an outgrowth of Peanut scale, and perhaps Coconut Scale is an over-reaction in the other direction. Peanuts have a maximum wingspan of 13 inches, while Pistachio rules call for a maximum wingspan of 8 inches or maximum 6-inch length (which allows high aspect ratio wing designs to compete). Coconut, as plugged last spring in this column, requires a minimum 36-inch span for monoplanes (30 inches for bipes) producing some gigantic models that have majestic flights.

However, this month we think small, with a full-size plan for the Pistachio Lockheed/Aermacchi LASA 60. Designed and drawn by Carl Hedley of the Miami Indoor Model Aircraft Association (MIAMA), the plan is presented as a reduction of Carl's Peanut plan. Thus, there are no wood sizes or dimensions for prop, wire, etc. This trick of photo reduction is popular now. Walt Mooney's "Bag of Pistachios" (Bag #6) is a collection of reduced Peanut plans. See the ad in back of *MB* to order yours.

For the LASA 60 Pistachio, we suggest building the whole structure from light 1/32-inch square balsa, with 1/64-inch sheet wing ribs. In the tail, you may wish to use 1/64-inch square crosspieces. Covering should be light tissue or condenser paper. Prop can be from 1/64-inch balsa warped on a can. For hints on how to build it light, get a copy of Bill Hannan's *Peanuts & Pistachios* book from Hannan's Runway (see ad or write P.O. Box A, Escondido, California 92025) or subscribe to MIAMI newsletter, *Hangar Pilot*, c/o Doc Martin, 2180 Tigertail, Miami, Florida 33133. Doc has had many hints on Pistachios in this rag; ask if back issues are available.

We hope you have good luck with your version of the LASA 60, an obscure Italian lightplane design very reminiscent of the Canadian "Found." Send us a photo of yours.

HINT OF THE MONTH

Our HOTM this month comes from Rich MacEntee, MIAMA scale maestro. To get light but solid ID numerals on his tissue, he first stretches it on a frame, watershrinking it. Then he cuts a stencil for the numerals from artist's frisket paper. This is a special self-adhesive film used by airbrush artists. It is very thin and easily cut with an Uber Skiver. Put stencil on tissue, fog lightly with color spray, remove. Voila! You will have perfect numerals.

Like his models, Larry Kruse's Insiders workshop is immaculate, with great attention to detail and finish. More in text. Larry Kruse photo.

MIAMA's Millard Wells seeks maximum charisma points with his Mr. Mulligan Bostonian.

AKRON ORNITHOPTER BATTLE

The venerable Goodyear Airshop Dock in Akron, Ohio, is the site of many historic indoor records, including World Records set by Dick Kowalski and Jim Richmond (see "Starwalker" drawing December '88 Insiders) in microfilm-covered models. However, the latest records were set by ultra-film flappers—the AMA Ornithopter Class. Here, in a report direct from record holder Roy White of St. Louis, is the saga of flying inside one of the largest (180-foot) dirigible hangers in the world. Roy also has a follow-up story on the kind of persistence it takes to get your model back:

"The record trial at the Air Dock in Akron over the Fourth of July weekend was most exciting! Would you believe that the Category IV record was set eight times in two days? Records were set twice by Don Slusarcyk, Sr., with 8:54 and 9:08; twice by Al Rohrbaugh, with 12:44 and 14:25, and four times by me. What a good time we had flying!

"I started my official flying with a flight of 12:40, setting a new Category IV record by four seconds. It was Al's turn next and sure enough, he did 12:44, also setting a new Category IV record by four seconds. My next attempt also set a record of 13:38. (Oh, how I had been waiting to do 13+ so I could name my ornithopter 'Miss Teenage American,' which I promptly did!) Well, by this time the day was late and Al had to leave for home, so his last flight of the day was 14:25 for the fourth new record of the day. I put up two more flights. The first was 14:06. Since the air in the Air Dock was still good, I put up my last flight of the day. It set yet another new Category IV record for the fifth time with 14:50!

"Sunday was a very exciting day for Miss Teenage American. She flew to the bottom of the steel (179 feet, six inches) and set a new Category IV record of 15:18! I believe we had about six clocks on it. What a high this was for me!

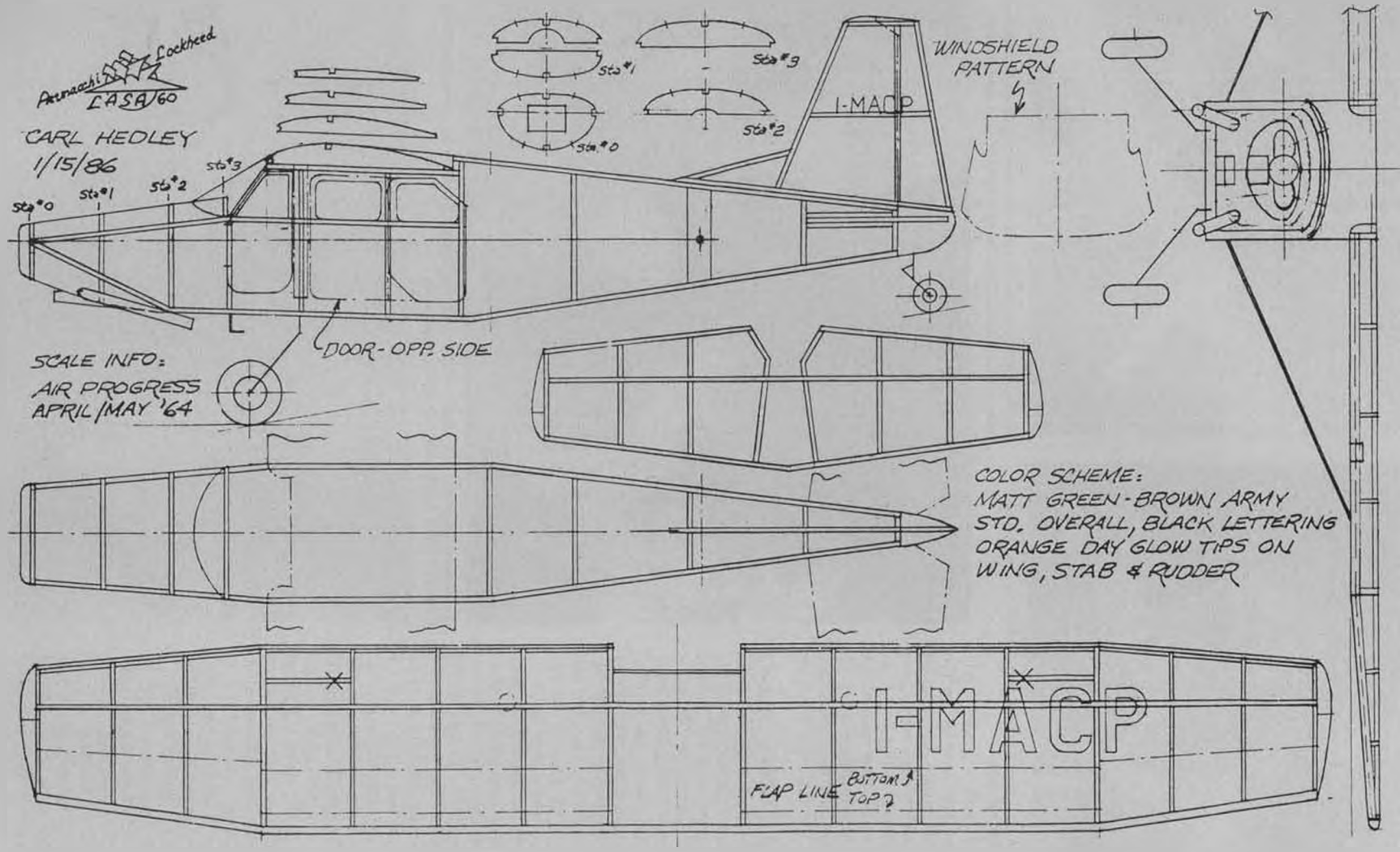
"Labor Day weekend we returned to the blimp hangar, but the weather was not cooperating. It rained all day Saturday, and you know what cold, damp air does for flying. Even though no new records were set, it was a thrill to see the four top ornithopters in the country flying at one time. Frank Kieser, Al Rohrbaugh, Joe Krush, and I were all in the air, and it felt like the Fourth of July to us! What a beautiful sight.

"Now for the bad news. Have you ever had a favorite plane, a plane that responded to your touch and garnered a lot of records?

AN OBSCURE SIXTIES LIGHTPLANE USED AS AMBULANCE/LIGHT TRANSPORT BY ITALIAN ARMY

Carl Hedley/MIAMA Club

Lockheed/Aermacchi LASA 60



PISTACHIO SCALE FULL-SIZE PLANS

Roy White, of St. Louis, is justly proud of his AMA record setting ornithopter. See text for details.

MIAMA impresario, Doc Martin, with a pair of floatplanes: his 1921 Martin MO.1 and John Tudor's 1911 Voisin canard bipe.

Have you ever lost such a plane? Well, maybe you can understand how I felt when my ornithopter Miss Teenage American hit the steel, lost her rudder, went out of control, and became wedged in the steel door at about 150 feet. I could have walked the steel and picked it up; however, the C.D. said no. I made a few attempts and broke two balloons. Then it was time to leave for home.

"Now for the great retrieval! In October I worked out a device with booms and hooks to attach to a balloon. I packed this, some binoculars, a telescope, and my helium tank. Then Mary Jane and I drove 600 miles determined to try to retrieve it. Well, every time we got near the plane, the balloon would touch the steel and pop. We moved the plane once, but it settled in another section. Finally, we were down to our last balloon and a half-tank of helium. We removed the booms and hooks and started again.

"By this time we had several security guards watching the operation. One of these, Rosemarie Baldwin, asked for the binoculars to see the plane. She mentioned that she had watched the flying at the record trials. She offered her help and she turned out to be a guardian angel! We think God tapped her on the shoulder, urged her to help, and then guided her through the whole operation! She quickly sized up the situation and sent another guard to buy some more balloons. She spied the plane from another angle (one that would not keep breaking the balloons). She had great depth perception. Next, she told me to stand still. Then, she guided me every step of the way until the plane came gliding straight down to me. What a heroine! I could not have done it without her! She refused a reward, saying that she would rather see this article in your magazine!"

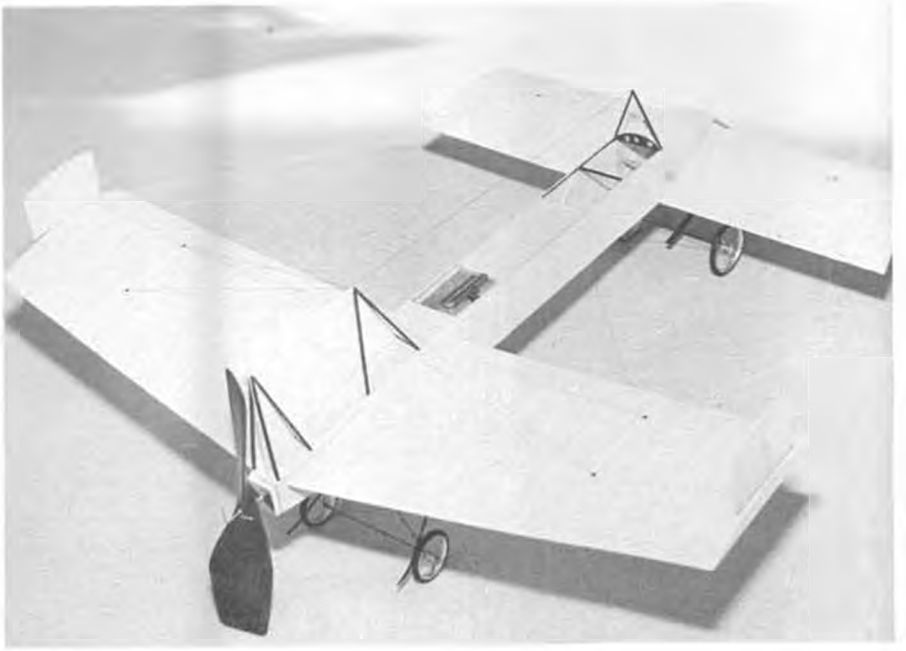
HADLAND TRIMMING ADVICE

The article by Butch Hadland, which was started in the January 1989 "Insiders," was to have been continued in this issue. However, due to word processing problems, the text is not available at deadline. Therefore, you will have to wait until the March "Insiders" to learn all those great secrets from Butch.

Speaking of Hadland, we made a serious

Continued on page 64

An elegant 24-inch FAC scale rendition of the Corben Super Ace, shown here with its builder, Florida's John Tudor. Excellent flying model.



1988 NATS Indoor Scale winner, a beautifully built 1913 Polish Drzeweicki canard by Larry Kruse.

James E. Peris's
JN-1

By WALT MOONEY. . . This month's Peanut is an easy-to-build replica of a delightful homebuilt sportplane. Mr. Peris, himself a modeler, has given his ship the same proportions that make for a fine flying model.

• This is a Peanut-scale model of a lightweight homebuilt design by a former member of the North American Flightmasters. It has simple lines and the right proportions to become a fine flying model. The shape of the design lends itself to simple construction and light weight. Without making any special effort, this model turned out to be a reasonably light Peanut. The model in the photos weighed six grams uncovered and eight grams complete, without the rubber motor. The finished weight included the color trim, the plastic propeller, and two coats of nitrate dope. The model has a stable flight path but the highest flight time to date has been only 28 seconds, because the propeller installed is relatively small. The propeller is a small CO_2 prop from Peck-Polymers that is naturally colored brown and has a pleasing shape, hence its selection for the model.

The real inspiration for making this model was its fancy color scheme. Mr. Peris sent me a colored photo of the real airplane and a three-view. (The three-view is reproduced on the plan.) The airplane is white and trimmed with red and wine. Now where is any wine-colored tissue to be found?

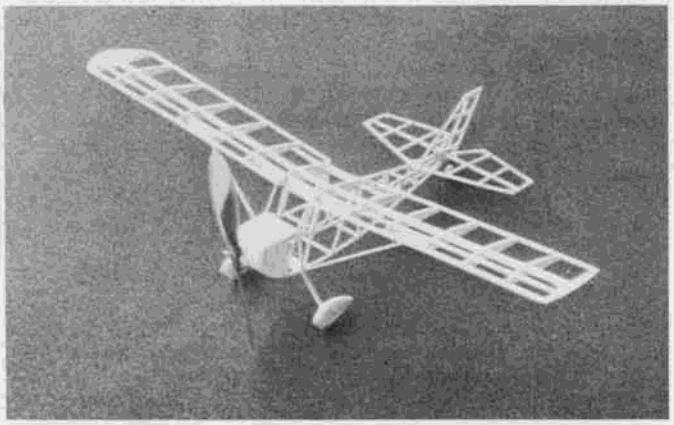
Because the model has such a simple time-honored structure, this article is going to concentrate on duplicating the color scheme of the real airplane.

The assumption is that you have completed the model structure and have sanded smooth ready for covering. Using lightweight white tissue to cover the complete model, watershrink the white tissue. When it is dry, give the model two coats of clear dope.

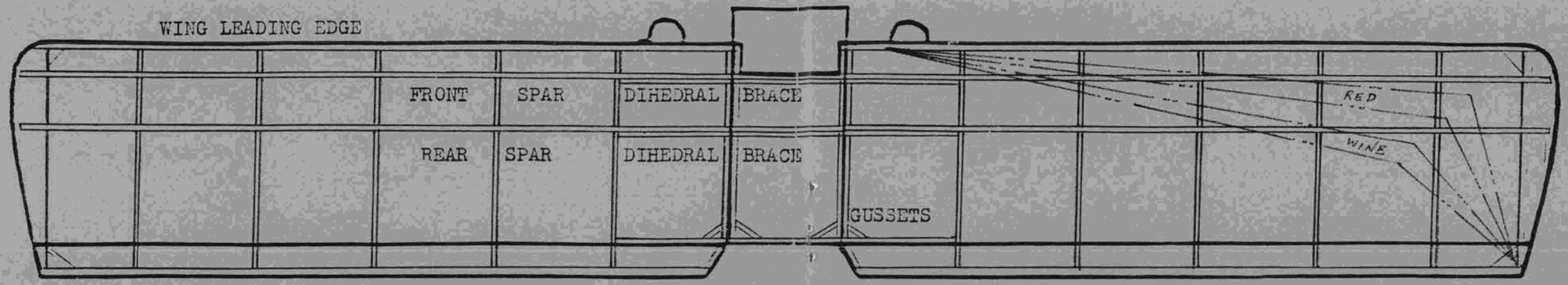
Now, red tissue is, if you'll pardon the pun, readily available at most any model shop, but "wine," ah, that's another matter. Well, there are people who make paper flowers. And paper flower tissue comes in almost every color of the rainbow. Art stores carry it. It is a little heavier than good model tissue and it has no noticeable grain direction. In addition, it is not colorfast if it gets

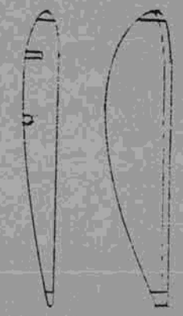
Continued on page 64

The full-size ship is basically white with red and wine trim. Wine-colored areas are the bottom half of the fuselage, rear of the fin and horizontal stab, wing struts, landing gear legs, top half of the wheel pants, and the aft sunburst stripe on the wing.

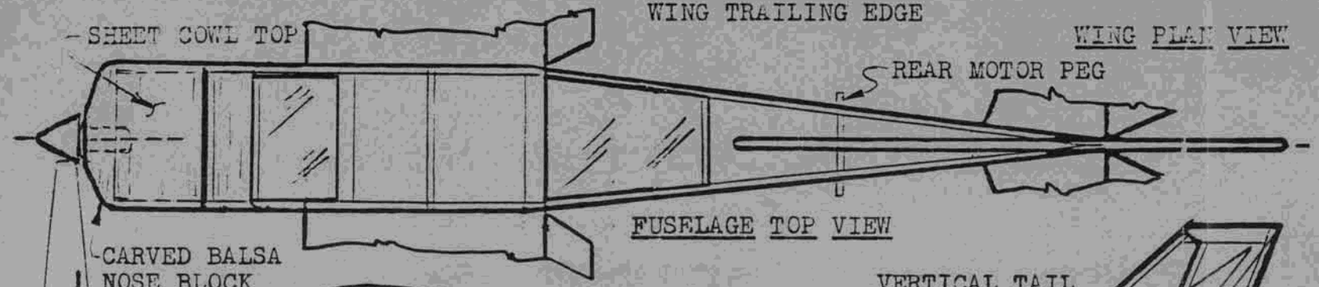


Model's construction is so simple and basic that Walt has devoted almost the whole text to color trimming. Lots of good info here.



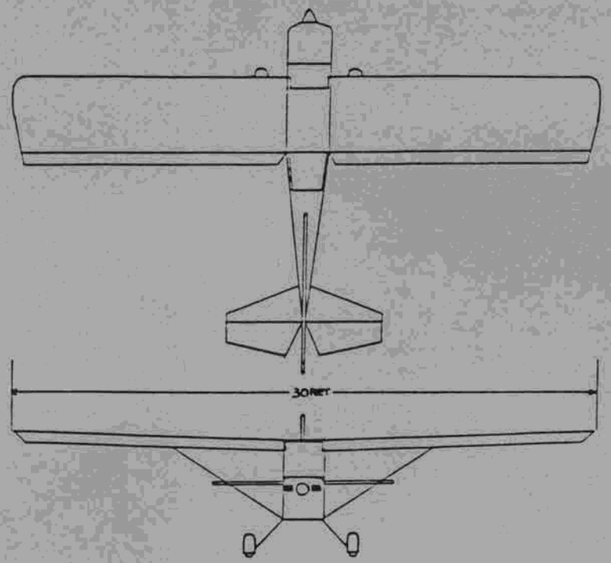


WING PLAN VIEW



JN-1

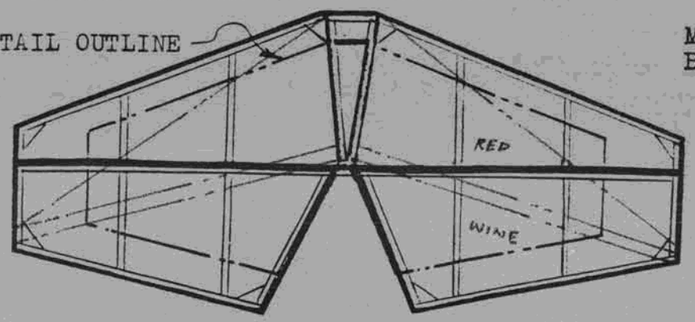
DESIGNER & BUILDER	JIM FERIS
SPAN	30 FT.
LENGTH	17 FT. 4 IN.
HEIGTH	5' 2"
WEIGHT EMPTY	320 lbs.
WEIGHT GROSS	600 lbs.
FUEL CAPACITY	5 gal.
WING CHORD	55"
WING AREA	140 Sq. Ft.
DIHEDRAL	2°
INCIDENCE	2°
ENGINE	KAWASAKI
H.P.	38
DISPLACEMENT	440
PROP. DIA.	52"
PITCH	29"
LANDING GEAR	STEEL + GLASS
MAIN WHEELS	WHEEL BARROW
TAIL WHEEL	INDUSTRIAL
FUSELAGE	WOOD, FOAM + GLASS
WINGS	WOOD, FOAM + GLASS
TAIL	WOOD, FOAM + GLASS
COVERING	4½ oz. FIBERGLAS
STRUTS	4130 STEEL TUBING



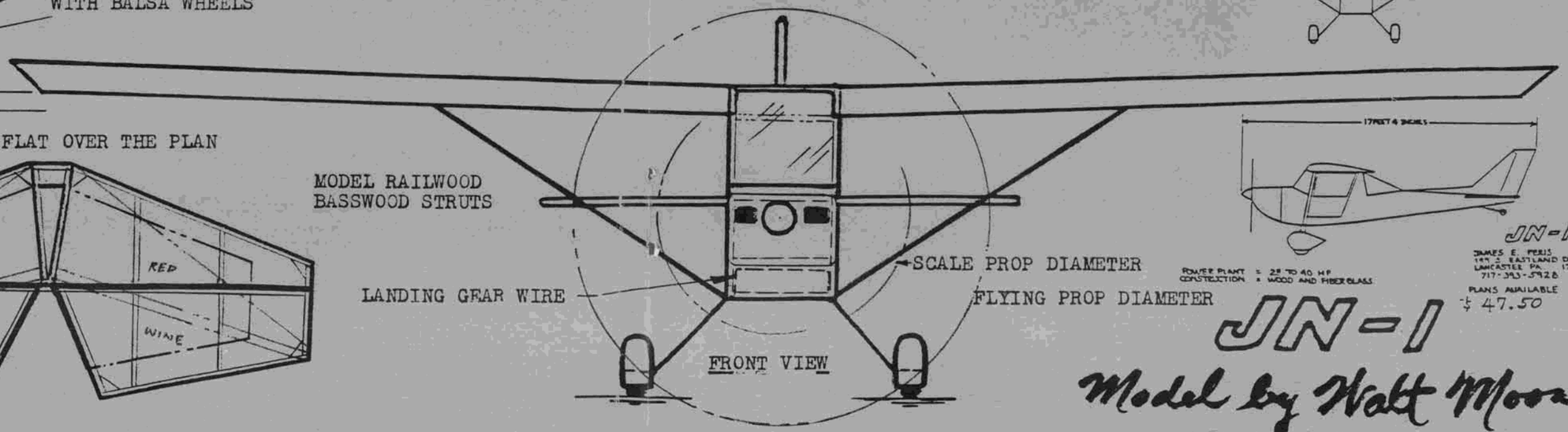
SCALE DIHEDRAL SHOWN

HORIZONTZL TAIL IS BUILT FLAT OVER THE PLAN

SCALE TAIL OUTLINE



MODEL RAILWOOD BASSWOOD STRUTS



JN-1

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POWER PLANT : 25 TO 40 H.P.
CONSTRUCTION : WOOD AND FIBERGLASS

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$ 47.50

JN-1

Model by Walt Mooney

02-21-88

Control Line

BY JOHN THOMPSON

• Every sport seems to have its end-of-season "classic" competition, and model aviation is no exception. Many regions have a big contest as their season finale. In the Pacific Northwest that contest is the Washington State Control Line Championships, also known as the Raider Roundup.

