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BELOW: This month's featured construction project is a nifty four-channel 1/2A sport job dubbed "Flat Cat," designed by Jose Tellez especially for the Cox .05 RC engine. Spans 34 inches and takes readily available micro RC equipment. Jose's second prototype 'Cat uses a Czech-made MP Jet .061 engine; hotshot fliers could probably even go up to a .10 with only a little beefing up. Article starts on page 68.

ON THE COVER

Well-known RC scale modeler Charlie Valentino, of Lake Ronkonkoma, New York, is pictured with his immaculate scratch-built 1/4-scale Boeing F4B-4. Charlie used a set of scaled-up vintage Cleveland kit drawings for the outline and engineered the structure himself. Model is powered by a Zenoah G-62, is guided by a Futaba seven-channel RC system, spans 89 inches, weighs 34 pounds ready to fly and features working lights. Covering is Super Coverite, and that beautiful finish, believe it or not, was all done with Krylon spray cans! Photo was taken by Frank Gudaitis, whose photo story on some of Charlie's other spectacular models begins on page 50.

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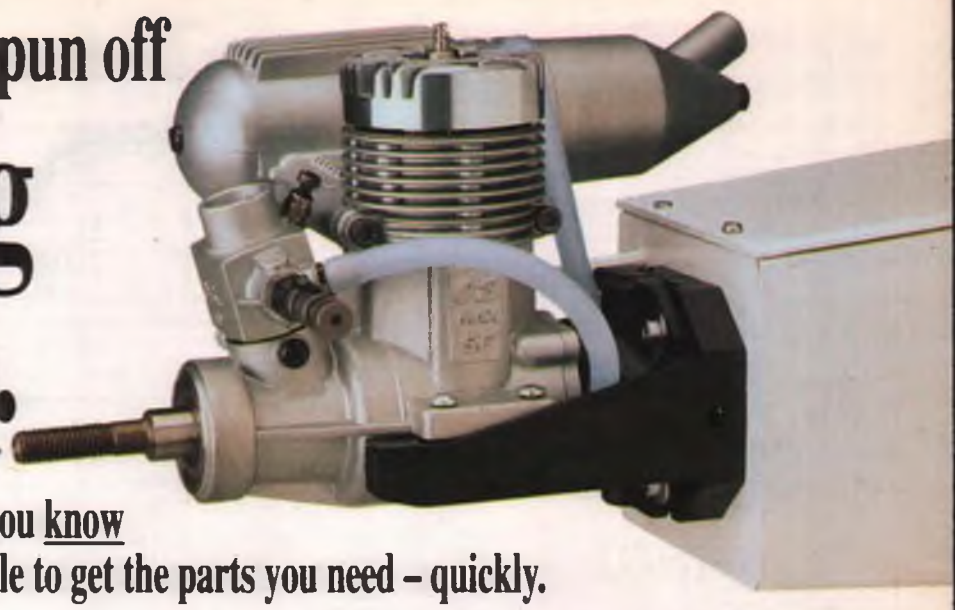

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BY FRANCIS REYNOLDS

Rebuttals to Jörgen Skogh's Aerodynamics Article

In the September 1995 issue we published a guest article on basic aerodynamics, written by Jörgen Skogh of Sweden. As soon as that article was published, I started getting letters. A number of aerodynamics-type readers told me that the Skogh article contained mistakes. This month we will present some of the rebuttals to that article. I've taken the liberty of shortening them and occasionally inserted a clarifying word or two in brackets.

Let's start off with a bang with a letter from S. Cole:

"The MD&TS column of 9-95 contains two errors of [serious] magnitude. These [incorrect statements] are:

"'Aspect ratio has nothing to do with induced drag.'

"'Lift equals weight.'

"If A/R has nothing to do with induced drag, why do aircraft manufacturers go to the added expense . . . of high aspect ratio wings? It is suggested you look at page 73 of Perkins and Hage (*Airplane Performance Stability and Control*, Wiley & Sons).

"With regard to lift equaling weight, for full-scale transport aircraft this is mostly true. For RC aircraft, it is almost never true owing to the fact that maneuvers are the game rather than 'straight and level.'"

Peter Soule had this to say:

"Jörgen Skogh's letter was interesting. A major blooper, however, deals with lift coefficient. Clearly, if you view the lift coefficient as the ratio of wing loading to dynamic pressure, you have to interpret wing loading as the ratio of wing *lift* to wing area, *not* aircraft *weight* to wing area!

"Example 1: In constant-altitude flight at the same speed, the lift coefficient must be higher in a turn than it is while flying straight and level. The induced drag is higher also.

"Example 2: The lift coefficient is slightly smaller in (unaccelerated) gliding flight than in level flight, and it is zero in a sustained vertical dive. Here too, wing lift, not aircraft weight, is the determining factor.

"Of course, when we talk about aircraft instead of wing alone we talk about the *aircraft* trimmed lift coefficient. The wing in a conventional aircraft has to lift not only the load impressed by the accelerated aircraft mass, but the tail down force as well; so the aircraft will generally stall at a lift coefficient below that of the airfoil of the wing.

"Example 3: A 60-degree banked turn requires a lift coefficient double that of level flight at the same speed. Stalls at high G-loading are examples of stall at speeds well above the quoted 'stalling speed,' which is associated with the lift-equals-weight condition. In short, the lift coefficient cannot be calculated if you don't know the lift. It *does* depend on the lift."

Daniel Fritz' letter to me starts off by identifying the true culprit:

"Regarding your September 1995 MD&TS column, how could you let yourself be so duped! Just when I thought we were finally done with people who subscribe to the Prandtl wing theory, you allowed one of them to revive the nonsense. I admit, if your mind can cope only with simple paradigms, then the theory is useful. However, the cause-and-effect relationship is backwards. A wing does not create lift 'by deflecting the air passing by downwards.' Air is deflected downwards at the trailing edge of the wing (and upwards ahead of the leading edge) *because* the wing is making lift.

"Whatever lift is generated must occur between the leading edge and the trailing edge of a wing. Once a molecule of air passes the trailing edge and becomes part of the downwash, it no longer

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Piper J-3 Cub 60 (GPMA0162) — **Wingspan: Standard Wing:** 90 in (2285 mm) **Clipped Wing:** 83 in (2110 mm) **Wing Area: Standard Wing:** 1123 sq in (72.4 sq dm) **Clipped Wing:** 1037 sq in (66.9 sq dm) **Weight:** 9.5-12 lb (4310-5440 g) **Length:** 56.5 in (1435 mm) **Engine Required:** 2-stroke .60-.90 cu in (10-15 cc) or 4-stroke .70-.91 cu in (11.5-15 cc) **Radio Required:** 4-channel w/5 servos

Piper J-3 Cub 40 (GPMA0160) — **Wingspan: Standard Wing:** 76.5 in (1945 mm) **Clipped Wing:** 61.5 in (1560 mm) **Wing Area: Standard Wing:** 820 sq in (52.9 sq dm) **Clipped Wing:** 653 sq in (42.1 sq dm) **Weight:** 6.5-7.5 lb (2950-3400 g) **Length:** 49 in (1245 mm) **Engine Required:** 2-stroke .40-.60 cu in (6.5-10 cc) or 4-stroke .48-.70 cu in (8-11.5 cc) **Radio:** 4-channel

Piper J-3 Cub 20 (GPMA0158) — **Wingspan:** 61.2 in (1555 mm) **Wing Area:** 525 sq in (33.9 sq dm) **Weight:** 3.75-4.5 lb (1700-2040 g) **Length:** 39.2 in (995 mm) **Engine Required:** 2-stroke .15-.25 cu in (2.5-4 cc) or 4-stroke .20-.26 cu in (3-4 cc) **Radio Required:** 4-channel

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has any ability to act on the airframe.

"The fact that a wing's upper surface is 'longer' than the lower surface plays a critical part in creating the dynamic pressure difference. Consider the often overlooked relationship between this and the angle of attack. As the angle of attack increases, the point of divergence moves toward the lower surface of the wing. This increases the 'distance' around the upper surface while decreasing that under the lower surface. Assuming the airflow remains attached, more lift will be generated at the same speed (which, of course, will require more power [and the aircraft will climb]—or the aircraft will fly more slowly at the same [or lower?] power setting).

"Keeping in mind $F=MV^2$, it should be no surprise that the faster but less-dense air coming off the upper surface can deflect the more dense airflow beneath the wing. The lower-surface airflow is itself already deflected 'down' because of the angle of attack; at the trailing edge it is further deflected down by airflow off the upper surface. This downwash is a byproduct of the wing's function. It is the equal but opposite [Newton] reaction. It is not, however, the lift, nor does it play any part in causing a wing to fly.

"At the very end of his article, Skogh acknowledges total pressure variations 'do indeed, add up to the total lift of the airfoil.' If the best corroboration Skogh can offer is an article by Nigel Moll in *Flying* magazine, then it is truly time to put this 1910 wing theory to rest. One trip to any decent library will produce numerous works validating the traditional wing theory outlined above. There is a reason why we have all heard of Bernoulli, and [few] have heard of Prandtl."

And we heard from Mickey Nowell:

"I bought the September issue specifically for this article and was looking forward to someone straightening things out in the modeling press. I am disappointed. Skogh makes several mistakes and reaches some very incorrect conclusions.

"The first fundamental error is very typical of non-formally trained aerodynamicists. This point is so often missed it is worth emphasizing here. Skogh's basic lift equation, L=W, is not an equation for aerodynamicists. It is a condition that is required for level unaccelerated flight. Most armchair aerodynamicists see 'L=W' and read this statement as 'The lift is always equal to the weight.'

"Formally trained aero people see this statement and read: 'If you are going to have level flight without climbing, turning or descending then you must make enough lift to equal the weight of the aircraft.'

"Several erroneous conclusions come out of the first interpretation. One is that the aircraft will always magically produce enough lift to equal the weight. This is the mistake that [*MB* helicopter columnist] James Wang continues to make in ridiculously asserting that the heavier you make a helicopter, the faster it will fly in straight and level flight. Another erroneous conclusion you can come to is that since 'L=W' always, you can substitute W for L everywhere in every single aero equation. This is good algebra but poor aerodynamics. This is the mistake that Skogh makes.

"Let's set some things straight. An infinite wing, or a wing that touches the sides of a wind tunnel, does not produce induced drag. It does produce lift. The circulation that Skogh talks about is there and does produce lift, but the upwash angle in front of the wing matches the downwash behind the wing and the lift vector is not tilted. A finite length wing produces tip vortices that are the result of high pressure under the wing trying to get around to the low pressure side on top. These vortices create an additional downwash that is in addition to the circulation downwash. This 'induced' downwash is what tilts the lift vector back and creates 'induced' drag.

"The strength of the tip vortex is a function of the amount of lift the wing is producing (lift coefficient), the wing planform (aspect ratio), tip shape, wing twist, taper, etc. (all lumped into an efficiency factor, not an ellipse factor).

"The equation most seen in the literature is: Coefficient of Induced Drag equals the Coefficient of Lift squared divided by the quantity (aspect ratio times e). This is easily rederived from Skogh's own stated equation. The Pi factor [shown in Skogh's article] is missing because it was from Prandtl's original work, assuming a pure elliptical planform where the area formula has a Pi in it.

"The result of looking at this equation is that the induced drag is proportional to lift coefficient [squared] (this makes sense as at higher angles of attack the pressure differences between the top and bottom of the wing are large, generating strong tip vortices), and inversely proportional to aspect ratio and planform efficiency.

"Weight has nothing at all to do with induced drag. A wing in a wind tunnel [at a given angle and velocity] will make the same induced drag whether made of lead or Styrofoam. The same aircraft flying at the same speed with two different weights will have two different amounts of induced drag, because *to maintain level flight you must produce enough lift to be equal to the weight;* therefore for the same speed the heavier airplane will have to fly at a higher Cl, will produce higher induced drag and coincidentally must make more thrust to overcome this increased drag to maintain the same speed as the lighter airplane. Interesting [and often missed] conclusions: lighter airplanes can go faster than heavy ones on the same power!

"Now for something that is widely misunderstood. When you turn the airplane, you must increase the Cl since when banked you are tilting the lift vector off to the side. You must, to maintain altitude, produce *more lift than weight* so that the vertical component matches the weight. The same aircraft turning (or climbing, etc.) with the same speed must fly at a higher angle of attack (up elevator) and will therefore slow down from increased induced drag when

continued on page 87

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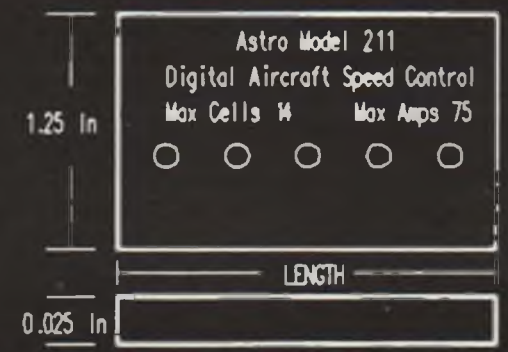

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over the counter

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JR'S F400 RC SYSTEM

JR's new F400 is designed to be the ideal entry-level or sport airplane radio, a high-

quality but economically priced, no-frills four-channel FM system that includes servo reversing on all channels, buddy box trainer system and direct servo control. The receiver supplied is the R600 (1 ounce, just 1/2-inch thick), the servos are JR's 507 standards (three of 'em), and the system comes with 600-mAH Sanyo NiCds and charger. From Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

GREAT PLANES NEWS

O.S. has come out with four completely new non-ringed sport performance aircraft en-

gines, the .25 FX (pictured), .32 SX, .40 FX and .46 FX, all of which come with mufflers and incorporate a remote needle valve as an integral part of the backplate. Other distinctive features include a low-profile crankcase design, squared-off cylinder fins, longer crankshaft, bigger front ball bearing, and a redesigned carburetor. These engines should be in hobby shops by the time this issue hits the stands. From Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300.

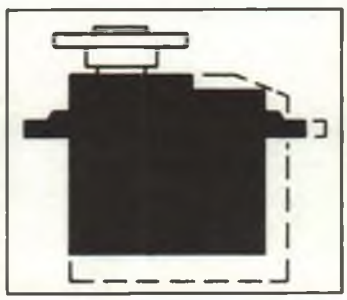
ZIROLI'S BIG SKYRAIDER

A 1/6-scale Douglas A1 Skyraider is the latest large model plans set to be offered by Nick Ziroli, making 19 in all. Four sheets make up the plan set, which sells for $46; a fiberglass cowl is also offered at $42, and a canopy goes for $18. What you end up with is an attractive all-wood model that spans 100 inches, covers 1620 square inches, is 78 inches long, weighs 30-35 pounds ready to

fly, and is designed for engines of from 3.7 to 5.2 cubic inch displacement. From Nick Ziroli Plans, 29 Edgar Dr., Smithtown, NY 11787; (516) 467-4765. A fully illustrated catalog is yours for $2.

REALLY TINY SERVOS

One of the most interesting new items we saw at the Chicago RCHTA show was the new HS-60 *super-micro* servo from Hitec RCD, illustrated here full size with the HS-80 micro shown dotted for comparison. The 60 is smaller in all three dimensions than the 80 (especially in height), and weighs 13.3 grams as compared to the 80's 17.8 grams. Factory torque rating for the 60 is 16 ounce-inches of torque—just over half of that of the 80. From Hitec RCD, 10729 Wheatlands Ave., Suite C, Santee, CA 92071; (619) 258-4940.



RUBBER SCALE LOW-WINGER

Tom Herr's latest rubber scale kit is a more modern subject: the distinctive V-tail Beechcraft Bonanza, scaled to 30-inch span and complete with over 80 laser-cut parts, all stripwood, rubber, hardware, decals, windshield, spinner, computer-drawn plans, tissue, illustrated instructions and more, retail priced at $34.95. The landing gear is designed to be removable for even better and more realistic flight performance. Check with your local hobby dealer for availability. From Herr Engineering Corp., 1431 Chaffee Dr., Suite #3, Titusville, FL 32780.

ONE HOT LITTLE DIESEL

The latest addition to the over 250 diesel and glow en-

gines imported by Carlson Engine Imports is a Russian-made reproduction of the 1950 Elfin 1.49cc (.09 cubic inch) diesel, which was a favorite of free flighters and in fact won the World Champs in 1952. The Russian repro features ABC

When contacting the manufacturers/distributors mentioned in Over the Counter, please tell them you read about their products in Model Builder magazine!

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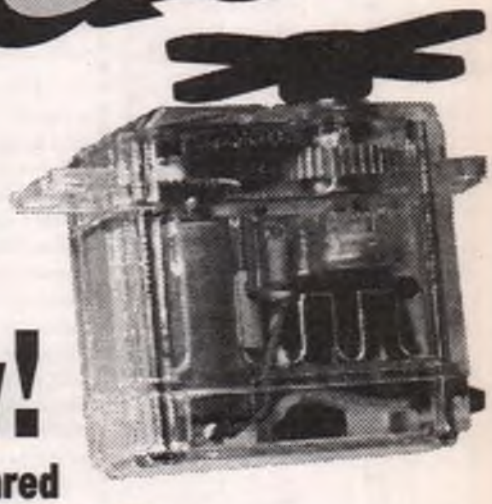

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construction and weighs in at only 2.64 ounces. Going price is $55; check with Ed Carlson for available options and shipping charges. Carlson Engine Imports, 814 E. Marconi, Phoenix, AZ 85022-3112; (602) 863-1684. A complete catalog is yours for a buck.

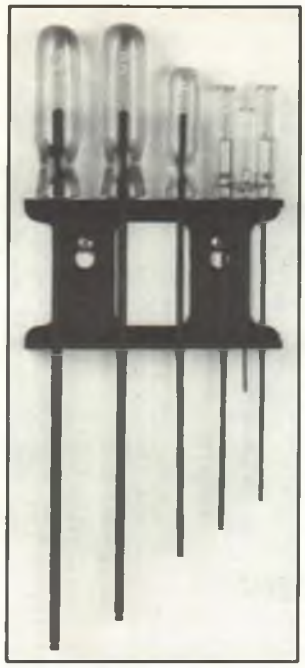
FUTABA'S FS-1

Unveiled at the RCHTA show in Chicago late last year was Futaba's new FS-1 Fail Safe device, an add-on accessory that plugs between a servo and the receiver and allows you to set a predetermined position for that servo (such as low throttle) in the event of radio interference or other loss of signal. The FS-1 measures .31x.78x1.37 inches, weighs just 1/4 ounce, and retails for $79.95. Useful in RC boats and cars, too.

Check it out at your local hobby shop. From Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.

DU-BRO NEWS

A useful addition to any modeler's workshop is Du-Bro's new ball driver sets, offered in both standard inch sizes (six pieces, $15.95 retail) and metric sizes (five pieces, $14.95). Both sets come with a special wall-mounted holder, which is also available separately ($3.95) if you already have an assortment of ball drivers and just need a place to keep 'em. From Du-Bro Products, 480 Bonner Rd., Wauconda, IL 60084; (800) 848-9411.



STREAM'S ELECTRIC HOTROD

The sleek Akro Pro 25E is the newest kit from Stream Inc., a 42-inch span sport/aerobatic model designed for the Model Electronics geared Turbo Plus motor and a 10-cell battery pack. The 4-pound, 410 square inch all-wood ship uses a symmetrical airfoil and is designed for full four-channel controls. The complete kit with formed landing gear, ABS cowl and wheel pants, clear canopy, die- and machine-cut wood parts, full-size plans and instructions retails for $89.95. From Stream Inc., P.O. Box 1113, Newport News, VA 23601; (804) 591-0720. A complete catalog is available for $1.

MODEL ENGINE MAG

Model Engine World is a monthly English publication well into its second year and is now available to U.S. model engine enthusiasts at a reasonable price. We haven't seen a copy, but it's described as having engine reviews, rework info, engine construction articles, a German engine column, free non-commercial advertising and a variety of other features. Subscriptions are available at $45 for 12 issues, or you can get a sample copy for $4 postpaid. Checks or money orders should be made out to U.S. agent Richard Palmer and sent to him at P.O. Box 609, Palisades, NY 10964; or call him at (914) 359-9240 after 5 p.m. EST.

FOR ELECTRIC FLIERS ONLY

If you're into electrics, we recommend you invest a pre-addressed business envelope with two 32¢ stamps for the current catalog of plans, partial kits and accessories offered by Modelair-Tech. One of the newest plan entries is for the "LOWWATT" model pictured here, the first in a series of "Stick Scale" Speed 400 models built almost entirely from 1/8x1/4 balsa sticks. The LOWWATT spans 36 inches and weighs in at 16 ounces or less with a six-cell 500-mAH battery and micro radio. Full kits for this model and others are expected to be available soon. Send for your catalog from Modelair-Tech, P.O. Box 12033, Hauppauge, NY 11788-0818; (516) 979-1475. *MB*

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MODEL BUILDING 101

BY J.J. LEVINE

Learning Art and Science through the Building and Flying of Model Aircraft

As you read this, we are the midst of our fall/spring semester at Simpson Middle School, Marietta, Georgia.

Approximately 800 students, building our three different model aircraft, will learn the practical applications of aerodynamics, mathematics, physics, science and even literature. We're delighted with the ever-expanding group of interested individuals throughout this country and in Great Britain that are eager to "cookie cut" our program in their areas.

James E. Mathis, a partner in Mathis and Mathis, CPA, was appointed and has accepted a position on the Board of Directors of Model Building 101. Jim was directly responsible for leading our company through the maze of technicalities involved in obtaining our 501(a)1 designation from the IRS.

A retired military officer, Jim was with the IRS for seven years and for the past 15 years has been a Certified Public Accountant. He has handled our business and private affairs with expertise and to our complete satisfaction since 1983. It was natural for us to turn to him for guidance and direction. We are very grateful for his research and performance, and consider ourselves fortunate to have him oversee and direct the financial division of this not-for-profit corporation. He can be reached at Mathis and Mathis, CPA, 1224 Sandtown Rd., Marietta, GA 30060.

Dennis P. Brooks has also been appointed and has accepted a position of Director with MB101. Brooks is a graduate of the Aeronautical Academy and was a reserve test pilot on helicopters for 12 years, during which time he also flew rescue craft for the Space Shuttle. He is also a computer specialist, which skill he incorporates into his many talents.

Since his retirement, Dennis has formed, in the schools of Colorado Springs, a comprehensive teaching program for students to learn rocketry and RC flying. Brooks has been invaluable as a source of educational programming. He has submitted, for our use, outlines for physics, science, math and even literature to incorporate into our Middle School programs. Dennis can be reached at 8595 Contrails Dr., Colorado Springs, CO 80920-4965.

Marvin Malicki has been designated and has accepted the position of Advisor to MB101. Since the inception of our program, Marvin has been an active and staunch supporter of our project. We met when he was vice-president of the Cobb County Radio Control Club in Georgia. His background in modeling extends from the early '30s. After leaving the Air Force he became a Construction and Sales Manager for a steel framing company. It was 41 years later that he decided to retire from that organization. I have come to trust his judgment, dedication and willingness to help at all times, in any capacity.

As an advisor, we have also come to depend on Marvin to do whatever was necessary, while suggesting many of the improvements that are constantly being appended to our project. I welcome him aboard, and judging from his past record, look forward to his participating for many years to come. Marvin Malicki can be reached at 759 Sugar Springs Ln., Marietta, GA 30060.

Please note: None of the officers or advisors of Model Building 101—including myself—are financially compensated for their time or work devoted to the operation of our organization. We are extremely grateful to them for their altruistic contributions and dedication.

In searching for willing and qualified associates, we have become acutely aware of a truism within the fable about a cobra and a good samaritan. Bear with me, it is germane to our subject matter.

It seems that in a dry, unbearable blistering dessert, a cobra was trapped beneath a huge boulder.

As in all fables, passing by was a good samaritan. The cobra, able to speak, said, "Free me, good stranger, for unless you do I will surely die in this heat."

Disregarding his own health and safety and under those sweltering conditions, our good samaritan struggled mightily with the mass of stone and after what seemed an eternity, inched the rock sufficiently for the snake to wriggle free.

Almost immediately the cobra coiled and struck the samaritan with a fatal bite.

"Why," asked the mortally wounded samaritan, "after saving you from certain death, have you thus killed me?"

The reply came automatically, it was simple and spoken softly: "It's my nature."

Therefore have I learned, for those that become involved or prefer to remain indifferent, it's their "nature." We seek individuals having compulsive feelings that require them to give of their talent and expertise.

We are not evangelistic in our attempt to recruit. I, for one, can do nothing less than devote all of my time to this project. We urge you to join with us, in your area or ours. The reward you will find is in the hearts and minds of the students you teach. Their memory of what you have done is your living monument in the future.

• • •

As was noted in our previous article, our regional headquarters for the state of Georgia, located at the Chatahoochee River Club field in Cumming, Georgia, now has a fully operational classroom for the instruction of teachers learning to conduct classes using the MB101 curriculum. Future reports, in our newsletter and column, will detail specific activities which will hopefully be replicated throughout the country.

As a not-for-profit IRS 501(a)1 designated company, we solicit your tax-deductible donations for this worthy cause. You may contact us at Model Building 101, Inc., 1891 Branchview Dr., Marietta, GA 30062; (770) 973-3598; Fax: (770) 422-2765. ***MB***

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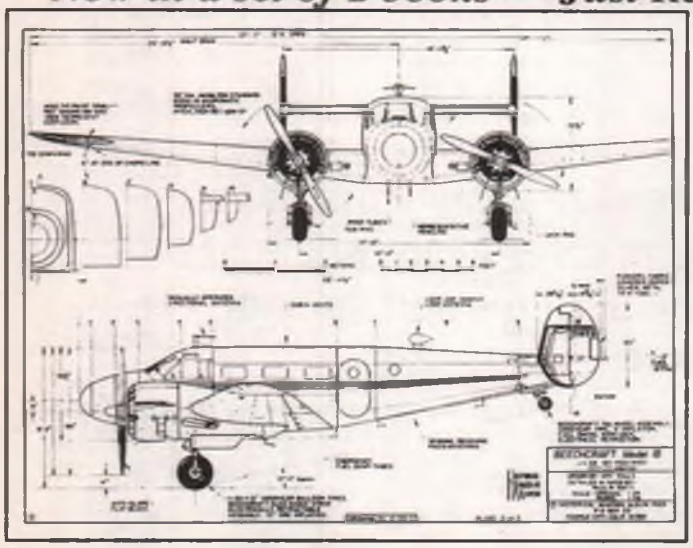

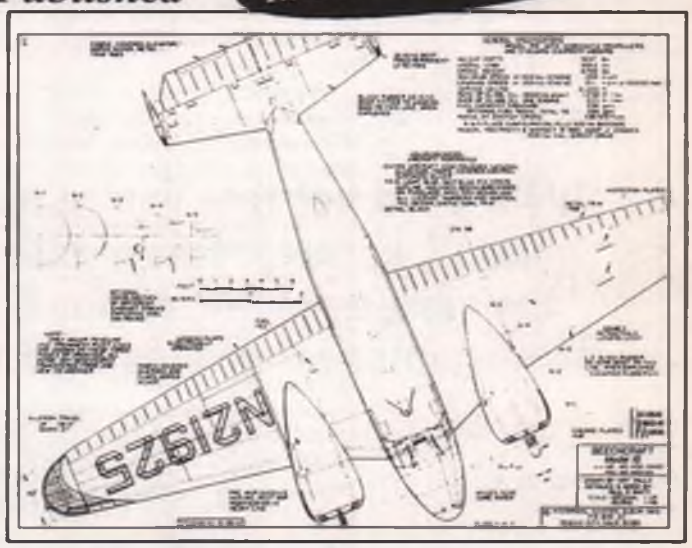

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Is There a Control Line Club Near You?

It's a good bet that you're not too far away from some good CL activity. This month John talks about some of the various clubs, regional newsletters and special interest groups that serve CL modelers.

Control line model airplane clubs and flying groups seem to be popping up all over.

Last month we mentioned the new Southern California Association of Team Racers (SCATR), which plans a schedule of monthly races this year.

Next comes news from a little farther up the coast, in the Oroville and Yuba City area of California, where the Sutter Buttes Control Line Unlimited group has formed.

"We're about 15 guys, half of which fly regularly," reports member Tom Hagler. "In the three years we've been a club the membership has grown from three to 15, with most of the growth in the past year. There seems to be good CL interest in these parts, and we have informative flyers in the local hobby shops. Still, we frequently pick up new members who didn't know we were around."

The SBCLU fliers are mostly precision aerobatics enthusiasts, with a few who have flown some combat. Some fly in local contests, entering in stunt, balloon bust and carrier events. The club has been affiliated with Western Associated Modelers, but plans to switch to AMA affiliation this year as WAM ends its independent status and joins with AMA as a large club.

"Our big claim to fame is the 'Kids Fly Free' thing we do at the Yuba Sutter Air Expo every August," Hagler reports. The idea of the program is to get youngsters acquainted with CL flying. The club builds the planes and then helps the kids learn to fly them. Most recently the club used the Top Fun, a design by Allen Wulf from around 1989. Little Wizards have been used in the past.

"As in past years, were unable to accurately count the number of flights, but we estimate it was around 150," Hagler says. "There were lots of repeaters, but probably 100 kids flew."

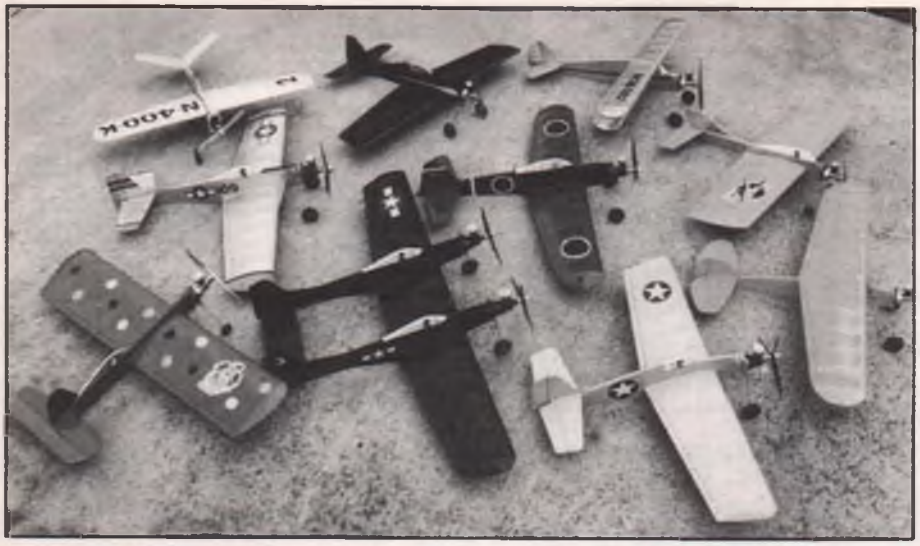
The club meets the fourth Tuesday of every month at 1338 Hunn Rd. in Yuba City, at 7 p.m. Anyone in the area interested in flying with the club can contact Tom Hagler at (916) 534-5435.

The Sutter Buttes Control Line Unlimited's "Three Stooges Stunt Team," from left: Clint Ormosen, Mike Bush, and Tom Hagler. The Sutter Buttes group does a lot of flying in the Yuba City area of California. Photo provided by Tom Hagler.