Sponsored by the Seattle Skyraiders, the contest takes place, appropriately, at the Boeing Space Center in Kent, Washington. In 1988, as always, the contest was a model of smooth administration and a great success. The Skyraiders are a large, strong club with plenty of workers to do the job right. Contest Director Dave Gardner gave the contest a real professional touch in 1988, and the competitors went away already making plans for '89. If you haven't been to this contest, mark your calendar for the second week after Labor Day. There's something for everybody interested in CL flying.

It's a two-day contest with the full range of CL events. A pizza party, a modern tradition for the Northwest's two big contests (the other is the Northwest Regional Championships on Memorial Day weekend in Eugene, Oregon), happens on Saturday night.

Turnout for the 1988 contest was strongest in combat, precision aerobatics, balloon bust and scale, spotty in racing, carrier and speed. AMA combat was the most popular event with 23 top-quality entries.

Northwest contest flying is in a transitional period at present, with the uncertain status of the long-depended-upon *Flying Lines* newsletter; as a result, Northwest contest officials set in motion a process to assure better promotion of contests in the coming year. A regional contest flyer mailing list is being placed on computer and will be in operation by the time you read this with the first use promoting the Northwest Sport Race Drizzle Circuit racing series, which began in December. This process will allow contest officials to obtain a comprehensive mailing list to use in mailing their flyers to make sure the best possible dissemination of contest advance information. The goal is to make sure everybody knows the schedule so that attendance will be strong in all events at each contest.

Here's a look at the winners of the Raider Roundup's competition events:

Old-Time Stunt: Randy Schultz, Seattle, Washington (285.88 points). *Beginner Precision Aerobatics:* Henry Hajdik, New Westminster, B.C. (233 points). *Advanced Precision Aerobatics:* Phil Granderson, Portland, Oregon (468.3). *Expert Precision Aerobatics:* Pete Bergstrom (509). *Sport Goodyear Race (Jr.):* Tim Strom, Seattle (11:15.98). *Sport Goodyear (Sr.—Open):* Dick McConnell, Seattle (11:01.26). *Mouse Race I (Jr.):* Wes Mullens, SEattle (6:52.74). *Mouse I (Sr.—Open):* John Thompson, Cottage Grove, Oregon (5:39.32). *Mouse II:* Jim Cameron, Bremerton, Washington (10:28.34). *Northwest Sport Race:* Jim Cameron (9:19). *Northwest Super Sport Race:* Bob Danielson, Bothell, Washington (9:45). *Record Ratio Speed:* Marty Higgs, Vancouver, B.C. (92 percent of record). *1/2-A Combat:* Travis Lyne, Garibaldi Highlands, B.C. *Slow Combat:* Mel Lyne, Garibaldi Highlands. *Fox-Doo Combat:* Mel Lyne. *AMA Combat:* Norm McFadden, Lynwood, Washington. *Balloon Bust (Jr.): Wes Mullens (1,323.09 points). Balloon Bust (Sr.—Open):* Dick McConnell (875.04). *Profile Scale:* Dave Mullens, Seattle (149 points). *Sport Scale:* Jim McCurrach, North Vancouver, B.C. (165). *Northwest .15 Navy Carrier:* John Hall, Sumner, Washington (195.17 points). *Profile Carrier:* Bob Parker, Renton, Washington (240.11). *Class I Carrier:* Roy Beers, Vancouver, Washington (198.91). *Class II Carrier:* Bob Parker (210.75). *Grand Championship Trophy:* Mel Lyne.

GRACE AND BEAUTY

In a recent column I began a series of

Photographer Jim Cameron caught brothers Tom (left) and Tim Strom with their first contest trophies, won at the Raider Roundup, otherwise known as the Washington State C/L Champs.

Junior racing action at the Raider Roundup: from left, Wes Mullens, Tim Strom, and Shawn Mullens.

A couple of Precision Aerobatics fliers pose with their ships at the Raider Roundup: Jim Cameron (left) and Dave Mullens.

Former MB C/L columnist Dan Rutherford came out of retirement to fly Fast Combat at the Raider Roundup. Cameron photo.

periodic discussions of getting started in CL competition. The first in the series was about racing, which I asserted was one of the easiest entries into the competitive endeavor.

Another of the easy entries is through Precision Aerobatics, an event that is attractive to many beginning fliers and also is a sure draw for spectators whether at the schoolyard on a Sunday or at a contest.

One of the advantages of Precision Aerobatics, nicknamed "stunt," is that it has many levels, ranging from the rank beginner learning his first loop to the expert whose pattern is so advanced that tiny wiggles or bobbles in the course of an eight-minute pattern are "major mistakes." Aircraft can range from a simple kit profile to a scratchbuilt masterpiece, depending on the flier's point on the scale from beginner to expert. At their advanced levels, stunt planes are control line's most beautiful, graceful, and pleasing to fly, to watch, and just to look at on the ground. They also have the major advantage of being the one CL event that normally uses mufflers, making them compatible on more flying sites and an excellent ambassador for modeling to the general public.

Before we begin a discussion of how to get started in precision aerobatics, let's get specific with a brief description:

The object of precision aerobatics is to fly a prescribed aerobatic pattern, to be evaluated by a panel of judges somewhat like gymnastics or diving is evaluated by judges. Each maneuver receives its own score. A score it added for appearance, for ability to start within one minute, and for completing the entire pattern in the proper sequence.

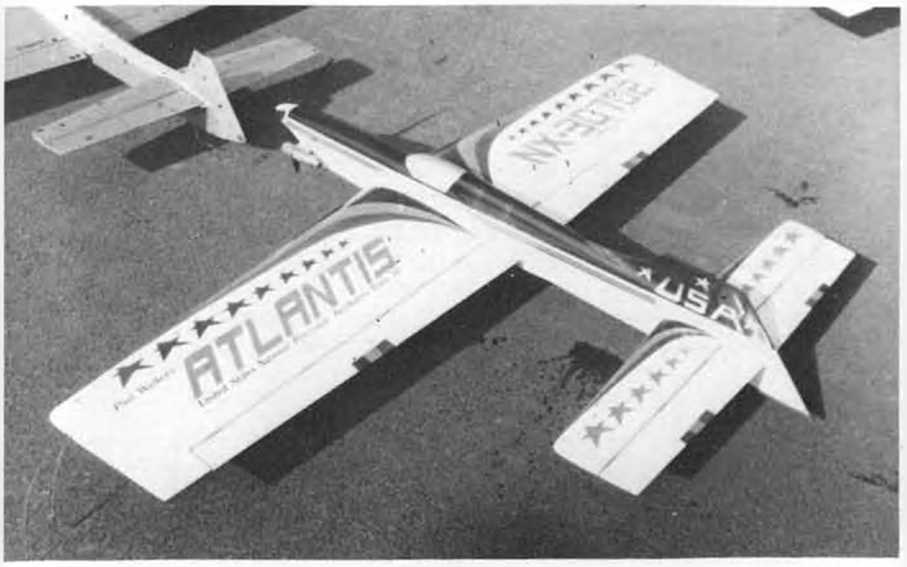
The pattern, described graphically in the AMA rule book, includes takeoff and level flight, reverse wingover, three inside loops, inverted (upside down) flight, three outside loops, two inside square loops, two outside square loops, two inside triangles, two horizontal eights, two horizontal square eights, two vertical eights, hourglass figure, two overhead eights, a cloverleaf, and landing.

Precision Aerobatics is greatly enhanced by the existence of the Precision Aerobatics Model Pilots Association, which has instituted a skill class system that makes room in competition for fliers of any skill level.

Membership in classes is determined by

A nifty Howard "Pete" entered by its builder, Bob Parker, in the Scale event at the Washington State C/L Champs. Photo by Jim Cameron.

Interesting markings on this P-51 built by Jim Fuller. Another Jim Cameron photo taken at the Washington State C/L Champs.



Very sharp Precision Aerobatics model by Paul Walker, U.S. World Championships team member. Paul flew it at the 1988 Northwest Regional Champs in Eugene, Oregon.

scoring in previous contests. There are classes for beginner, intermediate, advanced, and expert fliers. There also is a novice pattern in the rule book, but I've observed that most beginner fliers can start right out with the regular pattern. The scoring system is structured so that you can do the part of the pattern you know how to do and add to it as you learn.

The advancement of airplanes is similar. One can fly in the beginner class with a simple unflapped profile and an open-face .35 and have reasonable success; an intermediate-class flier probably will have advanced to a flapped profile with a muffler and uniflow tank; an advanced flier probably is using a full-bodied stunt plane; and an expert is using the most sophisticated of airplane and engine.

Let's take a look at how a person might go from "zero experience" to expert in a few steps. Understood in all of this is the dedication of building time and flying practice, as stated in this column before: nobody wins their first contest. Success in model competition, as well as in anything else in life, demands study, preparation, practice, and a great deal of "paying your dues" through competition.

We'll assume that our beginning flier has learned to control an airplane in a circle; he does not know how to do any maneuvers of any kind.

The starter airplane should most sensibly be one that can maneuver but is simple enough in design for the flier to be willing to risk damaging it in the inevitable crashes.

For the earliest beginner, I'd recommend a simple aerobatic 1/2-A profile, such as the Sig Skyray. All we're trying to accomplish with this plane is to learn how to use our control system. By the time we're finished, we should be able to do inside and outside loops and to fly inverted. If you've got the time to build and repair, a full-size profile such as a Ringmaster or Flite Streak actually will handle the maneuvers better. The 1/2-A (.049) powered plane is suggested because of its simple, sturdy construction.

(Let me insert here a note about a source for several kits that would be suitable for our beginner to consider. There are a number available from Dox Generix Kits, P. O. Box 111, Jasonville, Indiana 47438. He offers sport-stunt trainers full-body and profile stunt-sport planes, combat planes for all classes, some old-timer replicas, etc. Write for his brochure.)

Our beginner flier should enlist the help of an experienced flier if at all possible. He should make as many trips to the flying field in a short time as possible, fly as much as he can, and advance as rapidly as he can. One serious mistake for new fliers is to spend too much time going round-and-round. When I teach new fliers, I try to get them trying maneuvers as soon as possible. The sooner you learn to fly upside down, the less likely you are to build unbreakable habits; you want to get yourself to automatically operate the controls correctly whether your plane is upright or inverted (when the controls are opposite).

In truth, there are only two necessary "maneuvers" to know in flying control line aircraft: upright flight and inverted flight. If

you can do both of those, you can do any other maneuver, as in the same way that once you know how to turn a car's steering wheel left and right, you know more or less how to steer around any corner.

Start out by varying from your level flight to flying high, then low. Then learn to climb and dive. When you can do this fairly consistently and confidently, get ready for your first inside loop. (An "inside" loop is one in which the plane turns up from level upright flight, toward its canopy; an outside loop is one in which the plane turns the opposite way, toward its landing gear.)

Starting high enough to give yourself plenty of room, give the handle "up" as if you were going to climb, but don't counteract it. Let the plane go up to vertical and over onto its back and around back to level (you may have to add more up to pull out of the dive). Usually, depending on how your controls are adjusted, full-up control is not necessary; too much control can stall the plane. Practice smooth, round loops until you can do them consistently and vary them in size as you desire.

Now to try an outside loop. In doing your climbs, dives, and inside loops, you've learned how your plane responds. Use that knowledge to get the plane up high enough to do a loop that starts by giving down control. Let the plane dive vertical and past vertical until it's upside down and then climbing again, leveling out high. Again, practice these for smoothness and size.

With both kinds of loops, it will take some practice not to make them too tight, a common problem with beginners. Use the whole sky in practicing your loops; big, medium, and small. If you fly your plane at 45 degrees high (lines going up from your hand at 45 degrees), you will see where the tops of your loops would be in a stunt pattern with the bottoms at five feet; chances are that your early loops are not nearly that big.

As soon as you've become comfortable with loops of both kinds, it's time to learn the "lazy eight." This is not a maneuver of the stunt pattern, but it's a stop on the road to inverted flight. When you begin learning the stunt pattern, you will learn a different kind of eight.

The lazy eight starts with a half inside loop and finishes with a half outside loop. Picture an "8" lying on its side.

Begin from level flight and pull up as if you were starting your inside loop. As the plane begins to come down from the top, begin reversing the controls as if you were beginning an outside loop (you did "up" to start the loop; as the plane begins coming down, change smoothly to "down') so that the plane turns to the right and pulls out of the loop upside down and continues around and up, finishing an outside loop. Your early attempts may look more like an "S," but keep working on it until it has that lazy-eight shape.

Again, practice your lazy eights for several flights; make sure you can do it with confidence.

At this point, you know all the control movements you will ever use in aerobatics: up and down!

Now we will make the lazy eight into inverted flight: Do a regular lazy eight, then do another one but ease off on the "down" control as you come out of the inside loop, stretching the eight out horizontally. Start making the eights longer and longer, with an increasing period of upside down flight between the inside and outside portions. With each eight, make the upside down part longer, until it takes a whole lap before you give the "down" control to finish the eight. Finally (making sure you have plenty of fuel), just don't bother to do the second half of the eight. You are flying inverted! You have learned how the controls work well enough that you don't need to instantly get the plane back upright; you can do it when you feel like it. You can finally finish off the eight by using "down," or you can use a little "down" to climb high enough to give "up" and tuck the plane under as if you were finishing an inside loop. Now, practice inverted flight with climbs and dives; remember that when you're flying upside down, moving your handle down makes the plane go up and vice versa. It soon becomes second nature.

Everything else about learning the stunt pattern will now seem easy.

Now that you're ready to start learning the pattern's maneuvers, it's time to step up to an airplane suited for actual aerobatics, if you've started on a trainer such as the suggested 1/2-A plane. Any built-up wing profile probably will do for early learning. My favorite stunt beginner plane is a lightly built Top Flite Flite Streak with a well broken-in Fox .35 stunt engine. I found that such a combination will fly the complete AMA pattern well enough to allow anyone to learn the maneuvers. There's no need for anything fancier until you are ready to enter a contest, and even then the Flite Streak would be adequate for beginner class. (Note: You'll need a four-ounce tank. If you use a smaller tank, you may have to leave only one lap between maneuvers rather than the required two. This is okay for practice but the two laps is required for competition.)

If you have your heart set on a flapped stunter, try a Top Flite Tutor or Sig Twister, either of which can carry you to the advanced class. If you're an accomplished scratchbuilder, think of trying an imitation from *Model Builder* plans; this plane is capable of expert-level stunt flying. When you reach the expert level, there are several commercially available top-quality kits and a vast array of plans, but it's too early to start thinking about that!

Here's a suggested way of learning the stunt pattern that worked for me and some others: Once you begin learning the pattern, always practice the maneuvers *in order.* Once you know all the maneuvers, always do the *whole pattern in order,* never varying the sequence. In order to compete in stunt, you need to learn not only the maneuvers but also the sequence; it's part of the scoring. You want the pattern to become so automatic that you can never slip and forget a maneuver or get them out of order.

Your early efforts at the pattern are not going to be concerned with great grace and beauty; you want to get the plane through all the proper turns. As you practice, you will work on getting the shapes just right. Start by flying the maneuvers high enough to make sure you can do them without being afraid of the ground, and then gradually bring them down to the 4- to 6-foot height for bottoms of maneuvers as you gain confidence. Don't wait too long to get down there; habits are hard to break. Initially, fly your maneuvers *bigger* than prescribed in the rule book, because that makes them easier for both you and the plane; again, gradually bring the sizes into line as you gain skill. Don't worry about doing them too big; the beginner's tendency is to do them too small. Learn the maneuvers one at

a time and start working on the next one in the sequence each time you learn one.

There is no substitute for studying the rule book to learn the maneuvers and for having an experienced precision aerobatics pilot to help you learn the pattern and critique your flying. But here is some general information and a few tips about the maneuvers:

Wind

Learn how to tell which way the wind is blowing. Experienced fliers often can tell just by turning and feeling the wind on their back; you may have to toss some grass or powder or put up a combat streamer as a "wind sock." Success in aerobatics depends on your ability to know where the wind is. Most maneuvers are done downwind; the judges will view the pattern from upwind.

Starting

The pattern actually starts when you signal to the judges that you are ready to start. They will then begin timing. You must get in the air within one minute and complete the flight within eight. Even though you are just practicing, you should always work with these factors in mind so that they will be second-nature in a contest.

Takeoff and Level Flight

Your plane should roll along the ground until it reaches flying speed (at least 15 feet) and then lift gently to the 4- to 6-foot height; the rule book says you should hit the flying height one lap after starting your roll. No leaping into the air! Continue on for two more laps and pay attention to your level flight; you are going to be scored on these as well. Then leave two more laps for the judges to write down their score.

After your takeoff and two level laps, you must decide if the flight will be official. If your engine is not running well or there's some other problem, you may want to wave the flight off and take an "attempt." If the flight is going to count, you must signal to the judges, get their acknowledgement, and then commence your aerobatic maneuvers.

Reverse Wingover

Starting dead upwind, you make a square corner to vertical, flying straight over the top, pulling out *inverted* at 4 to 6 feet high on the downwind side of the circle. Continue inverted at 4 to 6 feet to the upwind side and make another square corner, going up over the top and pulling out at 4 to 6 feet upright. The corners should be as square as possible and the path of the plane exactly vertical when going up and down. Start your practice by pulling out higher, say 10 feet, and gradually train yourself to get down to the proper height. Nailing down this maneuver will help you get over a lot of your fear of the ground! Leave two laps for scoring.

Inside Loops

On the downwind side of the circle, do three consecutive inside loops, with the bottoms at 4 to 6 feet and the tops at 45 degrees. (Remember, 45 degrees is pretty high; don't pinch the maneuvers down too small.) Continue for one more half loop and exit the maneuver inverted, gradually coming down to 4 to 6 feet to prepare for your inverted flight segment. Make the loops all exactly on the same track and the same size.

Inverted Flight

You need to do six laps, two to allow the judges to write down their scores for the inside loops, two to be scored for inverted flight, and two more for the judges to write. Though only the middle pair will be officially judged, try to make all six laps as smooth and as near the 4- to 6-foot height as possible. Uneven flight will make an impression on the judges even if it's not in the laps being scored.

Outside Loops

On the downwind end of the sixth inverted lap, pull up smoothly into your first outside loop; do three loops exactly tracked over one another, with the bottoms at 4 to 6 feet and the tops at 45 degrees. (Don't be distracted by a touch of dizziness as you pull up into the first outside loop; sustained inverted flight can have that effect, but it'll go away quickly.) As you finish the third loop, continue around until the plane is upright at the top of the loop and gently return to level flight at 4 to 6 feet. Leave two laps.

Inside Square Loops

Do two inside loops with square corners, finishing in level upright flight at the end of the second loop. You will find that last corner the most challenging because it is the one you will tend to round off as your plane dives straight for the ground. Making the loops big to start with will give you time to prepare for each corner. Be careful to make the corners smooth. Don't horse the plane violently through the corners, that will cause loss of speed, stalling, and an ugly maneuver, if not a crash. Think of the maneuver not as a *square* but as a *loop with straight sides* and it will help you avoid overdoing the corners. Keep the loops in the same place and work on making all the sides the same length and the corners consistent.

Outside Square Loops

In the second lap after the inside squares, begin a gentle climb to the 45-degree level. As you pass downwind, do two outside square loops. Here, the second corner will be the most difficult, as your plane dives straight to the ground and you square off inverted. Again, try to make the corners smooth, particularly that second corner. You don't want the plane bobbing violently or losing speed as it prepares for the outside turn into the vertical side of the loops. Start your first outside squares very high and build up your confidence. You'll finish the second loop at the 45-degree level and gently return to 4 to 6 feet during the laps between maneuvers. Make all the sides the same length and work to keep the maneuver from leaning one way or another (keep the top corner centered between the two

bottom corners).

Triangles

These are identical to the inside square loops except that there are only three corners, two at the bottom and one at the top. Work on making the corners smooth and the loops on the same track, with the tops at 45 degrees and the bottoms at 4 to 6 feet.

Horizontal Eights

This is a different maneuver from the lazy eights described above. In this case, the inside loops are on the right side of the maneuver, and the outside loops are on the left. Try to make the loops as round as possible. As the plane reaches downwind, pull up into an inside loop so that the loop is to the right of dead downwind (the left edge of the loop would be dead downwind). As you finish the inside loop and climb to vertical (the official start of the maneuver is at the vertical, so your first inside loop will seem like 1-1/2 loops), reverse controls and do an outside loop directly to the left of dead downwind—if the plane were writing in the sky, the two loops would touch dead downwind. As you finish the first outside loop and return to vertical, reverse controls and repeat the maneuver; another inside and outside loop. Continue around the second outside loop past vertical and pull out of the maneuver at the top of the outside loop, returning gently to normal level flight. Keys to this maneuver are keeping the intersection between the loops in the same place and keeping the loops all the same (proper) size, with bottoms at 4 to 6 feet and tops at 45 degrees.

The sequence again: Inside loop to the right, outside loop to the left, inside loop to the right, outside loop to the left, exit to level flight.

Square Horizontal Eights

Do another pair of horizontal eights exactly as those described above, but with square corners. Be careful not to make the corners too violent so that the plane does not lose any more speed than absolutely necessary. With so many consecutive corners, it is vital to keep speed up. Start out by making the maneuver very large to give yourself time between corners; bring them to size as you gain confidence.

(If you are an experienced flier just learning the stunt pattern and not learning to *fly* at the same time, here's what I've found to be an excellent training tool for learning the complicated maneuvers without fear of the plane stalling and falling: Take out a fast combat plane or any other high-speed maneuverable airplane and practice your square eights and some of the other complicated maneuvers, or the whole pattern for that matter. Your combat plane will stay tight on the lines and you can transfer what you learned to the slower stunt plane. Beginners can use a combat plane to hone their reflexes and learn to automatically react to upright and inverted flight situations, but trying to do complex pattern maneuvers may be a bit much for a novice at combat speeds.)

As with the round eights, keep the loops the same size and the intersections constant, and make sure all the sides are the same length.

Vertical Eights

Starting at 4 to 6 feet, do one complete inside loop and continue around for another half loop. With the plane upside down at the top of the loop (45 degrees), reverse controls and do an outside loop on *top* of the inside, with the top of the outside loop straight overhead. When the plane returns to inverted at 45 degrees, reverse controls and do a second inside loop, then a second outside loop on top of that one. As you finish the second outside, continue around another half inside loop, finishing level at 4 to 6 feet. Keep the loops directly on top of one another, the intersections constant, and the loops the same size.

Hourglass

This is a relatively simple maneuver but one that is a challenge for most airplanes (it's another one that an experienced flier may want to learn with a fast plane so that line tension will not be a distracting factor). Start just left of downwind with a smooth inside corner of greater than 90 degrees so that the plane climbs slightly on its back across the wind to the very top of the circle, where it should be just to the right of the wind. Make a smooth outside corner so that the plane levels off across the top of the circle to the left. Make a second outside corner so that the plane dives down from left to right, slightly on its back, and finish with a smooth inside corner at 4 to 6 feet. The keys to this maneuver are keeping the climbing and diving segments straight, the corners consistent, and the maneuver symmetrical. Start by doing the maneuver high (bottom about 10 feet and top beyond the peak of the circle, so that you are leaning back to see it) and gradually bring it down as you gain confidence. A significant factor will be gaining confidence that your *plane* can make that last corner; once you're sure of the plane, you'll become sure of yourself.

Overhead Eights

After the hourglass, this maneuver seems to be much less nervewracking, but it is one of the more difficult ones to do well because it is done so high that it is hard for the pilot to find a point of reference to guide placement of the maneuvers. Find your own method, either by the way you plant your feet or by some ground-based reference. Beginning dead *upwind*, pull up into vertical flight. At the top of the circle, pull into an inside loop and repeat the maneuver. As you finish the second eight, exit straight downwind and pull out into level flight. Work on your intersections, loop sizes, etc. as above. Keeping the loop sizes and locations correct will be the biggest challenge.

Four-leaf Clover

This is a complicated maneuver but not a difficult one, and only one is required. The round segments make it an easy one for the plane to handle. In the second lap between maneuvers, gently climb to about 38 degrees elevation. When you reach downwind, pull up into an inside loop with the top at the top of the circle (this is the upper right leaf). Finish the loop (it's actually only 3/4 of a loop) by climbing vertical into another outside (3/4) loop directly above the

one you just did (it is the upper left leaf). Come out of the second outside inverted at 38 degrees, fly across the wind, and drop into an inside (3/4) loop with the bottom at 4 to 6 feet (the lower right leaf). Pull out of the final inside loop at vertical and climb out and over the top of the circle, pulling out on the upwind side of the circle.

The sequence again: Climb to 38 degrees, upper right inside loop, lower left outside loop, upper left outside loop, lower right inside loop, pull out over top. Work on loop size and intersections. Make sure you practice this maneuver with an adequate supply of fuel in the tank.

Landing

Finish out your tank with the plane somewhat high. As the engine quits, begin a smooth, gradual descent. Land with no bounces, flips, etc. and bring the plane to a stop.

If you have done all the maneuvers in the proper sequence, you will be scored as follows: 0 or 5 points for starting within one minute; 10 to 40 points for each maneuver, including takeoff/level flight and landing; 25 points for completing the pattern; and 0 to 20 points for appearance. The 25 points for completing the pattern will be deducted if you leave out a maneuver, don't leave two laps between maneuvers, do maneuvers out of sequence, etc.

As we've said many times in this column, the only sure road to success in precision aerobatics is dedicated practice. Nowhere is this more true than in precision aerobatics where *precision* is the key word.

As always, I welcome letters, questions, technical tips, photos, contest information, etc. John Thompson, 1505 Ash Ave., Cottage Grove, Oregon 97424. •

Big Birds. . . . *Continued from page 15*

any binding. Four of these horns (#326 to # 329) have ball links made of plastic and range in size from 5/16 to 3/4 inch; the other four (#330 to #333) were obviously designed for heavy-duty/BIG Bird use and have ball links made of metal and offer sizes from 1/2 to 1-1/4 inches.

The horns with the metal links not only come with clevises and retaining bolts and nuts, but they also let you choose between the use of 2-56 or 4-40 threaded pushrods.

Another feature of these horns is their curved shape, which offers a choice when mounting. You can install them way back from the hinge line where there is more "meat" to anchor to and still have equal throw on both sides of neutral, or you can bolt them nearer to the hinge line if differential (more up than down) is desired.

And even if you don't want ball links and opt for Robart's "regular" style (#325), you'll be getting a horn that seems to be stronger and less apt to bend than most others.

These new Robart horns are grey-colored, whereas the horns you've been using have probably been white, but that shouldn't be a problem for anyone.

1989 NATIONALS

Got all excited when I found out that the '89 Nats (July 15 through 23) will be held up here smack dab in the middle of Washington (the Evergreen State).

Headquarters will be in Richland, although the nine-day happening is gonna be spread out in what we refer to as the Tri-Cities Area. Gonna try to get there for at least the Giant Scale event. Lookin' forward to meeting lots of folks.

THOUGHT OF THE MONTH

Since getting older, I've come to realize and appreciate that virtue is nothing more than vice at rest.

Al Alman, 16501-4th Avenue Court East, Spanaway, Washington 98387; (206)535-1549. Remember, no matter what you're doing, *safety* is always the bottom line. I can always use more input from you guys and photos of your latest projects. •

Electric Power. *Continued from page 22*

would sell!—mp)

"I am looking forward to tracings of the Seagull (*my 05 float plane design—mp*). I am very interested in trying this model with a stock offroad 05, especially in Colorado's rarefied air. Because I spend much time in Indiana as well, I will be able to make direct comparisons with low altitude performance.

"I am still amazed at the existing ignorance of electric flight. I recently asked a hobby shop owner in Kentucky what he had in stock of electrics. I was treated to a speech on how electric airplanes really didn't work! This, of course, rather motivates me! Although my shelves display a dozen diesels collected for memory's sake, they will more than likely rest there in peace. Electrics are just too clean, convenient, and fun!

"I keep running into people who are very interested in getting into R/C flight. I would like to offer these people something more than a list of models, materials, accessories, tools, etc. I am thinking about a very systematic and well packaged approach to getting a beginner going correctly and painlessly. This is the goal of my new company, "Ekologi Modellsport" (note the quasi-Norwegian spelling!). As the name implies, it will emphasize clean and quiet flight. For those interested in this, contact Ekologi Modellsport, 4013 S. Quintero Way, Aurora, Colorado 80013; (303) 699-7414." Thank you, Jon, for your report!

Well, I think it will be some time before anyone reports electric float flying above 9000 feet! The neat thing about it is that it is routine and easy! The tracings Jon mentioned are for building the Sea Gull, my 05 float plane design that I have mentioned before. It is very efficient, and can ROW very nicely on just five 1200 mAh cells and a stock offroad 05 car motor. If readers are interested in the tracings, send a dollar to cover the cost of copying, stamps, and envelopes, and I will send you a set of tracings. The address is: Mitch Poling, 1519 NE 98th St., Seattle, Washington 98115. The tracings include the rib pattern and spacing, fuselage sides, tail surface outlines, and float outlines, plus all wood sizes. The tracings are not plans and instructions are not included, so you do need to be willing to be an independent scratchbuilder. The reward is a very nice flying plane that is suitable for small lakes where noise is a problem. My

other request in return for such a bargain is that if you build the plane, send a letter on how you like it! Enjoy!

I am feeling some guilt in repeatedly using the designation "05." As Bob Kopski has pointed out in his excellent column many times, the term "05" is nearly meaningless. So, how about designating "05" as meaning a "100-watt" motor? This refers to the input. Reality is that a six-cell motor drawing 15 amps is about 90 watts. If it is drawing 12 amps it is about 72 watts. A seven-cell motor with the same numbers is drawings 105 watts and 84 watts. Motors are frequently run at both higher and lower draws, as low as 8 amps, as high as 20 amps, which leaves us close to a 90- to 100-watt average. Since 100 is a nice even number that is easy to remember, 05 equals 100 watts nominal would be easy to comprehend. Think of it as a light bulb flying around up there!

Once the 100-watt figure is in mind, some neat things fall into place. For example, wing areas in square inches are usually three to five times the wattage! Maximum flying weights in ounces are about half the wattage. These are nice handy rules of thumb. Think watts up!

I have been hearing good things about the Gates/GE 1.4 Ah cells lately, and since Indy RC (10620 N. College Ave., Indianapolis, Indiana 46280, phone 800/338-4639) had a sale on them, I couldn't resist. By the time this column is out, the sale price is probably over ($16 for a six-pack!), but the non-sale price is only about $20 or so, very reasonable. So, I ran a set of non-scientific runs on this pack and several other brands, which are in the following table. These are only a single run, and statistics say that for reasonably reliable results at least three runs are needed (uncertainty drops with the square root of the number of runs). Also, the Kyosho and the two Panasonic packs had not been cycled for about a month, and that certainly took some edge off them. Differences of 100 rpm or so are probably not significant. Nevertheless, the results are interesting. All charging was done with the NorCal Accu-Charger 1, which is a peak detecting pulse charger at a fairly constant rate of five amps. By the way, I highly recommend the Accu-Charger; it holds the charge rate very well, charges up to seven sub-C Cells at up to 6 amps, and has a very reliable peak cutoff. It has never overheated a pack, and rarely shuts off prematurely. Contact AB Tech, 5689 Glasgow, Troy, Michigan 48098, for details. And now for the table! The numbers are rpm/amps in that order.

Minutes	0	1	2	3	4	5	6
Kyosho Racing	10000/14	9620/12	9480/12	9420/12	9300/12	9120/11	7000/6
Panasonic Avenger	9700/13	9300/12	9130/12	9000/11	8900/11	8800/11	8200/9
Panasonic Eliminator	9900/13	9530/12	9520/12	9320/12	9000/11	8860/11	8500/10
Sanyo SCR	10,700/16	10,090/14	9990/14	9720/13	9370/12		
Gates/GE 1.4 Ah	9950/14	9750/13	9600/13	9420/12	9180/12	9000/11	8800/11

I used the DSC 075 motor, a Top Flight 7x4 nylon prop, 60 degrees F, 75 percent humidity, and 29.5 inches atmospheric pressure. I ran all these packs down to about 7500 rpm/7 amps, add half a minute to all the ones that do not show that. The Kyosho Racing pack is matched Sanyo SC cells; the Panasonic packs use Panasonic cells. The price on the Panasonic Avenger has been very reasonable too, in the low $20 range for a six-pack. Anyhow, you can see that performance is very close on all the packs, except the Sanyo SCR, which is definitely a powerhouse. It produces 300 to 600 rpm more than the others right up to its cutoff. The total capacity of the packs was: Kyosho, 1.16 Ah; Panasonic Avenger, 1.15 Ah; Panasonic Eliminator, 1.22 Ah; Sanyo SCR, 1.20 Ah; and Gates/GE, 1.42 Ah. All these packs fast-charged very smoothly, and were only slightly warm at the end of the charge. After the runs, all the packs were warm except the Gates/GE, which was hot, but not uncomfortable to pick up. It wasn't nearly as hot as the 1.8 Ah packs I have tested before. My conclusions are that if you want maximum power, go for the Sanyo SCR. If you want performance that matches almost any other pack, extra flying time, and to save money, get the Gates/GE; it is a bargain! One other note: It did take about four complete charge/discharge cycles to break-in the Gates/GE pack, the rpm were about the same, but it picked up about 10 percent more capacity after the break-in was done. Enjoy!

Till next month, fly higher and fly longer with electrics! •

F3E Champs. . *Continued from page 21*

bad tip stalling through the full flight range.

The team used Astro 60 motors with K & R folding propellers with onsite support by Tom of K & R, powered by 27 Sanyo 900 mA SCR batteries.

The extremely high temperatures and high humidity was very harsh on motors

and batteries. During the whole meet we encountered very little lift, meaning we had to run our motors a lot during the duration task.

As the former team manager and now team member, I feel that by raising funds through corporate grants we can take promising F3E pilots to European national contests a few times a year to keep abreast and then we can field a competitive World Class Team. •

Insiders. . . . . . *Continued from page 51*

caption error in the November "Insiders" when we said that Butch's pair of Hosler "Fury" models, proxy-flown by Doc Martin at the US Indoor Champs, was a British design. The models were British designs, but the full-scale 1939 Hosler was designed and flown in Indiana. It never got off the ground until they put skis on it and flew it off a frozen lake. Our apologies to all Hoosiers.

THE LARRY KRUSE SHOP

Here's our workshop of the month. It's Larry Kruse's of Liberal, Kansas. He writes:

"You want a workshop photo? You got it! My shop was incorporated in the initial planning of our home when we built it in 1983. It differs from the usual basement workshop in that I tried to make everything roll out, fold down, adjustable, and expandable to account for the changes in subject preference I seem to go through periodically. I did all of the cabinet work myself of 3/4-inch common plywood, so it's far from top-of-the-line. It is, however, very utilitarian, convenient, and cleans up easily. Here are the specs:

"Shop size: 14 x 22 feet.

"Cabinetry (left to right):

"1. Small pier cabinet with 24- x 54-inch fold-down work area and pullout storage cabinet on rollers.

"2. Adjustable center shelving for wood, plan tubes, etc. with fluorescent lighted fixed workbench 24 x 50 inches. Work bench in expandable to 48 x 50 inches using an overlay surface.

"3. Corner cabinet with multi-shelved Lazy Susan top and bottom for glues, liquids, paints, epoxies, and dopes.

"4. Large four-door storage cabinet 48 x 82 inches for indoor wood, rubber, tools, multi-drawer parts bin, kit storage, Dremel Shop, and accessories.

"5. Lighted desk, file cabinet, and overhead storage for office supplies.

"6. Large pier cabinet with 36- x 54-inch fold-down work surface and pullout storage on rollers.

"You want obscure? You got it! The second photo is my 1988 Nats-winning 1912 Drzewiecki canard rubber scale developed from information provided by yourself, Doc Martin, and the books *Polish Aircraft 1893-1393, Polskie Konstrukcje Lotnicze,* and *Jane's All the World's Aircraft—1913.*

"The model spans 17-1/2 inches and has an airbrushed tissue covering. Prop size is 6-1/2 inches D x 10 inches P; hand-carved balsa. All-up weight (sans rubber) is 22 grams. THe little canard is an excellent and extremely stable flier." •

JN-1 . . . . . . *Continued from page 53*

wet, and besides it does not shrink very well. If used with care, however, it can increase your color scheme options quite a bit beyond the standard red, yellow, blue, white, and black that is usually available in hobby shops. So go down to an art store and select the colors needed.

Now, to add the color trim. Clean off your workboard so that there is a smooth area at least as big as the model plan but if possible as big as half a page of a newspaper. Now get a section of a newspaper, at least a half a dozen sheets thick, and lay it down over the workboard. This will be your cutting surface for cutting out the color trim patterns that will be doped over the white tissue to give the color trim.

Now, decide how many similar color patterns are required for your model. In the case of the JN-1 there are four required of each color stripe for the wing and for each half of the horizontal tail. Fold your colored tissue so that there are at least four smooth layers and lay it down over the newspaper. An extra layer or two of colored tissue at this point will give some spare stripes in case of an error alter. Now tape the corners of the tissue layers to the newspaper so that it won't move. Next tape the plan, or a tracing of it, down on top of the tissue.

Get a nice new razor blade with a sharp corner point, and a straight edge for a guide, and proceed to cut out the decora-

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tive stripe down through the plan, several layers of tissue, and at least one layer of the newspaper. Now you can lift out at least four identical colored-tissue stripes.

Get out your dope brush and some very thin dope. Carefully take one tissue strip and lay it in place on the white tissue-covered wing. Make sure it is located properly, and, starting in the approximate center, dope through it to make it adhere to the white tissue. The thin dope will penetrate the flower tissue very easily and it will make a very smooth sharp-edged stripe.

If the tissue stripe is not exactly located as it is being doped in place, it can be shifted around as long as the dope is wet. Check the stripe location and orientation as soon as the center is initially doped to get it just right.

If after the entire stripe has been doped in place, the location is incorrect, it can be removed by wetting it with a brush and thinner and gently peeling it off. Extreme care may allow you to get it off in good enough shape for reuse but generally a new stripe is in order.

The bottom half of the fuselage is simply double-covered with the wine tissue. Cover the bottom first and trim the edges. Cut one straight edge on a piece of wine tissue to use as the upper color separation line, and cover each side, locating that line very carefully, and doping from the center towards each end.

The top of the wheel pants have a compound curve to them. This means that the colored tissue must stretch a bit to give a smooth result. A paste stick was used to attach the tissue to the pants, and we found that it took two pieces of tissue to do each pant. The paste softened the tissue so that it wrapped smoothly around the top of the pant to the top centerline where it was trimmed with a sharp blade.

Control surface hinge lines, cowl cooling inlets, and wheels were colored with a black felt pen.

This model wanted to fly straight ahead and required about five degrees of left thrust in order to circle within the confines of a basketball court indoors. It balances in a level attitude when supported at the second spar from the leading edge, and required a little bit of down elevator to cure a slight stall. •

G.P. Sportster *Continued from page 27*

didn't belong on a ten-pound-plus aerobatic hummer like this. Also, I believe that the landing gear assembly would be even stronger and more durable if the W-2 ribs were sandwiched between 1/16-inch ply doublers and not just faced on one side with the ply.

My first flight almost wasn't; that is, I almost didn't get that one required normal landing that usually follows a takeoff. I needed full up-trim and full back stick just to keep her from making a Kamikaze attack seconds after takeoff and couldn't bleed off much speed even though the Magnum was idling below 2000 rpm, so it took me a while to calm down after a very hot and smokey landing. And then it was back to the proverbial drawing board.

What else could cause this kind of problem? Incidence and/or thrust being off seemed like distinct possibilities, so out came my Robart Incidence Meter and once again I read zero/zero. By this time I was confused, frustrated, and angry, and began to yell at the Robart Meter. While ranting and raving and waving the meter wildly about, I noticed that the stupid needle in the stupid meter was not moving smoothly; ye gads, it was sticking.

I pried the Robart open and discovered that the plastic indicator needle had warped and was rubbing against the face of the meter. I couldn't figure out why this had happened since my shop is at a comfortable 68 to 70 degrees all year round and none of my tools are subjected to high temperatures. At any rate, I carefully bent the needle forward to eliminate the binding and then measured incidence and thrust angles again.

Now with the meter working properly, I was getting the right readings. Although the engine was aligned properly, the wing wasn't. Somehow the damned thing was locked in at well over a half degree negative, which certainly accounted for the plane's disposition toward committing suicide.

Measuring v-e-r-y carefully with the meter and a ruler, I shimmed the trailing edge down an eighth of an inch, which put the wing at a slight (.2 of a degree) positive angle of attack, and then a test flight.

Would you believe that although she was

far less prone to dive, the SS still needed lotsa back pressure? So I lowered the trailing edge another sixteenth of an inch and flew again. But even this wasn't quite enough. I had to crank in yet one more sixteenth of an inch (a total of 1/4 inch) to get this birdie flying right.

Viva la difference! Now she grooved, and now I had an *airplane*, one that was predictable, aerobatic, and fun to fly. And because of her thick (18 percent) symmetrical airfoil, we're talkin' about constant speed through all maneuvers and lightness on her feet when landing.

This is the kind of plane you can throw in your car and use as an everyday knock-around. She's capable of most every maneuver and looks good while doing 'em.

POSTSCRIPT

As soon as Great Planes heard about a number of tail failures, they initiated more flight testing and came up with an airworthiness modification that was sent to all known Super Sportster owners. In essence, this mod anchors the horizontal stab more securely to the rear of the fuse and can be accomplished either during construction or after the plane is built.

Although I'd encountered no flutter problems (GP is quite adamant about using their hinges and wire pushrods), I did make the suggested modification to the tail feathers and found that the additional weight brought her balance point back to almost 33 percent.

This .4 of an inch rearward shift in balance turned the Sportster from a mighty good sport flyer into one helluva stunt machine. The best part about this change was that although now capable of being wild and wooley, she's still not vicious and remains totally predictable.

This 90/120 is gonna find a happy home with guys who like to amaze themselves and others with their prowess. Because of her thick airfoil, she may not be the fastest ship at the field, but she will be one of the quickest and most honest. •

Hawks. . . . . . *Continued from page 30*

"flight." The airplane was powered by an "old" Astro Ferrite 25 with 12 cells turning a 16x10 prop on a belt reduction. Gordon won the Most Impressive and Best Scale awards with the airplane on Sunday. Gordon also won the Smallest Airplane award on Saturday with a free-flight Flying Saucer, which was a cute little 12-inch disk powered by a HyTork 111 motor that actually flew quite well considering the wind.

Randyl Britten won the Best Scale award on Saturday with his Porterfield, powered by a Cobalt 15 and 12 cells. ALthough Randyl cannot document the scale military markings, it appears realistic in flight. Another outstanding entry in Scale was Bill Weed's SE-5 biplane, powered by an Astro Cobalt 05 and 7 cells, but it unfortunately refused to fly. However, I've heard that this is a common problem with SE-5s.

All of you know of Bob Benjamin. Well, at least you've seen his artwork on the cover of *Model Builder*. He is an excellent flier and a heck of a gentleman. To make a long story short, Bob won the Most Aerobatic award on Sunday by flying his Astro Challenger, which is a glider powered by an Astro Cobalt 05 (geared) and 7 cells, through some maneuvers which would be difficult even with an aerobatic plane. Some participants remarked that the airplane should have come apart during some of the maneuvers, but Bob said he has very high confidence in his "silk and dope" coverings, much more so than in any plastic film. Seeing is believing.

A close second place in the Most Aerobatic category on Sunday was Dave Nofziger's ElectroStreak, powered by an Astro Cobalt 05 and either 6 or 7 cells, depending on which pack happened to be charged. I suggested to Dave that he put in a Cobalt 15 and 12 cells (zowie!). Dave was our only contestant from Oregon this year (Lebanon, Oregon); we can only assume that the rest of them went to the National Fun-Fly.