Kids start lining up around 9:30 a.m. for the Sutter Buttes "Kids Fly Free" day in August. About 100 learned to fly last year. Tom Hagler photo.

We've also heard from Tom Sater in Kenosha, Wisconsin. The local Flying Dragons club is an active CL group with about a dozen regulars and a large number of occasional fliers.

"We get together regularly in the spring, summer and fall (about twice a week), and



Brodak Mfg. & Dist. Co. is producing a whole line of "1/2A Series" profile CL ships, for skill levels 1 through 4, and with a variety of wing and tail designs—including a biplane, a double-fuselage twin-engine model (F-82 twin Mustang), a V-tail, and more. Kits feature die-cut parts, a complete hardware package, full-size plans, and photo-illustrated instructions. Check with your local hobby shop for availability. Produced by Brodak Mfg. & Dist. Co., 100 Park Ave., Carmichaels, PA 15320; (412) 966-2726.

usually take the winter to dream up new plans, repair old planes and do some building," Sater reports. "Swap meets in this area also help to carry us through the snowy months."

The Flying Dragons range in age from young kids to fliers in their 70s, and interests range from sport flying to stunt and some informal combat. Sater himself is a flier who likes building and flying airplanes that are a little out of the ordinary, and flying is a family affair for him. His two small sons and wife also get some air time.

He got started about four years ago, the way many of us do, trying to get a plastic ready-to-fly plane to work. That project (an old model found in a basement) was a failure, but it ignited a spark that was fanned with the discovery of a book in the local library, Walt Musciano's *Building and Flying Model Aircraft*.

That helped get the Sater family flying, scratch building and flying their own .049-powered planes. Working without much help, their trial-and-error efforts progressed slowly until a modeler gave Tom an old profile P-40 Warhawk. He attached a K&B .28 Sportster for power.

"It was amazing how much easier the larger plane flew, with its stronger pull and greater wing area," Sater reports. "Since then, I've stayed with larger planes and rarely looked back on my small squadron of reed valves."

There's a lesson there for experienced modelers: Those old planes that you don't fly anymore can help a new, struggling modeler get started. If it's just hanging in your shop gathering dust, consider giving it away to a beginner.

The Flying Dragons fly regularly at a site dedicated for CL use by Kenosha County, just off Highway 50 next door to the county ice arena. For information about Flying Dragons activities, contact Tom Sater at 8849 34th Ave., Kenosha, WI 53142.

Model airplane clubs and informal flying groups exist all over the country. Many put out newsletters on a monthly basis. Their club meetings and flying sessions are always open to new fliers. Many put on small local fun-flies and contests as well as big regional meets.

What follows is a sampling of some of the more prominent model clubs that regularly send newsletters to us here at *Model Builder*.

(If you're a member of a flying group not listed here, send a report of your activities to the address at the end of this column, along with your club newsletter, and we'll try to let fliers in your area know about your club in an upcoming edition of the column.)

The Capital District Model Airplane Club serves the Albany, New York area, and members fly at various sites in Albany, Schnectady, Burnt Hills and Coxsackie. The regular flying sessions are usually on Sundays from 9 a.m. to 2 p.m. at parking lot H of the State Office off Western Avenue in Albany. Bill Hummel is president. Information about the club can be obtained from *Circular File* newsletter editor Robert Aronstein, 1416 Albany St., Schenectady, NY 12304.

The columbia Basin Balsa Bashers have contests or activities monthly at various sites in Richland, Washington. The regular flying sites are Marina Park and Horn Rapids Athletics Complex. Information about the club is available from newsletter editor Charlie Edmonds at 10115 Willow Way, Pasco, WA 99301.

The Eugene Prop Spinners have members from Oregon's southern Willamette Valley, and host the annual Northwest Control Line Regionals. They fly regularly at an overflow parking lot and grass area at Eugene Airport. The newsletter, *Prop Spinner Chatter*, is edited by club president Mel Marcum. For information about the club, contact Mel at 2065 Providence, Eugene, OR 97401.

The Northwest Fireballs serve the Portland area and southwest Washington state. Dave Royer is president. The Fireballs fly at Delta Park in Portland. Information about the club is available from newsletter editor Alice Cotton-Royer at 2435 N.E. 84th Ave., Portland, OR 97220.

The Orbiting Eagles are a longtime CL club in Omaha, Nebraska. They fly on the first and third Sunday of each month at Seymour Smith Park, and have a number of special events and contests each year. Gary Hays is president. Information about the club is available from newsletter editor Bob Furr at 8147 Read St., Omaha, NE 68122.

The Seattle Skyraiders serve the Puget Sound area of Washington state, with members from Seattle, Tacoma and the various small towns and suburbs. They fly at the Boeing Aerospace Center in Kent, and at Carkeek Park, among other informal sites in the area. Former precision aerobatics world champion Paul Walker is president. Their newsletter, the *Skywriter*, is edited by Steve Scott. For information about the club or a subscription to the newsletter, contact Steve at 11422-87th Ave. Ct. E., Puyallup, WA 98373.

The Sky Lancers of Washington D.C. is a club that puts on a variety of fun-flies and shows in the area of the nation's capital. Information about the club and the newsletter can be obtained from John Vlna, 13010 Collingwood Terr., Silver Spring, MD 20904.

The Southern California Association of Team Racers is one of several organizations in the Los Angeles area. Information about their 1996 racing series and other southern California activities is available from Kenn Smith at 521 Jansen Ave., San Dimas, CA 91773.

The Topeka Control Line Association flies on Saturday mornings and Sunday afternoons—and many evenings—at Gage Park in Topeka, Kansas. Regular meetings are held there during the summer months, and at Dee & Mee Hobbies at 3624 S. Topeka Blvd., October through April. The club also holds occasional contests, including the May TopClassical. The newsletter, *TOPCLASS News*, is edited by Travis Taylor, 1620 S.W. Mulvane, Topeka, KS 66604.

The Tulsa Glue Dobbers are an Oklahoma club that has remained active despite a search for a new flying site last year. The newsletter, *Round and Round*, is published by De Hill. Information about the club can be obtained from De at 5811 S. Utica, Tulsa, OK 74105.

Two clubs serve the Vancouver, B.C. area: the Pacific Aeromodellers Club and the Vancouver Gas Model Club. PAC, an all-CL club, publishes the excellent newsletter *Airwaves*. VGMC, which also has FF members, publishes the *Hot Head* news-

letter. Both clubs fly at a special CL site at Rice Mill in Richmond, B.C., and at other sites, and both clubs conduct fun-flies, contests and banquets. PAC president is Chris Cox, and information about the club is available from Frank Boden at 4791 Shepherd St., Burnaby, B.C., Canada V5H 1L6. Bruce Duncan is president of the VGMC and information about the club can be obtained by writing P.O. Box 58037, Vancouver, B.C., Canada V6P 6C5.

The Western Oregon Control Line Flyers is a new group in Salem, Oregon that is developing a city-owned flying site at the Salem Airport that should be in full use by the time you read this. Mark Wahlster is president. Information about the club is available from *Wolf Call* newsletter editor Mike Hazel, 1073 Windemere Drive N.W., Salem, OR 97304.

Those above are only a few of the many CL clubs that are active; they're mentioned because we've been receiving their newsletters regularly. Below are contacts for some of the other clubs or newsletters that we haven't heard from recently but still could provide a contact for activities in their local areas:

Aero Mail, c/o Terry Bull, 1428 Woodside Ct. S., Chesapeake, VA 23320.

Central Florida Control Line Wire Flyers, c/o Paula Barickman, 1518 Edmundshire Ln., Orlando, FL 32806.

Circlemasters, c/o Art Weber, 17560 Windemere Rd., Brookfield, WI 53045.

Hangar Talk, 12901 E. Speedway, Tucson, AZ 85746.

Knights of the Round Circle, c/o Kenn Smith, 521 Jansen Ave., San Dimas, CA 91773.

On Line, c/o Jim Correll, 2703 Knob View Dr., New Albany, IN 47150.

Roundup, c/o Gill Merriman, 3370 Villa St., Los Alamos, NM 87544.

The Pits, c/o James Duckworth, 629 Mariposa Rd., Stanley, NC 28164.

Prop Wash, c/o Wayne Gilchrist, 56 Newark Ave., Wayne, NJ 07470.

For those flies not near any of the groups listed above, it might be worth noting that there are a couple of excellent independent newsletters serving broad regions:

Tom Sater of the Flying Dragons club in Kenosha, Wisconsin likes to design unusual planes. This is his original "Skyshark." Tom Sater photo.

Flying Lines is the news of northwest CL model aviation, serving all of AMA District XI and British Columbia. A calendar of events and northwest club news are included. Subscriptions are $14. Write Mike Hazel, 1073 Windemere Dr., Salem, OR 97304.

New England Combat News has detailed news about all northeastern combat activity. Subscriptions are $10. Write Neil Simpson, 129 Podunk Rd., East Brookfield, MA 01515.

Finally, there are five CL special interest groups, all of which publish newsletters that periodically offer listings of members' addresses or local clubs that could help you find activities in your area:

Miniature Aircraft Combat Association, 517 Tulip Tree Apartments, Bloomington, IN 47406. Newsletter: *MACA News.*

National Control Line Racing Association, P.O. Box 384, Daleville, IN 47334.

Navy Carrier Society, 3734 Truesdell, Dallas, TX 75244. Newsletter: *Hi-Low Landings.*

Precision Aerobatics Model Pilots Association, 327 Pueblo Pass, Anniston, AL 36206. Newsletter: *Stunt News.*

North American Speed Society, Box 82294, North Burnaby, B.C., Canada V5C 5P7. Newsletter: *Speed Times.*

There are two other ways to track down fliers in your area, both involving use of a computer: The CL forums on both America Online and CompuServe.

On American Online, use the keyword "fly" to navigate to the Aviation area. Within that area is a Model Aviation section, and inside that is a Control Line folder. Lots of CL fliers check in there regularly, and there's a flying site library.

On CompuServe, use the keyword (go) "Modelnet" to enter the Modelnet forum. Click your way to the Control Line section, where a lot of CL modelers check regularly. Also on CompuServe is a library section that includes listings of clubs for each state. You can download the area of your interest and search through for CL clubs.

We'll mention other CL clubs that we hear about in this section in coming months. If your club wasn't listed above, or has updated information about the flying site or newsletter, let us know.

• • •

Send contest flyers, contest results, club news, photos, questions, technical tips and other items of interest to CL fliers to the *Model Builder* Control Line column. Write John Thompson, 295 W. 38th Ave., Eugene, OR 97405. E-mail at JohnT4051@aol.com. ***MB***

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GR1794 **SPEED 400, 7.2 V** **$11.00**
GR3321 **SPEED 400, 6 V** **$11.70**
GR3320 **SPEED 400 Race, 4.8 V** **$13.75**
Tiny 2.5 oz., 1-1/2" motors that power electric sailplanes like Timothy and Skimmer 400. More thrust than you'd believe.

BRAND NEW! HLAR004 **Skimmer 400 Electric Sailplane** **$29.90**
59" wingspan, 30-3/4" long, 342 sq. in. wing area. Use GR6065 SPEED 400 Direct Drive. Easy balsa kit. Selig airfoil. Aerobatic and thermals very well. We've even climbed to thermal altitude ***inverted!***

GR6065 **Direct Drive SPEED 400, 7.2 V** **$27.00**
CM002 **2:1 Titanium Gearbox for SPEED 400** **$29.80**
GR170315, GR170318, GR170323 **Gear Drive w/ SPEED 400** ..... **$34.80 ea.**
GR6065 is a complete drive unit with motor, 6-3 folding prop, spinner, capacitor, and mounting bolts. CM002 with SPEED 400 7.2 V on 7 cells gave 9 oz. of thrust and 10 minute motor runs at full power. "1703 Series" gear drive ratios: 170315 - 1.5:1, 170318 - 1.85:1, 170323 - 2.33:1. These have side mounts so they can be mounted like a glow engine.

HLJE10A **Motor Controller for SPEED 400 w/ BEC** **$47.40**
HLJE10B **Motor Controller for SPEED 400 w/ BEC, Brake** **$49.80**
Proportional throttles with BEC for 6 to 12 cells and up to 10 Amps (much more than SPEED 400 pulls). Tiny: 1.4 x .9 x .4", 1/2 oz.

GR1718 Graupner **Speed Gear 4:1 with SPEED 400 6 V** **$64.30**
GR1719 Graupner **Speed Gear 4:1 with SPEED 400 7.2 V** **$64.30**
Fits anywhere a SPEED 400 motor does. Gearbox is same diameter as motor. Mounting holes are spaced exactly the same as motor. 2-1/2" long, weighs only 3-1/2 oz. 18 oz. of thrust with GR1718, an 11-8 folding prop (GPE11080), and 8 cells. 21 oz. of thrust with GR1719, 11-8 folding prop, and 10 cells.

HCZ203 **Timothy 400 Electric Sailplane** **$112.00**
59" span, 25" long *ready built* balsa sailplane covered with Oracover! 400 sq. in. wing area. 10 minute motor runs, 30 minute flights and longer in thermals! 3 channels: rudder, elevator, throttle. For Speed 400 motors. Order drive unit GR6065 (complete with Speed 400 motor, 6-3 folding prop, etc.), speed control HLJE10B, and 6 cell battery pack B060600R. Flying video **VIDEO25 .... $9.00**

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Larsen RC's Electric Retracts, and Other Big Bird News

Come along as Bruce talks about several items of interest to Big Bird enthusiasts.

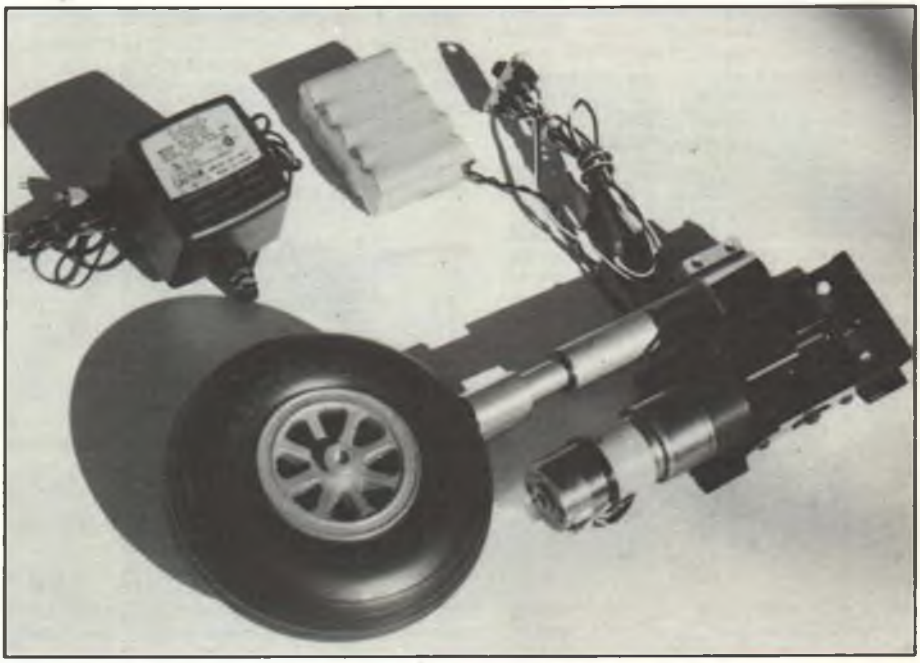
I was talking with Chick Young at Excalibur Model Supply recently. Chick asked if I would stop by his office and check out an electrically operated retractable landing gear that he has available. I knew Chick has a lot of experience as an N.C.R. field representative and is a storehouse of knowledge when it comes to electro-mechanical devices, so I was anxious to see the retractable gear he was adding to his model supply business.

The landing gear is manufactured by Dick Larsen, owner of Larsen RC Products in Soulsbyville, California. They were originally a compressed air (pneumatic) operated retractable landing gear, but Chick Young designed the electrical system.

Each Larsen RC Products landing gear is custom made to the model builder's specifications. You must supply measurements such as the distance from the bottom of the wing to the center of the landing gear axle for the correct length of your landing gear struts. It's also necessary to provide the diameter of the wheels you will be using so that the lower offset portion of the strut can be made to fit your wheel.

If you're building a kit, the manufacturer and type of plane should be provided so that the correct up and down limits may be pre-adjusted on the gear's limit switches. You should also provide the estimated finished weight of your plane so that the correct strut spring may be installed.

The main frame of the landing gear is manufactured from .125-inch aluminum and is anodized black. The rectangular trunnion box has machined mortised corners and is held together with steel screws. This makes a very strong box where the strut, motor and jackscrew drive are mounted. The mounting box is fully enclosed so that dirt and moisture will not affect the jackscrew drive and limit switches.

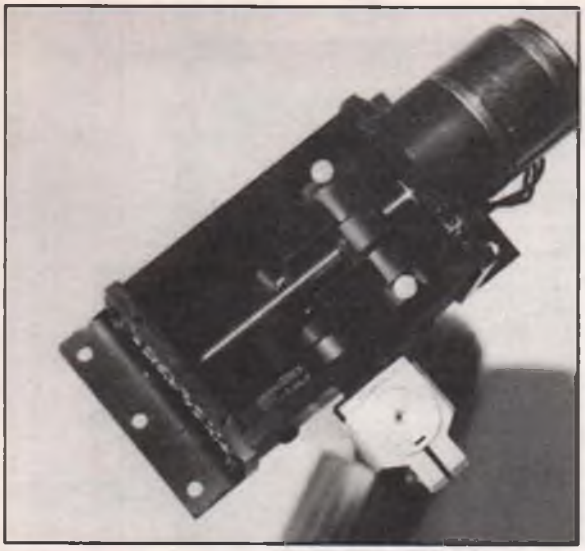


Larsen RC Products' all-metal electric retracts are custom made to your specifications. The system comes complete with 10-cell NiCd battery and charger. The wheel (not included) is available from Vailly Aviation. Nice-looking cast aluminum hub uses a Sullivan SkyLite tire.

The struts are made to your specified length. The upper outer portion of the struts will be .75-inch in diameter, the inner strut will be .5-inch diameter. You also have a .25-inch adjustment on the strut length. Optional gear scissors are also available. Both the inner and outer portions of the strut retain their natural aluminum finish.

The jackscrew on the retract gear mechanism is .25-inch in diameter and has 20 threads per inch; it gives positive end point locking and no-slip travel as the strut is extended or retracted. Side loads will not cause this gear to collapse, although a very rough landing could snap off the mount screws. The mounting holes are arranged so that the Larsen gear will fit into the mounting area of most popular brands of retractable landing gears.

The electric motor that operates the jackscrew does so through an all-metal-gears transmission and will easily lift an 11-ounce wheel. I installed a Vailly Aviation 5-inch wheel that weighed approximately 5 ounces and the gear retracted easily in 6 to 8 seconds. The electrical portion of the retract system is fully filtered to provide radio frequency protection for your radio. The 12-volt electric motor receives power from a 10-cell NiCd battery pack; an 800-



Here the access plate has been removed to show the motor-driven jackscrew and limit switches. The Larsen retracts are well-made, sturdy units that should stand up to some pretty heavy abuse.

their Humongous Sage Hen more than Bob Stykemain, who lives in Toledo, Ohio.

Bob wrote to me twice in 1995 relating his experiences with his Humongous Sage Hens. Bob has built no less than *five* Hens, every one with different features, from straight wing to retractable leading edge slats. Power has varied from an O.S. .40 four-stroke to a Super Tigre .60 Blue Head.

Through all of these modifications the Hen has continued to perform admirably. Due to Bob's success with the Hen, at least eight others have been constructed and used as trainers in his area.

Bob tells me the worst thing he did was to change the flat-bottom airfoil to a semi-symmetrical one, which resulted in a very squirrelly plane. He eventually built a new wing using the original airfoil and it flew well.

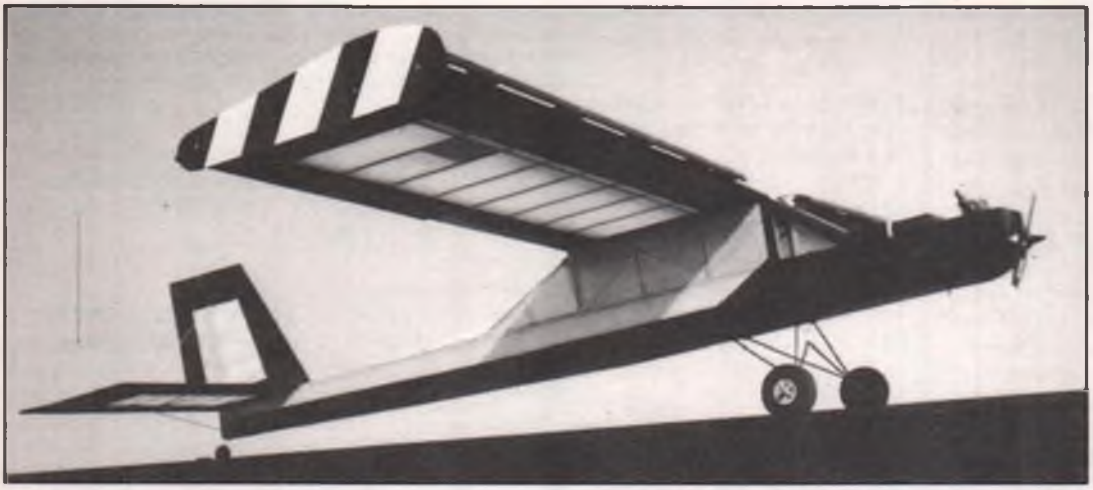
Bob is still experimenting with rudder area and is working towards a very large increase in size. Additionally he has increased the main landing gear spread, which is a good idea because I thought the landing gear width was the weakest point in the whole design. It was *strong* enough, just not wide enough.

Other successful modifications were conventional dihedral from the center of the wing, added ailerons, added flaps and cosmetic changes in the rather square nose.

It's very pleasing to see the Humongous Sage Hen being enjoyed by so many new RC fliers, because the design was made especially for them. I'm sure Al Alman would be happy to know that our big docile trainer has helped others enjoy our great hobby.

HELP WANTED

John C. Fredricksen is compiling a new edition of *Flying Model Warplanes; An International Guide To Planes and Kits.* John needs to borrow complete runs of French, English, German and Italian model magazines. If you are able to assist John please contact him at 461 Loving Ave., Salem, MA 01970.



The Humongous Sage Hen is back! Bob Stykemain's latest version (he's now built five!) is a far cry from the docile 7-foot polyhedral floater published as a construction feature back in the may '89 MB. Whereas the original was powered by a Saito .45 four-stroke, Bob's Hen is equipped with an O.S. .91 Surpass, has a rectangular aileron wing, retractable full-span leading edge slats, tip plates and a cosmetically modified fuselage. More in text.

CHARGING SMARTLY

Several letters have indicated that Sirius Electronics' new Smart Charger Pro Series is the only way to charge your NiCd battery packs, so I reread Eloy Marez' review of the charger (June '95 *Model Builder*) and decided to try one. It is indeed a marvelous charger and I called Don McGlauflin at Sirius Electronics to tell him how happy I was with it.

During the conversation Don informed me that he has sold the manufacturing rights for the unit to Ace RC. That's good for Don and good for us RC buyers, because the mA charger is provided that will fast charge a fully discharged pack in one hour. A single charge is good for over 50 retract cycles, which should satisfy even the most ardent touch-and-go fan.

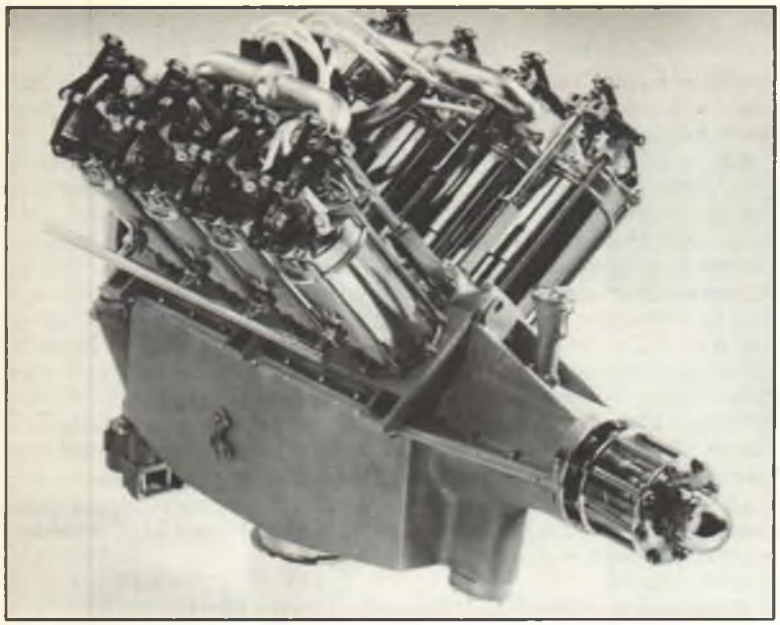
The Larsen electric retracts should easily handle planes into the 55-pound weight range. The landing gear and battery pack weigh 46 ounces. The actuation servo could add a couple of extra ounces—figure 3 pounds all-up weight.

For prices and availability, contact Larsen RC Products, P.O. Box 935, Soulsbyville, CA 95372; (209) 532-9370; or Excalibur Model Supply at (206) 863-3755.

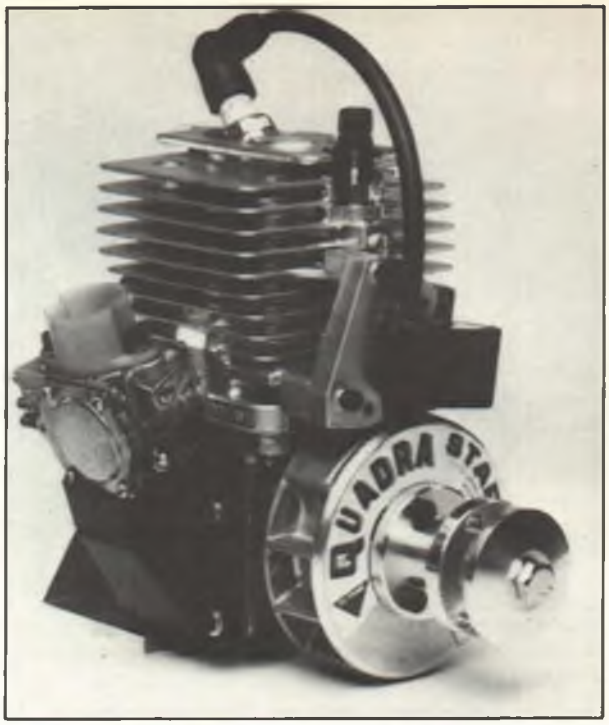
HUMONGOUS SAGE HEN REVISITED

Back in May 1989, Al Alman and I had the plans for our Humongous Sage Hen published in *Model Builder.* Most of the modelers who tried the Hen were happy with it, but no one seems to have enjoyed

Ikon N'west has another new plane for the Big Bird modeler, a Lockheed Vega in 1/5 scale. The 102-inch span beauty is 65 inches long, uses an O.S. 120 four-stroke and four-channel radio. Send an SASE for info: Ikon N'west, P.O. Box 396, Post Falls, ID 83854.



How about THIS for your next scale project? As a follow-up to their 1/4-scale working Gnome rotary, Replica Engines unveiled this incredible miniature OX-5, also 1/4-scale, a water-cooled V-8 capable of turning a scale-diameter 24-inch prop. Displacement is 7 cubic inches, bore is .95 inch, stroke is 1.25 inches. Priced at $5,500, only 100 will be built. Full particulars from Replica Engines, Rt. 1, Box 618, Gulliver, MI 49840; (906) 283-3321.



Quadra's new Q65 and Q75 will have reed valve induction, six boost ports and a rear-facing exhaust. These new designs should be real powerhouses. North American Power R/C will be the exclusive U.S. marketing agent for Aerrow engines—details in text.

cause Ace has the capability to turn out chargers a lot faster. *(Editor's note: See also this month's "Electronics Corner" column.)*

Some time ago, when I was attending an electronics class, one of our projects was to build a twin-output DC power supply, with a 120VAC input and a 0-18VDC output. I never had a use for the device until I purchased the Sirius Smart Charger. Now I may charge my transmitter and airborne battery pack using a 120VAC source, or use my 12VDC starting battery to power the Sirius charger.

The Sirius Smart Charger lets your NiCd packs be as good as they can be. Try one, you'll like it!

QUADRA NEWS

Aerrow Inc., manufacturer of Quadra and U.A.V. engines, has announced upgrades for its Quadra engine line. The venerable Q42 will be temporarily discontinued and an upgraded, newly designed unit will eventually take its place.

Aerrow Inc.'s Quadra Q65 (4.0 cubic inches) and Q75 (4.4 cubic inches) will use reed valve induction and six transfer parts. The new engines will also feature rear exhaust.

All of Aerrow's Quadras will be sold "firewall ready" with muffler, spark plug, capacitive discharge ignition, flush firewall mount, throttle linkage, spark plug wrench and Q-start spring starter. The warranty period will be extended from one to two years.

North American Power R/C Inc. will be the exclusive marketing agent and wholesale distributor of Aerrow Inc.'s Quadra engines in the United States. For dealer information, contact them at P.O. Box 92638, Southlake, TX 76092; (817) 251-0787, fax (817) 251-0547.

• • •

Well, Big Bird fans, I'm in the process of spending less time on the old word processor. I will be going to a bimonthly column and later possibly even retiring from the magazine completely. The stress of my regular job and need to meet monthly deadlines are just proving too great a burden. Writing this column has been a real joy for me and I hope it has been fun and informative reading material for you.

Bruce Edwards, 8304 53rd St. Ct. W., Tacoma, WA 98467. ***MB***

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HANNAN'S HANGAR

BY BILL HANNAN

"When it comes to luck or skill, luck is better!"

Our quotation this month is from the *Pacific Flyer*, edited by Wayman Dunlap, and very few model builders would disagree with that conclusion, would we?

IS BIZARRE BETTER?

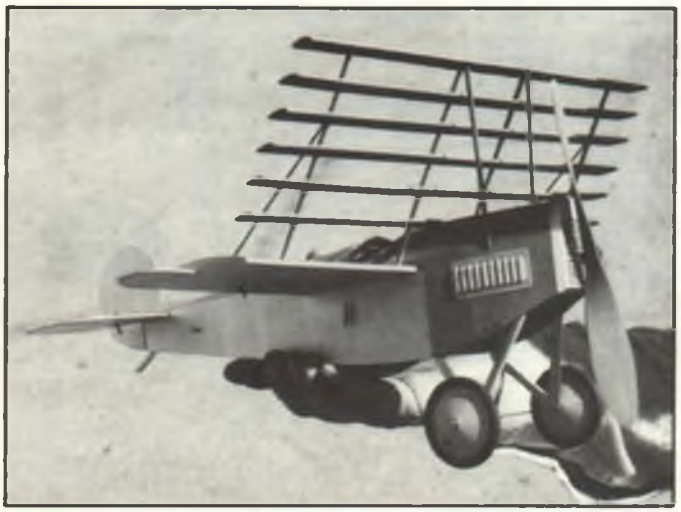
Our photo selection celebrates diversity in flying machines. Aviation history is punctuated with unorthodox designs which seem to hold special attractions for modelers. Why? Let's face it, "plain planes" are often visually boring, and lack the challenges offered by more esoteric aircraft. Of course, when it comes time to make them fly, the aforementioned "luck" may be a vital factor!