Speaking of *Model Builder*, Mitch Poling showed up on Sunday after missing Saturday's action due to being in Southern California to judge the Electroflight Championships (I think). He was very free with helpful advice for both the experienced and inexperienced electric flight modeler.

The Longest Flight award was hotly contested both days. Rick Lim (from Vancouver, B.C., Canada) won on Saturday with a total time aloft of 24:15, with his homebrew sail-

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The WRAM's Swap Shop has become one of the major show attractions with thousands of individual items changing hands. To help eliminate "registration crush", the Swap Shop will provide for preregistration forms. To receive these forms send a self-addressed stamped envelope to: John Isbister, 4 Devon Rd., Larchmont, N.Y. 10538.

SPECIAL NOTE
This year there will be no restrictions in the number of built-up models a registrant may place in the Swap shop. **For further information, write (enclose self-addressed, stamped envelope) or call: John Sbare, PO Box 26, Mahopac Falls, NY 10542 / 914-628-5988.**

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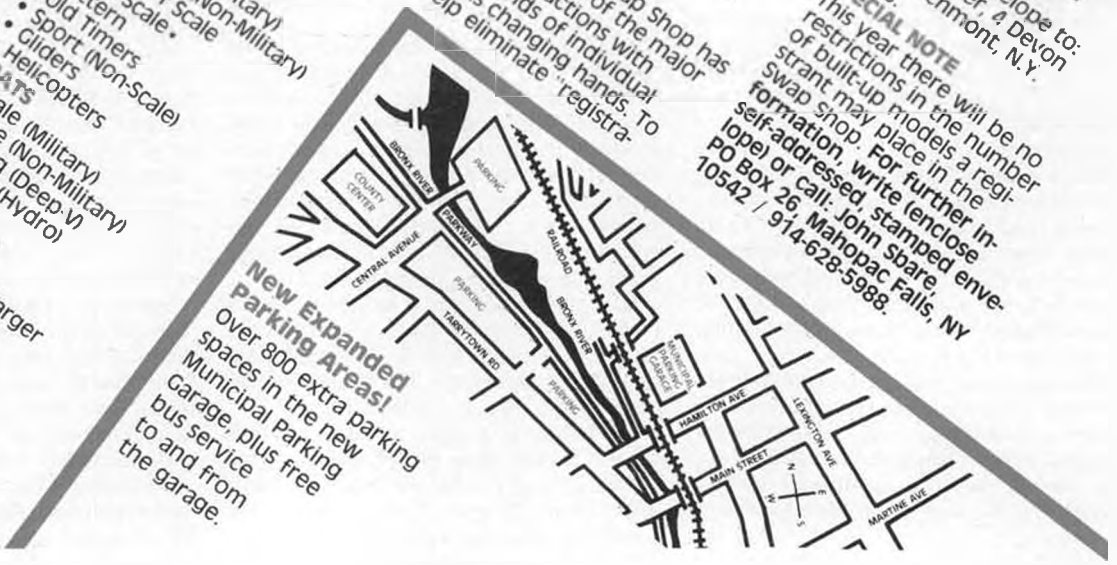

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plane powered with a Robbe motor and 7 cells. Rick also won the Largest Airplane award with that plane (96-inch wingspan). On Sunday, Bob Benjamin got the longest flight with a 22:37 time, using the same Astro Challenger with which he won the Most Aerobatic award. This year, awards were given to the longest flight by a non-sailplane, which was won by Neil Simpson with his little MRC Cessna (10:26) on Saturday and by Mort Arnold and his Amptique (9:50) on Sunday. So those of you who think that electrics don't stay up very long, wise up!

The Ugliest Airplane awards were won by your CD and Assistant CD, Bernard Cawley and Ben Almojuela. Bernard's Sorta-Schoolboy (Silver Streak motor powered by 6 cells) was just "beat up," however; Ben's Prairie Bird (Astro Cobalt 15 and 10 cells) has the ugly designed right in. The Prettiest Airplane on Sunday was won by Mike McIntyre and his Astro Challenger.

Speaking of your CD and Assistant CD (Bernard and Ben), they also teamed up to take the Best Crash award. My Skybolt bit the dust on Saturday and Bernard's Showmaster folded a wing and rekitted itself on Sunday. Needless to say, both awards were not made during the contest.

Lee Urbaniak made his usual pilgrimage to the Northwest Mecca of Electric Flight (Kent, dummy) from the bustling metropolis of Cheney, and made the usual excuses for not winning in any category. Lee did have a shot at the Longest Flight award, launching with three seconds left in the contest on Sunday, but the thermal gods were not with him. However, Lee is persistent and we will see him next year.

Support from various model airplane and equipment manufacturers was outstanding this year. Every participant went home with something! Between entry fees and donated prizes, the contest did not cost the Hawks a dime. A big thank you to the following contributors: Ace R/C, Al-Tec Products, Astro Flight, Eldenken Electronics, Great Planes Model Manufacturing, High Sky, Hobby Lobby, Jomar, Leisure Electronics, Peck-Polymers, Satellite City, Sermos R/C Snap Connectors, SR Batteries, and Tower Hobbies. And, of course, a big thank you ever one of the Boeing Hawks for hosting one of the best electric meets in the country!

Just a couple more observations. First, the capabilities of electric-powered model airplanes is increasing so fast that the airplane which might have won the Most Impressive award three years ago would not even be in the running today. That's how far we've come. Second, more and more Scale airplanes powered by electric motors are showing up, especially at electric meets. So you guys who are hard-core into Scale better start thinking about learning more about electric, or you may be left behind! •

Hannan. . . . . . *Continued from page 45*

and Space Museum, shows a portion of an exhibit called "Model Airplanes for Fun." Featured are a Thermic 20 hand-launched or high-start glider, the Lorin Wright promotional "Wright Flyer" catapult-launched glider of the 1920s, a commercially produced all-balsa biplane, and a "scratchbuilt original design." How nice to see basic models on display to inspire more of them!

SPEAKING OF GLIDERS

Among Mother Nature's strangest flying creatures are the flying squirrels. A book about them *Flying Squirrels, Gliders in the Dark*, by Nancy Wells-Gosling, examines them in minute detail. The author is more than a researcher; she keeps some of these fascinating flyers as pets. Like flying fish, these animals are primarily gliders relying upon launch momentum to carry them forward, although they doubtless also benefit from wind and thermal activity.

Two distinctive species are found in North America, and adult squirrels can range in length from 8 inches (Pistachios?) to 15 inches (Walnuts?), and may weigh from 2 to 8 ounces. The aspect ratio of these creatures is also of interest from an aerodynamic standpoint. With their "wings" (actually fur-covered membranes called patagiums) fully spread, the supporting surface looks nearly square, not counting the flat, bushy tail.

Launching themselves from high places, these amazing animals can glide for considerable distances, usually from 20 to 60 feet but occasionally hundreds of feet. They are also quite capable of mid-flight evasive action and turns of more than 90 degrees. The preferred landings are not on the ground but rather a quick flare and upward rotation to permit all four feet to impact against a tree trunk.

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K01000553	Heloball Muffler (for Webra 40/50)	28.99	24.99
CH0001	Circus Super Starter	29.99	21.99
MCDRC101	NI-HL-1 Ni-Starter (w/Charger)	26.99	23.99
CH0016	12V Wet Cell Battery (5.5 amp)	19.99	12.99
CH0036A	1.5V Glow Plug	2.10	1.99
CH236	Circus Handcrank Fuel Pump	15.99	11.99
IM63003	Silicone Fuel Line (Large)	3.20	2.99
K06030302	Circus Training Gear	16.99	13.99
JRS506	JR 506 Servo (Reverse Direction)	38.99	26.99
JS6H2	Circus 6 AM Heli Radio (CH12,38-56)	226.99	169.99
HELITIPS	Circus Heli-Tips Booklet	——	FREE
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CH0036A	1.5V Glow Plug	2.10	1.99
K01000551	Heloball Muffler	25.99	23.99
CH0001	Circus Super Starter	29.99	21.99
CH0016	12V Wet Cell Battery (5.5 amp)	19.99	12.99
IM63003	Silicone Fuel Line (Large)	3.20	2.99
MCDRC101	NI-HL-1 Ni-Starter (w/Charger)	26.99	23.99
JS6H2	Circus 6 AM Heli Radio (CH12,38-56)	226.99	169.99
JRS506	JR 506 Servo (Reverse Direction)	38.99	26.99
CH236	Circus Handcrank Fuel Pump	15.99	11.99
K06030301	Circus Training Gear B-28	16.99	11.99
HELITIPS	Circus Heli-Tips Booklet	——	FREE
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Pet flying squirrels may be given run of the house, and, surprisingly, some of these pets permit—perhaps even enjoy—being hand-launched into flight by their owners, according to Ms. Wells-Gosling. She even describes people tossing them into the air, then having them return like a boomerang!

Flying Squirrels, Gliders in the Dark is published by the Smithsonian Institution Press.

PANCHO BARNES

A three-hour television program based loosely on the life of aviatrix Pancho Barnes appeared recently. Although historically questionable, it offered a splendid panorama of aircraft scenes with such diverse types as a reproduction Travel Air Mystery Ship, Corben Super Ace, Ryan STA, Tiger Moth, Waco Taperwing, Waco UPF-7, Rose Parakeet, and many more. One especially dramatic sequence involved a Belgian Stampe biplane daringly flown through a hangar. The story itself was compelling, if one was willing to overlook the usual Hollywood deviations from facts and simply enjoy the wonderfully photographed flying machines.

An excellent account of how the film was produced appeared in the October 1988 *Sport Aviation* magazine. If you missed "Pancho Barnes" the first time around, by all means catch it during the reruns.

KIT/PLAN RULES UPDATE

Bob McDow has slightly modified the regulations for his 1930-1940s Comet and Megow model airplane contest. Although intended for the Columbia University New York indoor events, the rules may be useful for other nostalgia-oriented clubs as well. Similar low-pressure competitions have been popular for outdoor flying in other locations.

1. Model must be built from original manufacturer's plan or a reproduction kit. Plan must be submitted with the model at contest for checking measurements and construction. *There must be no structural changes.* Balsa or hardwood wheels only. Single or double surface covering according to plans. No condenser paper or plastic film covering.

2. *Any* propeller may be employed that will revolve without touching table when model is at rest.

3. Front ends (nose plugs/blocks) may be removable to allow full winding and also a Peck-Polymers thrust bearing may be employed.

4. If there is a *spar* on the bottom of the wing, according to the plan, it may be relocated to the top of the *wing* for structural strength.

5. Maximum wingspan is 16-1/4 inches.

6. Unlimited official flights, all hand-launched, are permitted. Total of best three determines score. There are *no* scale points.

SPEAKING OF CLUBS

The Los Angeles-based Flightmasters continue to publish one of the better newsletters. The club's Editor-in-Chief Mac McJunkin is ably assisted by other contributors on a revolving basis, most recently Bill Warner. The September/October issue featured plans for a Miles M20 Peanut, by J. F. Frugoli, of France, three-blade prop-hub making hints by Dick Howard, a grams-to-ounces conversion scale by Vern Clements, cartoons, an aviation "trivia" quiz, and a few zany diversions as well.

Subscriptions to the Flightmasters *Flying*

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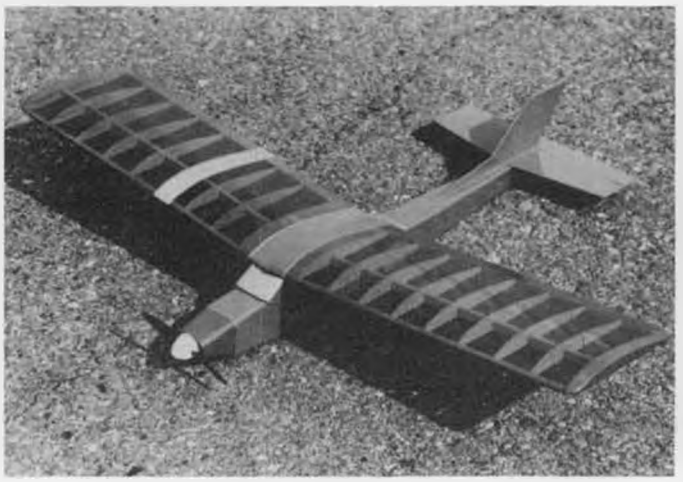
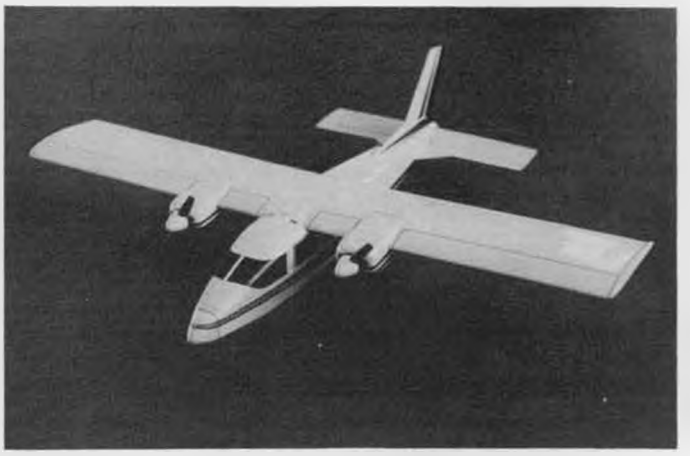


THE ASTRO SPORT

The Astro Sport is a cute little high wing sport trainer that is specially designed for schoolyard fun. Install the Astro Cobalt 020 Motor and you have a gentle and forgiving trainer that is very easy to fly. Install the more powerful Astro Cobalt 035 and it becomes a real schoolyard show-off doing snappy rolls, loops, and other schoolyard maneuvers. The kit contains all machine cut and sanded parts and is super easy to build. Wing Span 37 inches; Wing Area 292 sq. in.; Eppler-195, Flying Weight 22 to 28 ounces. **Kit # 1019 ..... $ 39.95**



PARTENAVIA P-68 VICTOR TWIN

Our popular PARTENAVIA P-68 kit has been comnpletely redesigned for the Astro Cobalt 05 Motor. The airfoil section has been changed to the Eppler-195 for improved aerobatic performance. The P-68 has always been a popular model at our electric contests, and in fact an Astro Cobalt 05 powered P-68 won first place in aerobatics at the 87 EAA Electric Championships. The deluxe kit features all machine cut and sanded balsa parts. Wing Span 50 inches, Wing Area 400 Sq.In., Flying weight 4.5 lbs.

Kit # 1013.....$89.95

THE ASTRO CHALLENGER NATS WINNER

Bob Boucher's Astro Challenger won the 84 Reno Nats its first time out and has been winning electric sailplane contests all over the country ever since. Powered by an Astro Cobalt 05 Geared Motor turning a 12 inch folding propeller, the Challenger climbs almost out of sight in 45 seconds, and can repeat this climb three or four times on a single battery charge. The distinctive wing planform with elliptical tips maximizes aerodynamic efficiency and minimizes tip stalls. It's gentle and forgiving nature make it perfect for beginners too. Kit features all machine cut and sanded balsa parts. Wing Span 72 inches, Wing Area 612 sq.inches, Airfoil Eppler 193 Flying weight 39 ounces. **Kit#1020..... $ 49.95**

THE PORTERFIELD COLLEGIATE

The Porterfield Collegiate makes a great sport scale electric model. It's gentle and forgiving nature make it perfect for beginners, but at the same time it can be quite responsive in skilled hands. The large wing and light wing loading lets the Porterfield climb steeply to and land short. Just what you need for flying in your neighborhood park or schoolyard. Beginners to R/C should install the Astro Cobalt 15 Geared Motor. More experienced flyers can install the Astro Cobalt 25 geared motor for very realistic scale like maneuvers. Wing Span 69.5 inches, Wing Area 690 sq inches, Airfoil Eppler 193, Flying Weight 4 to 5 lbs.

Kit # 1018 .....$ 79.95

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PARTING THOUGHTS

We close our column as it began, with quotations:

"Each builder interprets the hobby in his own way; pursuing the goal of flight, craftsmanship, and scale accuracy with different mixes of priorities." Bob Wetherell, writing about the Flying Aces Club Nationals in *Aeromodeller* magazine.

"It really does not matter how long it takes, as long as one is learning along the way, accomplishes something every day, *and* the end is finally attained. I have a lot of unfinished stuff in my shop; however, I rationalize them by saying: I learned what I wanted from the study." Herb Kelley. •

NORD 3202. . . *Continued from page 13*

rubber bands. Crude, perhaps, but observing crash damage resulting from plastic screws as a wing mounting device, rubber bands seem better. There are fuselage to wing fillets that have been left off the model. If you are going to use plastic screws for the wing mounts, add the fillets for scale and practical reasons. The cockpit canopy frame was made from strips of 1/64 plywood soaked and shaped around a waxed form. The straight pieces are pine (or spruce), the covering is celluloid glued to the frame, and a pilot is added just to assure the model that someone is in charge. The model finished up so that the balance point was just right without having to add any ballast to nose or tail.

EMPENNAGE

The empennage is also built in the normal manner, with balsa sheet reinforcing where the control horns are to be located. Hinges used were Du-Bro plastic, slotted into the balsa and held in place by a drop of CA glue. Structural glue used on this model was mainly Elmer's white or Titebond.

WING

The wing is made in the usual R/C model manner, with "D"-planked leading edge, two lines of spars with webbing, a "V"-planked trailing edge, capstrips on the ribs, and center section planked. This construction provides great strength with lightness. Remember to build-in some washout in the wingtips to combat tip stall.

Cut out all ribs, pin down 1/8 sq. lower spars (shim rear spar), glue in ribs except No. 1, add 1 x 1/16 trailing edge on bottom (also shim), make sure wing has washout by shimming tip, add 1/4 sq. leading edge trimming notches in rib front for good fit, bevel rear top of trailing edge and glue on 1 x 1/16 top trailing edge, glue in top 1/8 sq. spars, cut 1/64 ply pieces to go in aileron space, soak and bind on 1/2-inch dowel. When dry, glue two pieces together and bind again on dowel. When dry, install in aileron space, add top 1/16 sheet, cover around aileron space, remove both wing panels from plan, block up each tip 2-7/8 inch, glue in rib No. 1, and add bottom 1/16 pieces around aileron space, add 1/16 sheet webbing on front and rear spars, add soft balsa wing tips (hollow out).

Although not shown on plan, 1/64 ply pieces were used inside aileron spaces to provide support for dowel pivots. Add 1/16 sheet top covering on leading edge (sheet butts up against 1/4 sq.), glue on center section planking top and bottom but leaving bottom front until servo mount and servo pushrods to ailerons have been installed. Cut landing gear mounts. Take a deep breath and assemble your wire bending equipment and bend the l.g. wires, wire and solder them to the ply mounts, glue in l.g. assemblies, add leading edge 1/16 sheet planking, add rib capstrips. The ailerons are built by cutting a 1/16 sheet bottom, adding rib pieces, two headers that form the curved front of the aileron, capstrips, and the 1/8 dowel pivots, which allow the aileron to be removed by gluing the inner dowel to the aileron, fitting the aileron in place, then inserting the outer dowel through the tip into the aileron, with the outer dowel being able to come out if necessary. Use thin washers between aileron and wing and trim so aileron moves freely.

In attaching the wheels to the l.g. wires, copper or brass tubes are slipped over the end of the wire, flattened and drilled for the axle, then wheel and axle are put on and the tubes soldered. The gear is sturdy enough for normal operation, but when the model comes in hard on one side, the gear will flex and the wheel will sometimes put a hole in the covering. The wire size could be increased to 1/8, or an extra strengthening wire could be added. It's easy enough to make a field repair with a piece of covering.

FINISHING

Finishing is done by first using the sandpaper to smooth everything, giving the structure on the outside two coats of clear dope, light sanding again, covering the entire model with lightweight silk (or plastic covering if you prefer). The silk requires water shrinking, then two or three coats of clear dope to close the pores, then two or three coats of chrome-yellow fuel-proof dope (if you can leave the white areas of the insignia blank, it will prevent the yellow from bleeding through, assuming the insignia is to be painted on). Remember to give the inside cowl area plenty of soaking-in with fuel-proof dope. Probably, this model could be painted in aluminum if you dislike bright yellow. Wing walk areas were painted black; the areas under the cowl and central wing were painted black. One photo shows a black or dark green area in front of the cockpit. Prop and spinner were gloss black. The Musee de l'Air said one color scheme was a bright yellow plane with "low engine cowl and central wing panels painted in bright black color. Engine nose cowl, wing tips, and rudder were very often painted in Anti-collision fluorescent red. . .also the spinner in red."

FLYING

Anyone who is at ease flying a four-channel model should have no trouble with this one. First, make sure the model balances at or near the point shown on the plan. Also check to see if one wing is heavier and would unbalance the model sideways. Second, turn on the R/C equipment, stand behind the model, and go through the controls to make sure they are going the

right way and that the control surfaces are trimmed in neutral. The original model needed about 1/16 inch of right rudder. Take off using right rudder until the model is heading straight, and because the control surfaces on the Nord are large, don't overcontrol. Those big control surfaces will be an aid in snap rolls, spins, and other airborne maneuvers. Landings can be on idle or deadstick; the model glides very well.

Best of luck and keep those scale models flying!

Special thanks go to Elliot Kimble for help in test flying this model and to general Alain Brossier and Le Colonel Rougevin-Baville of the Musee de l'Air et de l'Espace, Bourget, France, for their aid in obtaining data, photos, and other invaluable information on the Nord 3202. •

Inside Engines. *Continued from page 23*

many others from Taiwan, are clone-like copies of O.S. designs. My nicest-running R/C diesel engine is a Taiwan Blue Bird .25 that has had a Davis Diesel conversion head for an O.S. .25 put on it; the fit is perfect. On Blue Bird, Royal, Magnum and A.S.P. some/many parts will interchange freely.

Let's look inside this month's engine. The interior was spotlessly devoid of loose machining metal "freebies." It has a ringless cast aluminum piston that is CNC machined and runs in an unusually thick (.080-inch) aluminum cylinder that's internally chrome-plated. The cylinder has slight cross hatch honing marks showing above the ports, and the taper from the bottom inside diameter to the top inside diameter is very minimal; this is AAC construction (aluminum piston running in a chromed aluminum cylinder). It's increasingly common on ABC, AAC, and ABN ("N" is for nickel and "B" is for brass) to see slight taper where the piston fits almost squeaky tight as it goes through top dead center, as K & B's new Sportsters do. Nearly parallel cylinder walling will require less running in, and this engine's instructions recommend only a very rich initial run for the first few minutes and then slight leaning of the high speed needle until you *just start* to break into a "two-cycle" sound for the remainder of the first tank's run. Then allow the engine to fully cool.

Next you're advised to make two to three flights with the needle *unchanged*, followed by leaning a *small* amount and still more rich running flights. You are specifically advised to *avoid* maneuvers like stall turns or top hats or long climbs that point the nose vertically, generate quick heat buildups, and lead to oil-less Chernobyl meltdowns. Loops along with horizontal or Cuban eights are okay, as they are leanings in the climb quickly followed by richenings in the descent. After six to ten flights, with full cooling in between, the instructions say the engine should be fully broken in and able to reliably run steady with the needle valve one-quarter to one-half turn *open*

from maximum speed. That's a nice smart needle setting they're advising.

Also, the instructions specify that the break-in runs be on a fuel whose lubricant is *only castor oil*, like K & B's "100" blend. After break-in more nitro can be used, like 15 percent. If, after six to ten break-in flights you decide to use a non-castor fuel (very common in the USA), they recommend the needle be opened *more* than half a turn from max rpm. Good advice! Today's synthetic oils, as great as they are, should have a liberal quantity of high-quality castor (like from Klotz or Castrol M) added for our normal sport flying in both two-cycle and four-cycle blends.

The cast cylinder head is epoxy-painted black and then is CNC machined to fit in/on the top of the cylinder, and the normally flat squish band is machined at a ten-degree chamfer angle, so the .180-inch wide squish band, along with the central .500-inch diameter bubble that's .125 inch high effectively forms a double bubble combustion chamber to force the compressed fuel/air mix towards the glow plug for better combustion. This cylinder head and its dimensions somewhat approximate the very successful Fox Standard's head, except Fox uses no chamfer on the squish. The head has a brass insert to accept the supplied glow plug and uses a soft .0075-inch aluminum head gasket and six bolts for positive sealing to the cylinder. Deck height (distance from the piston's top at top dead center up to the lowest edge of the squish) is .030 inch. When the cylinder head is machined to completion, two narrow decorative shiny cuts are made around its circumference, which is a nice cosmetic touch.

Exhaust timing of the Polk's .45 Blue Bird is 153 degrees, same as on the Magnum Pro .45. Most engines fall between 140 and 160 degrees; nearer 140 yields better fuel economy (more time per combustion cycle for the fuel to completely burn) as well as better big prop performance. Nearer 160 yields poorer fuel economy but more happiness with small props turning faster; tuned pipes really start to become effective near 160 degrees and upwards. Duke Fox's new Quickie .40 "Q" engine for R/C sport pylon racing has well over 150 degrees of exhaust timing and comes with a tuned pipe muffler designed for pure speed around the pylons.

The Polk's .45 Blue Bird has a .300-inch inside throat diameter through the carb (like the new Fox .45 and .50), and the carb looks like it's fully interchangeable with the O.S. carb; a single draw rod holds the carb in place. I'd like to see the throttle arm attached to its barrel in a better way on the O.S. and on these copies too. A bit of silver solder or a tiny spot weld between the arm and the rotating barrel would help prevent eventual loosening. The muffler is a simple single expansion chamber with a .350-inch inside diameter outlet. If you study the performance figures with the 10x6 prop, you'll see the amount of rpm restriction from the supplied muffler. J'Tec (John Tatone) is about to market their new "Snuf-ler," and I tried it on the 10x6 prop and recorded the findings. You'll see the idle speed was reduced and the high speed was increased for an improved speed range. Engine irritation was significantly less with the "Snuf-ler" and only a three-ounce weight penalty results.

This engine uses Japanese ball bearings and the front one is shielded; the prop driver "wraps around" the bearing to inhibit entry of crud to the front bearing. The hole through the crankshaft is a husky .435-inch inside diameter, and the whole shaft appears massive. It isn't surface-hardened. The connecting rod is pressure cast, bushed on the bottom end, has a lube hole, and appears to have been machine-buffed to a high shine. . .unusual! The combined weight of the connecting rod, wrist pin, single retaining clip, and the short wavy skirted piston totals only 13 grams; just under a half-ounce, which is light for a .45-size engine. The cutaway sections of the crank follow O.S. closely.

The engine exhibited a slight vibration mode going from 13,000 to 13,500 rpm, which is not too unusual as it's *never* possible to balance a single cylinder perfectly. The only fault I can find this month is that the instructions say this is a .46 and the engine is stamped as a .46 on the lug, but my measurements show it to be .45 cubic inch displacement. I'd also like to see the two metric Allen wrenches needed for servicing included in the box.

MEASURED PERFORMANCE

Per instructions, this engine was broken

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in with fuel containing 20-percent castor oil and with the muffler off. All rpm readings are with black Master Air Screw props, a K & B #4520 idle bar glow plug, and 10-percent nitro Red Max fuel that has had one ounce of castor added to the gallon. The supplied muffler is installed for the readings. Additionally, the new J'Tec "Snuf-ler" was tested as noted.

Prop Size	Low Speed	High Speed	Speed Range
9x6	2850	15,600	5.47:1
9-1/2x6	2750	15,400	5.60:1
10x6	2500*	14,100**	5.64:1
11x6	2300	11,950	5.19:1
11x7	2150	11,150	5.18:1
12x6	1900	10,450	5.50:1
10x6	2250***	14,300***	6.36:1

*without muffler = 3,100
**without muffler = 15,400
***with J'tec "Snuf-ler" installed

A speed range below 4:1 is unsatisfactory.

A speed range of 4:1 is barely satisfactory.

A speed range of 5:1 is average.

A speed range of 6:1 is excellent.

A speed range of above 6:1 is superb performance.

The Aristo-Craft/Polk's .45 R/C engine # ARI 0155 has a selling price of $89.95 at testing time. If not available at your local hobby shop, it may be ordered direct from Polk's toll free at (800)225-POLK. If this engine were more conspicuously advertised, I think we'd see more of them at the flying field. Please notice that this engine turned a 10x6 at a whopping 15,400 rpm, as shown above! •

ARFs. . . . . *Continued from page 29*

only to be hinged and glued into place. Not one bit of hardware was overlooked, as every screw, clevis, wheel collar, control horn, and whatever you could possibly need was supplied in a neat plastic bag, and everything was top quality. All this made assembly go very quickly, and the beautifully written instructions with their crystal-clear diagrams were virtually unnecessary.

The main landing gear required all of ten minutes to slip into place, including screwing down both gear retaining brackets. I remembered to fuelproof the landing gear slot with clear silicone rubber before installing the gear. Of course, most any type of fuelproofer will work well for this purpose. The nosegear was installed in the ready-made hole in the motor mount, and its height proved to be just exactly right for the fuselage to sit parallel with the ground. I made certain that I fuelproofed the inside of the fuel tank compartment with a light coat of epoxy thinned with a bit of alcohol to allow easy brushing.

I found that my standard Airtronics servos were an absolutely perfect fit in the ply servo tray. After securing the servos to the tray, it turned out to be an exact fit in the rear part of the cabin compartment. I epoxied the tray in place and installed the battery and receiver in the remaining space. There was more than enough room to see that these were well wrapped in foam rubber.

My trusty O.S. .40 FSR slipped snugly into place and was fastened down in no time. It was as though the motor mount was intended for this particular engine! The usual 10x6 fiberglass prop was bolted on, and the handsome white spinner topped it all off. The three very lightweight sponge rubber wheels were mounted on the landing gear, and this just about completed the assembly of the Royal-Air 40T.

Before embarking on the all-important flight tests, the last thing remaining to do was to weigh the 40T on the old kitchen scale. Ready to fly dry weight came out at 5 pounds, 5-1/2 ounces. A few calculations indicated that the wing loading was 16.7 ounces per square foot, absolutely in the ideal range for a well-designed basic trainer, more than fulfilling the promise made in the specifications.

With all throws adjusted to the recommended amounts, including a generous

inch left and right in the rudder, the engine was started and a few minutes were devoted to taxi tests. I was pleased to discover that the model was not "tippy" and rather sharp turns could be executed without scraping a wingtap. After completing ground range tests, I headed her into a very light wind and came up on the throttle. In about 50 feet she lifted off the runway with no help from me, and I instantly knew this was a real winner of an ARF! I know you've heard it all before, but please bear with me just this once more. It is as stable as you could want a trainer to be. No, it is not a hands-off powered glider, nor is it an old timer that can fly all by itself. It is just the best honest-to-goodness basic trainer you can buy in an ARF kit. To learn to fly with this airplane, you will need the assistance of an instructor, but if you have even an ounce of aptitude and motivation, you will learn to fly it in a minimum of time. It flies just like all the classic trainers with high wings, flat-bottomed airfoils, and equivalent wing areas. If you accept the Carl Goldberg Eagle 63 and the Sig Kadet Seniorita as good trainers, then you will feel exactly the same about the Royal-Air 40T.

As I continued the first test flight, I determined that a 1/4 throttle setting was ideal for instructional purposes. At this setting, slow, sustained flight was achieved and control responses were positive but gentle. As with all lifting airfoils, with higher throttle settings the 40T tended to climb, so it was necessary to hold some down elevator or crank in down elevator trim. My personal preference is not to fool with the trim any more than I have to. I had no trouble holding inverted flight, but full throttle was required. The usual maneuvers were all possible. Loops were smooth and were easy to keep rounded, rolls were slow and needed infusion of down elevator to keep the nose up, but spins and snap rolls were not possible even with maximum control surface throws.

Just as the takeoff was accomplished without any help from me, landings were almost the same. With the engine at idle and the plane on final, the glide was really flat. If I didn't bother to flare just before touchdown, I know the landing would still have been successful, albeit a little hard on the landing gear. However, experience and reflex action caused me to feed in the required amount of up elevator, and gently, ever so gently, without even the slightest bounce, the 40T placed her soft little wheels down on the runway.

Though everything about this model impressed me, I must single out those wheels for a bit of extra comment. If you are still using the heavy old-fashioned hard rubber wheels, give this new generation a try. They weigh only a fraction of what the old wheels weigh, they have much better traction, and most importantly, they absorb landing shock and smooth out many touchdowns that would normally have been rough and bouncy. The first hundred landings have, thus far, caused no discernible tread wear. So, as far as I am concerned, these wheels pass all my tests with flying colors.

The first flight lasted about 15 minutes,

and curious to know what the fuel consumption was, I removed the fuel hatch cover and inspected the tank. I was surprised to find I had almost half a tank left, so I performed a few timed flights and came up with the following results. Using my regular 5 percent sport fuel with straight synthetic oil, I flew a student on dual controls until the tank was empty. This was a typical instruction flight with mostly low throttle settings, and the engine ran for 21 minutes. I flew the next flight myself at mostly full throttle with a lot of aerobatic maneuvers and a few touch-and-go landings, and this time the flight lasted 15 minutes. Of course, I have no idea of the actual capacity of the tank, as it is unmarked and the instructions do not disclose this information, but my previous estimate of ten ounces seemed about right. This should be enough for anybody, but, if desired, there is room enough in the fuel compartment for an even larger tank!

I feel I should mention something about the plastic shrink covering provided on the 40T. It's plenty tough and can be repaired with any standard plastic film such as Super MonoKote or UltraCote. Little dents and dings can be quickly shrunk out with a heat gun, and, of course, the material is thoroughly fuelproof. One little problem I found was that after sitting in direct sun or in an enclosed vehicle for an hour or so the covering did tend to develop some sags over open framework areas. This had no harmful effect on the flyability of the model, and at first I tightened up the sags with my heat gun whenever the plane was back in the hangar. Eventually I discovered that the covering would shrink back to normal all by itself after a few hours in a cool place.

One of the biggest surprises about the Royal-Air 40T is its very attractive list price of only $123.95, but the model is available from various sources at a substantially discounted cost. Once again the hobby industry has proved it possible to provide a ready-built R/C model at a price which is equal to or less than the cost of a home constructed airplane.

I am so enthusiastic about the 40T that I have officially designated it as "The Best ARF Trainer of 1988," as no other ARF I know of offers its generous wingspan, light wing loading, and state-of-the-art design at any price. I challenge the competition to beat this product. The Royal-Air 40T is distributed by Royal Products, 790 W. Tennessee Ave., Denver, Colorado 80223.

ARTWORK FOR YOUR ARF

I suppose that as a devotee of pre-built models I am guilty of having a lazy streak when it comes to building and finishing R/C airplanes. Anything that makes life easier is my cup of tea, so you can imagine my delight when Lance Biddle, of Sinclair Custom Graphics & Design, Inc., sent me an assortment of samples of his computer cut, pre-spaced, and ready-to-apply letters and numbers. These are made in the best quality, highly fuel-resistant cast vinyls and are available in a dazzling array of colors, including gold leaf. Lance will fabricate any combination of numerals and/or letters in sizes ranging from 1/4 to 3 inches in height. Dozens of letter styles and symbols are available, and you can design your own individual layout or leave it up to him. Now we know how those pattern and pylon guys manage to have those flawless graphics all over their planes, and from now on these are available to all of us average modelers.

According to Lance, "We cut them to *your specifications* and send them to you *individually cut, pre-spaced,* and *ready to apply.* Can be used for airplanes, helicopters, cars, boats, models of all kinds, including full scale. Also, flight boxes, doors, signs, etc." I had no trouble in applying them to a number of models. The letters are held in a kind of sandwich arrangement between two sheets of protective backing. You peel off one sheet and this leaves the letters stuck to the other sheet with the adhesive side uncovered. Lay the letters down on the model, rub well to insure application, then peel off the other backing sheet; the results are amazing! In less than two minutes I had improved the appearance of the model immeasurably, and the lettering alignment was absolutely straight. The vinyl material is so thin it feels almost like a coat of paint. So far a month's worth of flying (that's over 30 hours for me) has not revealed any fuel damage, and each letter and number is still perfectly stuck down. If you would like to individualize your own models, get all the specifications, ordering info, and prices

from Sinclair Custom Graphics & Design, Inc., P. O. Box 665, Grove City, Ohio 43123; (614)837-0711.

Time to close the hangar door for this issue, so join me again next month. Meanwhile, you can reach me c/o *MB* or at 2267 Alta Vista Dr., Vista, California 92084; (619) 726-6636. •

Byron in Oz. . . *Continued from page 18*

need to be complimented by something *large*.

We had been told earlier that it was not possible to transport the super B-29 used in the Byron show. This was also the case with the C-47, which does the most realistic parachute drop imaginable. But what about those 1/5-scale B-25s?

"Sure" said the Byron team. "We can take the wings off one of those and even transport it in a van." The idea of taking a B-25 to Australia was put to Byron Godberson and he agreed. At that point I knew we really would have a showstopper for the Bicentennial aviation event.

Since Bob Carpenter was going to be personally crewing the C-130 to collect the Byron equipment, I was sure the extra bulk of a crate containing the B-25 would present no problem. "Carpy" would push out the sides of that thing if he had to.

Then on the Thursday of the "Striking Back" program, a crash occurred which threatened to shoot down all of our well-laid plans.

This involved a midair collision between two of the B-25s, one of which was written off. The other was superbly handled back to the field by Ken Bryan with the left wing bent up at about 60 degrees outboard of the engine. The rear engine fairing and flap were also extensively damaged.

Somehow, this airplane would not only be ready to go to Australia in October, but would be ready to fly again in the Striking Back show the following day!

The professionalism which would mark the Byron effort for Australia was clearly evident at Ida Grove, and I was absolutely confident that the right choice had been made.

Having collected the material I needed on the Byron operation for an Australian magazine article, I bid my newfound friends at Ida Grove farewell on the Friday evening after the show and headed back for the South Pacific.

Bob Carpenter and his team duly arrived in their RAAF C-130 at Sioux City, Iowa, in late September and loaded a broad range of Byron models.

Along with the B-25 and the F-18 were included a Corsair, Christen Husky, and a CAP-21. Already on hand in Australia was an F-15 and a P-51 Mustang. Mountains of support equipment was also brought with all battery care being provided by the Ace R/C Digipace-1 charger. It all represented solid confirmation of the power and diversity of the American hobby industry.

All was safely delivered by the RAAF into Richmond AFB in good time.

The Friday before the show, the Byron team stepped off their Qantas jet in Sydney after a 14-hour nonstop flight from San Francisco.

We drove to John Chadd's home where there was the chance to meet other Sydney modelers, had some lunch (plus a few beers), then headed for Bob Carpenter's place where the models were waiting, still in their crates.

Everything was unpacked and our American friends remarked how well everything seemed to run "upside down." Americans visiting Downunder are always telling us how they are amazed at everything operating inverted!

After a couple of days of R and R (including a helicopter run over Sydney), the serious business of R/C flying was at hand.

The Bicentennial Airshow was scheduled to run three Trade Days through the week, with the public days set for the weekend.

Tuesday had been set aside for the Byron team to be hosted at Richmond by 36 Squadron, RAAF, the boys who had brought the equipment and models out from the U.S.

The highlight of this visit to the RAAF at Richmond was the opportunity for the Byron team to fly a Lockheed C-130 simulator. Ken Bryan was slotted as pilot with Ken Bundt as copilot and Bob Carpenter as engineer (his regular airforce job).

They coped with a number of engine fires and three-engine approaches into Sydney airport. Then Al Tuttle took over as copilot and more disasters were encountered and overcome.

Ken Bryan enjoyed it so much, I have it on good authority he is planning to ask Byron Godberson to install a C-130 simulator for staff R and R at Ida Grove.

In conjunction with the show, an FAI conference was being held in Sydney, and among the overseas guests were an American three-man team who, with the German and Swedish delegations, attended a function on Tuesday hosted by the modelers. This gave the Australians the opportunity to meet John Worth, Executive Director of the U.S. AMA. Val Vickers hosted the group. She will be remembered by readers of *Model Builder* as the "stunning blond" in Stu Richmond's "Rambling Around Australia" articles. Val and her husband Steve are keen modelers.

On the Wednesday morning at 7:30, the Byron team flew for the local TV cameras and the "Good Morning Australia" show. This was followed by more flying for TV cameras later in the day as the publicity machinery for the airshow swung into top gear.

Wednesday night was the only evening the Byron team would have to relax. They weren't walking around in circles and dropping things any more, but we thought they deserved another sleep anyway.

Through Thursday, all of the models were flown at least twice at RCMC with no prob-

lems encountered and this was followed by another evening seminar.

On Friday morning everything was moved over to the base at Richmond and set in place for the public display operations.

From their base tent at Richmond, the models were moved on a huge flatbed military ordinance transporter. This contraption, festooned with dozens of models and people (including Ken Bryan hanging on for dear life to the precious B-25) created real excitement among the crowd as it moved slowly towards the flightline.

And so, the Byron boys along with a strong Australian team performed flawlessly in front on an appreciative crowd of over 200,000 people on each of the two airshow public days. Certainly the B-25 and the F-18 were the stars of the show with the crowd roaring and cheering the whole time. Admittedly, the weather had been very kind to us through the entire week with light winds down the runway on most days.

Bob Carpenter and his team also flew their C-130 in the show. This was the actual airplane which had flown the Byron team's models to Australia from the United States. And it performed in a way not exactly intended for the C-130, with 55-degree climbs right after takeoff, 90-degree banks, and a precision parachute extraction of freight right on the field.

The Australian Bicentennial airshow went through without accident (except for yours truly falling through both wings of a biplane model), which was a credit to the organizers who had received so much media pressure after the tragic accident in Germany not long before.

The Byron team were promised three things when they arrived in Australia. No. 1, they would work hard, No. 2, they would play hard, and No. 3, they would be poured back onto a plane for home on the Monday after the show. And that is exactly what happened.

It must be said here that until now, most Australian modelers had been skeptical of the construction of large models used by Byron. With the visit of the Byron team and their ability to communicate and to operate their models reliably, all that has changed.

The exercise also demonstrated that modeling can stand proud on its achievements. The models received more flying time than any other operation at the airshow, the model operation was mentioned and talked about more in the press than any other aspect of the show, and it received more television coverage.

Bob Carpenter, John Chadd, and their team and especially the crews of 36 Squadron RAAF are owed a special round of applause for a job superbly done. The question on everyone's lips after the whole thing ended was "When can we do this again?" (I can hear Carpy saying, "not too soon . . .")

As for Byron Godberson, he can stand tall on having the faith to see the project through and just let his people do their thing. In speaking to Byron at Ida Grove back in August, I expressed the view that he has some especially talented people working for him. Byron agreed. To be sure, in Al Tuttle, Ken Bryan, and Ken Bundt, Byron really does have special people on his team. Their first international operation was a runaway success.

One thing I do know is that there will now be a constant stream of Australian modelers attending the Byron "Striking Back" show at Ida Grove, Iowa. Now all we need is an expansion of the hotel capacity in that town. •

Plug Sparks. . . *Continued from page 36*

SOUTHWEST REGIONAL CHAMPIONSHIPS

Received a most interesting letter from Dick Bringgold with the announcement of the 39th Annual Championships to be held at Eloy, Arizona, on February 4 and 5, 1989.

The following activities will be offered (free flight and R/C Sailplane at Toltes Road Site): Free Flight (Phoenix MAC); O/T R/C (SAM 31), Eloy Airport; Collecto (MECA), Eloy Airport; R/C Sailplane (Central Arizona Controline Club), site not confirmed.

Notice should be taken that the annual dates have been moved from the normal January dates to early February in the hopes of obtaining better weather.

As usual, Al Lidberg will be the head Contest Director with Gordon Davies handling the Old Timer Events. Also planned is a Saturday Night Social Hour and Buffet Dinner. This should get everyone acquainted!

Dick Bringgold also sent in several photos of his "Secret Weapon." As can be seen in Photo No. 10, this turns out to be a Lanzo "Racer." As Dick says, this name is a misnomer, as the model flies very slowly.

One can appreciate the size of this model when one compares the size of the 60 4/C engine with the rest of the fuselage.

READERS WRITE

Received the neatest Photo (No. 11) in color from Stuart Warner, 26101 Country Club Blvd., #907, No. Olmstead, Ohio 44070, showing a little-known Dick Schumacher design, "Hoiman." This little-known design, first built and flown in 1936, was Dick Schumacher's first successful gas job. The name, "Hoiman," was later perpetuated in subsequent F/F and R/C designs, "Hoiman II" and "Hoiman III." This writer can well remember this blue fuselage and silver wing and tail when first flown at Moffett NAS. The model, Baby Cyclone-powered, was designed for the Texaco Event and later on the 45-Second Limited Engine Run Event.

Most fellows will remember the photo in the October 1937 issue of *Flying Aces* on page 46 showing a modeler taking a snooze in the shade of his model. Phil Zecchitella, who wrote the article "At the Nationals," failed to identify either model or contestant.

This writer was extremely fortunate to have run unto the drawings of this model. When Dick Schumacher, Senior Pilot for Western Air Lines, was killed in a training accident, the widow donated most of Dick's memorabilia to Russ Barrera, who started the world's first model aircraft museum. The reduced drawings (Dick kept a record of most of his creations a la Elbert Weathers) were then turned over to Pond, who, in turn, had them approved by the

SAM Board of Directors.