The first of our aerial oddities is Richard Granger's tailless Archaeopteryx. (It does have a vertical tail, but no horizontal.) Richard's father and uncle built the full-size prototype during 1930, and it remains flyable today in the famed Shuttleworth collection in England.

Another unusual model is the 1908 Koechlin Tandem by Benno Sabel of Germany. Benno specializes in offbeat pioneer aircraft, and managed to unearth enough documentation on this rare machine to enable his detailed flying model to be constructed. Certainly it has plenty of area for a Peanut, and lots of visual interest for the spectators.

Richard Granger's electric-powered free flight Archaeopteryx swept-wing tailless is a scale model of his father's full-scale 1930 original (see text). Photo by Reg Boor.

Beautifully constructed 1908 Koechlin Tandem Peanut by Benno Sabel has more area than a Flite and is considerably more challenging!



Otto Kuhni's finely crafted Avro Baby multiplane attracts attention wherever it appears. Photo by Bill Warner.

Next we have Otto Kuhni's unique Avro Baby, featuring "venetian blinds" above its main wings.

The standard Avro Babys of 1919-21 were regular biplanes, however this example, equipped with six narrow-chord airfoils, was tested briefly with unreported results. (Perhaps the fact that there was only one built is report enough?) Needless to say, Otto's rendition is a real crowd-pleaser.

"Gyrobleu" is an original French RC autogyro from the prolific pen of Georges Chaulet. Powered by an O.S. .46, the 70-ounce model features a controllable attitude rotor and central rudder. Unlike helicopters, autogyros are always in the autorotative mode, thus can usually make successful unassisted dead-stick landings. Since Georges flies Gyrobleu in a field surrounded by dense bushes, it is equipped with an automatic buzzer to assist retrieval, in case of an unscheduled landing in the shrubbery.

Finally, take a look at that exceptionally pudgy little Peanut Scale model of Ray Stits' Sky Baby, which was an aspirant to the "World's Smallest Airplane" title. Andy Clancy's 13-inch span RC biplane is powered by a G-Mark .06, which develops considerably more thrust than the plane's

weight, yielding rather startling performance.

LAZY VIDEO

Would you like to see that Sky Baby in action? It appears in a brief sequence of Andy's videotape. But the real stars of the 35-minute production are various sizes of Andy's own design Lazy Bee, which was originally inspired by Henri Mignet's French Flying Fleas.

Andy's Bees demonstrate capabilities which must be seen to be believed, including wild aerobatics within confined spaces, operation off both ground and water, and even leading a loose formation of ducks!

Although intended as a sales promotion for Clancy's line of kits and accessories, we suggest that anyone would find this tape highly entertaining. The $10 price includes postage and a complete catalog, from Clancy Aviation, 219 W. 2nd Ave., Mesa, AZ 85210-1317; (602) 649-1534.

TIME FLIES WHEN YOU'RE HAVING FUN

As another year rapidly approaches, we all seem to feel as if we're on a "fast-forward" schedule. We concur with this comment by *Fly In Scale News* editor Lawrie Kelsall: "Personally I think time itself has become a 'scalie' and reduced itself to about 1/12 scale!"

Typically, this is a time for reflection on the past and contemplation regarding the future. Since you will probably be reading these lines early in 1996, we wish everyone the best of health and happiness for the new year. We continue to be grateful to the staff of *Model Builder*, and to all of our loyal readers who make this curious Hangar column possible.

CONTEST NEWS

The 1995 Australian "Wet Wellie" free flight Schneider Trophy event featured a "mooring-out" test. This meant that the models had to prove their seaworthiness by remaining afloat for at least 10 minutes. As it turned out, so many photographers wanted pictures that the models were in the water for almost an hour. Among those entered were a Nieuport monoplane, Deperdussin, Sopwith Tabloid, Savoia S21, Savoia Marchetti S65, Gloster 6, Curtiss CR3, Supermarine S4 and S6B, Gloster VI, Macchi 52 and a Piaggio PC7. How's that for variety? Our thanks to contestant Tim Hayward-Brown for this report.

IN THE NETHERLANDS

Interscale '95 attracted a truly international turnout (Belgium, Czech Republic, Finland, France, Greece, Netherlands, Sweden, United Kingdom and the United States), for a free flight contest conducted over what Reg Boor described as "scale grass" in an indoor tennis facility. First place winners in each category were as follows: Flying Scale Rubber, Ed Stoll, USA, Corben Super Ace; CO_2/Electric, Antonin Alfery, Czech Republic, Spad 13; Peanuts, Antonin Alfery, Czech Republic, Avia BH 253; Pistachios, Gert Brendel, the Netherlands, VP-1 Volksplane. All hope to return for Interscale '96.

Charming Sonia, of France, upstages Georges Chaulet's RC "Gyrobleu," one in a long series of rotorcraft.

AND IN JAPAN

The 1995 Shonai Peanut competition category winners were as follows: Pioneer, Jiro Sugimoto, 1911 Voisin; WWI, M. Nagayama, Ansaldo SVA; WWII, M. Ohota, Shohki Fighter; Modern, T. Hirata, FRED homebuilt; Special one-design class for Evans VP-1s (28 entries!), Kazuhiro Suzuki; Pistachios, Kazuhiro Suzuki,

An RC Peanut! Andy Clancy's 13-inch span Stits Sky Baby is powered by a G-Mark .08, features nearly ballistic performance. More in text. Photo via Clancy Aviation.

HANNAN'S HANGAR

Mauboussin PM.X. In a touching tribute to the late Shoichi Uchida, the former Shonai contest director, ten of Shoichi's models were proxy-flown, the best duration being achieved by A. Igami, flying a JU-87 Stuka. Visiting American Chester Mack placed 2nd, flying Uchida's Wittman Tailwind.

THOUGHT FOR THE DAY

"A man who has one watch always knows what time it is. A man with two watches can never be sure." Bill Warner feels this old adage applies equally well to aircraft three-view drawings, which seldom, if ever, agree!

REALLY BIG!

Herb Weiss sent us a report from Hewitt Phillips, who, with a class of high schoolers, had gained recognition in the Guiness Book of Records some time ago for their 30-foot 6-inch span paper glider. Now it seems a group of British engineers have eclipsed that achievement by building a paper glider spanning a whopping 140 feet!

The mind boggles.

PRODUCT NEWS

Bill Warner has recently updated his comprehensive "Cottage Wings" list of over 200 sources of free flight model plans, kits and accessories. Also featured are addresses for many free flight model clubs in the U.S., Canada and England. For $1 plus a business-size return envelope with 55¢ postage, you can obtain a copy from Bill Warner, 1370 Monache Ave., Porterville, CA 93257. Arriving too late for inclusion on Bill's list is an illustrated list of flying scale model plans, and domestic tissue in 12 colors, available from D.C. Engineering, 35218 W. Pine St., Pinehurst, TX 77362.

A new glue called "Super'phatic" has been introduced in Europe, said to combine the favorable properties of cyanoacrylates and aliphatics, including low viscosity (wickability), 14- to 20-minute drying time, and minimal dried weight. U.S. distributors are sought, and details are available from George Wallbridge, The Chapel, Roe Green, Sandon, Buntingford, Herts, SG9 OQJ, England.

AMELIA AGAIN

It would seem by now that every possible theory about the 1937 disappearance of Amelia Earhart would have been published. Still, fresh "discoveries" appear every so often, usually with no conclusive results. Now, a book entitled *Amelia Earhart—Case Closed?* is available. What's different about this one are the qualifications of and the approach taken by its co-authors, Walter Roesler and Leo Gomez. Both men were model builders and later became highly skilled aircraft mechanics and pilots, with combined aviation experience of 67 years. Thus their five years of research and conclusions are based upon practical investigation from a purely technical standpoint, with a minimum of emotional speculation. Even the photographs and illustrations were selected from a "hard facts" point-of-view. Their closing tribute to Amelia seems fitting: "You have inspired us to do whatever it takes to pursue our dream; our destiny in life. Keep flying . . . ." The softbound 208-page book features numerous photos, maps and three-view drawings. For more information, phone Aviation Publishers/Markowski International at (717) 566-0468, or write to One Oakglade Circle, Hummelstown, PA 17036.

When contacting any of our mentioned sources, please tell them *Model Builder* sent you!

SIGN-OFF:

Ever wonder what the big attraction is about flight? Certainly an aircraft can be aesthetically satisfying on the ground or in a museum, but it is not really fulfilling its purpose. We liked this quotation from Elsa Peretti, found in the book *Scavullo on Beauty:* "I think energy is beauty—a Ferrari with an empty tank doesn't run."

Bill Hannan, Box 210, Magalia, CA 95954. *MB*

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ELECTRONICS CORNER

BY ELOY MAREZ

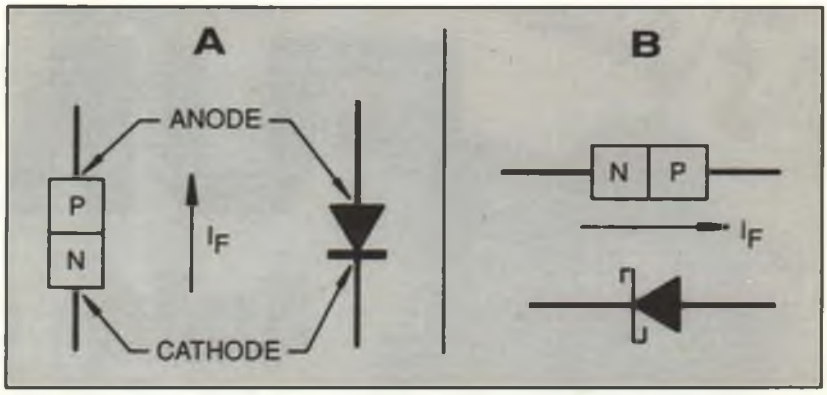
•Eloy's Simple Glow Plug Saver

•Futaba Super 7 Programming Manual

•News from Ace R/C, Petri Associates, and Custom Electronics

We all like to save! This month I'm going to tell you how to save some glow plug current—and more importantly, some glow plugs.

My four-stroke experience for some time has been limited to a Saito .45, which, as far as I can remember, has never required a glow plug change, so the cost of replacements has simply not arisen. However, my Air Force recently grew with the addition of a Saito .91, and in reviewing the needed spares I discovered that four-stroke plugs can now cost over $6!



Sketch and schematic symbols for a common junction or rectifier diode (A) and a physically similar but internally different Schottky or hot-carrier diode (B), for which Eloy has come up with an interesting RC application—see text.

The .91 is going into a 1500 square inch scratch-built biplane. I decided it would be a good idea to light the plug at idle for added reliability. However, I know from experience that once the engine is running, the plug no longer requires full starting voltage to keep the engine running at low speeds. And there's little doubt that the life of any glow plug is going to be affected, at least in part, by how long it has to keep up that cherry red glow.

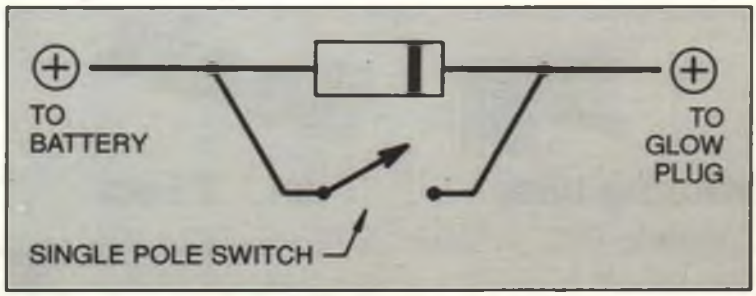
How do I know this? Because I've successfully used a 2-volt sealed lead-acid cell to power two glow plugs connected in series in a two-cylinder engine. Effectively, we have two equal resistances in series across a voltage source; each resistance will receive half the applied voltage. In this case, each plug would thus be getting 1 volt—minus whatever loss there is in the associated wiring and connectors.

What we need then is some way to reduce the 1.25 volts of a single NiCd cell down to something that will reduce the plug's glow—and current—and hopefully increase its life, but will leave it with enough life to keep the engine running reliably at slow speeds. A resistor? Too crude, besides the resistance of the plug is not constant, changing with "dry" and "wet," so the plug current itself would not be constant.

To my knowledge, there are no voltage regulators made that will work at these voltages at the required current, so that's out. I've mentioned here before, in connection with other topics, that a common rectifier diode, connected is series in a DC circuit, will drop the applied voltage by .7 to .75 volt—too much for this application. This thought led to me to explore some of the other specialized diodes that are available—Zener, tunnel, varacter, etc. This line of thought ultimately led me to the hot carrier diode (HCD), more commonly known as the Schottky or Schottky-barrier diode. It differs from the rectifier diode in a number of respects, the important one in this case being that it drops the applied voltage by .3 volt—just perfect to effect a slight cooling in a glow plug circuit.

The Schottky diode, named after its German developer in 1938, differs from the standard junction diode in internal construction. It is capable of faster action and often finds a home in high-frequency and microwave circuits. The internal differences also result in the lower (.3) voltage drop mentioned, which we are going to use here in ways never though of by Herr Schottky.

The circuitry is simplicity itself, being the normal single NiCd-to-glow-plug connections. There is a on-off switch in there somewhere, not shown since its location varies and has no effect on the operation. The diode, anode to positive, is installed in the positive line, with a shorting switch across it. With the switch closed, full starting voltage is applied to the plug, as it was initially. If the switch is open, the plug voltage is now reduced by .3 volt—enough to



Connections for the Schottky diode glow plug circuit couldn't be simpler. The only caution is the polarity of the diode itself; installed in the positive lead, the band on the body should face away from the battery.

Ace R/C is continuing to undergo some changes in its operation and its equipment. The first new product, in this redesigned stackable case, is the Digipace 3, to be reviewed by Elay next month. Other similarly packaged electronic items are scheduled to follow.

keep the plug in a running engine at a good high temperature but not enough to affect its life.

Schottky diodes come in a variety of packages, from SMT to TO-220, the latter being the package generally associated by us modelers with the MOSFETs common in electronic speed controls. They're also available in the common tubular component shape, about 1/4 inch in diameter. The catch is that they are not readily available; forget Radio Shack for this one. You'll have to find a real electronics parts supplier. Parts numbers are not important in this case; you need a Schottky good for at least 5 amps. All of them are rated for voltages higher than those used for glow plugs, thus this is not critical.

Mouser Electronics (800-346-6873) lists a 5 amp, 20V Schottky (#583-SR520) at only $1.92. Mouser is one of the few mail order electronics suppliers who doesn't have a dollar minimum on orders, and their free catalog should definitely be in your library. You're going to need a switch; #10S002 has all the required physical and electrical specs and is priced at $1.27. Mouser has branches in California, Texas and New Jersey, so you don't have to wait weeks to get your goodies.

SUPER 7 PROGRAMMING MADE SIMPLE

Futaba's Super 7 RC system has generated a lot of questions in the EC mailbox over the years, all having to do with programming; the manual was evidently not as clearly written as it could have been. Well, there's good news for you frustrated Super 7 owners, as noted writer Don Edberg has authored a 96-page book, entitled *Programming the Futaba Super 7 Radio System*, just for you.

Don is a well-known sailplane buff, but his book also covers sport, fun-fly, pattern, and flying wing aircraft. It includes step-by-step instructions (with examples), programming techniques and trimming charts and instructions. I haven't seen this book, but from the many examples of Don's work that I *have* seen, I'm willing to bet that if you own a Super 7, you are bound to benefit from it.

The book is priced at $10; $2.50 for U.S. shipping, $4.00 for Canada, and 80¢ tax if you're a fellow Californian. Order from Dynamic Modelling, 4922 Rochelle Ave., Irvine, CA 92714; (714) 552-1812.

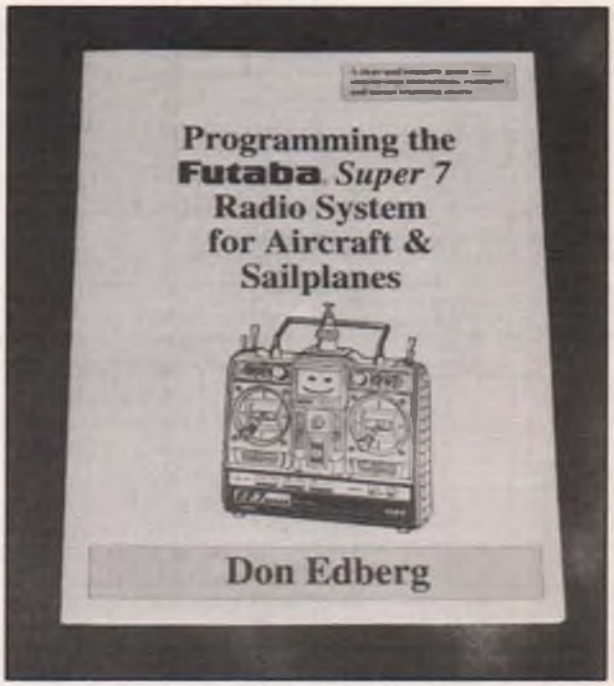
ACE R/C NEWS!

First of all, there's a new 1996 catalog that all you Ace R/C fans will want to get. They have dropped quite a few other manufacturer's products that used to be carried, but more important is that not only are all of Ace's proprietary products still available, many of the electronic items are being updated to include a unique new stackable case system used to house electronic products. So far they feature a new Digipace 3, Abacus, Multi-Charger and the Dual Digital Vari Charger. Ace has also acquired the Sirius Electronics "Smart Charge" NiCd charger I told you about in detail back in our June '95 issue. The Smart Charge is based on an IC designed specifically for fast charging NiCd batteries, incorporating all the requirements for 100 percent recharging and long battery life. The '96 catalog is available for $4 from Ace R/C, 116 W. 19th St., Higginsville, MO 64037-0472; (816) 584-7121.

A BRIGHT SUGGESTION

If scale lighting or night flying are in your future plans, you'll want to have a close look at a new lighting device named "Flite-Lite," now available from Marty Petri of Petri Associates, 11360 Etiwanda Ave., Northridge, CA 91326; (818) 363-3324.

The Flite-Lite is a receiver-actuated controller with four switched outputs. It can be operated by a transmitter's three-way switch or by three settings of a proportional knob-controlled channel. Outputs are provided for separate landing, navigation, and two alternating strobes. One of the strobes can be switched via a furnished shorting plug to emulate a rotating beacon. In use, the Flite-Lite will be All Off, Navigation and Strobes, or All On, according to the position



For those Futaba Super 7 owners who have found the factory-supplied programming manual somewhat lacking in clarity, well-known computer radio expert Don Edberg has come to the rescue with his new book, "Programming the Futaba Super 7 Radio system." Text has ordering information.

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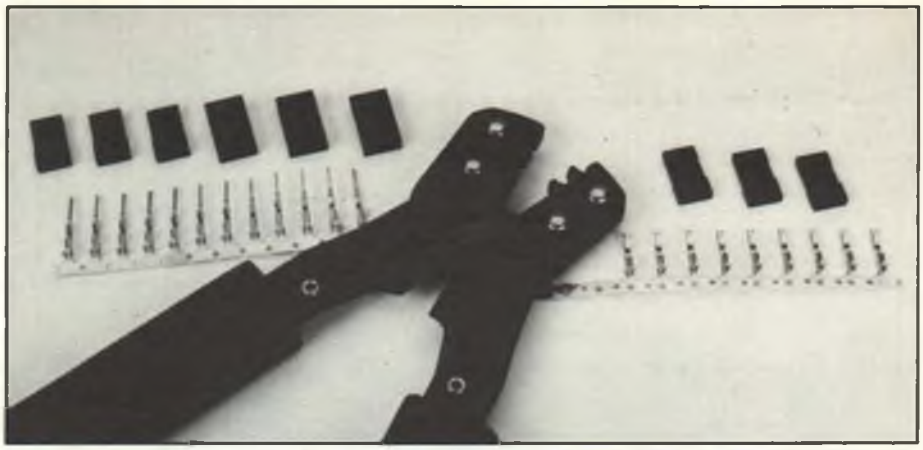

The components and crimping tool necessary to repair or fabricate common RC system connectors are finally available for do-it-yourselfers, thanks to Custom Electronics. More in text.

of the transmitter control switch or knob.

Landing lights of up to 40 amps can be switched; the other channels are rated at 50 volts at 1.5 amps—adequate for any installation you may have in mind. Various lamp sets are available, including two halogen landing lights; five 6V lamps, for wing, tail, strobes; and navigation lights, with sockets, in green, red and clear. In addition, most incandescent lamps can be used, limited only by their individual voltage and current ratings and your use of the correct batteries to provide the necessary voltage and current capacity.

The Flite-Lite itself is powered by the receiver battery. It uses some 10 milliamps of current—about the same as a servo at rest. It consists of a printed circuit board 1.5 x 2.5 x 0.5 inches, weighs less than 1 ounce, and is furnished with a receiver connector of your choice.

Connections to the lamps themselves are made through a 10-contact connector, furnished complete. It includes small metal female pins to which the wires must be attached. A Custom Electronics #CEL-1179 crimper is recommended, though for these one-time jobs, most of us are going to resort to the old soldering iron. And when you do, there's an important point to remember: Use a heat sink (needle nose pliers or forceps are adequate) between the end being soldered and the rest of the connector. Heating the connector body will cause it to lose its temper and ultimately result in poor contact.

DO-IT-YOURSELF CONNECTORS

Custom Electronics (RR1 Box 1238, Higginsville, MO 64037; 816-584-6284) can provide not only the crimper mentioned above, but also a full line of RC electronic products, some not available elsewhere. Intended for use with the crimper, which is priced at $24.95, are CE's Unassembled Connectors; both male and female ends which you can use to fabricate your own RC system wiring, using either original wiring cut to a specific length, or possibly heavier wiring for long leads or greater current loads. The connector package includes both the necessary plastic bodies and metal contacts, come four to a package, and are available for either male or female plugs for Airtronics, Futaba and JR systems. Male connectors are priced at $9.50 for four; female connectors are $9.95 for the same amount.

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PLUG SPARKS

BY JOHN POND

•The Evolution of Rubber Power

•The .375 Cubic Inch Morton Vanguard

•Sidney Struhl's Nomad Convertible

A considerable amount has been written by this columnist on free flight gas powered Old Timers but not commensurate time for rubber powered models. This changed radically when Ed Dolby of FAI Model Supply started to distribute some excellent performing rubber threads known as FAI Tan. The first batch was quite good but the latest rubber strands have put the fun back into rubber flying.

No question about it, good rubber has brought back the competitors to the various rubber power events. In that line of thought, this writer thought he would review the various phases of rubber power models.

Rubber power is the oldest form of motive power for model aircraft. As early as 1905, Ideal Models put out a kit of a Cecil Peoli twin pusher that was designed to compete in the distance and duration events of the time. These came in various configurations: single stick, twin pusher (and other variations such as tri-stick and push-pull), plus hydro type twins which flew quite well.

The introduction of balsa improved the performance of twin pushers immeasurably with duration flights of better than 5 minutes. In the early '20s, contests were dominated by twin pusher designs.

With the advent of the AMLA (Aviation Model League of America) as sponsored by *American Boy* magazine, designs (as they improved) began to resemble each other in shape and size. Photo No. 1 shows Carl V. Carlson's winning twin pusher that won the Junior National Contest at Detroit in June, 1928.

A feature that was "state of the art" at that time was a full span, wide chord rear elevator allowing the wing to be moved forward for more efficient lift. Also worth noting are the I-beam type motor sticks in another attempt to reduce weight and improve those dreadful glides.

Reduction of weight continued with August Ruggieri producing a featherweight twin pusher in 1931-32. This was followed by his record setting model in 1933-34. This design, featured in the 1934 Zaic Year Book, was probably the most popular twin pusher built in

Photo No. 1. Carl V. Carlson with the twin pusher that won the AMLA Junior Outdoor National Contest at Detroit, Michigan, June 1928.

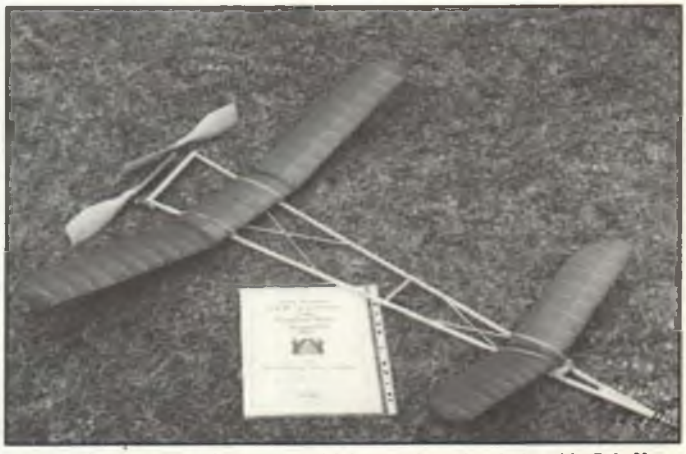


Photo No. 2. An example of the staggered A-frame twin pusher designed by Dela Maier and which took 1st place in the Twin Pusher event at the 1993 Australian SAM Champs; builder's name was not supplied.

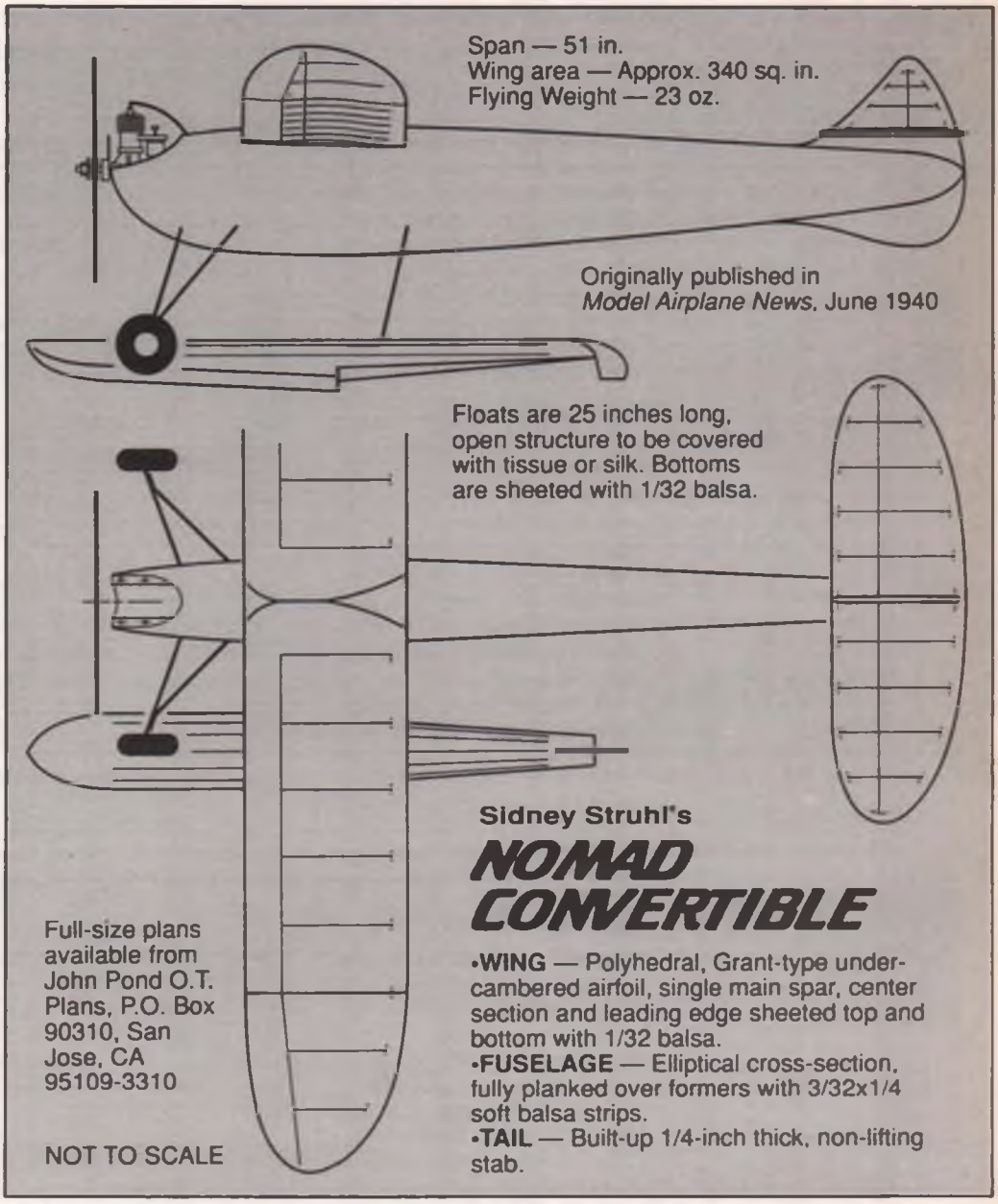
Photo No. 3. The Lanzo Stick has long been a favorite of O.T. rubber fliers. Don Reid of Ottawa, Canada flew this copy at the 1986 SAM Champs at Jean, Nevada.

large numbers. (This author built four in that period!) "Red" Ruggieri, as he was called because of that large shock of red hair, and the model appeared in *Model Airplane News*, leading to even more popularity.

In an early 1934 issue of *M.A.N.*, a staggered frame twin pusher appeared as developed by Alton Duflon. This was a serious attempt to reduce the head-on resistance of an open frame. This idea was incorporated by this writer and numerous others. Among the most successful was Wally Simmers' record making flight of 24 minutes—exceptional for a twin pusher! This record was later broken by Daniel Clini with a remarkable flight of 40 minutes using a rubber enclosed tubular stick fuselage.

This pretty well sounded the death knell of twin pushers for competition; however, in 1941, *Air Trails* published a staggered twin pusher by Dela Mater (Photo No. 2) that was quite successful.

Twin pushers were a natural for anyone getting into free flight rubber events. With contrarotating propellers, there was no torque to speak of. If a warp developed in the wing or elevator, this was encouraged as the model had no natural torque turn. Most adjustments consisted of sliding the wing back and forth until the best glide was obtained.



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MODEL OF THE MONTH

Photo No. 4. Another popular O.T. rubber subject is Gordon Light's 1935 Wakefield Winner; SCAMPS member Al Richardson was photographed at the '88 SAM Champs with his nicely decorated replica.

Early single-stick models were mostly pusher types as they lent themselves to easy adjustments. Probably the most outstanding flier was the Edsall pusher which registered some spectacular 1-hour flights! However, tractor stick models with the open motor stick required a considerable amount of wing warping and thrust adjustments. One of the biggest problems was to try to make the rubber motor as long as possible, running from prop hook to the tail post. With weight distributed over a long length, adjustments were quite critical.

In 1929, Joe Culver of Oakland won the Indoor Moffett event with a tractor featuring the tails on a boom behind the rear rubber hook. This combination proved to be the solution to the inherent stalling conditions of a tractor.

The rush was now on! Vernon Boehle produced a triangular stick fuselage enclosing the rubber motor that was an excellent flier (this writer built that, too!). This powerhouse design featured 16 strands of 1/8 with a 16-inch prop and only 120 square inches of wing area. Was a very stable model to fly.