Full-sized drawings were soon produced by John and Al Pond for general distribution to interested old timers. Among those that have been drawn to size are the Hop-A-Long, Candid, Pixy, Ethy, Josephine, Sally Snarf, and Gulliver. Some of the commercial designs have been Miss Fire kitted by Sky Devil Model Co. of San Leandro, California, and Thunderbird produced by Offenbach Hobby Supply.

As a matter of record, "Schooie" placed 25th in the Senior Gas Model Event at the 10th Annual Nationals at Detroit. This event was won by Fiske Hanley with a flight of 50:29 minutes. However, Schumacher did win a Burr Paterson Auld Medal with a flight of 12:04. Not bad for late, windy afternoon flying! (Results taken from September 1937 *Model Airplane News*.)

Back to Stuart Warner, who also submitted Photo No. 12 showing some fine construction work. Stuart sez the flying surfaces were made of five strips forming a laminated outline in one piece! Spars and ribs were added afterwards. This proved to be tricky, as the wing has elliptical dihedral and sweptback requiring a special building jig.

A hand-carved balsa cowl covers an Ohlsson 60 ignition. The entire plan was covered with pink silk and trimmed with maroon. He thinks Sig balsa, silk, and dope are the world's best. Stuart feels badly about not placing at the Toledo Static Events as several had no documentation and were finished with mylar plastic covering. As Andy used to say, "I is regusted."

SAM ACTIVITIES—AUSTRALIA

Received a letter of correction from former Australian SAM President, Bill Gordon, who writes to say he received credit for the Cabin Ruler in the August issue of *Model Builder* that was not of his doing. Bill goes on to say this particular design (Cabruler) is one he has always wanted to scale to New Ruler size. He regards it as a good-looking model.

Bill feels it incumbent upon him to comment on the schism that has developed in Australia. Simply stated, Australia is a vast country with relatively few modelers per square mile. A natural development is that separate groups will form as members come from different regions. As Bill says, to expect modelers to travel hundreds, let alone thousands, of miles for two-day meets, is an insurmountable problem.

The lone exception to this is the SAM Champs at Canowindra in New South Wales. This most central location has drawn well from all states with the exception of Western Australia. With limited time and travel budgets, the western boys find themselves strapped.

The Victorian NOTAM group decided to split because of rules differences and nitpicking. This may have been the catalyst but there had been rumblings of discontent before this. I don't want to take sides as I don't understand the problem's roots. However, I am quite disturbed the NOTAM group is holding their annual championship on the same dates as SAM 1788 Champs.

To this writer, this is a problem, as he cannot attend the SAM Champs at Canowindra and not show at the NOTAM Champs. I have too many friends on both sides of the fence. As Bill points out, the Victorian blokes are a lot of fun (particularly Monty Tyrrell) to have at a Champs.

Bill sends in Photo No. 13 showing SAM president Basil Healy on the left and former SAM Secretary, John Tidey, with John's SCRAM at an earlier Canowindra SAM Champs.

In addition, Bill also sent Photo No. 14 of his Jack Finneran Flyer of 1935 vintage. This modern version is powered with an Enya 40 four-cycle engine. Very nicely done, although we have run it before.

OLD TIMER INDOOR

This is something this writer has had in the back of his mind for the past ten years. When Frank Ehling approached this writer about holding the event(s) at the Nationals along with the O/T Events put on by this writer, the biggest problem was the time as the AMA Indoor events lead off the Nationals at least four to five days before any O/T Events, R/C, C/L, or F/F are held.

It remained for Edwin Lamb, 15911 S.E. 42nd Place, Bellevue, Washington 98006, to reintroduce the idea. Inasmuch as the Reno Convention Center would be available for indoor flying, Ed sent along Photo No. 15 to show what he has in mind.

As can be seen, Ed is holding a baby ROG and an indoor pusher. Both of these models are of 1927 vintage as taken from the AMLA reprints appearing in Frank Zaic's latest compilation, *Model Airplanes and the American Boy 1927-1934*. There are at least a dozen designs which would suit this event. If the modelers want to go to higher-performance models, this writer has the George D. Warner publication of *Six National Winners*, mostly 1930-31 vintage.

No rules have been proposed as of this date. Perhaps Ed could be enticed to write something for a starter. This writer stands ready to help out. Any comments from the readers would be appreciated.

FREE PLUG DEPARTMENT

Met Al Heinrich at the recent Vamps F/F Annual held at El Dorado Dry Lake in the Las Vegas area. Main reason for not seeing Al for quite some time has been recent separation proceedings and the accompanying trauma thereof.

However, Al has again settled down and is producing his well-known "Aero-Dyne" fuels. Al makes quite a variety including diesel fuel, various octane ignition mixes, and FAI fuel. In addition, Al has embarked on producing and selling standard nitrate dopes in clear and six colors from black to cream.

Heinrich also markets nitrate thinner as well as a non-tautening nitrate dope. (Great for wings over a long period of time!) In addition, covering adhesive and acetone are also offered. His prices on NGK, CM-6 spark plugs are great, ranging from $1.85 to $3.75.

For all of the above and additional information, write Al Heinrich at 398 W. Wilson, Unit F-214, Costa Mesa, California 92627, or better yet, call him at (714)646-8864.

MISS AMERICA DECALS

Ever since this columnist mentioned that

Miss America decals were available, he has been flooded with requests. The best this writer can do is to give the address of Earl Welch, 15234-40th Avenue So., Seattle, Washington 98188. Hopefully, this is a current address.

Patrick Blanco, 503 Irving St., Westbury, New York 11590, is one of the requesters for this information and at the same time submits Photo No. 16 showing his latest, a Miss America built from original Scientific Model Supply Co. plans. The framework is to be covered with silk and doped. As can be seen, the plywood side cowl covering has not been installed.

The only concession to "modern" materials is the Herb Wahl Anniversary Brown Jr. manufactured in the last few years. This should make a good winter project!

HELP WANTED!

Just about the time this column was being completed, this writer received a most interesting telephone call from Hurst Bowers, the curator of the AMA Museum.

Bowers complains the AMA Museum space is being cut up to make more offices. (Just what we need, more officials!) Hurst feels the museum serves a very useful purpose as the museum does provide education services, a reference material bank, historical summaries, and, of course, the old models on display.

The latter, of course, is the big draw to the museum, as over 400 people have dropped in during the last few months.

Hurst feels very keenly about the reduction of museum space. From a financial standpoint, the museum portion enjoys a tax-exempt status. Actually, the question that occurs to this writer is: Why did we collect money for the museum if we don't utilize the funds for what they were intended?

Hurst wants all interested AMA members to write headquarters. This is the only way to save the museum!

OBIT NOTICE

This is another tough obituary to write, as my longtime friend, John Drobshoff, died on October 26 at the age of 70 at Kaiser Permanente Hospital in San Francisco.

John Drobshoff was one of the original nine members of Junior Birdmen "Ace-Hi" Squadron 153, which later became the "Frisco Vultures" and more properly San Francisco Vultures. Those who have preceded us are Willie Deutscher, Alex Drobshoff, Charlie Werle, and now John Drobshoff. That's only five of the original members left! Gotta admit 1934 is a long time ago.

Drobshoff was active in modeling right up to the end. Photo No. 17 taken at the Woodland-Davis Flying Field (note lake on the right) shows Drobshoff with a design by his brother Alex, known as the "Little Diamond." This is a pylon version of John's Challenger kitted by Advanced Engineering of Fresno, California.

John will be remembered fondly by his numerous friends in the modeling game. We are going to miss the "Mad Russian'!

As we were about to wrap up this month's column, a letter from Gordon Codding of Kingman, Arizona, arrived with the notice that Vera Austin (widow of Clyde Austin) died after a lengthy illness at the age of 93. Gordon further states the rather small estate was inherited by a nephew in California.

Although Austin was closed and sold many years ago, Gordon Codding (3724 John L. Avenue, Kingman, Arizona 86401) has what he considers thousands of pneumatic timer body and shells. If anyone can think of a good use for them, write Gordon!•

R/C Soaring. . *Continued from page 41*

sults in a faster, flatter glide which is desired.

I went through my Eppler book, MTB 1/2, and tried to match up a similar Eppler section to this modified Paragon airfoil. The nearest I can come up with is either a E195 or E197. Both have good thermalling ability, wide drag buckets, and gentle stalling characteristics, but also have higher profile drag because of their greater thickness than the more common E193 or E205.

I have redrawn with pen and ink the pencil-sketched ribs that Fred has supplied for the reader's benefit. Not all of the Paragon's ribs are drawn because wing tip ribs W-10 through W-19 are the same design as W-9 with decreasing chord lengths.

The Paragon's relatively thick (12-percent) flat-bottom airfoil lends itself easily to this

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kind of modification. Other similar kit sailplanes may also benefit from the Phillips entry mod. However, I don't believe that flat-bottom sections less than 10-percent thick have as much to gain from this procedure. They are already low enough in mean camber that they already produce less lift, and their thickness is such that their drag values are already pretty low. Also, if not done carefully and minimally, the sharp leading edge that would result from trying to keep the same wing chord would produce a sharp stalling section that would not be as much fun to fly.

SLOPAR, A LIGHT AIR SLOPER

I recently ran into Mike Reed at a (shall I dare say it?) power flying site recently where I was attempting to show a beginner how to fly a low-winged .45-powered ARF (definitely not a specialty of mine!). He just happened to stop by the field on his way out to Corona, California, where he lives. We saw each other, exchanged greetings, and Mike told me that he had been meaning to send me a write-up on a slope glider he had recently designed. He said it flew exceptionally well, so I told him I would publish it. Here it is:

"Enclosed is the photo and three-view of my new Slopar. This sailplane uses the smallest wing chords I've ever tried using the Selig 3021 airfoil. It seems to work really well!

"I have another sloper in the works. This next one will be a 1.5-meter racing class sailplane based on a Bob Martin Talon fuselage. Features will include Quabeck 1.5/8 section, swept-wing, T-tail with swept horizontal stab, and two-function control. The plane is built, but it is awaiting a cover and paint job. Well, that's it for now. See you later on." The enclosed write-up on the Slopar was self-explanatory:

"The Slopar was designed to fill the need for a 'light air' slope glider. Carefully built, the Slopar will weigh about 14 ounces. This weight is ideal for low lift slopes such as beaches and calm inland slopes that have a wind velocity of nine to 12 mph. This glider can be ballasted to 28 ounces for flying in normal wind conditions.

"The basic shape of the Slopar was inspired by the Aermacchi 339 PAR jet. However, it is not a scale sailplane. It is an efficient, clean design that will fly in very light lift with some good looks thrown in. The versatility and low-drag qualities of the Selig 3021 airfoil give this plane sparkling performance.

"The Slopar was designed to use small radio gear, such as the Futaba Conquest four-channel with micro S33 servos. The fuselage can be built to house standard systems. Construction is balsa wood with fully sheeted wing.

"Plans are available directly through me, Mike Reed, 1775 Dumitru Way #B, Corona, California 91720, (714)737-5493. Folded plans are $7, rolled plans are $11. Money orders only, please."

WIND TUNNEL WORK AT PRINCETON

Last August, Rich Border of Klansburg, New Jersey, visited the Princeton Wind Tunnel. There he met with Michael Selig who is half of the total team doing the research on various low Reynolds number airfoils. Michael Selig and John Donovan share the work of data gathering and interpretation, and rightly should share in the glory. Rich sent me a brief couple of notes on his visit.

Rich reported that the SD (Selig/Donovan) 7032 and S3021 airfoils were testing the best. Rich included two somewhat hard to see photos of the test equipment at the tunnel. The photo which includes Michael shows the computer equipment used to collect and store data. These two guys gather 360K of information on each airfoil! Rich asked me not to run this photo because it did not give John Donovan the credit he rightly deserves. Well, Rich, you're off the hook, I take full responsibility; one photo is better than none. If somebody out in Jersey wants to supply me a photo of the whole team, I promise to run it! Apologies to John in the meantime.

The second photo shows a test model of the Eppler 214 inside the tunnel. The device at the left rotates to change the model's angle of attack relative to the flow of air. The far end (right) is free to go up, but is held down by a motor. The amount of power the motor uses determines the amount of lift being generated at any given angle of attack. The tube in the channel moves up and down and across the tunnel to measure turbulence and drag.

I hope to have more information soon.

My conversation with Michael a few months ago indicated that he and John were planning to wrap up the testing by November of 1988. Stay tuned for more info as it becomes available.

WING AND FUSELAGE RACKS

I recently received the following letter from Jim Clark of Columbus, Ohio. Jim has a very good set of ideas for storing wings and fuselages. Because it is one of the most versatile designs for this purpose that I've seen, I can't resist sharing it with you:

"Kudos for your R/C Soaring column in *Model Builder* magazine. I look forward to reading it every month. Along with several other members of my home club, the Mid Ohio Soaring Society, I am following with particular interest your coverage of the progress of Michael Selig and John Donovan's wind tunnel testing of low Reynolds number airfoils. (*Thanks, Jim, just gave you a few more tidbits above!—wrf*)

"In the interest of sharing ideas with other fliers, I am enclosing pictures of my solution to the pesky problem of conveniently storing our prized aircraft.

"The fuselage shelf is a variation on the prefab shelving available at any discount hardware store, consisting of shelving boards, aluminum channel mounting strips, and sheet steel brackets. The picture explains most of the setup of the shelf. It's a good idea to use three screws per strip with the middle one about one foot from the bottom. The upper support is the variation that makes it work. Take two of the brackets, cut them off to 3.5 inches, and drill a small hole near the end of each. Cut a one-inch diameter dowel (old broomsticks work well) to length (whatever length you want) and use wood screws to attach the dowel to the 3.5-inch cutoff brackets. Mount the brackets to the aluminum wall strips. Use some stout string to tie a piece of soft foam rubber to the dowel for each fuselage. Finally, use double-stick tape to attach pieces of foam rubber to the shelf as a fuselage nose rest. Putting the shelf near an electrical outlet will permit charging of batteries right where you store your transmitters and fuselages.

"The wing rack is simplicity itself. It is made with four 2 x 2s, two pieces of 1 x 2, and cotton clothesline. The 2 x 2s are hung with nails and screws (using expansion plugs in the wall). It's easier if you nail the 1 x 2s to the outer 2 x 2s before hanging them. The clothesline is cut to length and attached to the 2 x 2s with a staple gun.

"That's it. I hope these ideas will be useful to your readers. Keep up the good work." I like the wing rack, Jim. I have a storage problem right now that will be solved when I build my wing rack. Fuselages are so bulky that there are few really good ways to store them, especially when there are stabs attached.

I have always driven nails into the top of the hobby room wall and then used loops of heavy string to hang my fuselages by their tails. They hang securely and can't accidentally be knocked off! I use a three-foot pole or yard stick to help put the looped fuselage string on the nail hook. With a steady hand, it doesn't take long to hang 'em by holding the fuselage in the left hand while looping the string over the nail with the right hand!

WOOD FUSELAGES: WHERE'S THE STRENGTH?

I have always thought that putting cross-grained wood in fuselage tops and bottoms was wrong. I never got around to testing the relative strength of lengthwise grained wood on all four sides of a fuselage, so I always went with manufacturer instructions in these areas, and then wondered. Well, via the Montreal (Canada) Area Thermal Soarers newsletter comes the following article written by Bob Bayard of the South Bay (San Jose, California) Soaring Society.

"I've noticed that many kits with wood fuselages call for the top, behind the wing, to have the balsa grain running crosswise. I've also noticed that my Oly's (650 and II), which have this cross-grain feature, break near the tail. It made me wonder, why cross grain? For strength, friends told me. But it didn't seem reasonable that it would be stronger that way, since balsa is stronger in both compression and tension parallel with the grain than perpendicular to it. So I did a little test.

"I made two long boxes of 1/8-inch balsa. The dimensions of the boxes were 18 inches long and 3/8 x 1 inch in cross section, about the same cross section as the Oly fuselages in front of the tail. One box had all wood grain running lengthwise, the other had the top running crosswise. I broke them by putting the ends on blocks and pushing down on the middle. Both broke by cracking the bottom balsa piece

and the bottom edges of the sides.

"The box with the straight grain on top was about 70 percent stronger than the cross-grained box. To be sure it wasn't just a fluke, I made two more boxes the same way and broke them too. It wasn't a fluke.

"I thought that maybe it was torsion rather than beam strength that the designers were worrying about, even though all of my breaks were obviously not in torsion. So, I glued two broken pieces together end-to-end, one piece of each kind of box. When I twisted this 50/50 sample, the crossgrained part broke and the straight-grained part did not.

"Conclusion: It's stronger to build wood fuselages with all the grain running parallel, not crosswise, despite what the plans call for!"

WORLD THERMAL CHAMPIONSHIPS HOSTED BY THE NSS AND TOSS

That's right, it's claimed to be a World Thermal Championship! "A contest where the best pilots and their aircraft compete under the best conditions." The two hosting bodies will be the National Soaring Society and the Thousand Oaks Soaring Society, Thousand Oaks, California. Myles Moran (NSS 86-3631), 10428 Oso Ave., Chatsworth, California 91311, (818)882-4687, and Pete Carr (NSS 72-343, NSS President), 329 Little Ave., Ridgeway, Pennsylvania 15853, (814)772-4851, are coordinating the event.

The date is March 25 and 26, 1989; the site is Thousand Oaks Club Field, Chatsworth, California; the task on Saturday is 4 rounds to total 25 minutes with no flight exceeding 9 minutes, with special landing option and on Sunday it is a 4-minute duration with special landing and 8-minute duration with special landing. Aircraft Classes: Unlimited only, all AMA classes eligible. Launch equipment will be multiple winches with retrievers that are to be supplied by organizers. Awards will be trophies to fifth place plus prizes. The entry fee is $25 for both days.

Limited Entry: Includes seeded entries; all LSF Level V holders; all LSF Level IV holders who have completed their Level V contest wins; all winners of regional multi-club championships such as the NSS E.A.P., Ohio Cup, ESL Season Points Champs, etc. To be considered for entry, submit photocopy of LSF papers, proof of winning score for your club event, or other documents for committee review. Entry limited to five per frequency or 60 total.

Pre-registration ends March 1, 1989. For forms, site maps, and other information, and to have your entry considered, contact either of the above-named individuals.

NASF HOSTS LSF REGIONAL

The North Alabama Silent Flyers held the Southeastern LSF Regional Tournament on August 27 and 28, 1988, at Huntsville. The contest site was a 58-acre sod farm of hybrid Bermuda grass which looked much like a huge golf green.

The contest consisted of 10 rounds with the following format: 3 rounds of triathlon, 3 rounds of 2-minute precision, and 3 rounds of 6-minute precision. After 9 rounds, each contestant had the choice of picking a throwaway round and then reflying that round.

Landings were given 10, 15, and 20 percent of flight score based on LSF Level I, Level II, and 25-foot requirements respectively. Note that Bob Sowder is an LSF Level V (No. 60).

The contest was CD'd by Ron West with lots of support from local club members. The weather was hot (mid-90s) with little breeze, both days. All contestants expressed a real enthusiasm for the great contest site.

The above report comes courtesy of Ron Swinehart, President of the NASF. Thanks for sharing the event with us, Ron.

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The leader in electric R/C flight, **Kyosho** has taken the lid off superior electric performance and opened a whole new world of flying satisfaction to beginning pilots.

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The high wing design of the 47" span Cardinal gives it the smooth and stable flying qualities needed for easy beginning flights. It's also virtually impossible to stall, and with the included electric motor and matched prop, you'll have enough power for off-the-ground launches. Take a spare 6-cell battery with you to the field, and you can enjoy practically nonstop piloting with effortless replacement of the used pack.

Kyosho has put its expertise in electrics to work in the new Cessna Cardinal, resulting in a unique ARF that's durable, easy to fly, and above all else, lots of flying fun. Out of the box, it's magic.

If you've already experienced exciting gas-powered model flights, you'll love the Cessna Cardinal. It goes together fast, is great fun to fly, and provides a thrilling transition from gas to electric flying.

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Ron includes a note regarding his choice of contest ship: a Larry Jolly Model Products Meteor with flat, fully sheeted wings and ailerons. He has the ATRACS radio mod and believes it's the only way to go. He reports that at 95 ounces and a wing loading of 12.9, the Meteor flies great!

TIME TO RUN, TIME TO BUILD!

Thank you all contributors, both published and not yet published, we appreciate the contributions! Next month we'll have more goodies from the mailbag, plus an airfoil of the month!

Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, California 92330, (714)245-1702 •

Electronics. . . *Continued from page 19*

guessed at or did by gut feeling only. You can pick out any function at random, but the sequence starts you off exactly as you would normally set up your module by first setting up servo direction and amount of throw. Servo direction is indicated on the screen as Normal or Reversed, and throws are displayed in percentage of full, starting with 100 percent, which you can increase up to 110 percent or decrease down to 30 percent. No more juggling with linkages and those coarse mechanical adjustments. You then set your dual rates, also displayed as percentages, and, when needed, a variety of mixing functions with adjustable ratios one to the other, which are all displayed as easy to understand numbers. A couple of times through it and most of the mysteries disappear. Very soon you begin to wonder how you ever got along without it. I know just what you are thinking, but not too many years ago I remember a couple of accomplished reed fliers asking, "Who needs it?" about the newfangled proportional equipment.

Incidentally, seven channels of newfangled proportional equipment cost $700 in those days, and no discounts. The Futaba 7UAP will be less than that, in 1989 dollars yet.

All these 1024 systems include fail-safe features of various types, but I especially like an airborne fail-safe that monitors the receiver battery and when it gets to a critical point pulls your throttle back to idle. You can get back to fully controllable throttle for ten seconds by cycling the throttle stick, after which you get idle again. Once or twice of this should have you on a safe final approach to fly again after recharging. I love it; it sure beats, "I ain't got it'!

A complete descriptive catalog of all of Futaba's new goodies is available from Futaba at: 555 West Victoria St., Compton, California 90220; (213)537-9610. For those of you who like a name to write to or to ask for, it's "Patti"!

MORE FUTABA NEWS

The very popular FG Series, the familiar gold-colored transmitters, have also received an electronic face lift. Two new types have been introduced, a GFG six-channel and a 4FG four-channel system, both available as airplane versions and on AM only. Both transmitters are of the narrow band variety. To complete the narrow band system there are new receivers: the R114H for four channels and the R117H for seven.

Not so different externally, but quite so internally. One of the visible differences is the use of "J" plugs throughout, said plug now being the standard for all Futaba equipment in use on everything with the exception of its 3EGX, a two-stick boat system. Keeping things standard, the "J" connector furnished equipment also uses 1.52 millisecond timing throughout, which makes this equipment trainer system incompatible with older "G" series plugged systems.

The trainer system plugs don't match the older equipment, giving rise to some more of that nonsense about FM and AM plugs. Ain't no such thing! Plugs don't care what you use them on. As a matter of fact, the so-called "DIN" multi-contact plug so commonly used for trainers systems and charger connections, fully named "Deuitche Industrie Normenausschuss" loosely meaning Germany Industry Standard Connector, is borrowed from the audio industrie, err, industry and is not an R/C either AM or FM plug.

So regardless of what "my friend" or "the guys at the field" tell you, the current Futaba 4FG and 6FG AM systems are trainer systems compatible only with themselves, and not with any of the older FG

look-a-likes, and that is so not only because the plugs don't fit but for electronic (timing) reasons. Happens all the time, gang. New equipment often obsoletes what at one time was so-called "state-of-the-art." Another way of describing it is "progress'; all new products will at one time or another leave the older ones behind.

HARD TO BELIEVE

Here we are somewhere past midway with this month's offering and the subject of batteries has not come up yet. So, here goes!

What I have for you on the subject this month was prompted by a flying field discussion about load testing Ni-Cds, a subject that has been covered here before. A couple of simple resistors is all that is necessary if you only use the standards; i.e., 500 mAh capacity four- and eight-cell receiver and transmitter batteries. But as soon as you start to branch out, using five-cell or smaller or larger capacity receiver packs, your load testing becomes suspect. What is needed is a fully adjustable load, which is primarily what that rather simple-appearing schematic will do for you.

I say "primarily" because it is also a good explanation of just how transistors work. As you will see, the battery under test is connected directly across the collector and emitter of the 2N3055 power transistor, and when the transistor is in a conducting stage, current from the battery will flow through it. The Digital Volt Meter is connected across the battery to read its voltage. A milliameter can be connected into the battery to transistor circuit at the point marked "X" to read the load current. For setup purposes, the same DVM, set to read current, can be connected, and after the desired current is set, moved to read the battery voltage.

Now, how to make the transistor conduct the desired amount! Another battery, a common nine-volt alkaline variety, is connected to the base of the transistor through the 2K potentiometer, which is connected as a voltage divider. In such a circuit, the voltage across the pot, read between the ground side and the variable terminal, will vary as a percentage of the full voltage across the pot. As the center tap of the pot is moved towards ground, the voltage is lowered and increased to the full nine volts as it is moved towards the battery positive side. This variable voltage is applied to the base of the transistor, which will start to conduct at some point as the pot is moved off the ground side and steadily increase as the pot is turned further.

I'm sure you can see all the possibilities. For example, using the pot and measuring the resistance of it at the strategic points, you can then use fixed resistors and switch them for various current drains. Probably even easier will be to equip the pot with a knob with a pointer and simply mark off the different positions for the required drains. The physical arrangements are up to you; there is just no excuse anymore for im-

properly tested Ni-Cds.

AMA TRANSMITTER TESTING PROCEDURES

There are some differences of opinion within the R/C industry as to the validity of the AMA transmitting testing procedures.

The details are not the issue here. I mention it because to the majority of the R/Cers in this country, it is the only testing available, and I strongly recommend that your club take advantage of it and enforce the transmitter sticker program, for mutual protection. Because while the differences in testing methods might be subject to different interpretations, they do agree on one thing: the basic frequency of the transmitter, which has to be correct before a sticker will be attached to the transmitter.

The strict adherence to the use of stickered transmitters will help to weed out many of our interference problems, some caused by some complete and total "beeps" in our ranks. There are not many, but it only takes one at a field to wreck havoc and airplanes that are still operating on the old non-channel frequencies, having changed only the frequency flag to the new one closest to their old frequency. For example, if Joe Slob was flying on 72.240, White and Red, he now sports a Channel 22 72.230 flag and considers himself safe. Maybe he is, but he is also eating up Channel 24 at 72.270 directly and who knows what through Third Order Intermodulation. It takes club action to get rid of such a person; there is little an individual can do. Though, wait a minute, is there an 800-MAFIA number?

Well, so much for February. It's time to go to work on March. Let's see now. . . . •

Tech Stuff. . . . *Continued from page 43*

small end. In cutting a hollow fuselage, for instance, allow extra thickness aft for the slower wire speed, or the rear part of the fuselage foam core will be too thin. There is a better answer to that problem though: tapered cutting wire! The same current flows throughout the length of any wire, but if the wire varies in cross-sectional area throughout its length, Mr. Ohm says the resistance and therefore the voltage drop per inch and the watts per inch will vary, and the thicker portion will run cooler than the thinner portion. The cooler part will now take as long to cut the short tip chord as the hotter portion of the wire takes to cut the longer root chord. The thickness of the kerf will be the same at both ends, and the texture will be smooth all over! Perfection would require a different wire taper ratio for every different wing taper ratio, but in practice, one compromise wire taper ratio will eliminate 90 percent of our taper-cutting irregularities.

If tapered wire is commercially available, I haven't found it. I make my own. The method that works best for me is also the simplest. Just tension the wire in a bow or by some other means, fold a piece of sandpaper over the wire, and go to work. Use medium-grit garnet paper or carborundum paper, so it won't dull too fast. Squeeze the sandpaper against the wire and slide it back and forth. Work mostly near one end, half as much in the middle, and don't sand the other end of the wire at all.

A highly accurate taper is not necessary. Also, don't worry about whether you are keeping the cross section of the wire round; it doesn't matter. Any crude taper is going to be an improvement over the straight wire we have been using, but it isn't difficult to get a reasonably uniform taper. Analysis tells us that a wire with a 50 percent taper in cross sectional area is optimum for cutting a 50 percent taper wing. It will also cut any other practical taper ratio well enough. After sanding the wire for a while, I tried measuring the diameter of the wire at various locations and calculating the cross-sectional areas, but that was tedious.

The simple way to check the taper is to clamp the bow to the edge of a bench, energize the wire, and take sample cuts off the end of a rectangular bar of foam, measuring the time required to cut though the bar at various locations along the wire. Hang a fixed weight from the foam bar and let the weight do the work, so the cutting force is always the same. After checking, sand some more wherever it is needed. The complete tapering job will take you about a half hour. If the wing root chord is twice the tip chord, the wire should be tapered so it will slice through the test bar roughly twice as fast at the root end as it does at the tip end, and the middle of the wire should cut about 50 percent faster than the tip end.

If I'm not the originator of tapered wire cutting, please don't tell me!

CUTTING WIRE

I'm using #19 (.036-inch diameter) half-hard nichrome wire. This high-tensile-strength half-hard stuff is sold to industry particularly for wire cutting of foams. Number 19 is the only size I've been able to find in the half hard. A power source of at least eight amperes rating is needed to provide the current this fairly large wire draws. The small commercial variable auto transformers, such as Variac and Powerstat, will just make it if you use 8 or 10 amp fuses in them. I found this special cutting wire, and many sizes of soft nichrome, in a shop that

specializes in electrical heating elements. Look in your Yellow Pages.

You can also use the regular annealed nichrome in, say, size 24 (.020 diameter), but it will stretch at the higher wire tensions. Nichrome is not an absolute must for wire cutting, by the way. I and others have used music wire. It works fine for a few cuts, but at cutting temperatures the smaller sizes rapidly oxidize, and usually choose to break in the middle of a cut. Nuts to that! Steel MIG welding wire of .035 diameter has worked well for me. It is big enough that I have never had one break from oxidation.

Large diameter cutting wire has disadvantages, however. It requires more cutting force therefore produces more wire lag and leaves more threads of silky fused plastic, and it requires more current, which may mean a larger power supply.

Jack Lambie, in his book *Designing and Building Composite R/C Model Aircraft*, recommends stainless steel wire as stronger than (soft?) nichrome. I have been unable to find a retail source of hard stainless wire, however. Can any of you help us out? The annealed stuff seems as weak as run-of-the-mill nichrome. Neither nichrome nor stainless oxidize measurably at foam cutting temperatures because of their high content of nickel and chromium.

SOLDERING GUN FOAM CUTTING

Another very handy way to cut foam, which has been used by a number of modelers, is to use various shaped special tips in an electric soldering gun. One of the photos shows the grooving or tunneling of the surface of a wing core for the insertion of flexible pushrods for the ailerons. I used a paper clip as the source of wire for this little circular hot cutter. It runs at a nice temperature for either white or blue foam cutting. If you should make a soldering gun cutting tip that runs too hot, or even a little too cool, you can adjust its temperature if you plug the solder gun into an auto transformer. Most of these are designed to go somewhat above line voltage, as well as below.

Also shown is a heavy wire loop solder gun tip for hogging out large cavities in foam cores. You can use loops up to a half inch in diameter made of .036 steel wire. Because of the very low secondary voltage provided by the soldering gun (mine mea-

sures 0.24 vac), for larger diameter cutting loops you must use larger wire with better conductivity in order to get up to foam-cutting temperature. The two-inch rectangular loop shown was made of 12-gage copper house wire.

Grooves for low-winger landing gear support beams can be cut very neatly and very rapidly with a gun loop in the form of a small rectangle. Place a straightedge in the proper position on the wing core to guide the loop and control its cutting depth. The possibilities are endless. Foam core construction becomes fast and precise when you tool up for it, use your creativity, and get a little experience.

FOAMS

Last month I mentioned the availability of special blue Styrofoam with much higher compression strengths. I have now checked them out. The big bird boys may find some use for them, but for sixty-and-under models, they are too dense. Their strength-to-weight ratios are better than for the lighter foams, but their density is such that they would have to be cut unmanageably thin in order to hold the weight down on smaller models. The standard, lightest, and therefore best blue foam is Styrofoam type SM at 2 to 2.5 lbs./cu. ft.

My closing thought: design, materials, and processes all go together. Francis Reynolds, 3060 W. Lake Sammamish Pkwy. N., Redmond, Washington 98052; (206) 885-2647.•

Econo Throttle *Continued from page 31*

darkened room.)

Ready? Here we go!

CIRCUIT DESCRIPTION

The Econo Flight Throttle is extremely simple and contains four major functional blocks in its design. They are: the failsafe amp, blanking amp, pulse stretcher, and motor drive circuit.

The unit accepts a positive pulse input of about one to two milliseconds duration, with increasing pulse width on increasing throttle position, repeated every 20 milliseconds or so. Virtually every modern radio system with servo reversing on throttle generates this pulse format (with the reverse switch set correctly, of course). If your transmitter doesn't have servo reversing, it still has a 50/50 chance of being right, and if not, you could rewire the throttle stick for increasing pulse width with increasing throttle by swapping the outside pot leads and readjusting the wiper position for neutral.

C1, R1, R2, and U1A form the failsafe amp. If the input pulse disappears or "hangs up" high due to radio or connector failure (or from you guys out there who always forget to turn the receiver off *before* the transmitter), C1 discharges through R1, disabling the remaining circuitry. R2 protects the input of U1A from voltage below ground, and U1A squares up the pulse so it looks nice and pretty and is ready to feed the blanking amp.

U1B, the blanking amp, does exactly what its name implies; it "blanks out" the first one millisecond or so of the input pulse. The blanking time varies with the setting of VR1, C3 being fixed, and this gives us our *neutral* adjustment.

The input pulse, stripped of its first one millisecond of life, now encounters the pulse stretcher, made of an integrator (U1C, VR2, R3, and C4) and switching components which make the integrator ramp down when the input pulse goes high (D1) and ramp up when the motor is being pulsed "on" (U1D, R4, and Q1). VR2 changes the pulse stretcher gain, giving us our *sensitivity* adjustment. Properly set, the motor turns on for the entire duration of the 20 millisecond frame rate when our input pulse is at its two millisecond "full throttle, hammer down, pedal to the metal, full boogie" value. For input pulse values between one and two milliseconds, the motor pulse for a proportional time or duty cycle (semi-boogie?).

The final section of the Econo Flight Throttle is the motor drive circuit. In order to drive the MOSFET gates with sufficient voltages to drive them into saturation, the receiver battery and the motor battery voltages are "stacked" in series with R8, R9, and R10 giving RF isolation between the two. This precludes the use of a battery eliminator circuit to run the radio from the motor pack, but none of us is crazy enough to want to do that anyway; *are we?* Q2 level shifts the pulse stretcher output from the +5 receiver supply to the "stacked" supply, and in conjunction with R5, R6, R7, and R8, regulates the gate drive to a maximum of about 10 volts, half the absolute rating of the MOSFET gates. U1E complements the inversion from Q2. The MOSFETs handle the final, high current drive to the motor, and D2 and C5 serve as protection from inductive spikes.

CONSTRUCTION NOTES

If you have any question of your ability to wire the Econo Flight Throttle correctly, please seek help from a fellow flier.

The EFT will not operate with battery eliminator circuits! You must use a separate receiver pack.

Connect the pair of wires going to the "B+" and "B–" connections on the board to a connector matching your motor battery

pack. (B+ is positive and B– is negative; right?) Check polarity with a voltmeter. Please remember to wire an arming switch into one of the power leads. This is an important safety feature! Connect the pair of wires going to the "M+" and "M–" connections on the board to your motor. Use whatever noise suppression caps the manufacturer has supplied with the motor.

Obtain a connector to match your radio receiver and determine which wires are ground (normally black), +5 (normally red), and pulse. Use a voltmeter. With the transmitter and receiver turned on, touch the black (common or negative) meter lead to the ground wire and the red (positive) meter lead to the +5 wire of the connector. The meter should read about +5 volts. Now touch the red meter lead to the pulse wire (with the black meter lead still on the ground wire). The meter should read a few tenths of a volt, and should increase as you move the transmitter's throttle stick forward. Now unplug the connector from the receiver and connect the wires to the input of the Econo Flight Throttle as follows: ground to "G," +5 to "+5," and pulse to "P." Double check all your connections. For safety, remove the prop from the motor for your initial tests. Okay, ready to power up?

Adjust the neutral pot first so the motor turns off at one "click" above your low throttle stick position. Then adjust the sensitivity pot and full motor rpm at one "click" below your full throttle stick position. Use your servo reversing switch, if necessary, to get the proper stick direction. The EFT gives increasing speed with increasing pulse widths only.

The MOSFETs must have adequate airflow for cooling. I usually cut a small port in the fuselage to direct the prop blast onto the MOSFETs. Don't forget an air exit hole somewhere. (What goes in must come out!) A heatsink can easily be fitted to the unit if you so desire. Happy Flying!

The following items are available from Howard Cano, Box 5627, Arvada, Colorado 80005-0627: Econo Flight Throttle Basic Kit (pc board, CD4069, and three MOSFETs), #EFT-K, $16.00; Assembled and tested unit, #EFT-A, $34.95. Include $2 shipping per order. For questions and correspondence not accompanying an order, include SASE.

PARTS LIST

Semiconductors: U1, CD4069; D1, 1N4148; D2, 6-amp 50-volt power rectifier; Q1, 2N3904; Q2, 2N3906; Q3 to Q5, International Rectifier IRFZ40, Siliconix SMP50n05, or Motorola MTP50N05.

Resistors: R1 to R4, 470K; R5, 4.7K; R6 and R8, 2.2K; R7, R9, R10, 220 ohm; VR1 and VR2, 50K upright trim.

Capacitors: C1 to C5, .1 uF (100 nF).

Miscellaneous: 20-amp automotive-type fuse; two uninsulated 1/4-inch quick-connects. •

Free Flight. . . *Continued from page 49*

The remaining wing straight and diagonal ribs can be developed using the "eyeball" method or can be plotted using this month's Darned Good Airfoil chart. The stab ribs presented are the I rib, which is the root rib, and the L rib, which is the tip. The missing ribs should be developed by the "eyeball" method.

The tip plates are very important and must be included on both the wing and stab. Close attention must be paid to weight savings, but if you fly in areas where the ground tends to poke little holes in the covering, I would recommend that you double tissue the bottom of the fuselage.

Bruce's model flies right under power and right in the glide; however, it can be trimmed to fly left under glide by using stab tilt. No wing warps are used on the ship, as the large amount of taper on the wing tips have the effect of washout.

Now, one last little feature. The original article included one of those charts which indicate how the designer would build this model in different sizes. This chart has been included this month. Take a look at it, as the A-B sizes will produce a model with a wing area of 578 sq. in. and the B-C version will give you a whopping 927 sq. in. Full-sized plans are not available to the best of my knowledge. Good luck with it.

FEBRUARY DARNED GOOD AIRFOILS—Eiffel 431 and Eiffel 431, 85 Percent

The Eiffel is one of those sections that has been around and in use by free flighters for as long as I can remember. It is one of the old standards. Many of the early rubber

models used some version of the Eiffel, and if you have a good collection of Zaic Yearbooks, it appears regularly. So, here is the Eiffel 431 for your consideration. Jose Tellez took the standard 431 and reduced its thickness so that he could provide a "faster" climbing model which still maintained the glide.

One of the features of this section that endeared itself to the old timers was that it was very forgiving in both the climb and the glide, so it was easier to trim these models. For your consideration, I have included both the "full-sized" version of the Eiffel 431 and an 85-percent version, as used by Tellez. Take your pick.

FEBRUARY MYSTERY MODEL

In the Northwest we fly an event known as Cabin Nostalgia. The rules are the same as the NFFS Nostalgia event except that the model must have had a cabin or canopy in its original design. The February Mystery Model seems to me to be a perfect candidate for this event. This ship was a nice size at about 450 sq. in. wing area. It was powered by a K&B .15 Green Head and was entered in FAI events during the '50s. Its designer is still an active free flighter. Think you know what it is? Okay. Then, here's what you do: Just send a letter to Bill Northrop at *Model Builder* with the name of the model on it. Also include your own name and address. If you are the first one with the correct answer, you can expect to receive a free, one-year subscription to *Model Builder*. Do it now.

MYSTERY MODEL ANSWERS

As was to be expected, we had lots of correct answers to the October '88 *Mystery Model*. It was Herb Clukey's "Flyette," which is kitted by his Flyline Models company. Dan Yamada, Sacramento, California, made it by one day over several other readers. Bud Stevenson, of Salem, Oregon, was one of those narrowly edged out by Dan, and he commented on the chances a subscriber has to win this game. Barring day-to-day goof-ups, subscribers, and those who buy their *MB*s at hobby shops serviced by RCMB, have the best chance of winning. The other, and major portion of our distribution, is through the newsstand service. All copies of any one issue leave the printer on the same day. Subscriber and hobby shop copies go to the Post Office, and immediately (it says here) start their journey to your mailbox or to the hobby shop. The newsstand copies are bulk-shipped to the distributor and are normally expected to be on sale three weeks later. In other words, the Post Office has a three-week head start on the newsstand service. Draw your own conclusions!

The very short-nosed A/2 glider in the November issue was "Snoopy," designed by Dick Lyons, formerly from Illinois, and now a Californian. An Illinois modeler, Keith Hoover, was the first of only a few with the correct answer. Possibly the fact that he had just recently received a set of Snoopy plans from his friend, Dick, had something to do with his knowing the answer!

December's *Mystery Model* probably had more wrong answers than any model we have used for this game, but they all had

the right designer, Claude McCullough. That's probably what caused the problem. Claude undoubtedly came up with numerous variations on a theme. The correct name of his December model is the "Pixie." Some of the other names given, with Claude as the designer, were: Blazer, Matador, and Fledgling. Regular M/M answerer, Ed Turner, of Ft. Worth, Texas, was the winner this time.

Now for a couple of overseas winners. On October 15, Franz Czerny, of Vienna, Austria, wrote to give us the correct answer for the October M/M, the Flyette. Not bad on timing, but in the same letter, he commented that he received the May issue in September, the October issue two days later, and has never received the July and August issues! Some of his issues were misdirected to Australia before he received them. Again, you can draw your own conclusions about postal service!

Of course, it's not always the P.O. that goofs. Tom Andrews, of London, England, sent us an aerogramme in July with what may be the only answer to the July M/M, the "Atakee." Somehow, we missed this one, until Tom's recent letter, and will give him the benefit of the doubt.

So there are your five winners to finish off 1988. . . unless we receive another letter from overseas postmarked before December 31!

CORRECTION, CORRECTION

In the November and December issues of *Model Builder* "Free Flight," in the feature of George Benedek, I said that he was a resident of Czechoslovakia. He is a Hungarian who lives in Budapest. Also, the three-view of the Julian is in German, not Hungarian. I am sure those in the know will realize the faux pas, but for the rest of us, please excuse the errors.

UPDATE ON THE GOLLYWOCK

Mark Sexton has built and flown some Gollywocks (see January 1989 issue of *Model Builder* "Free Flight"). He disdained the use of the wing mounting system used on the original model. Instead, he determines where the wing will be mounted on the fuselage by completing nearly the entire model except for covering the top of the fuselage, then he straps all of the pieces together to find the 70-percent CG, and finally, he builds in a triangular opening just in front of the wing leading edge and a similar one just behind the trailing edge. He installs a wing wire hold down in each of these triangular openings and covers the fuselage top, leaving the triangle uncovered. Mark has sent along a sketch of the design and you can find it elsewhere in this column.

Mark also suggests that you apply a finish top coat on your Gollywock fuselage with banana oil, as it seals the tissue against soakage from the rubber lube being splattered around the inside. Now, I have looked high and low for banana oil and haven't found it. Next month, I will report on my successes in this search.

GAISER ON PANDA RUBBER

Bill Gaiser is one of the local free flighters who approaches the hobby with a scientific eye. Recently, Bill shared with me his tests of the new Panda rubber that is being imported from China by Champion Model Products. His report follows:

"I have received both the 6mm and the 4mm Panda rubber and, as promised, have run the tests that I always do on each batch of rubber.

"Torque is important. I do mine on a torque meter, but I have no quarrel with Fred Pearce's method or his results. As important as energy storage potential is that every motor, whatever its size, be wound to its maximum safe number of turns. To accomplish this I use the formula: Turns = C x L x Sq. Rt. of L/W.

"I have used the formula for at least 20 years and swear by it. It is equally applicable all the way from indoor motors to F1B. All that is necessary is that you have an accurate experimental method of determining C. This takes a certain amount of good, consistent lab procedure, which I will not go into here. When you have determined a C value, you are then able to wind any motor *of any size* from that batch of rubber to its maximum safe torque. As weird as the formula appears to be dimensionally, *it works!*

"Roughly, the procedure is to make up short loops of the rubber to be tested and wind to destruction. It doesn't tell you which is the best batch of rubber, as stretch and torque tests do this, but it does tell you

how to get the potential energy out of that 'best' batch or 'less than best' batch of rubber. The test does waste a certain amount of rubber. If this is a worry, you belong in a different hobby.

"The test results tell you more than just the max safe turn for any motor, it tells you the variability of C and weight per inch of loop for tine sections of the skein. The tiny sections are those that result in broken strands following maximum turns. For F1B, I would take off 40 grams and then 24 inches, 40 grams and 24 inches, etc. The 24-inch pieces went into the destruction test. By doing this, I had a view of the variability of the entire skein. This was especially valuable with some batches of Pirelli since the variability would progress fairly uniformly from one end of the skein to the other.