With this in mind, every

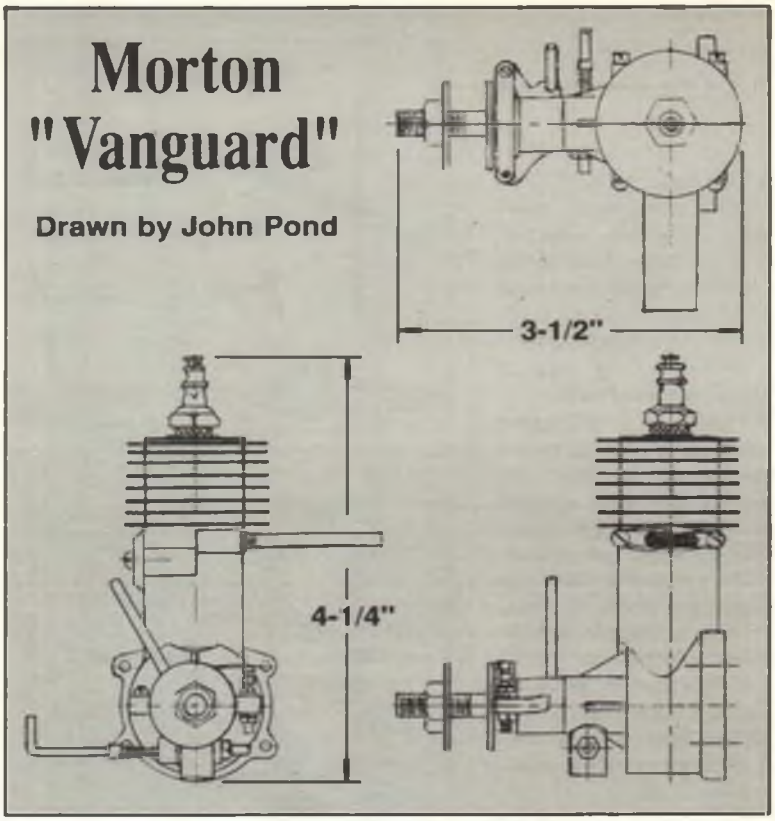
PLUG SPARKS

modeler who had a cabin model promptly took off the landing gear and entered it in the stick event. This led to the cross-section rule for stick models not to exceed length squared divided by 200. Many stick models were built to the maximum allowed, especially the Lanzo Record Breaking Stick as seen in Photo No. 3 with Don Reid of Ottawa, Canada at the Jean, Nevada SAM Champs.

By and large, cabin type models are the most popular and eye-pleasing, as their looks and flight characteristics approximate full-scale aircraft. Probably the foremost exponent of competition cabin models was Gordon Light, who won the Wakefield event twice and narrowly missed winning a third time. Light's models were extremely practical and well-thought-out and tested. Seen in Photo No. 4 is Al Richardson with a replica of Gordon Light's 1935 Wakefield Winner.

The most popular model of all is the Dick Korda Wakefield model as kitted by Burd and Megow. The Megow version of the 1939 World Champion was the best for building simplicity, flying, and losing in

continued on page 82



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Announcing: The Model Builder HLG Design Contest!

Here's your chance to gain international fame and fortune, by designing an AMA Class A sailplane based on the triple-taper S4083 wing described in the December '95 column. Also discussed: The first installment of a two-part review on House of Balsa's "Over The Edge" slope glider.

Regular readers will recall the feature on the new S4083 hand-launch glider airfoil that appeared in the December 1995 Soaring column. My original intent was only to do a regular "Airfoil of the Month" treatment of the S4083—but then the idea struck me. Why not give everybody a chance to experiment with this latest and hottest of Selig airfoils? There is, after all, still a great deal of scratch building going on in the HLG movement. Thus was born the full-size S4083 rib patterns and the corresponding HLG wing planform drawing that appeared in that column.

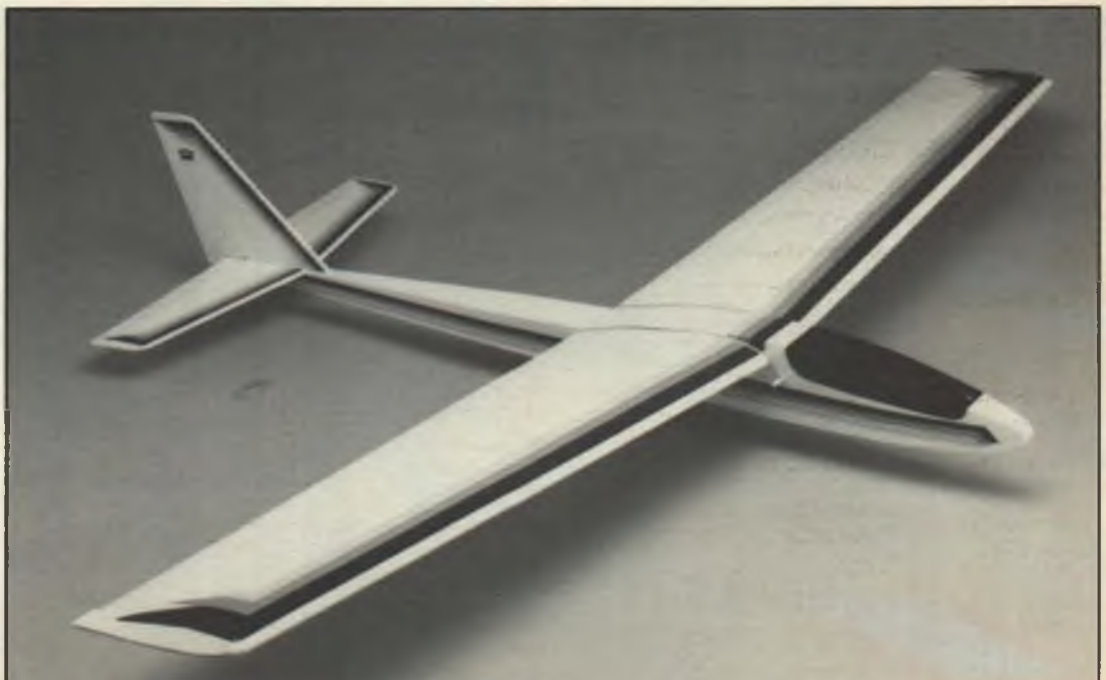
Since that time we've received letters from guys who are actually building wings from the drawing. The letter from Ray Kostuk (last name derived from his Internet address, sorry if it's wrong), who hails from Arizona, is typical of the responses we've received. In his letter he asks some very good questions—the kind that should be asked if you truly intend to build this wing.

Q: *The caption next to the wing plan states that the spar is 1/16x1/4. Is it 1/16 or 1/8?*

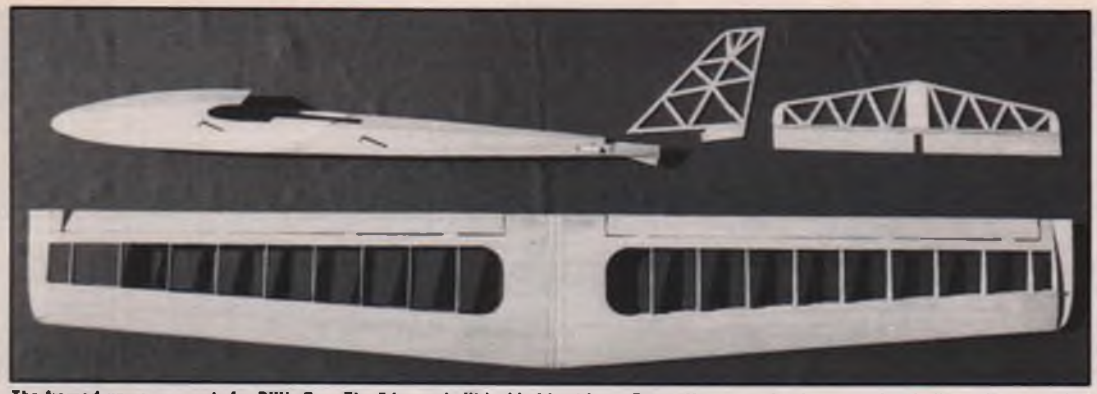
A: The caption is correct—1/16-inch thick bass or spruce for the inboard panels should be more than strong enough, provided you use shear webs as indicated on the rib patterns. Since there will be no real loads put on the wing, 1/8 is really not needed and only adds unwanted weight.

Q: *Is the T.E. formed by joining the two sections of 1/32 at the end of the airfoil?*

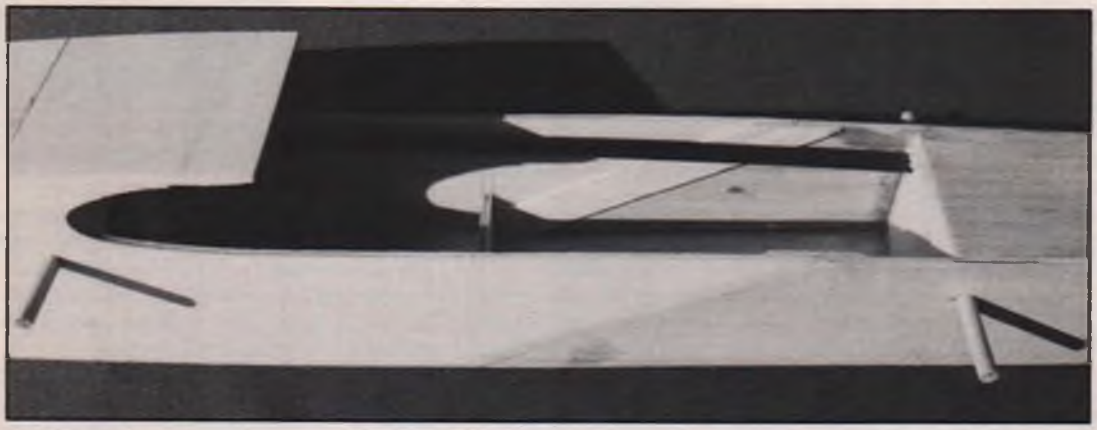
A: Yes. Using a sanding block and 320 or 400 paper, first feather the bottom T.E. sheeting (which would be 1 to 1-1/2 inches wide) to a knife edge, then apply a layer of 3/4-ounce fiberglass cloth—or better yet, super lightweight fiberglass or carbon fiber mat 1/2 to 3/4 inch wide—on top of the feathered edge using 30-minute (or slower) epoxy, not CA glue. Then, with the epoxy still wet, apply the top T.E. sheeting and carefully pin, clamp, or weight the T.E. assembly firmly and wait for it to cure. When the epoxy is hard, the top T.E. sheeting



This is House of Balsa's "Over The Edge" slope glider that Bill Forrey begins reviewing in this month's column. Makes an excellent aileron trainer; one of MB editor's clubmates, Don Dow, built an OTE as his second model (the first was a House of Balsa 2x8) and has quickly become a competent aileron pilot. Photo supplied by Don Dombrowski of House of Balsa.



The framed-up components for Bill's Over The Edge as built by his friend Larry Enger. Uses completely conventional all-wood construction throughout.



The OTE's fuselage has lite-ply sides, each of which is spliced from two die-cut pieces (the diagonal brace inside covers the joint). The fuselage bottom from the nose to the splice is also lite-ply, as are the hatch and wing fairing. The completed fuselage is quite strong and ready to stand up to some rough landings at your favorite slope site.

Don't be fooled by those "turbulator spars"—this is the BOTTOM of the wing you're looking at. The upper leading edge is sheeted with 1/16 balsa. The wing features a wooden dowel leading edge which not only assures a perfect nose radius but also gives a good measure of ding resistance. The cutout in the center is for the aileron servo. The wing halves are joined with 3/4-inch fiberglass tape; no plywood joiner blade is shown on the plans or supplied in the kit.

can be feathered down to the epoxy/glass layer for a very sharp, hard, ding-resistant T.E.

Q: *When building a wing with undercamber, what's the best way to lay it out so the wing doesn't warp? Do you press the ribs onto the bottom spar, or prop up the bottom, put the top spar down, and then turn it over to put the bottom spar on?*

A: Each rib will touch the building board only at the T.E. and L.E. area. Think ahead a step or two and put down a 1/32-inch shim just behind the place where the L.E. stock will be attached to the ribs. The shims will match the L.E. sheeting thickness and prop up the wing ribs perfectly.

Now shim up the bottom spar so that when the ribs are laid on top of it, the spar will slip into the notches perfectly. Experiment with the spar shim thicknesses until it's right. When everything is pinned in place and immobilized, hit the spar and T.E. joints (not the L.E. shims!) sparingly with thin CA.

Next, using thick CA, glue the unshaped L.E. stock to each rib. The L.E. stock must be touching the building board, not shimmed up like the ribs.

The top T.E. sheeting (with glass layer), shear webs, 1/16 ply wing panel joiners, and top spar can be added in that order. Butt the top 1/32 L.E. sheeting up to the L.E. stock and glue it in place at the L.E. *only* with medium thickness CA. The sheeting should be wide enough to reach from the L.E. back to only *partially* cover the top spar cap. Be careful not to over-glue the L.E. sheeting to the L.E. or gravity will cause the CA to drip down and adhere the L.E. shims to the ribs.

Next, sparingly apply thick or slow CA to the tops of each rib and the top spar, then lay down the top sheeting over the ribs using both hands and/or bean bags (I use old socks filled with dry lentil beans, or #9 bird shot, over a piece of yardstick to prevent between-rib sagging), or use your favorite method that will assure the top sheeting is touching every rib and the top spar.

When the CA kicks off, add the capstrips with thin or medium CA and the top surface is done. Flip everything over and apply the bottom L.E. sheeting and capstrips. By this stage, the wing panel should be stiff enough that it won't warp on you. The last step is to plane and sand the L.E. to shape and finish-sand the panel.

I closed my e-mail letter to Ray with a note telling him (and now I'm telling you readers) that *Model Builder* is sponsoring a model design contest for RCHLG designs using the same wing ribs and span measurements that appeared in the December '95 column. This will give the less experienced scratch builders a chance to compete since at least some of the hardest design work is already done.

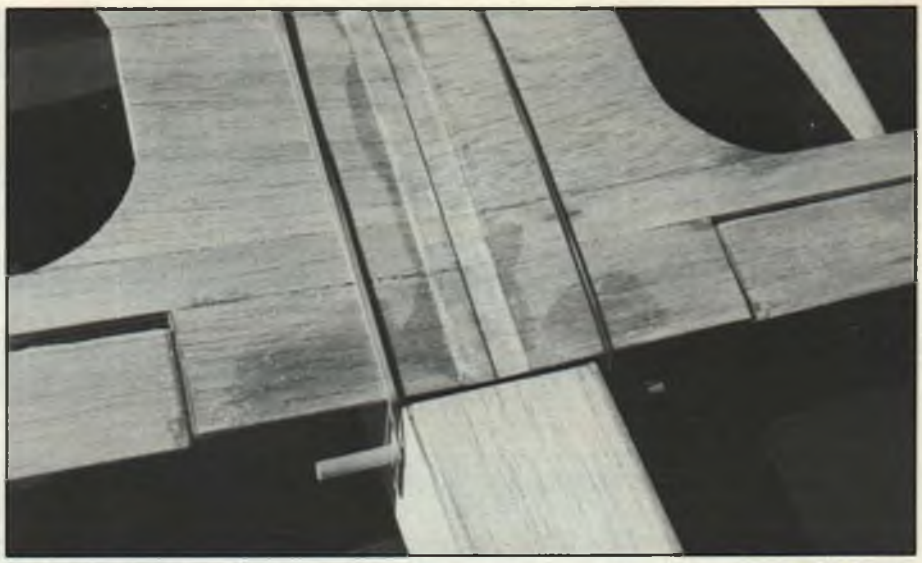
To allow some creativity, there will be variables allowed. For example, the wing *planform* can be varied as long as these ribs are used (i.e. you can change the sweep angles and polyhedral angles any way you want). If you wish, you can build a wing with ailerons, flaps, or flaperons; there are no limits on wing control function. You

need not sheet the wing or use capstrips as long as the full airfoil profile is preserved. The wing does have to be of all-wood construction, however—no foam core wings allowed. Even more creativity will come in with your personal fuselage and tail (or canard) design work. The judges will be *MB's* editor, me, and possibly other *MB* staffers.

Obviously, you'll need to prove that you've designed, built and flown an original design HLG that meets our requirements. We'll need to see a photo of the built but uncovered framework; three finished model photos at different angles on a simple, contrasting background (clean concrete is good, grass is bad); a photo of you launching the model to prove it has been flown; a brief written description of the construction basics; and a description of your model's flight performance. The deadline for all project documentation will be July 5, 1996. This will give you at least four full months to plan and execute your design. Prizes have yet to be determined, but they *will* be worthwhile.

Let's see what great HLG designs we can come up with!

(Editor's note: If you'd like to get in on the fun but didn't see the December '95 issue or don't want to cut up your mag, send us a large SASE and we'll send you two good copies of Bill's drawing. We'd also be interested in presenting construction articles for a couple of these models, perhaps even as partial full-size plans in the magazine centerspread if possible. A copy of Model Builder's *writer's guidelines is available if you're interested—just ask for a copy along with your wing plan drawings.)*



The center trailing edge of the OTE's wing could use a little protection from the six to eight #64 rubber bands that will be pulled over the sharp, unprotected edge. Builders may wish to add their own T.E. guard on top for extra strength—use 1/32 or 1/16 plywood, 1/2-inch wide by about 3 inches long.

MINI REVIEW: HOUSE OF BALSA'S "OVER THE EDGE," Part 1

Due to time and space limitations and other logistical considerations, I thought it would be best to present this product review in two installments. The first part will cover first impressions and building. The second part probably will appear in the May issue and will cover the radio installation, covering and flight testing.

The new "Over The Edge" (OTE) slope glider from House of Balsa shares a distinct family resemblance to other HOB kits: the roomy and boxy-looking fuselage with flat lite-ply sides, rather sharp corners, and a typical HOB lite-ply hatch cover in place of a canopy. It's functional and easy to build, if a little on the plain side aesthetically. Also a common thread among HOB kits is the wood dowel leading edge, a good feature that assures beginners of a perfectly round L.E. that is also unlikely to break in all but the most severe impacts.

Where the OTE differs from the other HOB gliders is control function and purpose. The OTE is intended for use as a first aileron ship. The intermediate pilot who has mastered the basics of flight with a rudder/elevator ship is supposed to naturally and easily step up to the OTE.

Inside the box is a very nice kit! The wood quality and die-cutting is some of the best that HOB has ever produced. Included is the hardware needed to rig up the control system and even a rib jig to assure vertical placement of every rib.

The full-size plans (two sheets) are supplemented by a complete exploded isometric drawing of the whole model printed on a third sheet, which makes the model easy to comprehend as a 3-D image. The instruction booklet has practically every step of the construction process clearly photographed.

I didn't do the actual framing of this model; a very good friend of mine, Larry Enger, who has been a modeler all his life, loves to build models and who is now retired, did. Larry doesn't pull any punches when he reviews a kit. If it deserves criticism, that's what it gets.

I was pleased to hear that the OTE went together very well, with only a couple of gripes worth noting. Larry says the parts fit is excellent, and that with only two minor exceptions, the wood was of good quality. The instructions were easy to follow.

Larry notes that when building the fuselage, be careful to follow the instructions regarding former F-5. With the pushrod hole lined up as it should be, you'll discover that F-5 is too wide by 1/16 inch—you must cut it down. Also, be sure to follow the instructions regarding the

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placement of F-5. It should be glued 1/16-inch below flush so that the upper tailboom sheeting can be dropped in (actually inset between) the plywood sides to be flush with the tops.

Gripe number two is almost a nit-pick in that the lite-ply fuselage sides (four pieces) were all bowed the same way instead of the right and left sides being bowed opposite to each other. The bowed sides make it a little more tricky to assemble the fuselage without it taking on the curve of its major pieces. Still, even though our fuselage pieces were bowed, the method of construction described in the manual straightened them back out again.

Here's a building hint: of the four supplied 1/16 A-grain sheets, use the two best ones (lightest and most flexible) for the leading edges. Save the others for things like the fuselage sheeting and shear webbing. There's more than enough wood supplied in the kit to do the optional rudder. Follow the plans and you shouldn't have any trouble.

Those are the only peculiarities we've found with the construction of the OTE kit so far . . . it's certainly not much to be concerned with if you are thinking of building this kit. We recommend it highly. Stay tuned for more.

Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330; (909) 245-1702 (evenings). ***MB***

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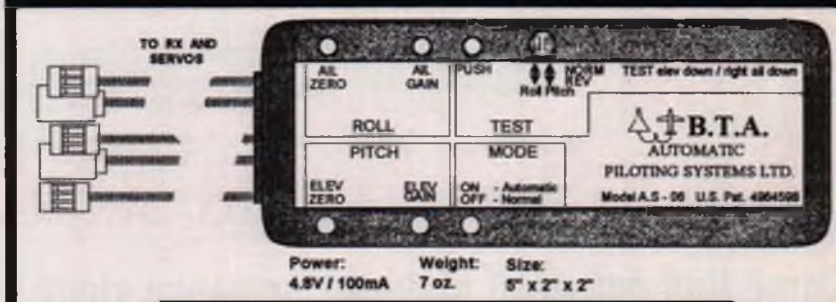

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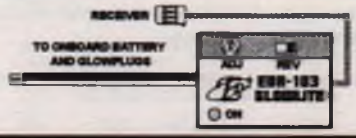

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PRODUCTS IN USE

■ By Ken Stone

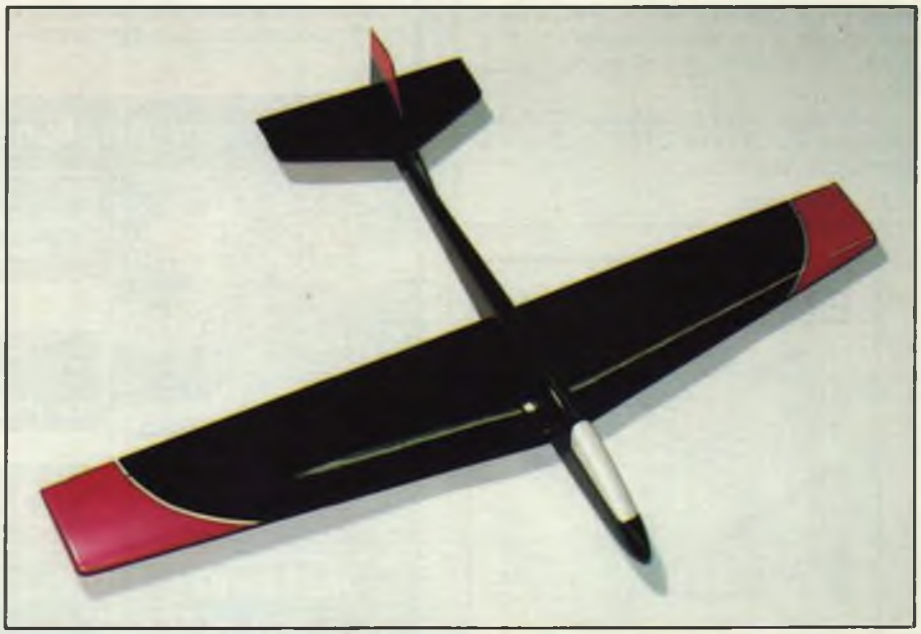
The "Silverstreak" Slope Aerobat from K&A Models

Come find out what high-performance slope soaring is all about with this compact 50-inch span aileron/elevator sailplane. Available with your choice of a wood or fiberglass fuselage.

WAIT JUST ONE MINUTE! You say you throw your model off a *cliff*? Call me before you do, I could use a good laugh!

That was my reaction a few years ago when I was first introduced to slope soaring. Today, with a dozen or so gliders under my belt, I can hardly make the time to build anything else.

All too often I've hiked to the top of the hill with my slope rocket to find the lift weak, or worse, the wind is howling and all I have is my trusty old Zepher, which is not much fun on those rippin' days. This brings me to a gem of a sloper, the Silverstreak, designed and kitted by Ken Williams of K&A Models Unlimited. It is available in both a wood-fuselage version and, as reviewed here, with a fiberglass fuselage. The Silverstreak has a light wing loading and will hang in there when the good lift goes away, but is also a strong aerobatic performer with ballast on those blustery days. Somebody understood my dilemma!



Eighteen ounces of mean slope machine! Ken finished his model in black, wine and silver MonoKote on the wing and tail, black enamel on the glass fuselage, silver on the canopy. You guys who have never flown an airplane like this don't know how much fun you're missing!

KIT CONTENTS

The high-quality epoxy fiberglass fuselage and separately molded fiberglass canopy are light weight yet strong. The accurately cut white foam wing cores need only minimal sanding before being sheeted with the supplied 1/16-inch balsa. The balsa tailfeathers as well as the other balsa and lite-ply parts are machine cut, and all are of exceptional quality.

The Silverstreak kit contains an extensive hardware package, all neatly organized and packed in sealed plastic bags, lacking only the elevator pushrod. Also included are full-size detailed plans and a four-page instruction booklet which is complete but definitely geared toward the more experienced modeler.

CONSTRUCTION

Time to roll up the sleeves and get to work! Start with the wings. The cores require only a light sanding to remove any fuzz. The wing skins are made up by edge-gluing the balsa sheets together as shown on the plans, sanding both sides and then cutting them to shape. Make sure to take into account the curve of the airfoil when sizing the balsa skins.

I used 3M 77 spray contact adhesive to bond the skins to the cores because of its light weight and ease of application, but any method you're familiar with will do. Carpenter's glue was used to attach the balsa leading and sub-trailing edges. The wingtips and root trailing edge stock (with torque rods) are attached after the leading and sub-trailing edges are sanded to shape.

When installing the torque rods, sand the brass bearing but grease the ends and wire so that glue will stick only where you want it to. The toughest part of this job was accurately bending the 3/32-inch torque rods, but once they are done and installed there sure isn't any flex! Aileron hinging was done with Sig Easy Hinges, although the plans outline an alternate method using the covering material which should work equally well. After sanding both wing halves smooth I joined them using 5-minute epoxy and glassed the center section with the supplied 2-ounce fiberglass cloth.

The tailfeathers require joining the machine-cut vertical stab parts together and

The usual first-flight jitters proved to be unwarranted as the Silverstreak flew straight and true right from the beginning. Photo by Larry Renger.

K&A MODELS' SILVERSTREAK SLOPE GLIDER

WINGSPAN ..... 50 in.
WING AREA ..... 312.5 sq. in.
FLYING WEIGHT ..... 18 oz. as tested.
WING LOADING ..... 8.3 oz./sq. ft.
AIRFOIL ..... Eppler 374.
ASPECT RATIO ..... 8:1.
RADIO ..... Two channels required (ailerons and elevator).
SUGGESTED RETAIL ..... $98.95 (fiberglass fuselage version), $59.95 (wood fuselage version).
Produced by K&A Models Unlimited, 13819 Winterwood Way S.E., Albuquerque, NM 87123; (505) 293-7154.

beveling the elevator leading edge. I sanded the leading edges round and tapered the trailing edges to 1/32-inch thickness.

The fiberglass fuselage should be thoroughly washed with warm water and soap to remove any mold release. Completing the fuselage consists of the usual stuff such as installing the wing mounting blocks, elevator servo mounts and a Sullivan Gold-N-Rod #514 for the elevator linkage (the only hardware item I had to purchase separately).

Something not clearly covered in the instructions was the canopy installation. I like to use a piece of music wire that extends about 3/4-inch past the front and rear of the canopy and is glued in place at the middle, under a small piece of spruce. This leaves the end of the wire free to flex. The canopy can then be slid back on the fuselage, with the wire entering a hole, then forvard into position. Simple yet effective.

The last part of the building procedure is mounting the wing to the fuselage. Take your time and measure the distance between both wingtips and the tail of the fuselage until they are even. Time spent here can mean the difference between a great flying model and a dud.

Silverstreak presents a menacing appearance in the air. The first test flights were made at Yorba Linda, a popular Southern California slope site. Larry Renger photo.

RADIO INSTALLATION

The great thing about slope soaring is its simplicity. I used a full-featured, lightweight, inexpensive Cox Cobra two-channel radio with its 80111 mini servos and 8219 micro receiver. Servo locations are clearly show on the plans so installation is easy.

For the elevator pushrod I decided to use only the inner sleeve of the Sullivan Gold-N-Rod and a piece of 1/32-inch music wire to save weight. I used a Z-bend to connect to the elevator horn and a standard set screw type pushrod connector at the servo. The plans show a 500-mAH battery pack in the nose but I had a hard time trying to shoehorn one in, so I replaced it with a AAA dry cell pack which works great.

FINISHING

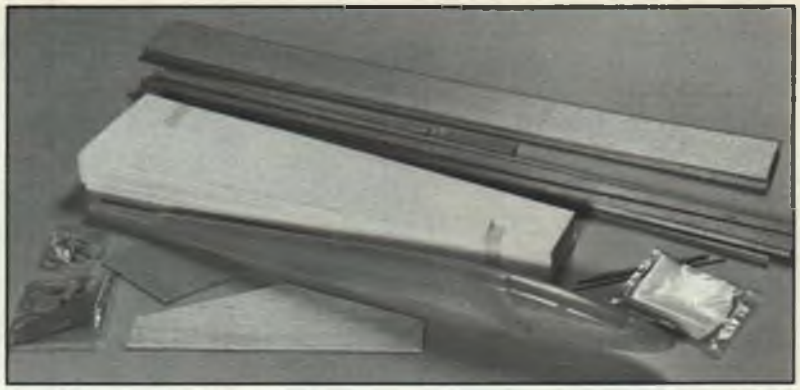
Obviously, the finish on your Silverstreak doesn't need to be fuelproof, but it does need to be durable. After lightly sanding my fuselage and canopy they received a couple of coats of spray-on primer with sanding and filling in between. The final coat is gloss black "Porcyln Epoxy Enamel" on the fuselage and silver on the canopy. This combination worked well, but always remember to check your paints for compatibility.

After letting the fuselage and canopy dry a couple of days I rubbed out the finish using a combination of Mothers Mag Cleaner, Meguires Wax, and a bit of elbow grease. The result is a mirror finish that closely matches MonoKote.

The wing and tail surfaces were final sanded and vacuumed, than covered with black, wine and silver MonoKote. A good finish happens well before the final coat of paint or covering is applied, so take your time to do the prep work right.

CG location and control throws are covered in the instructions. The Silverstreak

The radio in the author's model is an inexpensive two-channel Cox Cobra, with two 80111 mini servos, 8219 receiver and AAA dry cell battery. As far as we know, the Cobra is the only two-channel rig on the market that combines the primary flight controls on one stick (the way it should be!).



The Silverstreak kit. Included is a slick fiberglass fuselage and canopy (a wood fuselage kit is also offered), white foam wing cores, machine-cut balsa and lite-ply parts and an extensive hardware package.

took about 1 ounce of lead in the nose to achieve proper balance, which could probably have been eliminated if I had used a 500-mAH battery. Oh well. When all was said and done the Silverstreak weighed in at 18 ounces, yielding a light 8.3 ounces per square foot wing loading.