"The foregoing is a long way of explaining my conclusions regarding Panda rubber and certainly more work should be done. The results of the Panda testing and tests on 1982 Pirelli and 1982 FAI follow.

"Conclusions: 1. The 6mm Panda is too variable to be useful. 2. The 4mm is much better; equivalent in variability to Pirelli, except one loop broke while stretching. And the break was not at the knot."

RUBBER TEST RESULTS

Panda Rubber, 6mm
Test No. "C"
1. 6.21
2. 4.72
3. 4.51
4. 7.11
5. 7.32

Panda Rubber, 4mm
Test No. "C"
1. 6.77
2. 7.10
3. 7.43
4. Stretch break
5. 6.59

1982 Pirelli, 2mm
1. 6.11
2. 6.32
3. 6.80
4. 6.70

1982 FAI Rubber, 2mm
1. 6.34
2. 6.26
3. 6.31
4. 6.32

For the information of our readers, I have been in touch with George Schroedter, proprietor of Champion Model Products, and he is on his way to China in the near future to check up on and improve his contacts with the Chinese who are supplying the Panda rubber. The results of his visit and how it relates to both an improved quality and supply of this power strip will be carried in *Model Builder* "Free Flight." Stay tuned.

JACK'S MODELS MOVES

Jack's Models, the company that gives you the Satellite kits and other free flight competition accessories has moved from the Southern California area to settle in the green valleys of Oregon. If you are looking for any of the excellent Satellite kits that Jack produces, contact him at 7178 Aumsville Hwy., Salem, Oregon 97301. If you can't wait, give Jack Moreland a call at (503)588-8407.

KUSTOM KRAFTSMANSHIP ADDS TO ITS LINE

If you are on the mailing list to Joe Klaus's Kustom Kraftsmanship firm, then you are aware that Joe has added a big bunch of items for free flighters and others to his line. If you are not on the mailing list, then send a buck to Kustom Kraftsmanship, P.O. Box 3010, Fallbrook, California 92028. Request his new catalog. You'll be pleasantly surprised with what you will find available.

THE END AGAIN

I think that wraps it up for February. I'll leave you with a few thoughts gleaned from our friends:

Nat Comfort shares: "Nostalgia Ain't What it Used to be." Seen on a bumper sticker, as reported by commentator Paul Harvey.

Nat Comfort adds: "I thought something was missing 'till I tried R/C—it wasn't." Bill Baker shares: "A man should place a bet every day. Otherwise he might be walking around lucky and never know it . . ." from an old horse trainer who died broke.

And from Bob Stalick: Thanks for sticking with me for another issue of *Model Builder* "Free Flight." Catch a thermal for me! •

Astro . . . . . *Continued from page 25*

are a few areas where the plans don't provide as much detail as they might. An experienced builder familiar with electric power would have no trouble, but a newcomer might find himself wondering what to do. Astro Flight reports that they are working on a new set of instructions to ease the workload for future builders. In the meantime, I hope I can help you over what might otherwise be a few tough spots.

Keep in mind while working that weight control is important. This would not be a good airplane on which to use epoxy glue. I used Hot Stuff products. Keep the sanding block handy and don't be afraid to use it.

The tail surfaces are straightforward. Don't be scared by the curved, laminated leading edge on the horizontal stab. The kit instructions mention that you might want to

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bend it wet. This is okay if you are more comfortable doing it that way.

As the wood in the Challenger kit is of excellent quality, I wasn't concerned with doing a dry bend; I cut several "pinning blocks" from scrap balsa, pinning through them and using them to hold the two laminations in place while building the rest of the structure in place against them. I had no problem with distortion after removing the completed structure from the board. Be aware of one possible source of error: the stab trailing edge and tips are 3/16- x 3/8-inch balsa. This looks very similar to the 1/4- x 3/8-inch wing leading edge. Make sure you pick up the right piece of wood. The rudder holds no surprises. I sanded mine to a semi-feather at the trailing edge. This isn't necessary but results in a nice appearance and a slight weight saving. I cut slots as appropriate for the hinges provided in the kit; these are one-piece plastic hinges with a "waffle" pattern in the tabs for secure attachment.

You should have no problem with the wing. I had no trouble bending the spars and the leading edgestock for the outboard panels without wetting, using pinning blocks as with the horizontal tail. You will have to notch the trailing edge to accept the ribs before beginning assembly. Do be aware that the wing is built entirely flat on the board; there is no washout (twist) built into this design. Leave the top center section sheet ahead of the spar off until after the wing center panel has been removed from the plan so you can install the tie-down dowel properly, with scrap filler between the two center ribs. The sheeting is completed after the dowel is added.

The fuselage is based on two 3/32-inch sheet balsa sides with 3/16-inch square balsa corner reinforcements added as indicated. These are necessary for you to be able to sand the corners of the fuselage round after assembly. There are no formers aft of the wing trailing edge. Don't worry; if you sheet the top and bottom cross-grain, as the plans indicate, you won't need any. The structure is plenty rigid as designed. Assemble the sides at F-1 and F-2 using a square to insure alignment. Install the 3/32-inch sheet crutch, which is really a cabin area floor. Be careful when adding the nose block that the pre-cut hole, which forms the motor mount, is set at the angle shown on the plan, as this determines motor downthrust.

To insure proper alignment of the rear portion of the fuselage, pin the assembly over the top view of the plan, bottom down, and join the sides at the tail, being sure that you line up on the centerline. Pin as necessary to line up the sides with the outline on the plan and sheet the top with 1/16-inch balsa cross-grain. This will lock up the assembly so you can finish the bottom off the plan. Notice that there are two alternative nose drawings shown; if you are using a direct drive motor, you simply slide it into the precut hole in the nose block. If you have a geared motor, remove the gearbox, slip the motor into the noseblock from the rear, and reattach the gearbox. You might want to add a keying block or two to prevent the motor from rotating in the mount and moving the prop shaft off center. I found that after a few dozen flights, my gearbox (and prop centerline) had been moved about five degrees off center by motor torque.

Cowling the geared motor will require you to do a little carving and hollowing of the nose block material provided. I matched my nose cowl to a spinner and attached it with small screws to two thin plywood plates Hot Stuffed (Special T) to the front of the fixed nose block. Although this added a fraction of an ounce, this made for a readily removable cowl. If you don't use a spinner, you'll get plenty of cooling air through the front of the cowl. I added two flush intakes under the nose; check the photos for a look at these. Keep in mind when planning locations for your motor and radio switches that you may need to be able to shift the motor battery around somewhat to balance the airplane. Make sure you leave yourself room enough to move!

The wing attachment is pretty much self-explanatory. You will need to tap the 1/8-inch ply wing mount and the 3/16-inch balsa filler that lies over it to accept the 1/4 x 20 wing bolt. It's a good idea to flow thin CA into the area after cutting a thread, then run the tap through again, in order to get a really strong installation.

I suspect that most Challengers will be covered with plastic film products, and the

airplane is designed to have acceptable structural strength using these materials. Since I prefer a little more rigidity in an airframe and like the total freedom from worry about slipping or sagging, I used Sig's Silray (silk-rayon fabric) applied and finished with butyrate clear dope. At the expense of somewhat more time and effort being required to complete a covering and finish, this approach results in superior strength, including resistance to surface flutter at high speeds, an absence of seams that might slip, and an avoidance of that "plastic" look. Silray is available only in white, but I dyed mine with ordinary Rit dye for a really neat deep orange see-through finish. You've no doubt heard that "silk-and-dope" is too heavy. Published figures indicate that silk and an appropriate amount of clear dope is equal to or lighter than an equivalent plastic covering. Here's the facts: I used a 300 mAh battery, rather than the lighter 250 mAh pack shown on the plan. My servos are a fraction of an ounce heavier than the S-33s indicated, and I added an aluminum spinner. The advertised weight of the Challenger is shown variously as either 39 or 40 ounces. My airplane weighed in on a commercially certified digital scale at 39 ounces! If your local hobby shop doesn't carry it, you can order Silray directly from Sig.

With the building and finishing done, I installed a lightweight radio system that I had been saving for an appropriate project. My Airtronics 92245 mini-receiver and three 94401 servos fit with no problem. (I used a third servo and micro switch furnished with my 05 system in place of the Astro electronic on-off control shown on the plan.) I elected to use a slightly larger radio battery, as mentioned earlier, and installed a 300 mAh pack from SR Batteries. Though I haven't pushed it to the limit yet, I have already determined that I have over an hour's flying time in this pack, and my ESV tells me that I can do this with a safe margin of reserve charge left. This system operates with one of my "old reliable" Airtronics Championship 7 transmitters, and has proven to be a super match for this airplane. With the radio system and motor battery in the position shown in the photos, I found the airplane to be in perfect balance.

I had done several "run-ups" in the shop before the airplane was finished, and so had become familiar with the Astro AC/DC Auto Charger before it was time to fly. This is one neat unit and completely eliminated my concern about having to learn exotic battery charging procedures in order to be able to fly electric. It consists of a timer-controlled charger, operating off either household line current or an automotive battery, with a current adjustment that allows you to charge 4- to 7-cell packs of from 250 to 1200 mAh capacity in 15 minutes. A meter allows you to monitor and adjust current during the charge period. An adjustable trickle-charge circuit takes over at the end of the timed fast-charge automatically. Provision is also made for voltage monitoring with a separate meter to allow peak charging. As this was my first "fast charge" system, I was initially a little apprehensive about getting everything right. A few minutes spent studying the instructions eliminated the anxiety—everything worked perfectly on the first try.

With everything ready to go, Mother Nature cooperated for once by providing us with a beautiful Saturday evening; warm, gentle breezes dying away to a flat calm, and everyone else in the club unaccountably gone home early, leaving the field empty for my wife (and good flying buddy) Teryl and me to check out the new goodie. This is when all the "will it really work like they say?" gremlins jump out and bite you, but I told myself that Astro Flight didn't get that good reputation for nothing, and did a range check, final inspection of the Challenger, and that final walk out onto the runway. Wiggle the controls, flip the throttle stick forward (*Love* the sound of the Cobalt!), moderate toss, and . . .WOW! Hot dog! I love it! Up went the Challenger at a consistent 30- to 40-degree angle of climb until I had her near the limit of visibility. Since the air had cooled to the point where there wasn't much more than a few patches of "zero sink" lift remaining, eventually I had the airplane back down at a hundred feet or so. Turning on again, I found that I had sufficient charge to make two more max climbs, with a little left to play around in the landing pattern. At about that time, one of my friends showed up and I treated him to a repeat performance. Was he impressed? You betcha!

The Challenger turned out to be easy and straightforward to fly under power and with the motor off seemed willing to ride even the light lift available in the still evening air. Subsequent practice reveals that the airplane does a fine job of spotting her own thermals; flying hands-off through un-

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WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, Washington 98027.

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IGNITION AND GLOW ENGINES. Collectors, runners, used, new. Sell, trade, buy. SASE for large list. R. L. Eierman, 504 Las Posas, Ridgecrest, California 93555; (619)375-5537.

ATTENTION INDOOR FLIERS! Fast and powerful motorized rubber band winder. Battery powered. $10 postpaid. Electric Winder, 1441 E. 54th Place, Chicago, Illinois 60615.

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known air will result in a pronounced turn away from any lift encountered. The excellent rudder authority of the Challenger allows an immediate turn into the thermal, and you're on your way. The trick is to let her do the hunting for you.

The first flights were made with a 12-6 Super M prop. When I felt I had enough time on the airplane to be able to make a comparison, I switched to the Hobby Horn folding propeller. This is a 12-7, with black glass-filled nylon blades attached to a machined aluminum hub. It is designed to work with the Astro Cobalt 05, and no modification was necessary to mount it. As I suspected, the greater pitch resulted in a somewhat better climb with an attendant increase in current drain, which showed up as a decreased amount of "extra" charge after three climbouts. The glide, needless to say, was markedly improved. As I can't find a "standard thermal" to use for calibrating performance, I can't give you quantitative figures, but there is no doubt that the folder will give you a competitive edge. The most dramatic evidence of the cleanup that resulted from using the folder was the first few landings I made after having used the "fixed" prop; I had to rethink my entire approach pattern, as the Challenger acted as though she had been greased.

To say that I'm pleased with the Astro Challenger-Cobalt 05 system would be an understatement. Any reservations I had held about getting into electric for keeps disappeared with that first flight. If you are on the fence yourself about electric and have any interest in sailplane flying, this is the combo that will make a believer out of you. There are a lot of electric sailplane kits and motor systems around that will fly. This is the one that will really perform the way you hoped it would.

A few weeks after my first flight I took the Challenger to the Puget Sound Electric Model Flyers Sixth Annual electric fly-in in Seattle. This is a two-day affair that always draws some of the top electric fliers in the Northwest. On the first day I made a few flights but spent most of my time looking and listening. On Sunday, I decided to get serious! The day was mostly overcast, with light, spotty lift, but the Challenger and I got together and won the high-time trophy! As if that weren't enough, I had decided to put on a little demonstration of the aerobatics that can be done with an airplane like the Challenger; I took home the aerobatic trophy "for showing how much can be done with a plane not often thought of as aerobatic at all." Remember my comment about the extra strength inherent in a doped silk covering? I put the Challenger through consecutive loops, stall turns, lazy eights, rolls, short stretches of inverted flight, precision high speed low passes with breakaway pullups, and a split S, and she loved it. It just goes to show what a versatile airplane Bob Boucher designed. Build it right and you can stop worrying about getting out of those "hat sucker" thermals!

My wife has asked me to add a little postscript for her. As a longtime active supporter of my model aviation activities, Teryl has

NOTICE: New Full Size Plan prices are now in effect. Send a long self-addressed stamped envelope for your list of retail plan prices.

been involved with her own rubber power and control line airplanes, and has more ability with an R/C trainer than she realized. As a veteran elementary teacher, she has for years been incorporating aerospace and model aviation units in her classroom instruction. Even so, she has never been at ease around my engines, even the four-strokers I use almost exclusively now. During the first flight of the Challenger she said, "I think I could really get interested in that." As I landed for the first time, she took a good look at the airplane and said, "I want one of those." Her message to those of you with wives, girlfriends, or daughters who might just be holding back from full involvement with model airplanes because they can't come to be as comfortable around engines as you are, try an electric. You might get a lot more out of it than just a clean, quiet airplane!

We are currently building an Astro Viking with a geared Astro Cobalt 035 for Teryl.

I have a thing for scale airplanes, too. The more I think about it, the more I realize that I need an Astro Porterfield with a Cobalt system. Can't you just see how neat that would be doing quiet touch-and-gos? •

Counter. . . . . . *Continued from page 7*

ware, and a formed tailwheel wire that will accommodate up to 2-1/4-inch wheels. Look for it when visiting your favorite hobby shop.

* * *

New books this month include these titles from Zenith Aviation Books: *Miami Props* by Austin Brown and Mark Wagner, a 128-page all-color look at the transports that fly into Miami and off to exotic Caribbean and Latin American destinations. Filled with close-up photos of venerable aviation workhorses, this is an interesting follow-up to the earlier *Big Props*.

Digging into aviation history, specifically the German FW-190 fighter, was the task of well-known author Heinz Nowarra, who has produced a beautiful volume containing 250 line drawings and photos of the Focke-Wulf fighter that proved itself to be a match for the British Spitfire in WWII. Germany's best piston-powered fighter is followed from concept to development in this complete look at the aircraft.

Another in the continuing *Aircraft Archive Series* is this second volume on *Post War Jets*. You'll find detailed drawings and photos of such jetplanes as the F-86E Sabre, DeHavilland Sea Venom, Miles M77 Sparrowjet, Grumman F9F-8 Cougar, and the Republic F-105 Thunderchiref, along with many more interesting aircraft. This detailed collection of original scale aircraft drawings is the best yet seen, and is a worthy addition to anyone's aviation library. All of these books are available from Zenith Aviation, Box 2MB, Osceola, Wisconsin 54020. •

Dear Jake. . . . . *Continued from page 9*

ladies to perform an outside humpty.

The quality of flying by the international field of competitors was remarkable. Every pilot, including the two alternates who flew judge practice flights, performed superbly. In an atmosphere where all the flying was excellent, it was truly difficult to differentiate the five best for the finals. The highest points went to those aircraft that drew the straightest lines in the sky, did not over or under rotate any spin or roll maneuvers, or

were flown by a sixteen-year-old pilot.

On Sunday, the five finalists battled it out for the money in a grueling series of eight flights each. When the wind came up after the first round, things got even tougher. Scores in the known, free, and unknown were close, so the outcome came down to the three-minute free-for-all program. These airshow-like routines allowed the pilots to do anything they wanted to show off their skills and their aircraft's capabilities. Chip Hyde did a spectacular torque roll, and Steve Rojecki did a very original maneuver called "shortening-the-propeller-on-takeoff." But Hanno Prettner took home all the marbles with a lomcevak-like maneuver called the "Hanno Screw." Several veteran T.O.C. competitors remarked that it was not the first time that they had experienced a Hanno Screw.

The Tournament of Champions is more than just a model airplane contest. It is an entire entertainment package put together like a Vegas floor show. Between each round of competition, there were several demonstration programs including the full-scale Eagles Aerobatic Team, the Violett ducted-fan jets, and a variety of R/C helicopter performances. Two of the helicopter demos were capped off by beautifully choreographed crashes, proving once again that helicopters don't really fly, they just beat the air into submission.

Well, that's about it. It was a marvelous show for one and all, and I hope they continue it uninterrupted for years and years. Now, Bill, about that expense account that I submitted. They have these things in Las Vegas called slot machines. See. . . .

(Sincere apologies to Bill Bennett, Phil Kraft, Doc Edwards, and to all the other hard-working and dedicated people who put on the Tournament of Champions. I hope you guys have a sense of humor. The T.O.C. is the premier modeling event in all the world, and its return after a four-year hiatus was a resounding success. Congratulations to the contestants and many thanks to the organizers and sponsors for a great show.

Mr. Bennett and his staff have announced that there will be a T.O.C. in 1990, with a new field and a new headquarters hotel, the Excalibur, now under construction by Circus Circus Enterprises. Hope to see you all there.)

Jake •

Workbench. . . . *Continued from page 9*

magazines about the new R/C frequencies and the 1991 narrow band equipment. We think the most clearly written and to-the-point explanation of the whole situation has been summarized in the following by AMA Executive Director, John Worth. Read it once, then once again, and then maybe a couple of more times after you finish this column. Take your time and really absorb it . . . and believe it.

Regarding the need for narrow band equipment for all 72 MHz Radio Control operations, beginning in 1991, the problem involves much more than interference from other R/C operations. It needs to be realized that non-R/C commercial operations (typically voice communications) are authorized to use all the frequencies in between the 50 we will have for R/C in 1991. Thus, no matter what R/C frequencies you choose to use in 1991 (actually even now), there can be commercial voice operations, right next to any of our R/C frequencies. Therefore, if you don't have narrow band R/C equipment, your chance of being shot down will be greatly increased. Even if your club elects to use R/C channels spaced at 40 to 80 KHz apart at their field, there can be (and probably will be, the way commercial non-R/C operations are growing) a voice or other communications signal only 10 KHz away from any R/C frequency. On this basis, narrow band R/C is a must; if not right now then for sure within a couple of

years.

In any case, most current R/C transmitters are either narrow band already or they can be adjusted to be narrow band. The basic problem for 1991, therefore, is to obtain receivers which are narrow band. Current technology can provide such receivers and some are apparently already on the market while others soon will be.

Meanwhile, although the growth of non-R/C activity only 10 KHz away from our R/C frequencies makes the need for narrow band equipment increasingly important, experience to date indicates that where such activity prevails does not necessarily preclude R/C operations on adjacent channels, unless the commercial transmitter is near to those operations and emitting very high power. In the Washington, D.C., area for example, monitoring of ten such commercial transmissions operating in between and on both sides of R/C channels 28 through 48 revealed no interference problems for narrow band equipment.

Regardless of what AMA or the FCC requires, narrow band equipment will be a necessity for the near future, simply to avoid interference from non-R/C operations. This is what you need to consider if you expect trouble-free Radio Control.

GIPSY PLANS

Several months ago, we mentioned availability of one-third scale plans blown up from our original one-fourth scale drawings for the Gipsy Moth DH-60 biplane. Quite a few sets were sold, and to the best of our knowledge, several aircraft are under construction. The plans are now permanently included in our plans list as number 2892, and will be found in this month's full-size plans list. Sure wish I had the time to build one.

AIR CANNON

We've had several letters from modelers who have built the "air cannon" published in our October '88 issue, but the one from Clyde Deatherage, of Auburn, California, gave us the best laugh. We've excerpted some of it for you.

I used a three-gallon plastic bucket that had contained carpet adhesive. The vortex tube is a plastic container that was hair shampoo, 2-3/4-inch diameter about 7 inches long. I used a large plastic garbage bag for the diaphragm, but being only 2 mil. thick, I put two layers on, one at a time.

Like you say. . . It blows out candles at 25 feet and with a little aiming, I can put out one at a time when they are spaced at 6 inches apart.

I "shot" my cat from about 30 feet. She jumped about 3 feet in the air and came down and wouldn't move for about 10 seconds, then very slowly searched and pawed the area around her looking for what hit her.

I took it to our last club meeting and demonstrated it at the show-and-tell portion of the meeting. It was a big hit. If you ever saw a bunch of adults playing like little kids, this was it. They were shooting at guys across the room and getting about the same response as I did with the cat.

FOOD FOR THOUGHT

We gleaned this one from the March '88 newsletter of the Southern Alameda County Radio Controllers, John and Nancy Mitchell, editors.

We hear a lot about the "infinite value" of human beings, but Harold J. Morowitz, a Yale University biochemist, recently proved it.

Working with a chemistry supply company's catalog, he began tabulating the true value of the human body.

Hemoglobin ran $285 a gram; insulin, $47.50 a gram; human DNA, $76.00; and alkaline phosphatase, $225; among others. On the more expensive side, bradykinin (amino acids) sold for $12,000 per gram, and follicle-stimulating hormone cost a whopping $8 million for each gram.

When the final list was compiled, Morowitz calculated that each body gram averages out to $245.54. Multiplying that amount by his dry weight (68 percent of the body is water), he arrived at his final value: $6,000,015.44.

"It was a tremendous upgrade to my ego," the biochemist said upon learning he was a veritable six-million dollar man. •

TYPO DEPT.

In the January, 1989 issue, in Bob Benjamin's Daydream Biplane article, a typographical error in the last column on page 101 occurred. The correct prop was a Graupner 14-7.

Flight School.

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Go to school with the Professor, the radio control trainer that makes electric flying easier than ever.

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Wingspan	48.82" (1240mm)
Area	446.5 sq. in
Weight (w/rec system)	39 oz.
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