Basic construction through final sanding took 25 hours, while finishing and staring at my new creation took another 7 hours—all over the span of about eight evenings.

FLYING

The day finally arrived. Conditions were ideal, it was late afternoon on a 300-foot southern California slope with 20-mph winds. After checking control surface directions and radio range, the big moment was here. The model gracefully left my hand and with a couple of clicks of trim was performing like an old friend. Control response was smooth and accurate; this glider goes where you point it. Rolls are axial and quick. The Silverstreak loops true and level inverted flight requires only minimal forward stick pressure. On setting up for landing I noticed how well this plane settles in with no tendency to tip stall.

The second time out with 4 ounces of lead ballast aboard showed what slope soaring is all about. Yahoo! It tracks smooth and straight, with impressive speed retention. Boy, does this model cover ground in a hurry while retaining its positive feel. The Silverstreak sure does live up to its name.

Although I would not recommend the Silverstreak to the first-time flier, it could easily be a great second project. Good luck and happy landings! ***MB***

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500TL	5" (127mm)	1.500"	38.10mm
550TL	5-1/2" (140mm)	1.700"	43.18mm
600TL	6" (152mm)	1.850"	47.00mm

400TL - 600TL Tires have a 3/16" (5mm) Axle Dia.

Field Testing Reports

Dan Webb, 1st Place Winner of the Post 1935 Military class competition at Bomber Field, notes:

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Pre-Shaped Elevators
Pre-Shaped Rudder

SPECIFICATIONS:

Top Wing Span:	54.5"
Bottom Wing Span:	51.75"
Total Wing Area:	966 sq. in.
Length:	50"
Weight:	6.5 - 7.5 lbs.

SIG

KIT # RC-69

Designed By: Harold Hester

Since 1957, thousands of modelers worldwide have been delighted with the slow flying, yet fully aerobatic, flight performance of the original ASTRO-HOG (monoplane). As the old saying goes, "NOTHING FLIES LIKE A HOG!". Well, now you can have the same easy-flying aerobatic performance in a sport biplane design - the new SIG HOG-BIPE! Just like the ASTRO-HOG, the new HOG-BIPE performs any maneuver in the book, yet flies slow enough to let you enjoy it. This is barnstorming at its best.

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BY KEN KETNER / PHOTOS BY TROY ELLISON

THE BUZZER 100

An oldie but goodie! The author presents a redesigned version of Bill Winter's 1948 cabin free flight, for the Brown B-100 or similar size CO_2 motors. Won 1st place in the Open CO_2 event at the 1994 AMA Nats!

Have you dreamed of having a model that wanted to fly away every time, was easy to build, a beauty to view and was powered by a motor that was a cinch to start, made almost no noise, and required almost no maintenance? Perfection is not to be expected, of course, but let me tell you how I came close to this ideal.

A new Brown B-100 CO_2 motor—factory serial number 363—arrived at my Lubbock, Texas mailbox a few months ago. (It's part of the fun to "send off for things" and to have them appear miraculously!) After a couple of test runs I could see that it was a little jewel, so I began to search for an airframe that would be its equal. I happened at the time to be reviewing my favorite older model magazine, *Air Trails*, especially issues from the late '40s and early '50s. I particularly love the full-size plans they put in almost every issue. On page 50 of the December 1948 issue, I stumbled upon the ideal ship, the Buzzer, designed by none other than the old master, Bill Winter, and with a fold-out plan!

In 1948, Bill Brown, the powerplant genius, released his CO_2 motor through OK-Herkimer. Brown's Campus Industries had also introduced the smaller Campus A-100. Not to be lost in the CO_2 boom, Polk's Hobbies, which featured a line of gas engines under its "Buzz" trade name, produced the Buzz CO_2 motor, which had a bore of 3/16-inch. Winter's Buzzer was designed for the Buzz motor, and Bill Brown's new B-100 looks to be about the same size.

With that thought in mind I photocopied Winter's Buzzer plan, then set about modifying it for my B-100. I planned to install a dethermalizer and make a number of other modifications while using some innovative construction techniques I had been developing. The result is a ship that is easy to trim and won't stay on the ground. The airframe and motor are a beautiful pairing. Mine has flown away twice; only luck, and the help of my clubmates, the Latex Rangers (Flying Aces Club Squadron No. 25), brought it home in one piece.

The author's prototype Buzzer 100 ready for action. The little Brown B-100 motor looks lost in the cowl; the Gasparin-designed GM-120 would be another good choice. Both of these motors and their associated chargers are available through Peck-Polymers.

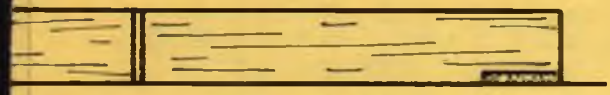
BUILDING THE BUZZER 100

The plan is printed on both sides of the magazine centerspread. One side includes both wing panels and the horizontal stab; the other has the fuselage, which is too long to be shown in one piece. Build the wing and stab first, then cut and splice the plan as shown to make a complete fuselage profile drawing.

The model employs a wing construction method I developed that assembles fast and flies great. Refer to the sketches on the plan. Place the 1/16x1/2 trailing edge, the 1/16x7/16 center spar and the 1/8 x3/16 leading edge down on the plan. Cut 20 front rib blanks (7/16x1-1/2 inches) and glue them in place between the L.E. and spar. Cut 20 rear rib

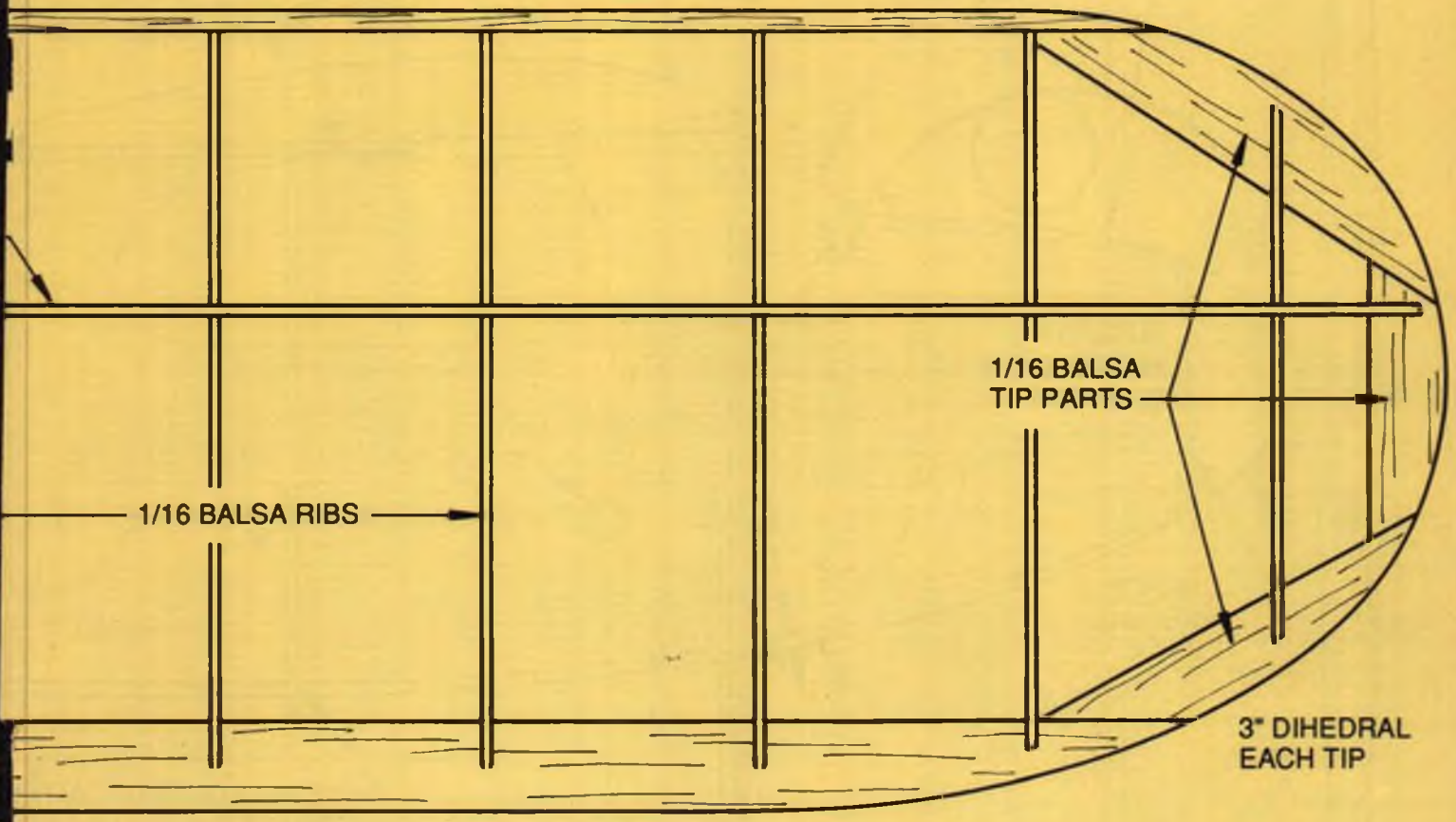
For best glide performance, Ken recommends using a folding prop such as this SonicTronics 8x4, developed for electric powered RC sailplanes. The star-in-a-circle is the logo for Flying Aces Squadron No. 25, the "Latex Rangers."

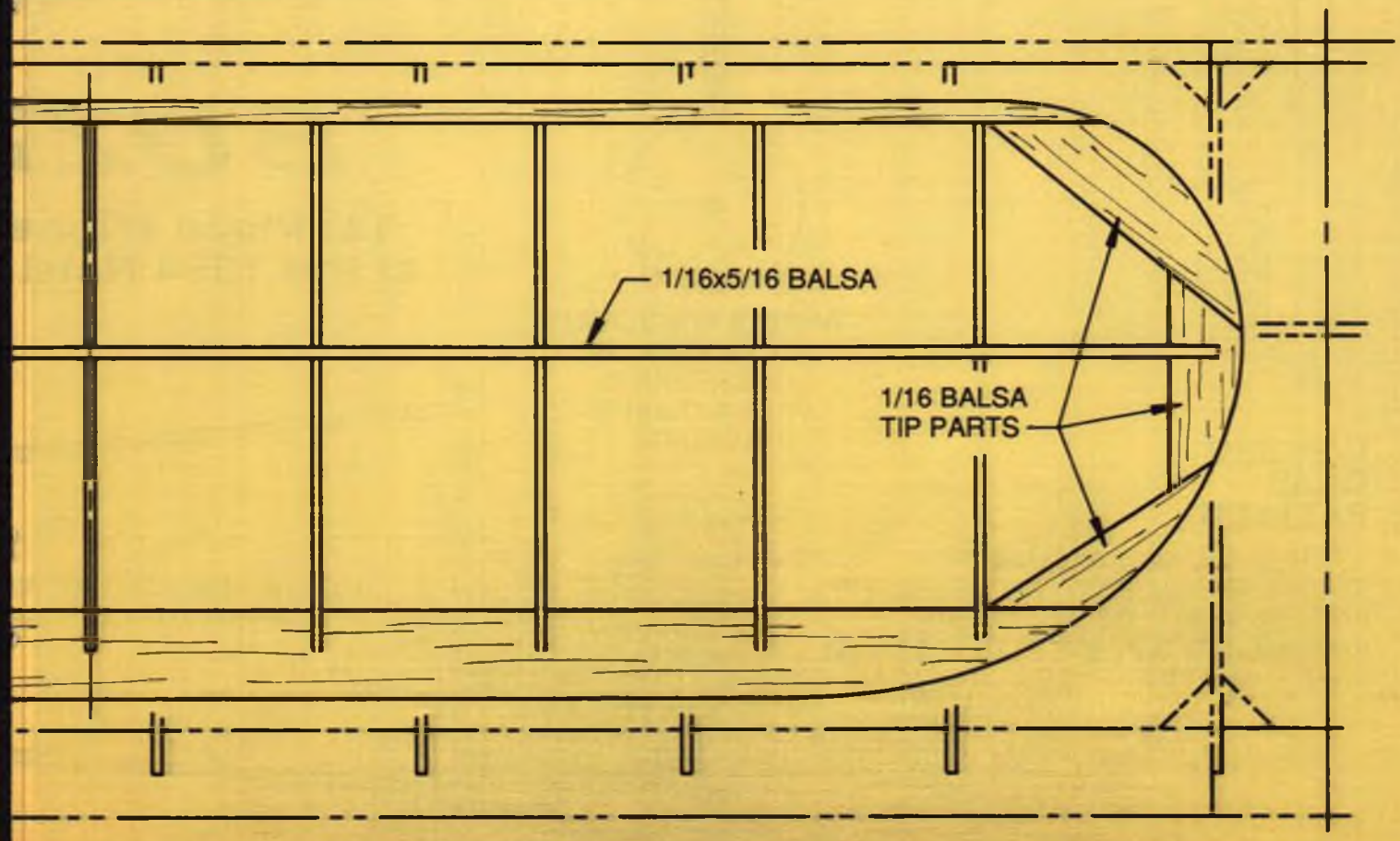
continued on page 84

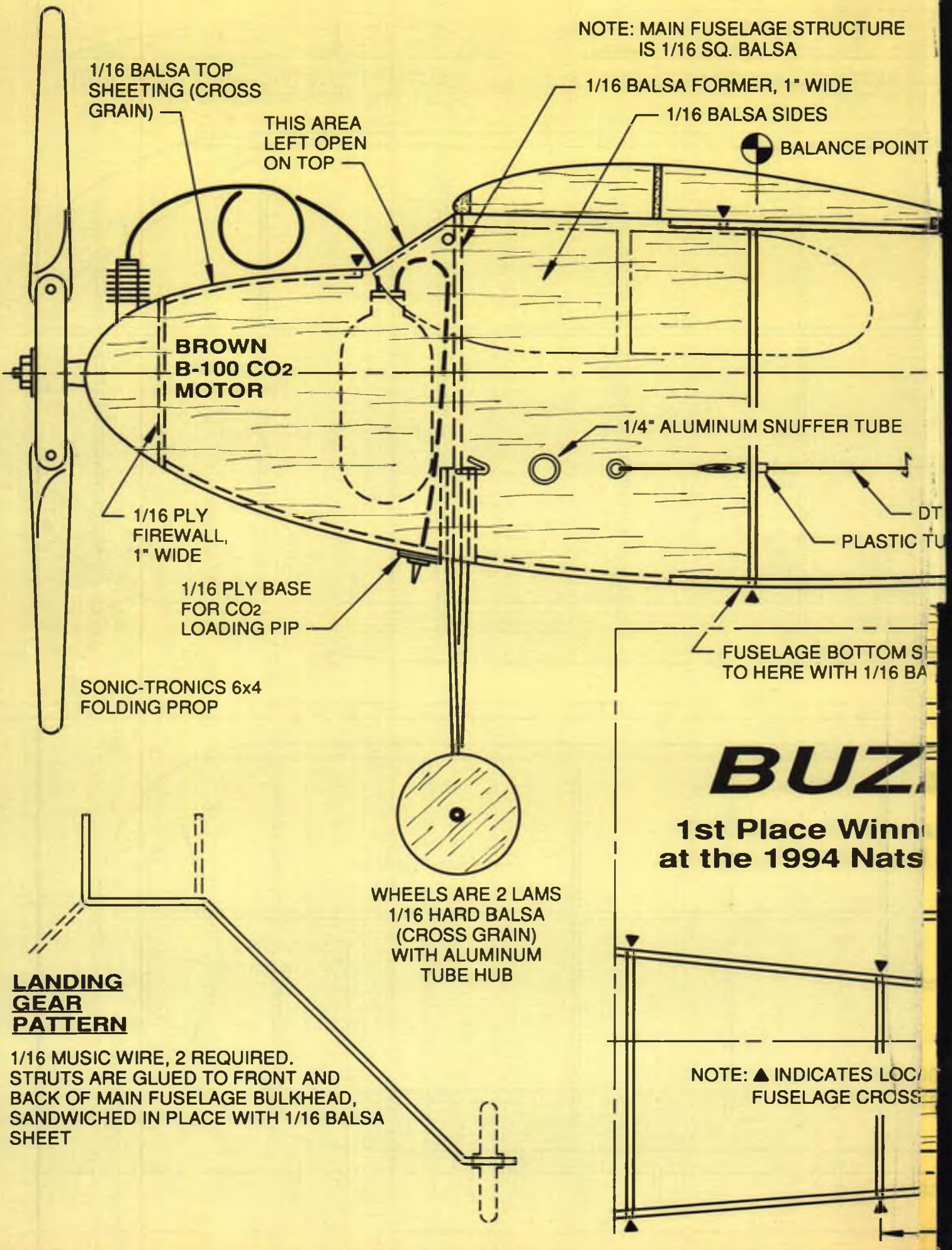


LUE RECTANGULAR 1/16" BALSA RIB
NKS IN PLACE.

3. CUT RIBS TO APPROXIMATE SHAPE WITH SCISSORS, FINISH WITH SANDING BLOCK.



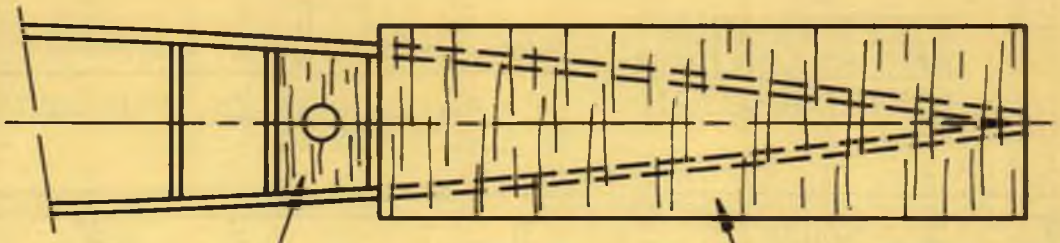




BUZ

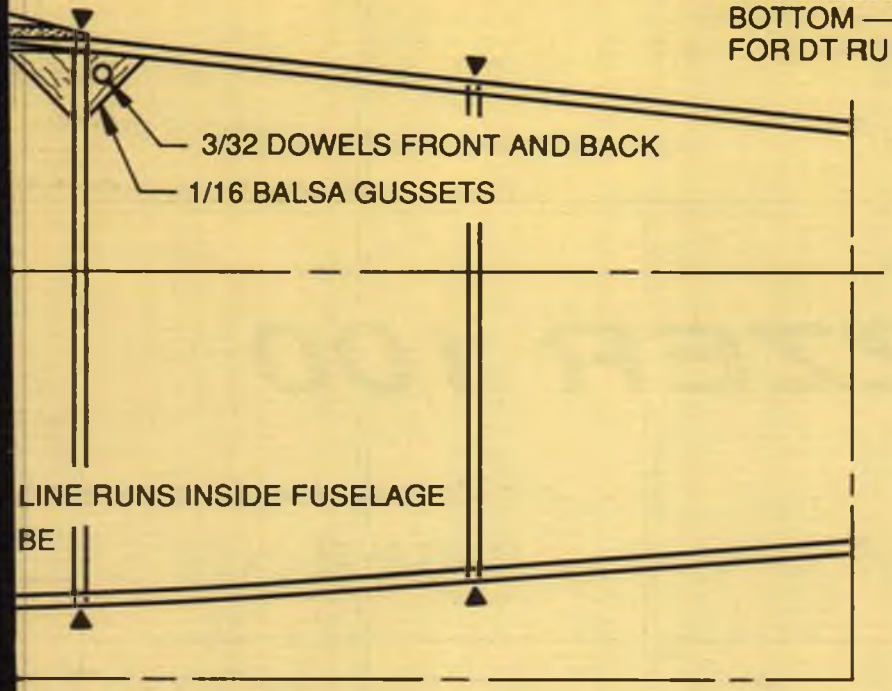
1st Place Winn
at the 1994 Nats

FUSELAGE TAIL END TOP VIEW



1/16 BALSA FILL-IN ON BOTTOM — HOLE IS FOR DT RUBBER BAND

1/16 HARD BALSA STAB PLATFORM, 1" WIDE, SET SO THAT TAIL HAS 1/2" RIGHT STAB TILT



3/32 DOWELS FRONT AND BACK

1/16 BALSA GUSSETS

ENTIRE MODEL COVERED WITH JAPANESE TISSUE

LINE RUNS INSIDE FUSELAGE

BE

NOTE: VERTICAL TAIL PARTS ARE ALL 1/16 BALSA

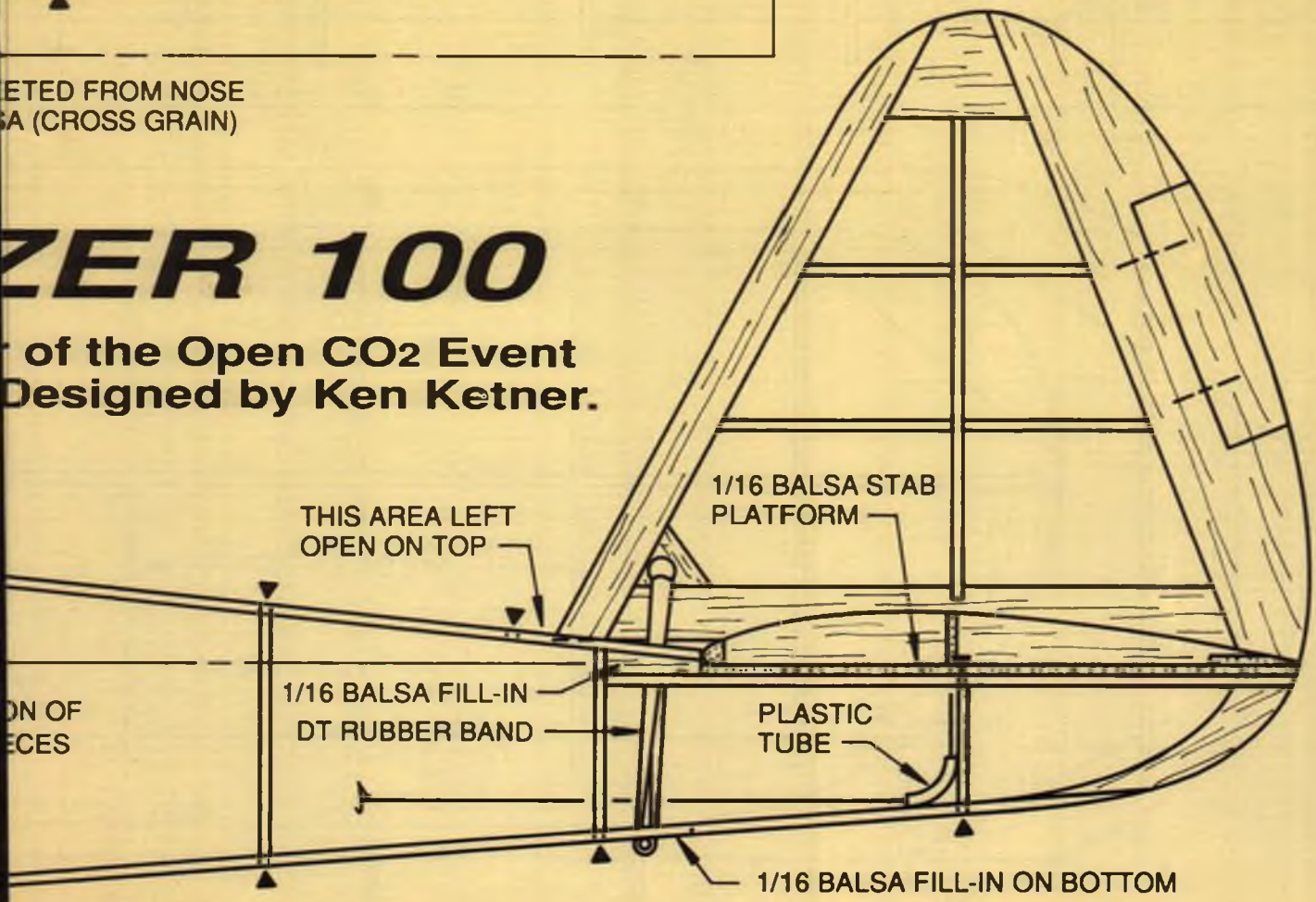
ETED FROM NOSE

A (CROSS GRAIN)

ZER 100

of the Open CO_2 Event

Designed by Ken Ketner.



THIS AREA LEFT OPEN ON TOP

1/16 BALSA STAB PLATFORM

ON OF

ECES

1/16 BALSA FILL-IN

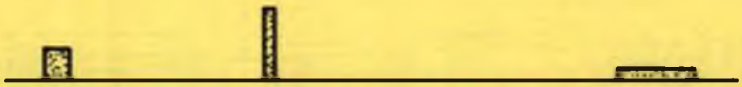
DT RUBBER BAND

PLASTIC TUBE

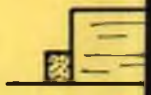
1/16 BALSA FILL-IN ON BOTTOM

SELAGE IS 1-1/8 INCHES WIDE FROM NOSE TO HERE, PULLS TOGETHER AT TAIL

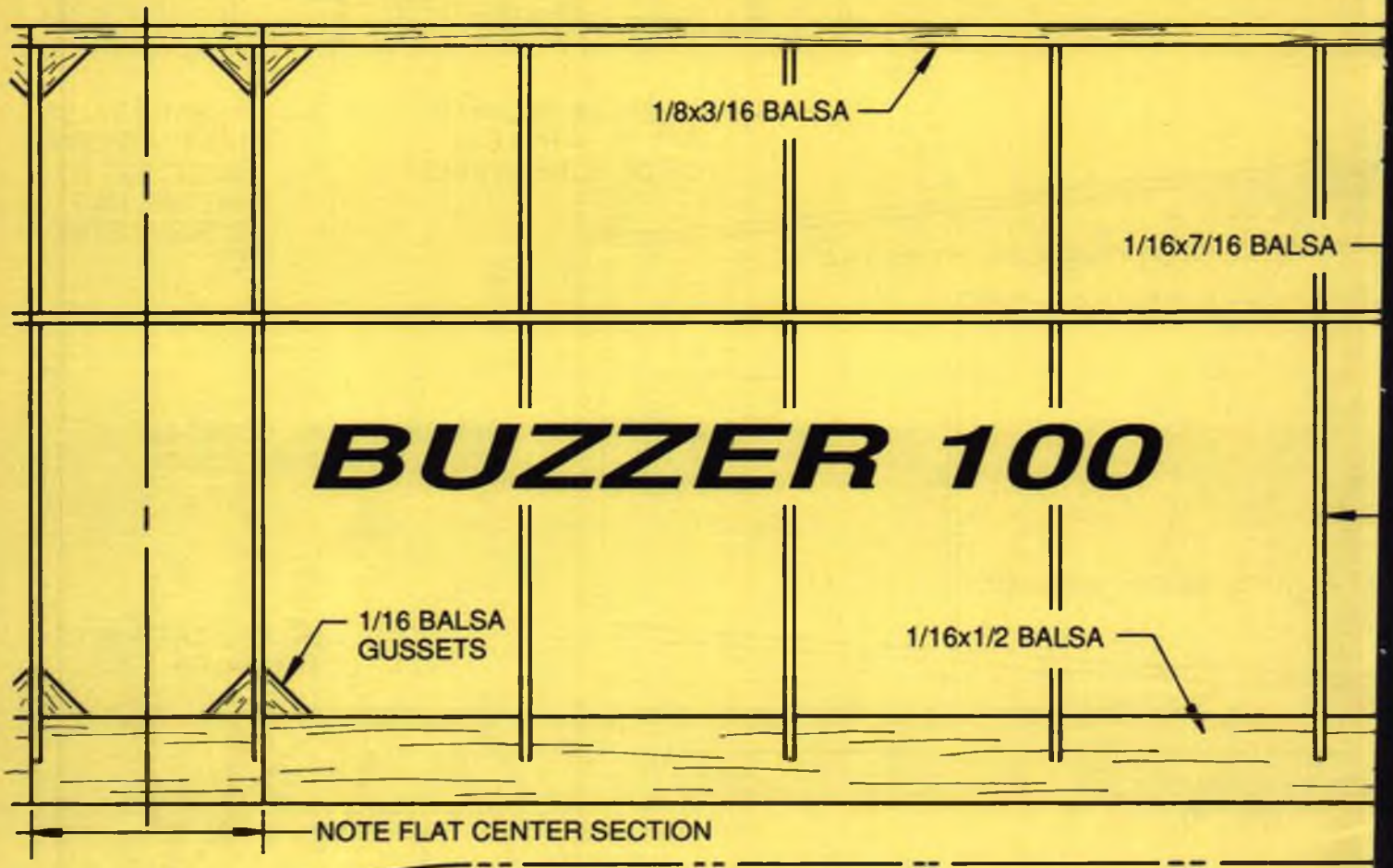
STEPS IN WING AND STABILIZER CONSTRUCTION



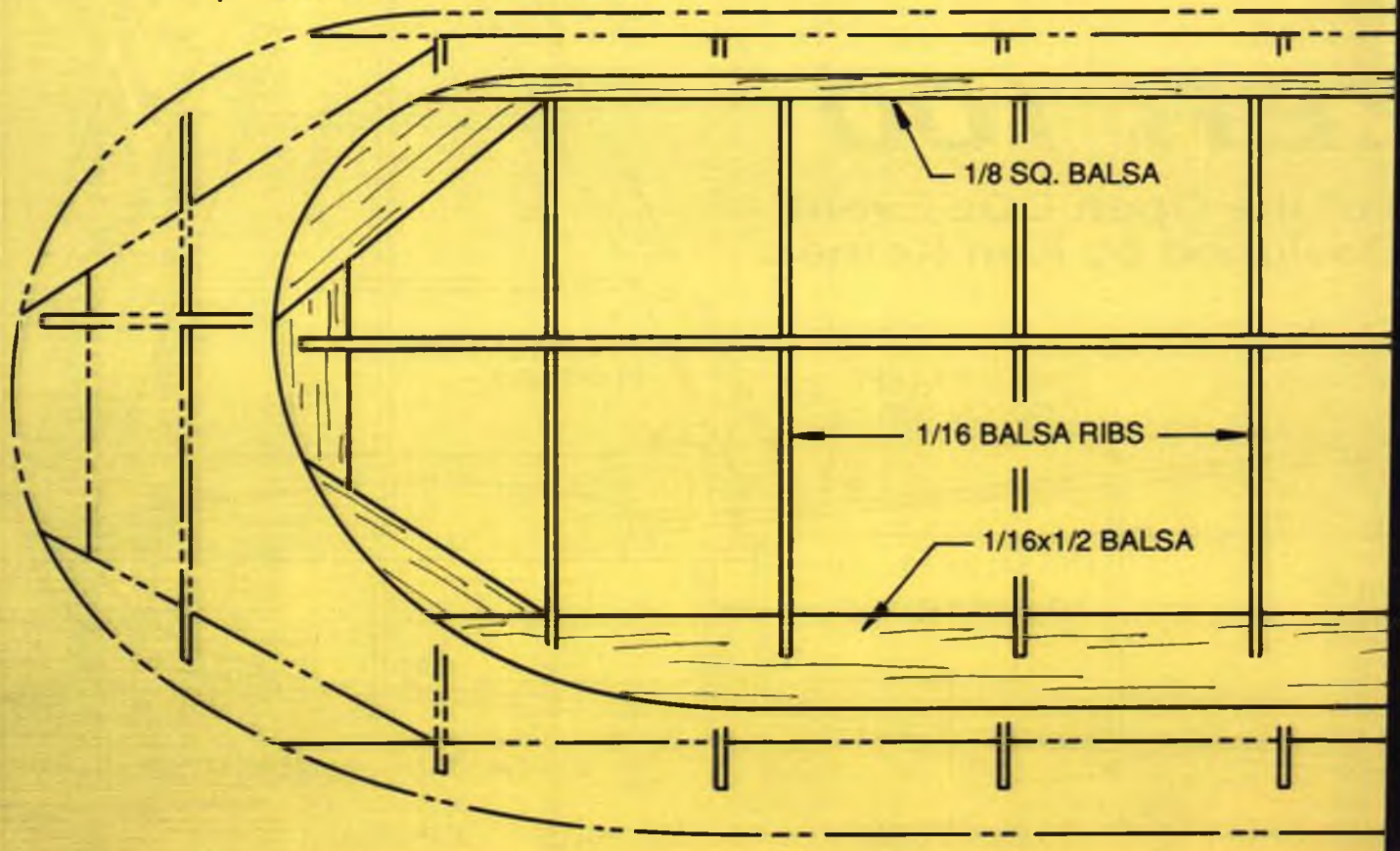
1. PIN LEADING EDGE, SPAR AND TRAILING EDGE TO BOARD.



2. G
BLA



BUZZER 100



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DURING WORLD WAR II, the P-47D Thunderbolt earned a reputation as a durable, dependable aircraft that served its pilots well. Thanks to Top Flite's Gold Edition engineering, you can now command an authentic 1/8 sport-scale version of the Thunderbolt that in the air will serve you equally well, with the same formidable profile of the full-scale indestructible "Jug". 3-D computer-designed construction techniques allow the P-47D's interlocking parts to assemble quickly and accurately, and astounding detail features and precision-formed scale parts will have your model looking just like the "Bonnie" P-47D-23 Razorback. You'll be proud to own this scale replica of a nostalgic American warrior, and as with all Top Flite Warbirds, you'll enjoy building and flying it as well.

Dramatically enhance the P-47D's realistic appearance with the Scale Cockpit Kit (TOPQ8405) which adds an instrument panel, seat and other exciting scale touches. The Canopy Conversion Package (TOPA1616) transforms the P-47D-23 into the distinctive D-25 version, the original P-47D model introduced by Top Flite almost 20 years ago.

The scale lines of this impressive fighter have been preserved throughout, from the optional in-cowl muffler and static display prop to the optional wing mount and belly mount fuel drop tanks. Fixed landing gear is included, but the kit will easily accept optional retracts for even more realism.

The secret is in the airfoil

The P-47D's root airfoil (S8036) and tip airfoil (S8037) were developed for this kit by Dr. Michael Selig, a competition-level R/C pilot, internationally recognized expert in low-speed airfoil design, and founder of the Low Speed Airfoil Tests Program at the University of Illinois.

Dr. Selig's use of state-of-the-art aerodynamics software to create the P-47D's airfoils has resulted in a plane that offers a slow stall speed, excellent stall resistance and superior handling throughout its speed range. That translates into more forgiving, more confidence-building R/C warbird flight.

Specifications: Wingspan: 63 in (1600 mm) • **Wing Area:** 713 sq in (46 sq dm) • **Weight:** 8-10 lb (3630-4540 g) • **Wing Loading:** 27-32 oz/sq ft (82-98 g/sq dm) • **Engine Required:** 2-stroke .61-.90 cu in (10-15 cc) or 4-stroke .91-1.20 cu in (15-20 cc) • **Radio Required:** 4-7 channel w/4-8 servos

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AT-6 TEXAN
Wingspan: 69.4 in

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Charlie Valentino's AIR FORCE

You've seen an example of his work on the cover of this issue of *Model Builder*; now take a look at some of this master craftsman's other outstanding scratch-built RC scale models.

Photos and text by Frank Gudaitis

The beautifully detailed RC scale models on these pages are all the work of a man who has been building models for over 60 years.

He is Charles Valentino of Lake Ronkonkoma, New York. With the exception of the gorgeous 1/4-scale Boeing F4B-4 pictured on this month's *Model Builder* cover, all of Charlie's airplanes are scratch-built from Nick Ziroli plans, and represent six to seven months of full-time work. All are built to 1/5-scale except the B-25 Mitchell, which is 1/8-scale and took something over eight months to complete.

Two Zenoah G-38s supply the power for Charlie's 1/8-scale North American B-25, a replica of the Confederate Air Force's "Yellow Rose." Spans 101 inches, has flaps, retracts.

Such a craftsman obviously uses only the best materials and products available. Charlie favors Futaba RC systems, Zenoah and Quadra engines, Robart retracts, Super Coverite covering, and ZAP cyanoacrylate glues. Perhaps most amazing of all is that those flawless glossy finishes are all done with Krylon spray cans, sprayed over an automotive primer base! For a flat finish, such as on the B-25, the P-40 and the Stuka, Charlie switches to Pactra's Formula-U polyurethane.

Most scale modelers have built at least one P-51 Mustang at one time or another, and Charlie is no exception. His

The Junkers JU-87 Stuka is always a favorite with spectators and pilots alike. Charlie's 1/5-scale model features working dive brakes and a semi-detailed cockpit. Flat camouflage colors are Pactra Formula-U, the rest is Krylon.

What looks like an authentic WWII color scheme on this F4U Corsair is really a copy of the Unlimited racer campaigned by Howie Pardue. It's hard to believe Charlie can get this kind of a finish out of Krylon spray cans. Note the fully detailed cockpit and dummy radial engine—a spruced-up version of the molded plastic one produced by Nick Ziroli.

That's Charlie posing with his "Big Beautiful Doll," modeled after a well-known full-scale P-51D. That flawless silver finish is done with automotive bumper paint. Like most of his other models, this one is powered by a Zenoah G-62.

Charlie Valentino's AIR FORCE

Another view of one of last month's cover subjects, the Curtiss P-40D of Gen. Chennault's Flying Tigers fame. Charlie's model has Robart 90-degree rotating retracts, flaps, Zenoah G-62.

model is copied after an existing aircraft, "Big Beautiful Doll," is equipped with flaps and retracts, weighs 31 pounds and is powered by a Zenoah G-62.

The Curtiss P-40D is done up in the desert camouflage colors of General Chennault's Flying Tigers, and sports a Zenoah G-62 and Robart 90-degree rotating retracts. Flying weight is 28 pounds.

The sole twin in the group is the B-25, with two Zenoah G-38s. Spans 101 inches, weighs 33 pounds, has flaps, retracts, the works.

Charlie's 93-inch span F4U Corsair is finished in the military-type livery used by Howie Pardue on his Unlimited racer. The model sports a fixed landing gear, Zenoah G-62 engine, operating flaps, and a highly detailed dummy radial engine.

The Grumman F9F Panther, featured on the cover of last month's *Model Builder*, is Charlie's only ducted fan ship to date, equipped with a Rossi .77 and weighing in at 25 pounds.

Silver automotive bumper paint was used for the finish on the P-47 Thunderbolt (and the P-51 too). Has flaps and retracts, a Quadra Q65 engine and spans 83 inches.

The German Luftwaffe is represented

The venerable Republic P-47 Thunderbolt is a favorite of scale modelers; this copy of an early razorback version spans 83 inches, weighs 30 pounds and carries a Quadra Q65 up front.

by the Junkers JU-87 Stuka, complete with operating dive brakes. Power for the 100-inch, 30-pound model comes from a Quadra Q65.

Charlie's latest project is a pre-WWII subject, the Boeing F4B-4, built to 1/4-scale. He purchased a set of enlarged model plans from Cleveland Model and Supply Co. and redesigned the structure to current standards. The engine is a Zenoah G-62, flying weight is 34 pounds, and the model is complete with functional lights.

Wherever Charlie's superb models are shown they are admired as examples of elegance, and are frequent award winners. *MB*

Grumman's first jet was the F9F Panther, a Navy shipboard fighter which saw action during the Korean War. Charlie's 1/5-scale replica is powered with a Rossi .77 ducted fan setup.

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6.5 X 5.5	3	3.95
6.5 X 6.0	3	3.95
6.5 X 6.5	3	3.95
7 X 3	15	1.59
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8 X 7		1.79
8 X 8		1.79
8 X 9		1.79
8 X 10		1.79
8.5 X 5	4	3.95
8.5 X 5.5	4	3.95
8.5 X 6.5	5	3.95
8.5 X 7.0	5	3.95

SIZE	USE	PRICE
8.5 X 7.25	5	3.95
8.5 X 7.5	5	3.95
8.75 X 7.0	5	3.95
8.75 X 7.5	5	3.95
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8.75 X 8.25	5	3.95
8.75 X 8.5	5	3.95
9 X 4	16	1.99
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9 X 9		1.99
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9.5 X 7.5N	5	3.95
9.5 X 8.0N	5	3.95
9.5 X 8.5N	5	3.95
9 X 6.5	5	3.95
9 X 7.5	5	3.95
9 X 8.5	5	3.95
9.5 X 4.5	11	2.29
10 X 3		2.29
10 x 4		2.29
10 X 5		2.29
10 X 6		2.29
10 X 7		2.29
10 X 8		2.29
10 X 9		2.29
10 X 10		2.29
10.5 X 4.5	11	3.95
11 X 3		2.49

SIZE	USE	PRICE
11 X 4		2.49
11 X 5		2.49
11 X 6		2.49
11 X 7		2.49
11 X 8		2.49
11 X 9		2.49
12 X 6		2.89
12 X 7		2.89
12 X 8		2.89
11 X 10	7	7.95
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11 X 13	7	7.95
11 X 14	7	7.95
11.5 X 4	8	2.89
12.25 X 3.75	8	3.49
12 X 9	7	7.95
12 X 9W	7	7.95
12 X 10	7	7.95
12 X 10W	7	7.95
12 X 11	7	7.95
12 X 11N	7	7.95
12 X 11.5	7	7.95
12 X 12	7	7.95
12 X 12.5	7	7.95
12 X 12N	7	7.95
12 X 13	7	7.95
12 X 13N	7	7.95
12 X 14	7	7.95
12.5 X 9	7	7.95
12.5 X 10	7	7.95
12.5 X 11	7	7.95

SIZE	USE	PRICE
12.5 X 11.5	7	7.95
12.5 X 12	7	7.95
12.5 X 12.5	7	7.95
12.5 X 13	7	7.95
13 X 6		4.25
13 X 7		4.25
13 X 8		4.25
13 X 9	7	7.95
13 X 10	7	7.95
13 X 11	7	7.95
13 X 12	17	7.95
13 X 13N	9	7.95
13 X 13.5N	9	7.95
13.5 X 9	7	12.95
13.5 X 10	7	12.95
13.5 X 11.5N	7	12.95
13.5 X 12.5	10	12.95
13.5 X 13.3	10	12.95
13.5 X 13.5	10	12.95
13.5 X 14	10	12.95
13.5 X 14W	10	12.95
14 X 5N		12.95
14 X 6		12.95
14 X 8		12.95
14 X 10		12.95
14 X 11	17	12.95
14 X 12	10	12.95
14 X 12N	10	12.95
14 X 13	10	12.95
14 X 13N	10	12.95
14 X 13.5	10	12.95
14 X 13.5N	10	12.95
14 X 14	10	12.95

SIZE	USE	PRICE
14 X 14N	10	12.95
14.4 X 10.5	10	12.95
14.4 X 12	10	12.95
14.4 X 13	10	12.95
14.5 X 14N	10	12.95
14.5 X 14.5N	10	12.95
15 X 8	10	12.95
15 X 10	10	12.95
15 X 11	10	12.95
15 X 12	10	12.95
15 X 13N	10	12.95
15 X 14N	10	12.95
15.5 X 13N	10	12.95
16 X 8		12.95
16 X 10		12.95
16 X 12		12.95
16 X 13N	10	12.95
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20 X 14		25.00
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22 X 12	13	31.00
22 X 14		31.00
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21 X 10		37.00
21 X 12		37.00
22 X 10		45.00
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24 X 14		55.00
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12	35 CC
13	70 CC
14	.21-.25 Free Flight
15	15 Free Flight
16	29 Free Flight
17	YS 91

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TOOLS OF THE TRADE

The right tools can make all the difference when doing a particular job. This month Roger talks about the ones every electric enthusiast should have on hand. Also discussed: Astro Flight's Model 115D AC/DC Digital Peak Charger.

In addition to being a model airplane builder and pilot, I also enjoy woodworking. In this craft, there's an old saying: "With the right tools, every job is easy." Of course, the same can be said of model building. How would you like to try build a plane without an X-Acto knife or razor blade? It would be pretty tough!

For the moment I'm going to assume that those of you who have an interest in building planes from plans or from kits know about the basic tools of model construction. What I'd like to discuss are the specialized tools used when building and flying electric models. I'll give some suggestions on where to find these tools at the end of this column.

Photo No. 1 shows the few basic tools used to work electrical wire. Note the spools of wire on the right side of the photo. Wire size is described as "gauge"—the smaller the gauge number, the heavier the wire. Wire used in electronic equipment is very small—usually 22 to 28 gauge, while the wire used in your house's electrical circuits is typically 8 to 12 gauge. Electric airplanes typically use 10-14 gauge wiring. As you would suspect, as the wire gets smaller, its electrical resistance goes up. This is not normally a concern for small electric power systems, but if your motor is going to draw 20 amps or more, the power loss through the wire can become significant.

The wire in the picture is 12 gauge stranded wire. Wire can be either solid or stranded; your house wire is solid, it's stiff and hard to shape. The stranded wire we use is flexible because it's made of many individual small wires twisted together. *High-flex* wire (expensive stuff!) can have more than 1,000 individual strands and can be bent tightly without taking a set, making it easy to stuff in the fuselage of your plane. I like to use two colors of wire to keep track of the voltage polarity.

Also in the picture is a razor blade, a pair of needle-nose pliers and diagonal cutters. I've found the razor blade to be the easiest tool with which to strip off wire insulation. There are specialized stripping tools available, but I've become used to the simplicity of a razor. To strip the wire, I place it on my workbench, put the blade above where I want the insulation to be removed and roll the wire underneath the blade. This leaves a clean cut in the insulation without cutting into the wire strands underneath. I can usually pull the insulation off with my fingers—if not, the needle-

Photo No. 1.

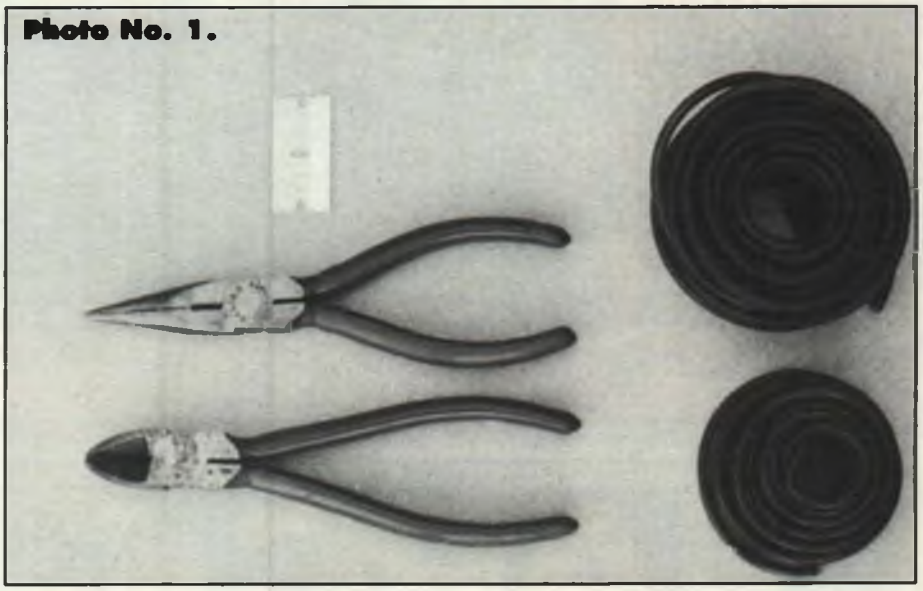
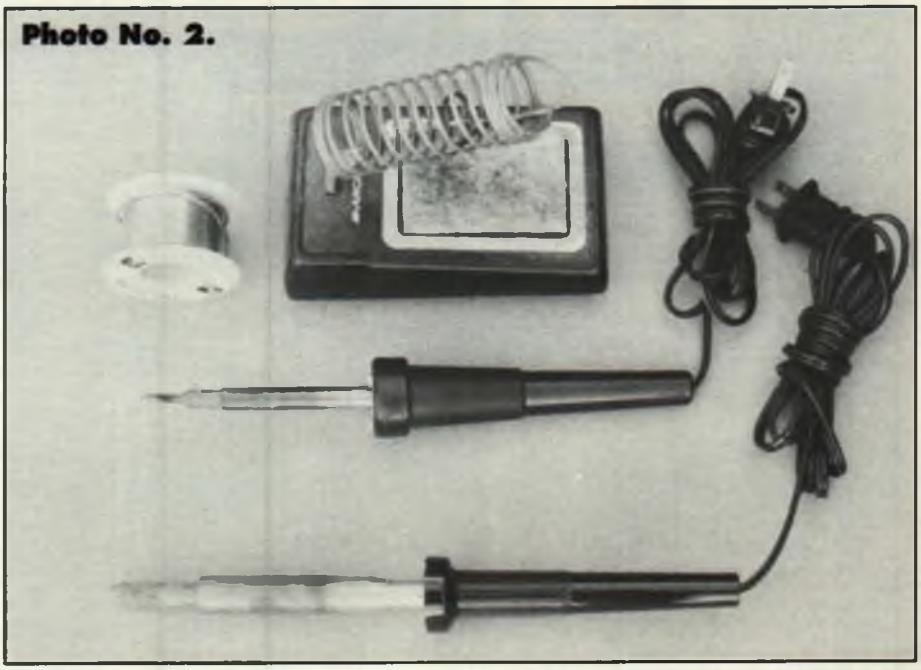


Photo No. 2.



nose pliers come in handy. The diagonal cutters are used to cut the wire to length and can also be used to strip insulation, but you have to be careful to not cut into the wire strands.

After the wires are cut and stripped, solder is used to secure them to the connectors, switches, speed controls, battery packs and to each other. Solder is an alloy (a combination of metals) made up of tin and lead, and has the interesting property of having a lower melting point than either tin or lead by themselves. Common electrical solder is 60 percent tin and 40 percent lead, and is available in several different sizes. It's shaped like a wire, but it has a hollow core filled with a rosin which acts as a cleaning agent for the wires to be joined. When the solder heats up, the rosin first liquefies and cleans the metal, then the solder melts and makes the bond. A roll of solder lasts a long time—I've had the one in Photo No. 2 for over four years!

Soldering irons are rated according to their wattage, which is a measure of the heat generated. The small one in Photo No. 2 is a 25 watt iron, which I use for 75 percent of my modeling work. This iron has a chisel-shaped tip and is ideally suited for soldering wires to each other and to electrical terminals and connectors. The iron at the bottom of the picture is an 80 watt iron; I use this one to solder larger wires together (like those on landing gear parts) and to assemble battery packs from individual cells. The soldering iron holder is shown at the top center of the picture; the rectangular object in the holder is an ordinary kitchen sponge that is used to keep the soldering iron tip clean.

Photo No. 3 shows various instruments that are useful in measuring voltage and current. On the left is a generic analog volt/ohmmeter, more commonly known as a VOM. This particular unit has been in my arsenal for 20 years and has served me very well. It can measure voltage, current and resistance in a number of different ranges.

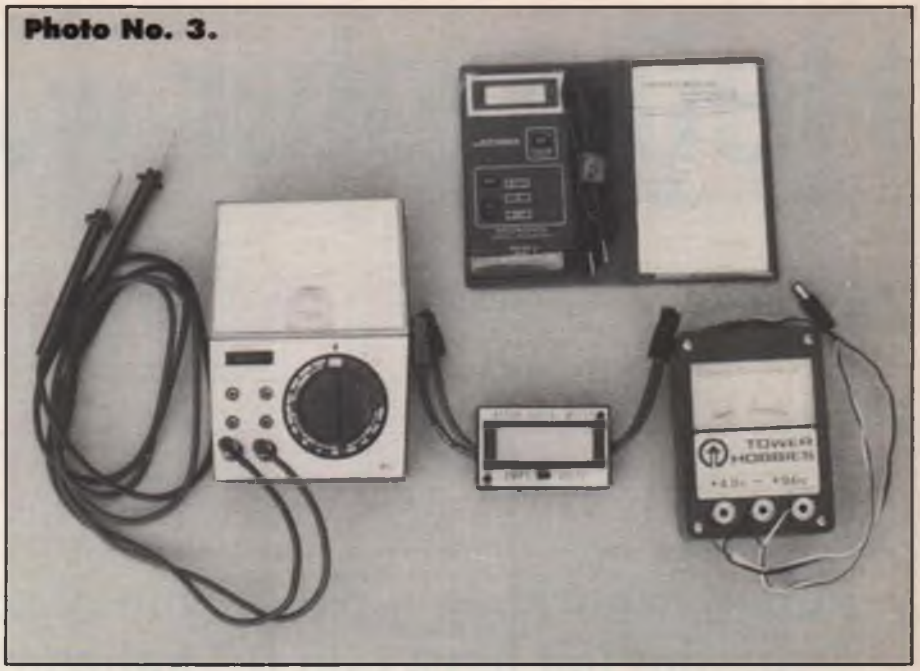
The expanded-scale voltmeter (ESV) shown in the bottom right of the photo. Using this instrument is the easiest way to insure that your receiver and transmitter batteries are in good shape and ready for action. It works just like the VOM, but there is additional circuitry that allows the meter to read a smaller range of voltages. My ESV reads from 4 to 6 volts for receiver batteries and from 8 to 12 volts for transmitter batteries.

At the top of the photo is my digital voltmeter (DVM). This is an inexpensive model that I bought from Radio Shack a few years ago. It measures voltage and resistance and is most useful when charging motor battery packs with a non-peaking charger. Plug the red and black test probes into the appropriate jacks on your charger and you can read the voltage across the battery pack during the charge cycle. By keeping an eye on the meter, you can determine when peak voltage is reached.

The little rectangular unit at the bottom

continued on page 63

Photo No. 3.



ASTRO FLIGHT'S MODEL 115D AC/DC DIGITAL PEAK CHARGER

Another in Astro Flight's line of new digital peak NiCd chargers is the Model 115D, designed specifically for small electric power systems (seven cells or less).

The 115D looks quite a bit different as compared to the 18-cell Model 110D reviewed here in the January '95 column. It has a START button, a current adjustment knob and a resetable circuit breaker just like the 110D, but instead of the 110D's two-line digital readout, the 115D has four status LEDs in the upper left-hand corner and an LED bar graph to indicate the charge current. The 115D can't tell you the charge time or peak voltage or the milliamps pumped into your battery like the more sophisticated 110D can, but the 115D does have one convenience the 110D doesn't: the ability to charge up to eight cells from a 110-volt AC wall socket—this in addition to also being capable of charging up to seven cells from a standard 12-volt automobile battery.

On the right are the AC and DC input cords, on the left is the output cord with its Tamiya-style connector—implying that the 115D is aimed at entry-level RC airplanes as well as cars and boats, which typically use these connectors. Be sure to check the polarity if you change over to a higher performance (lower resistance) connector such as the Astro Zero Loss or Sermos.

The 115D's charging sequence is simple and completely automatic. When attached to a 12-volt battery or plugged into the wall, the READY light comes on. Hook up your NiCd battery and push the START button once; the lighted status LED moves up to TRICKLE. Push it again and you're in the FAST charge mode. A third push puts you back into the READY mode.

Left in the TRICKLE mode, your battery will be charged at a constant 400 milliamps for 5 hours or until it peaks, whichever comes first. In the FAST charge mode, you can adjust the charge current from 1 to 5 amps on the bar graph; the charger instructions include a chart showing the suggested charge rates and times for various capacity NiCd packs. In use, we found the 115D would consistently peak a discharged seven-cell 1700 SCRC pack at 5 amps in under 20 minutes. In the FAST mode the charger will automatically cut off at 45 minutes if the battery doesn't peak first. In either the TRICKLE or FAST charge modes, when the pack is fully charged the charger shuts off, the PEAK lamp comes on, and you're ready to go.

The 115D would be a fine choice for sport electric fliers who don't plan to get involved in anything bigger than seven-cell power systems. Unlike the 110D, the 115D doesn't give you the kind of battery information that performance-oriented electric fliers like to keep track of, but it's considerably less expensive than the 110D and has the advantage of being able to charge from the nearest AC wall socket—useful if you're one of those lucky souls who has a park or schoolyard right across the street. If you'd like more information on the 115D or the other digital peak chargers in the series, contact Astro Flight at 13311 Beach Ave., Marina Del Rey, CA 90292; (3100 821-6242. *MB*

Helicopter World

■ BY JAMES WANG

RUNNING THE GAUNTLET

James reports on a novel type of contest designed to put the fun back into RC helicopter competition.

In late August of '94 I had the opportunity to attend a fascinating and unique helicopter contest called the Gauntlet, held in Allentown, Pennsylvania. Contestants competed in three events: standard FAI routines, 22 compulsory Gauntlet maneuvers, and freestyle 3-D hotdogging. Trophies were awarded in four categories: FAI only, compulsory event only, combined FAI and compulsory scores, and hotdogging.

Guess what? Curtis Youngblood won 1st place in all four categories!

If you've observed a few FAI contests and have become bored with watching the same FAI maneuvers time after time, the Gauntlet compulsory maneuvers are sure to keep you captivated. A few months before the competition, contestants were provided with a list of 22 difficult maneuvers they must do. *(Editor's note: James provided diagrams and written descriptions of all 22 of the compulsory maneuvers flown at the Gauntlet, including an extensive chart he compiled listing all of the equipment and setup data used by the contestants, but there's just no way we could fit it all in along with the photos. For those readers who are interested in trying their hand at some of these complex maneuvers, or who just want to see what was being flown, send a large SASE with 55¢ postage to the* Model Builder *magazine offices and we'll send you copies of all seven pages.)*

Curtis Youngblood and his wife/caller, Julie. Curtis won all four categories of the Gauntlet, flying his modified Schluter Futura.

The compulsory event is also called the Unknown Maneuver schedule, because the maneuvers to be flown are announced to the pilots only a few minutes before the beginning of the round. Each round of unknown/compulsory comprises two hover maneuvers, five flying maneuvers, and one landing maneuver.

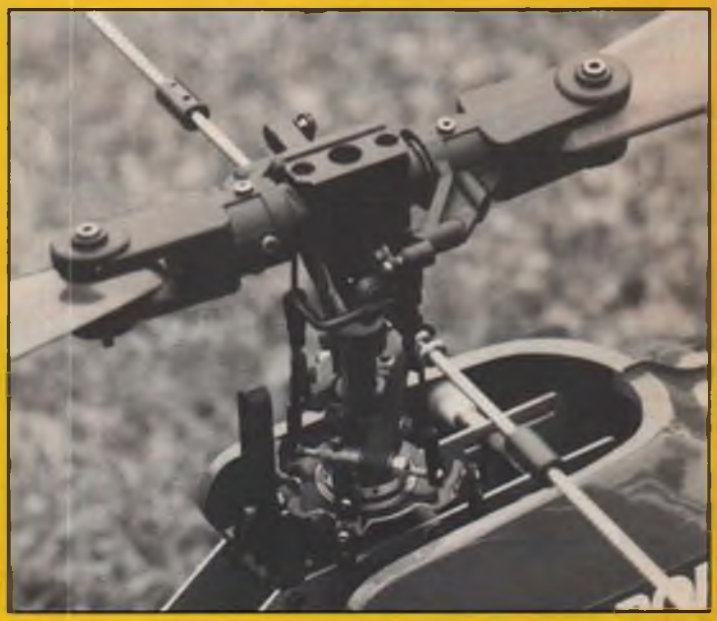
The hotdogging category was what the audience was really waiting for. Five of the ten contestants vied for the King of Hotdogging title. Each of the five pilots brought a cassette tape that was broadcast while he performed. First place winner Curtis Youngblood chose big band swing music from Glen Miller. Curtis' 3-D performance was smooth and not radical; he choreographed the maneuvers well with the music. One of his newest stunts is pirouetting while doing a loop. His Futura would go into a loop, pirouetting on the way up, then another pirouette at the top of the loop, then another on the way down. The whole motion was continuous and mindboggling.

The 2nd place winner, Ray St. Onge, flew his X-Cell Custom Graphite in pace with the theme from Top Gun. Ray crashed his number one hotdogging helicopter on Saturday when a ball link popped off; hence, on Sunday, his flying was not as aggressive as usual. Ray's 3-D maneuvers are done very close to the ground; his backward loops begin at eye level.

The 3rd place winner was Wendell Adkins. He didn't pull out of his death spin until he was 20 feet off the ground! Any spectator with a heart pacemaker would have overloaded temporarily. Wendell also demonstrated an impressive rolling circle. He proved that not only can he do graceful FAI maneuvers (he was a member of the 1993 USA World Championship team), he

Helicopter World

Not an expensive chopper about to bite the dust but merely Ray St. Onge practicing his 3-D hotdogging routine.



Close-up of Curtis' Robbe/Schluter Futura with its modified swashplate and modified washout link.

Clean looking feeder tank installation on Cliff Hiatt's X-Cell Pro. Uses the new gold-anodized Delta-3 assembly on the rotor head. Cliff is the current World Champion.

can hotdog, too. Unfortunately, this time he had mechanical difficulties during his FAI rounds.

Both Ray and Wendell believe the X-Cell Custom Graphite is the best machine for 3-D hotdogging. They say the graphite sideframes increase structure rigidity, which is important for 3-D.

Paul Soha, a newcomer to the contest circle, did the best 3-D tumbling. His X-Cell Custom tumbled end-over-end without losing any altitude. While tumbling consecutively 10 times, his X-Cell also translated slowly from one end of the flying field to the other.

Vincent Trino, a 15-year-old from Bakersfield, showed what he's learned from Curtis Youngblood. Vincent flew to Texas more than once to take lessons from Curtis on 3-D flying. He flew an X-Cell Custom (metal sideframes) with an O.S. .61 SFN ABC and a V-Tech pipe; the same heli/engine combination that Curtis used previously.

Vince flew his 3-D to the music of ZZ Top. It was interesting that none of the five contestants flew their repertoire to classical music. I think the beautiful aerial ballet would choreograph superbly to a classical piece. The tempo of the rock music was too fast, and the pace of the maneuvers really couldn't keep up with the beat. My friend David Ramsey suggested that the judges should wear headphones so they only hear the music and not the engine. This would *really* reveal the quality of the choreography.

Now let's take a closer look at Curtis' Robbe/Schluter Futuras. He uses one for FAI and another for hotdogging. The two models are similar but are set up slightly different.

Both Futuras are highly modified. The standard hex-shaped aluminum tail booms are replaced by a graphite tube. He also replaced the teetering tail rotor hubs with a more precise solid metal hub similar to that on the Schluter Champion. To reduce weight, excess material on the metal swashplates has been machined away by the factory. On a stock Futura, the flybar sits in a plain steel tube at the center of the rotor hub; Curtis' flybar is supported by two ball bearings in a machined metal seesaw.

This is an excellent model. The main rotor blade grips are also new. Curtis uses the thin X-Cell control paddles for quick control.

On Curtis' FAI Futura, he uses a huge horizontal fin (about 10 inches wide) to enhance forward flight stability. On his hotdogging Futura, he uses the horizontal fin from the Robbe/Schluter Moskito, with the lightening holes left uncovered to further reduce its effectiveness. The tail rotor blades are NHP's lightweight graphite blades. Tail rotor pitch control is via a 1/4-inch graphite arrowshaft similar to that used on the X-Cell Pro. The most noticeable change is the canopy—Curtis' own design.

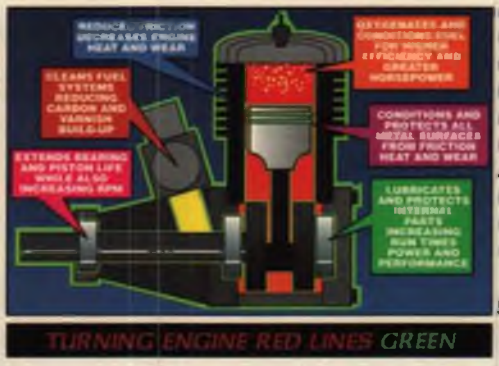
[Robbe/Schluter has a new kit called the Futura SE (Special Edition), which contains all of the upgrades and modifications that Curtis uses. It retails at $1,500.]

Curtis flew the Futura like he flies the X-Cell. His rotor speed is 1,750 rpm in hover and forward flight. He uses a modified O.S. .61 SFN ABC with a V-Tech tuned pipe and Powermaster 15 percent fuel. During FAI aerobatics or hotdogging, the model wasn't moving fast at all (I estimate 50 mph), but the maneuvers were smooth and graceful. His modified Futuras are very impressive.

Curtis uses the new JR NES-4000 "super" servos. The beauty of these expensive servos ($100 apiece) is that they have almost

POWER REV WITH SP-10

Due to the revolutionary affect new Snake Oil Lubricants' Power Rev is having on R/C engines, many modelers are making it their "Secret Weapon". Power Rev will quickly transform any R/C engine into a faster, smoother, more powerful and efficient powerplant. The special SP-10 lubricant formula in Power Rev R/C Fuel Treatment, R/C Engine Treatment, and R/C 2-Cycle Oil is the secret that effects a positive change in the surface metal of all internal engine parts. This electro-chemical conditioning causes the parts to become repellent to each other which helps to eliminate friction. The results are phenomenal! Power Rev R/C Fuel Treatment stabilizes and oxygenates fuel for more efficient combustion, and even longer running times. And regular treatment with Power Rev R/C Engine Treatment will guard your engine from wear as it lubricates and protects all internal engine parts. The big names in R/C are using Snake Oil lubricants now and they swear by them. So if you notice a bottle of Power Rev hidden in a buddie's field box you'll know why he hasn't told you about it... that's his secret weapon!



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MB 490 Fretsaw $149.95

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Length.....24"
Engine.....049-.099
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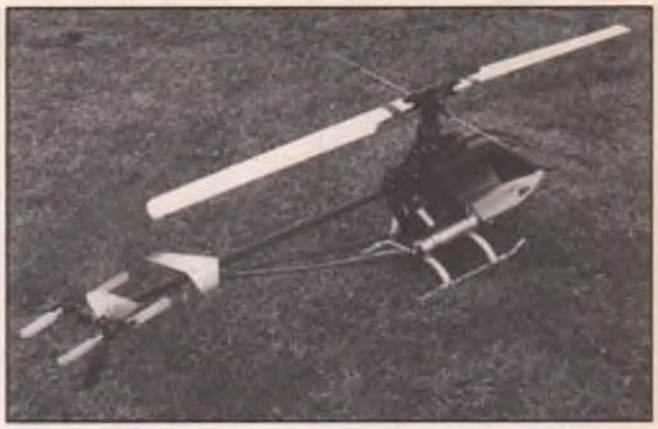
HOBBY HANGAR

Helicopter World

Curtis Youngblood's 15-year-old protégé and expert heli pilot, Vincent Trino, competed with a metal-frame X-Cell Custom.



Paul Soka's 3-D X-Cell Custom Graphite with twin tail rotors and Miniature Aircraft's new 3-D Rotorsport Kevlar main blades.

Always a consistent flier, Wayne Mann hovers his X-Cell Pro while Cliff Hiatt observes.

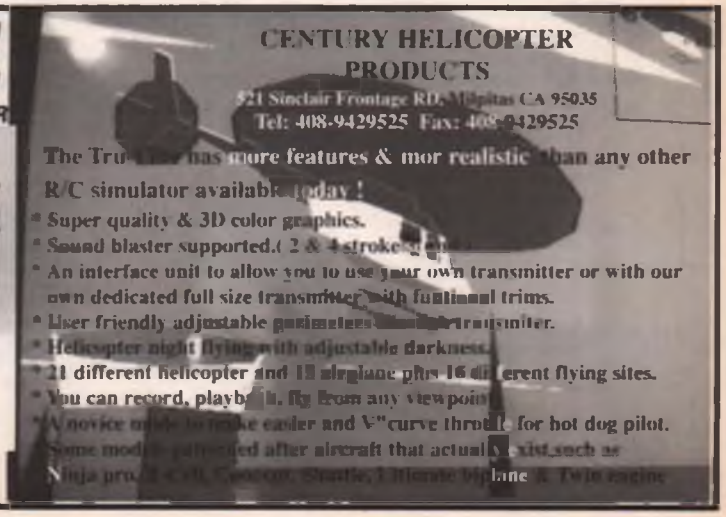
zero deadband, due to a whole new electronic circuitry design that constantly monitors the servo wheel position and electronically corrects it to ensure the output arm position is exactly what the pilot commands. JR calls it high "holding torque" capability.

Have you ever wonder how Curtis can fly backwards at high speeds without the tail weathervaning on him and spinning around 180 degrees? Curtis says he turns the gyro as high as possible without causing the tail to hunt. But in order to maintain sufficient yaw control, you have to max out the tail control travel, and even "overdrive" the tail pitch control slightly. The other secret is to fly backwards with the tail cocked to one side slightly. Thus, the airflow is always pushing on the vertical fin and trying to yaw the helicopter. Then, you only have to hold sufficient tail rotor to prevent the tail from swinging around. If you try to keep the tail boom centered while flying backward, the tail becomes unpredictable. In high-speed backward flight, Curtis' tail boom can be cocked 10 to 20 degrees.

After the contest, David Ramsey and I had an opportunity to chat with Wendell Adkins. He says he modifies every engine he uses. He learns by trial and error. Over the years he has ruined many engines, but he says he now knows how to optimize the performance of an O.S. .61 SFN. It takes him about a week to modify an engine, he says, and when he's done with it, he has a pile of shavings on the table. Wendell says his X-Cell with the Triumph fuselage has been clocked at least 10 mph faster than Dwight Schilling's Concept 60 and Wayne Mann's X-Cell Pro.

Wendell uses both a U-shaped Magna pipe and a Chapman V-Tech tuned pipe. He says that when both are tuned properly, both give about the same performance. The U-pipe has a narrower rpm range for peak performance, but the slope for that peak is very gradual. Hence, you can still get excellent performance when the engine is operating off the peak rpm set by the header length. Wendell says the peak curve for the V-Tech pipe is flatter, and that it has a slightly broader rpm range. But once the engine is off that plateau of rpm range, the boost drops off rapidly.

See you next month! James Wang, 7365 Main St. Suite 106, Stratford, CT 06497. *MB*



FREE FLIGHT

BY BOB STALICK

•The Indoor World Champs is Coming!

•Cox Killer Bee Update

•Joe Kehr's Baby Cirrus

•Cottage Industry News

Photo taken in 1995 shows, from left: Jerry Bowman, who built the first Baby Cirrus (this month's featured model); Joe Kehr, designer of the model; and Jack Hamilton, who built the Baby Cirrus pictured, complete with a McCoy .049 diesel.

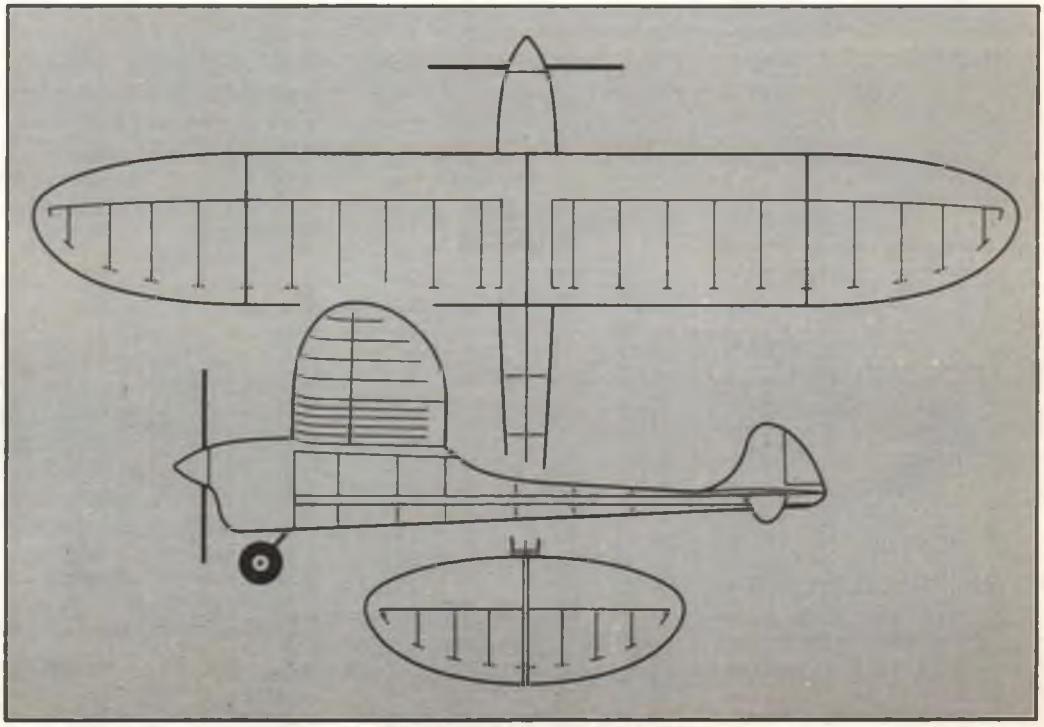
This month we have two big news items of interest to free flighters. First off, the Indoor World Championships appears to be heading for the Kibbie Dome in Moscow, Idaho on August 5-8, 1996. CIAM confirmation is still pending as of this writing, but plans for the big event are already underway. Contest manager Andrew Tagliafico has begun to recruit volunteers to assist with directing the event, timing, jury membership and the like. Contact him if you're willing to contribute several days of your time to assist with the best indoor fliers in the world. This is your chance to not only see some beautiful country but also to help with this major event. Andrew Tagliafico can be reached at 10039 S.W. Quail Post Rd., Portland, OR 97219; (503) 452-0546.

Andrew has scheduled the Kibbie Dome Annual for August 1-3 and the Second EZB Internationals will be held at the Dome on August 4. Mark these dates on your calendar.

The second piece of news is for you Nostalgia fliers: the NFFS Nostalgia Committee has completed its study of the Cox Killer Bee engines and has approved them for Nostalgia competition. Two caveats are contained in the approval:

1. The engine must use the sport glow head, not the competition head. Contestants and contest directors alike will need to be vigilant.

2. The committee will review the results of the 1996 contest season to review the performance and effect the K-Bees have on the contest results. It's possible that the approval could be revoked or that further conditions could be placed

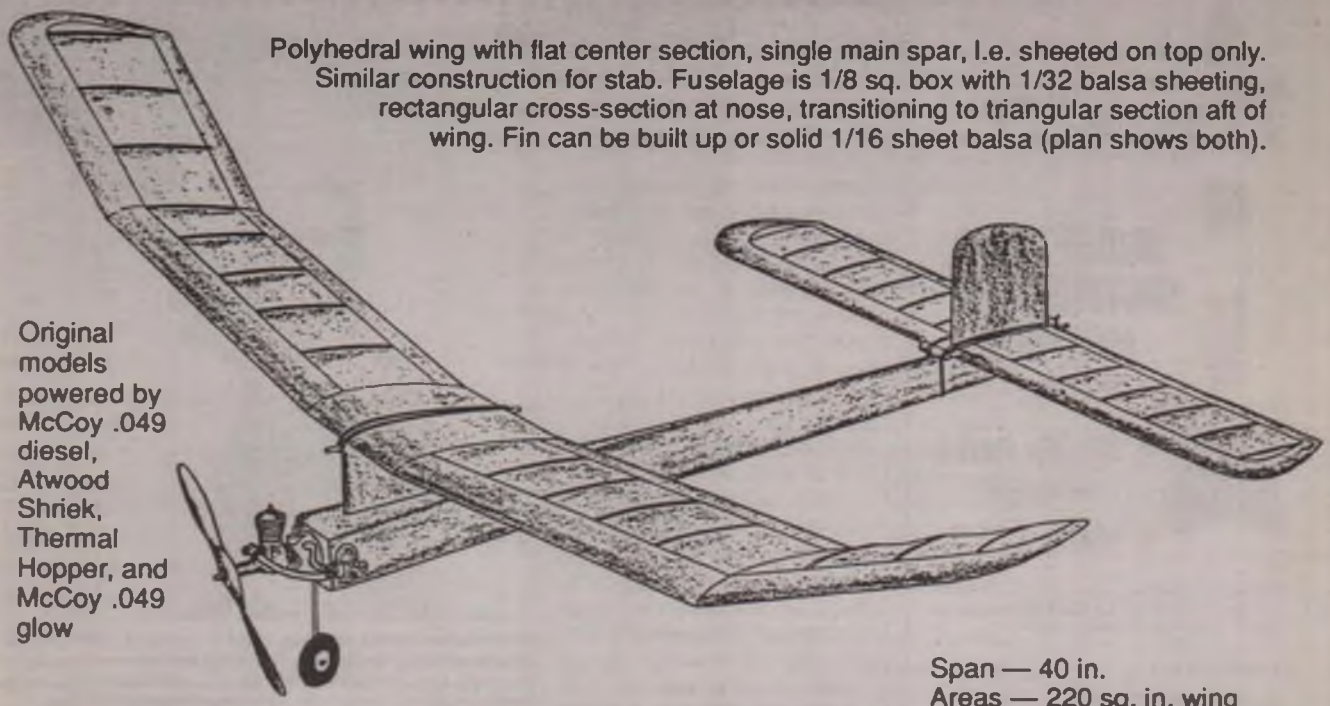


MARCH MYSTERY MODEL

"BABY CIRRUS"

NFFS Nostalgia-legal 1/2A, designed by Joe Kehr, 1953

Polyhedral wing with flat center section, single main spar, l.e. sheeted on top only. Similar construction for stab. Fuselage is 1/8 sq. box with 1/32 balsa sheeting, rectangular cross-section at nose, transitioning to triangular section aft of wing. Fin can be built up or solid 1/16 sheet balsa (plan shows both).



Original models powered by McCoy .049 diesel, Atwood Shriek, Thermal Hopper, and McCoy .049 glow

Span — 40 in.
Areas — 220 sq. in. wing
90 sq. in. stab (41%)
Overall Length — 28-1/4 in.
Flying Weight — 6 oz.

Full-size plans available from Joe E. Kehr, 7504 E. 82nd Pl., Tulsa, OK 74133-4253. Cost is $7.50 postpaid.

MODEL OF THE MONTH

upon the use of these engines.

I had a chance to review the results of the engine tests run by members of the Nostalgia Committee, and their results were somewhat better than those I published in the December *Model Builder*. A number of tests were run with fuel up to 50 percent nitro and obtained rpm figures in the 20,000 range. I may have purchased an engine not quite up to snuff, as my results were in the 16-17K range, and I never did get the engine broken in well enough to use 50 percent fuel.

MARCH MYSTERY MODEL

This model came from a now-defunct model magazine from the late '40s. What I like about the models from this period, and this month's example is no different, is that they tend to be unique and distinctive from one another, in contrast to many seen at the contest field today. This Class A design was built for a Bantam or Hornet engine on spark ignition (natch!) and has been approved by SAM as an Old Timer, since the text claims it placed in a 1941 contest; however, its real winning ways began in Fresno, California in March, 1944.

Think you can identify this month's stumper? If so, send it in to *Model Builder* along with your name and address. In a couple of months they'll draw at random from among the correct entries, and that person will get a free one-year *MB* subscription. Do it now.

NOVEMBER MYSTERY MODEL WINNER

A featured construction project in the December 1954 Aeromodeller *was the "Swiss Miss," a .15-powered competition model designed by the British and Italian duo of Arthur Collinson and Silvio Lanfranchi. Frank Parmenter sent in one of the seven entries received and related that Lanfranchi, representing Switzerland, flew the Swiss Miss to 2nd place at the 1954 FAI World Champs at Long Island, New York. The winner of the one-year* MB *sub is Nat Antonioli of Poway, California.*

MB Editor's Soapbox:

Let's talk about the Mystery Model feature for a minute. The number of responses we've been getting lately has been pretty poor. Take 1995 for example; we started off great in January with 18, but except for the August issue (the "Talon" A-2 Nordic, 28 entries), the rest

BOB AND LAVERA ISAACSON

The following was received from columnist Bob Stalick just prior to going to press:

Noted F1A flier Bob Isaacson and his wife, LaVera, were the victims of a fatal auto accident on the evening of October 6—the day before the Juan Livotto FAI Contest. The accident was caused by a speeding drunk driver who forced them off the road to their deaths near their home in Bakersfield, California. Consequently, the Livotto meet will be known in the future as the Bob Isaacson Memorial FAI Contest.

Bob was the designer of several models which were honored by the NFFS as Top Ten Models of the Year. The Wishbone and the RI-14 were both so honored. Bob also was a member of the U.S. FAI team on several occasions—most recently in 1991, where he joined with Jim Parker and protégé Randy Weiler to represent our country in the F1A event.

According to Steve Geraghty, "You sometimes hear about an individual who puts their heart and soul into helping others in free flight; Bob was that individual. When Bob's knees began to go and he felt he would have to discontinue towline glider, he began to coach a younger flier, Randy Weiler, doing so well that Randy made three U.S. teams. All this and Bob still had time to win contests here and in Europe. About his knees: not many know this, but Bob was a lineman for the University of Southern California Trojans and actively played many minutes in two Rose Bowl games."

We have lost another stalwart from the ranks of our membership. May Bob and LaVera rest in peace. *MB*

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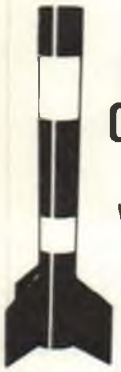

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FREE FLIGHT

of the year has averaged only five entries a month—as few as two (twice!), never more than eight. That's hardly worth the space the feature takes up in the magazine, not to mention the three or four or sometimes more hours it takes this editor to first draw up and then carefully ink the drawing. Those who respond are usually among a half-dozen or so "regulars" who enjoy the challenge; the feature apparently has little interest for the rest of the FF readership.

We discussed this with Bob Stalick, who admitted that good Mystery Model subjects are becoming increasingly difficult to come by. That might be part of the problem—the subjects might just be too obscure. At any rate, we both agreed that after all these years, the feature has pretty much run its course, and Bob has decided to cut back the Mystery Model to only two or three times a year, choosing more familiar subjects so that a greater number of modelers will be encouraged to enter. Readers will still have a shot at winning a free one-year MB sub, and Bob will have some more space to use for photos or other stuff.

Jerry Bowman with the first Baby Cirrus in the fall of 1953. The site is the Tulsa Glue Dobbers flying field. The model flew out of sight and was never recovered. Note that the fin in this photo is solid sheet balsa, whereas the other photo shows a built-up fin. Both are called out on the plan.

MODEL OF THE MONTH

This month's featured model is the "Baby Cirrus," recently approved by the NFFS for Nostalgia competition. The story of the model was provided by its designer, Joe Kehr:

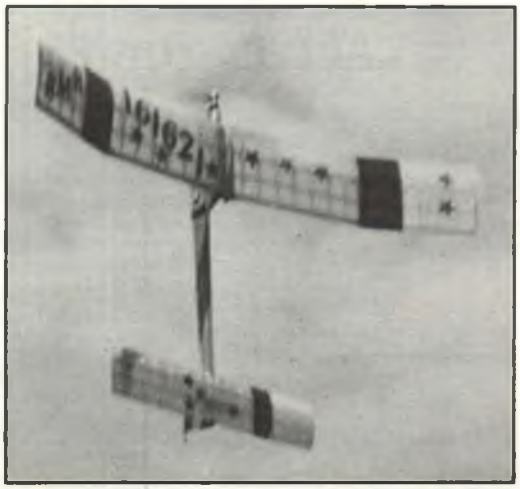
"My job with the oil company provided drawing board time to draft out some designs (during lunch and after hours). My first Cirrus was a B-C free flight. This proved to be successful and a number were built and flown in local and regional contests. My friend Jerry Bowman then suggested we try 1/2A. The .049 motors were beginning to come on the market, and he felt that a scaled-down Cirrus would be just the ticket to get us started in the class. The results were more than either of us expected.

"Our first 1/2A models were powered with Atwood .049s and then practically every other motor on the market with any performance. Each model built 'flew right off the board.' If the models were constructed exactly as drawn and flown per instructions on the plan, they were as competitive as any of the hot planes on the market in the 1950s.

"When constructed to plans, the structure is extremely rugged. We carted these planes to contests all over the southwest in hot conditions that were ripe for warping. Our experience was to find the wings and tails resistant to getting bent out of shape, probably due to the built-up trailing edges and sheeting leading edges. Once adjusted, we could fly the Baby Cirrus right out of a steamy car trunk and not be concerned.

"A number of different versions of the Cirrus were designed. Included was one with a 7-foot wingspan called the Super Cirrus. All were successful, but the Baby Cirrus proved to be the big winner. The key appears to be the combination of wing and stabilizer areas, moment arm length, the lifting stabilizer, the thrust offsets and the incidence setting. I believe any attempt to scale the Cirrus up or

continued on page 76



John Goretti sent in this shot of his Stardust 350 caught in a vertical climb at a recent SAM 30 contest. This spectacular picture shows not only the excitement of power free flight, but also a very attractive model. John admits to being an active free flighter at age 71.

ELECTRIC POWER *cont. from page 55*

on the meter, you can determine when peak voltage is reached.

The little rectangular unit at the bottom of the photo is Astro Flight's digital voltage and current meter. This instrument is very handy when testing motor and propeller combinations for power, current and time duration. Since all of my wiring systems use Sermos connectors, I installed some on my Astro meter too. I insert the meter in the motor circuit just after the battery pack. Voltage and current can both be read with the flip of a switch, and with some practice, you can do it all in just a couple of seconds.

So where do you go to find all these things? Your local Radio Shack is a good place to start. There are over 3,000 stores in the U.S., they have a comprehensive catalog (it used to be free, but I guess those days are gone!), and they carry the tools that you'll need. Here are the catalog numbers for some of the useful electric modeling items you can pick up there:

Tools

64-1812—Needle-nose pliers

64-1813—Diagonal cutters

278-1268—12 gauge stranded wire (not color-coded)

64-2055—30 watt soldering iron

64-2078—Soldering stand

64-005—.032-inch diameter solder

Test equipment

22-211—Analog VOM (25 ranges)

22-215—Analog VOM (43 ranges)

22-169—Digital volt/ohm meter (DVM)

The other items can be picked up at various places. For instance, the 80 watt soldering iron is much too beefy to use in electronics work, so you'll need to go to a home supply center like Home Depot or Home Base to find it. You can usually find 12 gauge color coded wire at an electronics supply house. You might also try some electronics surplus houses. These are the people that buy used electronic equipment, remove the parts and resell them at substantial discounts. Hit them at the right time and you might score some red and black, 12-gauge, stranded, two-conductor wire like I did a few weeks ago!

The expanded scale voltmeter is available from any mail-order RC company or from your local hobby shop—likewise the Astro Flight meter. And finally, another good source for pliers, cutters and other miniature tools is Micromark. Their catalog is available by writing to 340 Snyder Ave., Berkeley Heights, NJ 07922-1595, or calling (800) 225-1066.

WATTS HAPPENING

The Las Vegas Radio Control Club will be holding their third annual Electric Radio Control Fly-In on February 24-25. Their flying site is at Sam Boyd Stadium, located at Boulder Highway and Russell Road in Las Vegas. The flyer promises open flying most of the time with a few special events and lots of awards and prizes. There will also be a modeling symposium at a nearby hotel. All this, plus a raffle and a "Tailgate Swap Shop" just can't be missed. For more information, call Dick Corby at (702) 870-9522 or Fred Reese at (702) 876-4718.

MAILING LIST

A while back I advertised the Electric Modeler's Mailing List that at present includes about 40 names. If you would like to have your name included on the list, please send me a note to that effect. An e-mail note or a postcard is fine. There is a wealth of talent out there from all parts of this country and it's a shame to not be able to spread it around! Send me an SASE to request a list of modelers in your area. Feel free to write me at 6462 Sunny Brae Dr., San Diego, CA 92119; or call (619) 463-4453 (weekdays between 8 and 5 Pacific time), or via e-mail at 74164.3237@compuserve.com. *MB*

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■ By Eloy Marez

JR'S BEST: THE PCM 10SX RC SYSTEM

The 10Sx is the flagship of JR's line of top-quality radio control systems, designed to be the best possible competition pattern radio but with features that make it highly desirable for other demanding events as well.

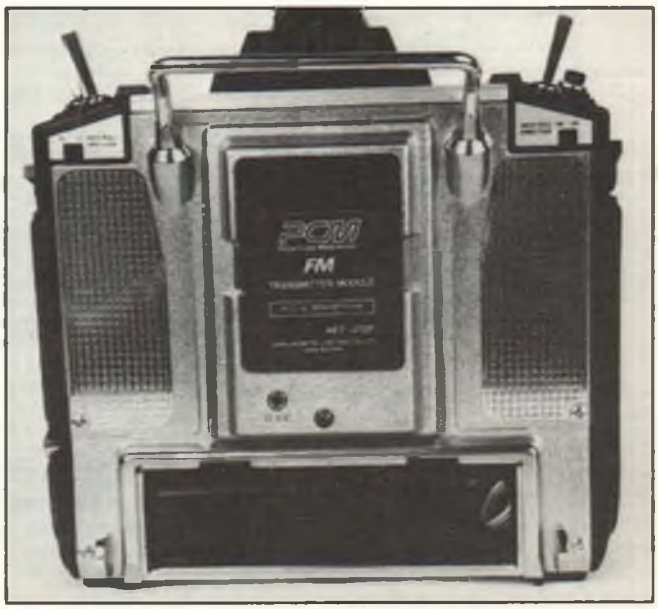
They said it couldn't be done! "They" in this case were a couple of dedicated F3A (Pattern) flier friends who, a couple of years ago, insisted that their JR PCM 10S systems were definitely the epitome of pattern radios and could not possibly be improved upon in any way, shape or form. Well, my friends, it could, and it was! Witness the new and improved JR PCM 10Sx system.

The 10Sx is the result of the combined efforts of Japan Remote Control and Horizon Hobby Distributors, U.S. importers of JR equipment. It includes design suggestions by such world-class F3A competition fliers as Chip Hyde and Hanno Prettner. It includes many features and functions useful to other classes of RC flight, such as scale, but it is first and foremost a competition pattern system. It incorporates not only all of the necessary transmitter requirements for this highly critical class of RC flight, but also those recommended in the companion receiver and servos.

A teenager would no doubt describe JR's PCM 10Sx as "awesome!" It's an apt description, as the system incorporates all of the functions required by the serious pattern flier and others who fly complex aircraft.

THE TRANSMITTER

Admittedly, looks are not the most important criteria in an RC transmitter, but that's the first thing that will impress you—this transmitter looks and speaks quality. The next thing to impress you will be the feel; it drops into your hands with all controls intelligently and logically placed. Molded rubber pads are furnished for the rear of the case, which you can add to fit



Rear view of the 10Sx transmitter with the battery cover removed. Separate curved grips are furnished that you can attach to the back of the case exactly where they fit your hands best.

The transmitter antenna mounts in a swivel ball mount; the antenna itself stows through an opening in the side of the case. The meter reads battery condition, the exact voltage being

Everything you'll want to know about the programming of the 10Sx is displayed on this large LCD screen. All entries are made by touching a portion of the screen itself—there are no buttons to push.

your particular grip and provide the best possible balance.

Electronically, the quality follows. Internally we see all modern design and components, SMT (Surface Mount Technology) robotic assembled PC boards and cleanly fabricated plastic and metal parts. The latter includes such innovations as ball bearing supported gimbal assemblies, which also feature adjustable length sticks and adjustable spring tension. The 10Sx is microprocessor controlled, its heart being a 16-bit chip. It all boils down to 10 channels, 10 model memory, with selectable PCM or PPM (FM) modulation. Furthermore, both 1024 and 512 PCM modes can be programmed, making the 10Sx compatible with most other JR receivers, both FM and PCM, that you may happen to own.

Control of the 10Sx is all done on a 1x4-1/16 inch adjustable contrast LCD touch screen. I found the programming simple and logical. Setting up the 10Sx for a four- or even five-channel sport airplane can be done using only common sense, without he help of the manual. However, to fully understand and utilize all of the sophisticated features of the 10Sx, one must first understand the companion aircraft and all of its capabilities and requirements. Stated another way, if you don't understand the basics of aerobatic flight and the control inputs required to perform the various maneuvers, you won't be able to master all the abilities of this type of transmitter.

Just what are all these fabulous capabilities? Hang on to your flying cap while I tell you. First of all, there are the normal features you would expect in a radio of this caliber: servo reversing, travel adjustment, dual rates, customized exponential, VTR (variable trace ratio), flight timer, battery alarm and failsafe. Then it begins to get interesting, with such things as independently adjustable servo speed, selectable trim rates, DSC (direct servo control), analog (needle) voltage reading meter, and a coded lock to prevent unauthorized program changes.

The all-important trims get their share of attention, with rates selectable in 1 percent increments, trim memory that recalls proper trim when the system is turned on, sub-trim for electronic centering, and cross-trims between throttle and elevator if desired.

And then the mixing! This is where it gets really hard to visualize, most of us needing an airplane in front of us with working controls before we can begin to understand the effects of everything possible. Mixing includes:

- Programs for eight differently executed snap rolls.
- Eight programmable mixes, three of which can have eight point mixing.
- Wing mixing for flaperons, elevons, and quad flaps.
- V-tail mixing.
- Variable pitch prop mixing.
- Elevator-to-flap mixing for small-radius loops.

Other control functions include:

- Trace rate to set the total throw of two servos using either aileron, elevator or rudder as the master channel.
- Manual snap roll switch sets the rate adjustment to large throws on rudder, elevator and aileron with a single switch.
- Landing mode adjusts the flap and elevator positions, and can be coupled to the throttle if desired.
- Model-to-model program copy.
- Data reset function, for getting back to the original settings.
- Servo test cycles all servos through their full range.
- Data transfer from one 10Sx transmitter to another.
- Mode changes require only a remove-and-replace operation on the throttle ratchet and a couple of touches on the screen.

While the instruction manual I received was a draft copy, I found it more than adequate, obviously being the work of knowledgeable English-speaking modeler(s). I find control mixing the hardest of all to understand and to program, but my tests of a number of such sections always left me with an understanding of what to enter to obtain the desired results.

RECEIVER

The receiver supplied with this system is the NER-D940S, a PCM/FM dual conversion unit with claimed 10 KHz narrowband selectivity. It measures .83x2.09x.75 inches, and weighs 1.69 ounces. It also incorporates a microprocessor and other desirable features such as ceramic filters and what JR calls its ABC&W (Anti-Blocking, Cross-Modulation and Window) circuitry. I know for a fact that JR receivers are favored by many who fly high-noise-generating machines such as helicopters, electric power, and spark ignition engines.

SERVOS

The 10Sx is available with your choice of JR's NES-517 (40 ounce-inches of torque), NES-4131 (90 ounce-inches) or NES-4721 (119 ounce-inches) servos, all of which are built into the same .73x1.52x1.32-inch case. The 517 is the

All auxiliary controls are logically placed for ease of operation. Many of the controls can be assigned various functions according to the airplane's and pilot's needs.

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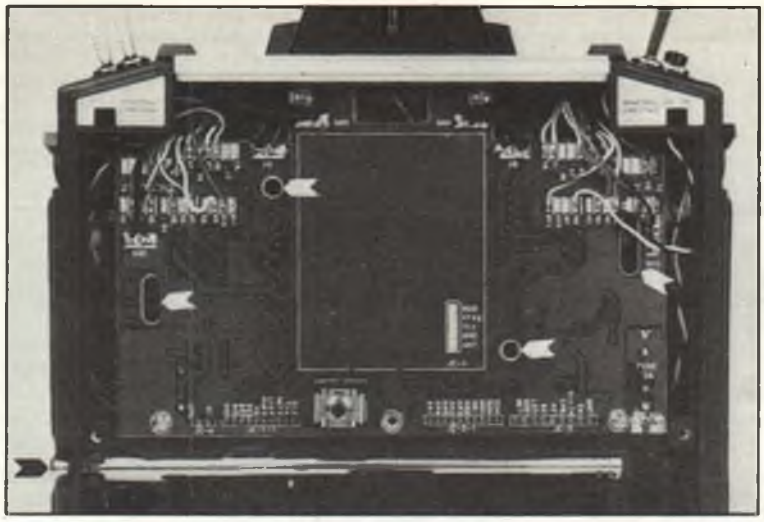
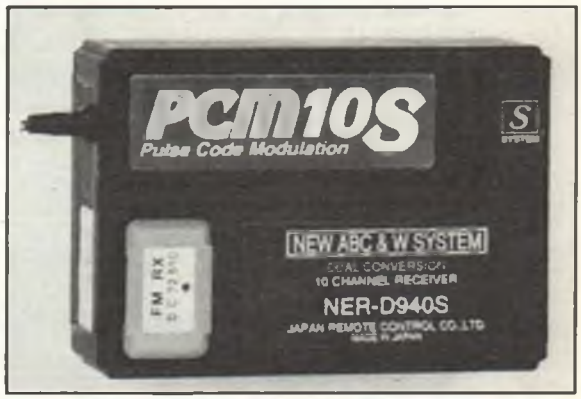


Insides of the 10Sx show the modern construction. Arrows point to the stick tension adjustment screws; the lower arrow indicates the antenna access and its stowed position.

single ball bearing version of JR's "standard" 507 servo; the 4131 and 4721 both feature coreless motors and dual ball bearings. Of course, the entire line of JR servos is 10Sx compatible, from the 341 micro to the monster 605.



The 10Sx's companion receiver, the NER-D940S, is a small unit, 10 channels, PCM; selectivity is claimed as 8 KHz at 50 dB. Many other JR FM and PCM receivers can also be used.

BATTERIES

NiCds, of course! The transmitter battery is a 700-mAH pack; the capacity of the airborne pack varies according to the servo package you choose. A dual overnight rate charger is furnished. The transmitter is rated at 200 mA drain, which calculates to over three hours operating time, but for those who need longer times, the design allows for quick battery replacement.

ACCESSORIES

The 10Sx comes with everything necessary to install and operate it in the average model: servo arms, fuselage and wing servo trays, switch harness with fuselage charge mount, frequency flags, dual and single servo extensions and servo mounting hardware.

Numerous optional accessories are available for special applications. They include the small six-channel NER-226 receiver, aptly called the "credit card" receiver due to its small 1.43x2.06x.55-inch size. Although gyros are considered primarily a helicopter requirement, they are used in some fixed-wing aircraft, and JR has four to choose from, including one using the latest piezoelectric technology. Electric fliers can pick from a number of ESCs (electronic speed controls). It seems all your needs have been anticipated, including neck straps, longer gimbal sticks, a shortened base-loaded transmitter antenna, even an aluminum transmitter carrying case.

WARRANTY

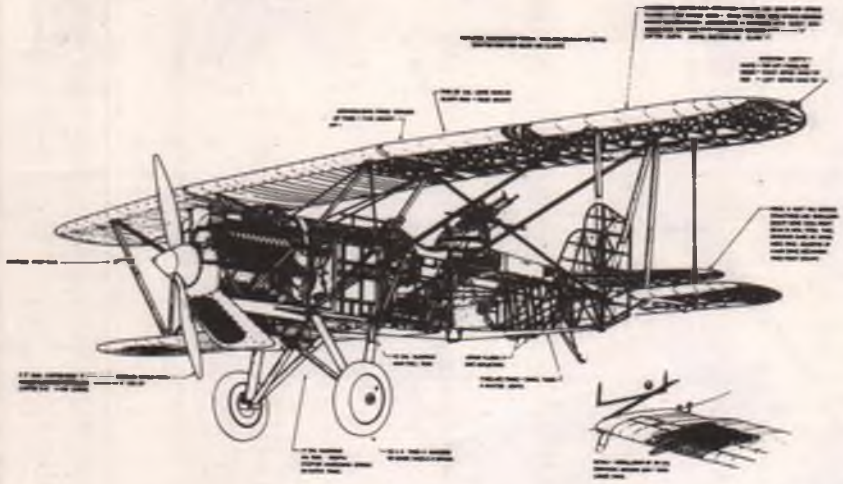
More good news! One year from date of purchase, with the usual restrictions about mishandling, abuse, crash or repairs by your well-intentioned "expert" friend!

Service for your 10Sx and all other JR equipment is available at the Horizon Service Center in Illinois; complete instructions are included in the manual. And owners of the older 10S transmitter will be glad to learn it can be upgraded to Sx specs, with new software and faceplates, for $200. Call Horizon at (217) 355-9511 for more info.

BOTTOM LINE

As is already obvious, the JR PCM 10Sx system is not for every RCer. It is plainly intended for those with a high degree of skill and the dedication it takes to obtain and to harness that skill. There cannot be any shortcuts in its design or execution—there are no such shortcuts. This kind of electronic device can be expected to be more expensive than one with lesser capabilities; the 10Sx carries a suggested retail price as high as $1,690 or as low as $1,330, depending on the version and type of servos you choose. The real price is something else—your nearest JR dealer will have to be your source of that. Whatever your 10Sx costs you, no doubt you'll think like my friends did about their 10S . . . it can't get any better than this! ***MB***

PETER WESTBURG'S SCALE VIEWS



Super-accurate aircraft drawings. Use for scale documentation and/or for developing model construction plans. All drawings are 28x40 inches border-to-border, and are scaled as listed below:

1/24 scale: 1/2"=1 ft.

WE-18 Douglas O-35/B-71, $7.00.
WE-23 Douglas XO-36/XB-7, $7.00.

1/12 scale: 1"=1 ft.

WE-2 Boeing F4B-4/3, $26
WE-3 Boeing P-12E, $20.00
WE-4 Curtiss A-8 Shrike, $20.00.
WE-7 Curtiss Gulfhawk 1A, $14.00.
WE-8 Curtiss N2C-2 Fledgling, $26.00.
WE-9 Curtiss O-1B/A-3 Falcon, $20.00
WE-10 Curtiss P1B Hawk, $20.00.
WE-12 Curtiss XP/YP-23, $20.00.
WE-13 Curtiss SBC-4 Helldiver, $26.00.
WE-14 Czech Avia B-534, $14.00
WE-15 Davis D-1K, $14.00.
WE-16 Douglas O-25C, $20.00.
WE-17 Douglas O-31A/O-31B, $20.00.
WE-19 Douglas O-38/O-38B, $14.00.
WE-20 Douglas O-43A, $20.00.
WE-21 Douglas O-31C/Y10-43, $20.00.
WE-22 Douglas O-46A, $20.00.
WE-25 Fokker D-17, $20.00.
WE-26 General Western Meteor, $7.00.
WE-28 Grumman F2F-1, $20.00.
WE-29 Grumman F3F-2, $20.00.
WE-34 Stearman 4E Mailplane, $14.00.
WE-36 Travel Air 2000, $14.00.
WE-37 Waco ATO Taperwing, $14.00.

1/10 scale: 1.2"=1 ft.

WE-1 Berliner/Joyce P-16, $26.00.
WE-5 Curtiss BFC-2 Goshawk, $26.00.
WE-6 Curtiss F9C-2 Sparrowhawk, $26.00.
WE-11 Curtiss P-6E Hawk, $26.00.
WE-24 Fiat CR-32, $20.00.
WE-27 Great Lakes Trainer, $26.00.
WE-30 Hawker Fury Mk I, $26.00.
WE-31 Hawker High Speed Fury, $20.00.
WE-32 Hawker Persian Fury, $20.00.
WE-33 Monocoupe 90A, $14.00.
WE-35 Swedish Sparmann P-1, $14.00.

Drawings by Nick Karsten:

KA-1 Douglas DC-1, $14.00.
KA-2 Douglas XO2d-1, $26.00.
KA-3 Fokker D-VII, $26.00.
KA-4 Curtiss A-3 Falcon (Perspective Cutaway), $7.00.
KA-5 Great Lakes 2T-1 (Perspective Cutaway), $7.00.
KA-6 Waco UPF-7, $20.00.

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BY JOSE M. TELLEZ

FLAT CAT

For those who like 'em small and agile, try this full-house 1/2A RC aerobat.

When you first walk up to the flight line with your Flat Cat, nobody pays much attention. Most 1/2A airplanes are met with great disregard these days where 1/4-scale and more is in vogue, but this one really performs!

Not only will you be standing with a satisfied grin on your face when your Flat Cat lands, but you will also have a group of fellow fliers come over to take a closer look.

Flat Cat was designed around the new Cox .05 RC engine. The goal was to have a fully aerobatic model that would avoid the usual nervous high-speed flight that most 1/2A RC models exhibit. The 'Cat will do anything you think you can handle but will do it smoothly and at a rate that allows you to see what you're doing and make those necessary corrections. In the air it is a joy and on the ground it handles like a gentleman.

Most of the success of Flat Cat can be credited to a low wing loading and a high-lift symmetrical airfoil. The two prototype models weighed in at just under 24 ounces; with a wing area of 255 square inches, this yields a wing loading of about 13 ounces per square foot. The thick, low aspect ratio wing lets the airfoil work in a favorable regime and makes the structure quite sturdy.

The fuselage dimensions were dictated mainly by the equipment it had to house. The engine and the fuel tank defined the nose section, since I wanted to use a 2-ounce fuel tank for 12-15 minute flights, and it had to be placed such that the proper

Jose with his two prototype Flat Cats—virtually identical except for some minor fuselage structural details. Both are covered in bright colors of MonoKote and Oracover with black on the undersides for good visibility.

FLAT CAT

Designed by Jose M. Tellez

WINGSPAN ..... 34 in.
WING AREA ..... 255 sq. in.
FLYING WEIGHT ..... 23.5 oz.
WING LOADING ..... 13 oz./sq. ft.
OVERALL LENGTH ..... 30.5 in.
AIRFOIL ..... 16 percent symmetrical.
POWER ..... Cox .05 RC or MP Jet .061 recommended.
RADIO ..... Four-channel micro RC system required.

height relative to the engine was met. This resulted in a rather wide nose which required a notch in the side to accommodate the muffler, but it works well. Should you be satisfied with shorter flights, you may opt to use a 1-ounce tank and narrow down the nose. I recommend not touching any of the other dimensions since either by design or luck, they seem to be simply ideal

The radio used is of the micro variety. I used both Futaba (S-133 servos) and Hitec RCD (HS-80 servos and 535 FM receiver) in my prototype models, but equally good components are available from other manufacturers. The battery pack shown on the plans is rated at 270 mAH; I've used it as well as a 150 mAH pack which will save some weight provided you can maintain the proper balance point. I usually keep my airplane on a field charger between flights so the small battery has never presented a problem.

If you've elected to build this model you are obviously a scratch builder, so I won't insult your intelligence by telling you which stick to glue where. A few pointers, however, might clarify the plans or suggest a way to speed up your progress.

FUSELAGE

The 3/32 balsa fuselage sides are indicated on the plans by a bold line. The easiest way to transfer the outline to the wood is to cut up the side view from the plan, spray it with 3M "77" spray cement (wait at least 1/2 hour before adhering it to the balsa sheet to avoid permanent adhesion), then have at it with your X-Acto knife. The same pattern will be used four times; twice for the balsa sides and twice for the 1/64 plywood doublers, but you need not respray with the contact adhesive. Use a slow-set epoxy to join the ply doubler to the sides but be very stingy with the epoxy—remember, you want this model to be light.

I strongly suggest that you drill all the bulkheads and the firewall for fuel line, pressure line and pushrods prior to assembly, since the small dimensions would make it very difficult after the fuselage is assembled. The plan shows notches in the appropriate bulkheads which allow for the wiring installation. The on-off switch and charging jack are not shown since this will depend on your equipment selection. In my case, I installed both the switch and the jack on the bottom of the fuselage just ahead of the landing gear.

In addition to the removable wing, the plan shows four removable hatches. One provides access to the battery, another

The Flat Cat was originally designed for the neat little Cox .05 RC (left), but on his second model, Jose chose to go with the slightly larger MP Jet .061 (right). See sidebar for his impressions of the latter.

THE MP JET .061

After flying Flat Cat over the last year and a half, I came across a glowing report on the Czech MP Jet engines being handled by Carlson Engine Imports. Being an enthusiast of small engines, I paid my dues and was soon admiring a splendid little .061 specimen.

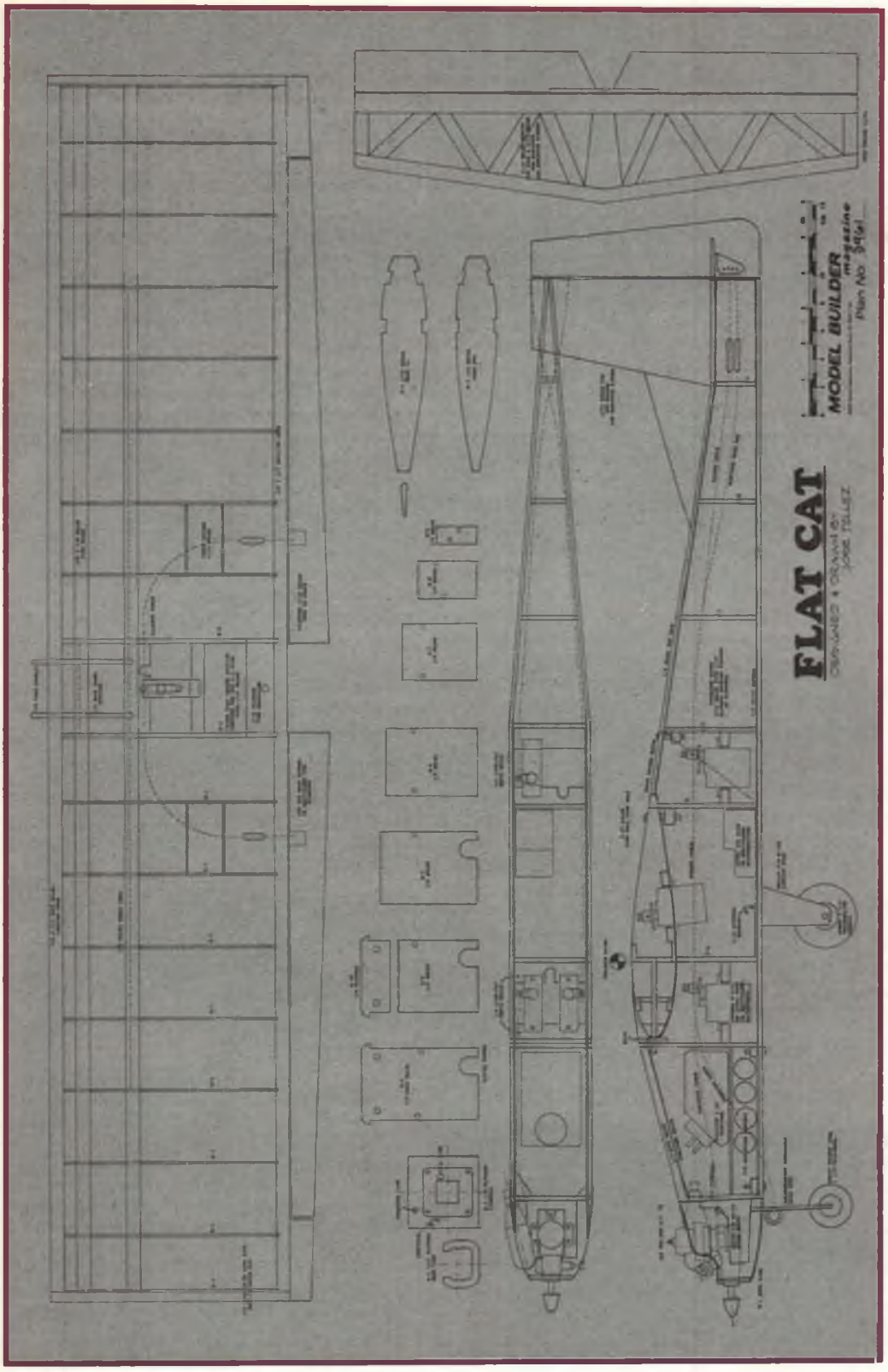
I found the MP to be very well behaved. It starts readily, idles like a four-stroke and since the muffler seals well at the exhaust, it is cleaner running than most 1/2A engines I've tried.

One problem I did have with the installation was that the muffler runs straight back, parallel with the thrustline, and in most cases will not clear the side of the fuselage. A phone conversation with Ed Carlson solved the problem when he remembered that the marine version of the MP has a muffler extension, which he shipped me post haste and which fit to perfection!

For these photos, Ed Carlson of Carlson Engine Imports loaned us an MP Jet .061 ball bearing glow engine (one of five different versions offered), and we found it to be an exceptional piece of work. Features Schnuerle porting, dual ball bearings supporting the crankshaft, cast iron piston and steel liner, one-piece cast aluminum crankcase, and a button-type glow head. Nice touches include a locating pin in the crankcase for the cylinder liner, bronze bushing at the bottom of the conrod, and wire circlips to retain the wrist pin in the piston. Engine comes with muffler, three head shims, a wrench, and instructions.

So now you have two brilliant options to power your Flat Cat: the speedy little Cox .05 or the somewhat more powerful, slightly heavier and more expensive MP. Take your choice and pay your price, but if you opt for the MP, don't forget to also order the muffler extension.

A complete 10-page catalog of engines and accessories is available for $1 from Carlson Engine Imports, 814 E. Marconi Ave., Phoenix, AZ 85022. ***MB***



exposes the fuel tank, the third lets you tinker with the elevator servo and the antenna leadout, and the fourth provides access to the aileron servo through the top of the wing. All this accessibility means a bit more work, but remember that as soon as you make any component inaccessible, it is a guarantee that it will need adjustment or service.

The servo rails shown on the drawing are made from lite-ply. After they are cut to size, mark where the servo screws are to go and drill with a 1/8-inch bit. Next, cut a short length from the yellow fluted inner tube from a Sullivan #508 or #515 pushrod and insert it into the hole (it will fit tight). Apply a drop of thin CA to the assembly to secure the tube—allow plenty of time for the CA to set—then trim the plastic flush with the top of the ply surface. Since these tubes are made to accept 2-56 threaded rods, you can mount your servos with 2-56 machine screws which will thread in easily. If you've never used the above scheme I urge you to try it—I bet you'll use it from now on for all your servo mounts. I used the same scheme to hold down the three hatches.

For the ailerons, throttle, rudder and nose gear I used Sullivan #507 flexible cable pushrods. They are very light and have adequate rigidity to handle the small control surfaces. It is key, however, that you start with a minimum friction installation. The setup shown on the plans works quite well. For the elevator (which handles the heaviest loads), I used a Sullivan #503 pushrod. Note that the elevator and rudder pushrods cross over towards the tail end of the fuselage to provide a better exit angle.

Once you've assembled the basic fuselage box, temporarily install the motor mount, then fill in the nose around the mount with small balsa blocks. Place the engine on the mount and determine where the nose should be cut off to install the nose ring. Now you can remove the engine and shape the nose to a nice rounded blend from the firewall to the nose ring. Next, install a triangular piece of balsa just behind the firewall as shown on the drawing. This piece will allow you to grind out a notch for the muffler.

The plan shows an 8-32 nylon wing bolt going into a strip of 1/4-inch lite-ply. Use a plastic or metal thread insert in the lite-ply. Ohio Superstar Products Inc. (204 5th St., Chester, WV 26034) makes some neat little plastic inserts they call "All Threads" which work beautifully.

My models' fuselages were finished with fiberglass cloth and epoxy, which makes for a very strong structure. If you think you can handle this finish with minimum weight, it is ideal; otherwise just use MonoKote or prime and paint.

FLYING SURFACES

The wing and tail surfaces are quite simple and require no special explanation. I might just comment that you won't find a notation on dihedral on the plans; there is none, but don't worry, the aircraft is quite stable

The wing and two fuselage hatches provide access to the fuel tank and radio. A lightweight RC system is a must for a small model like the Flat Cat; this shot of Jose's #2 ship shows a Hitec RCD 535 FM micro receiver, Hitec HS-80 micro servos for the rudder/nose wheel, and a Futaba S-133 micro for the elevators. Another S-133 is mounted in the wing for the ailerons. A 270-mAH receiver pack sits up front under the fuel tank.

without it. The aileron hinges are Sig (or equivalent) Easy Hinges split to half width, four half-hinges on each aileron. This gives an easy working aileron that works well with the Sullivan #507 cable. The drawing calls for MonoKote hinges on the tail surfaces; these allow for maximum flexibility, but small pieces of Easy Hinge could be used as well.

For control surface defections, you can start with the following and then tune them to you like: Ailerons—3/8-inch up and down measured at the inboard edge. Elevator—3/8-inch up and down measured at the inboard edge. Rudder—1/2-inch left and right measured at the elevator intersection.

FLYING

This is not a ferocious airplane that will make you sweat the first flight. It's responsive but not jittery. Since it has a symmetrical airfoil and when sitting on its wheels there is a small negative angle of attack, the model will have to run until it achieves enough speed for the elevator to rotate the fuselage for a positive angle of attack, so don't let a slightly long ground run alarm you. It tracks beautifully on the ground and will lift off gracefully with a bit of up elevator.

From there on, just enjoy it; it does a nice axial roll, will do round loops from straight and level, and is just as happy right side up as inverted. Snaps are quite showy and therefore the spins are also, but the model recovers as soon as you relax the rudder pressure. Slow it down for a landing and it again tracks nicely back to the pit. You can, as a matter of fact, slow it down so much that at high angles of attack the bottom of the rudder will drag on the runway. The plan does not call for a tailskid, but if you like these high-nose landings, favor the tail with a small plywood skid.

Because the muffler on the Cox .05 covers the exhaust, it is no longer possible to use the familiar start procedure of feeding raw fuel into the exhaust port. I found that feeding raw fuel into the venturi and using a 1/2A starter does the job nicely.

The only warning I may make is that because the Flat Cat flies so well, you may forget that it is a small model and if you let it get too far away, you may lose orientation, so keep it in close and enjoy!

You may direct any comments, questions, kudos or knocks to Jose M. Tellez, P.O. Box 733, Laguna Beach, CA 92652. *MB*

PRODUCTS IN USE

■ By James M. Wang

NHP's "3-IN-1" Airplane/Helicopter Flight Simulator, from Horizon Hobby Distributors

Our resident RC helicopter specialist is more than just a little impressed with this newest version of the popular NHP computer simulator. Now includes graphics for both helicopters and airplanes.

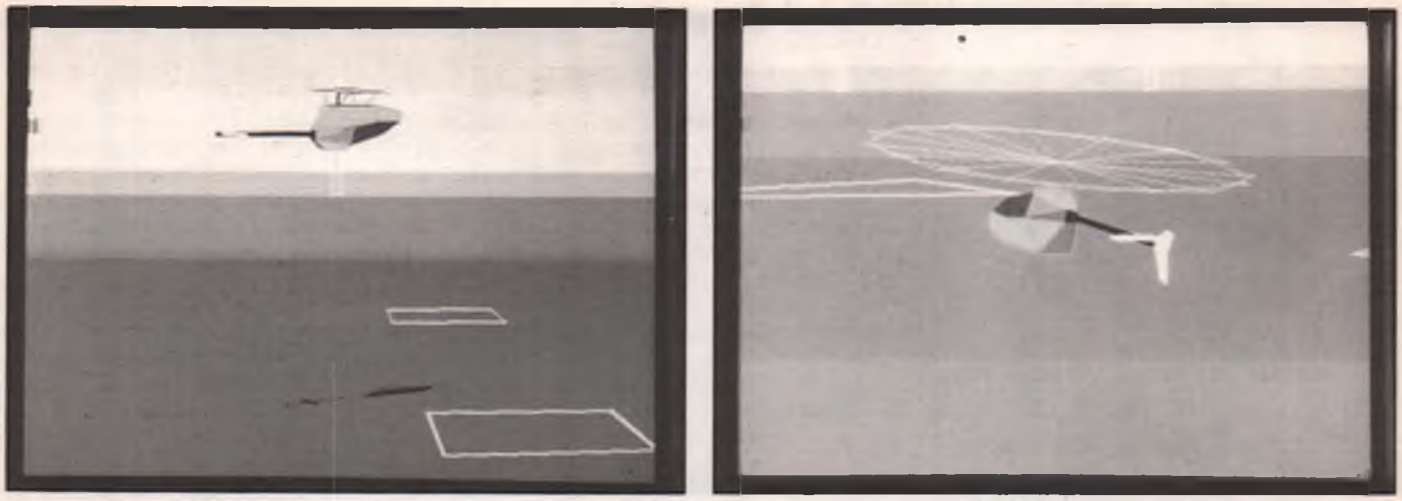
Let's take a look at the new "3-in-1" airplane/helicopter flight simulator program produced in England by Northern Helicopter Products and distributed in the U.S. by Horizon Hobby Distributors. It's an upgraded version of the original NHP heli simulator and now includes airplane simulation, but since I'm not a fixed-wing flier (yet!), we'll limit this discussion strictly to the helicopter functions.

This software can be helpful to both beginners and experts alike. A beginner can learn the basics of RC helicopter flight quickly and inexpensively at home. Also, as an experienced heli pilot, I find it particularly helpful for trying out new 3-D hotdogging routines that are too risky to learn on a real model.

I prefer the NHP simulator over the others on the market for three reasons. First, the pre-programmed flight dynamics are the best I've seen yet. I've been flying RC helicopters for 19 years, and this is the first time I've been able to really get the feel of flying an RC helicopter without actually starting up an engine. In hover, the computer helicopter handles just like a real model. The system is so realistic that I believe a complete novice could become proficient enough on the simulator to be able to pop a real RC helicopter into a steady hover on his first flight.

For advanced pilots, the NHP simulator is extremely useful for practicing stationary 3-D aerobatics, such as hovering rolls, backward flips, forward tumbles, switchless inverted flight, and death spins. I have a phobia about doing switchless inverted hover close to the ground. However, with the computer simulator I have no fear. So what if it crashes—just hit

Russ Williamson, a member of Horizon's R&D Department, gives the NHP 3-in-1 simulator a workout. One of the nice things about this particular simulator is that you use your own "real" RC transmitter with all of its various functions and mixing features; Russ is using a JR x-347. Comes with a 3.5-inch disc, interface adapter and interface cord, and requires an IBM compatible 486 PC.



Two examples of the NHP simulator's computer graphics. Allows you to learn and practice switchless inverted flying and 3-D aerobatics without endangering your model.

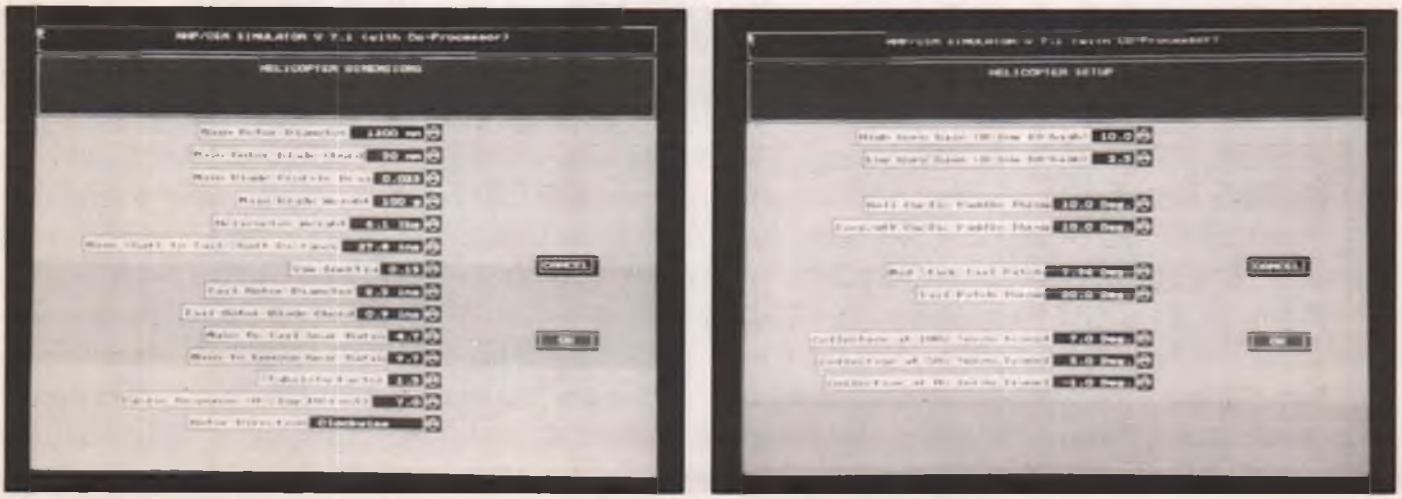
the ESC key on the keyboard and it's ready to go again. For people who already know how to fly but are eager to try 3-D hotdogging, the computer simulator is definitely a worthwhile investment.

The NHP program has a phenomenon I've noticed on other helicopter simulators: In high-speed level flight, the model tends to become unstable suddenly, while a real helicopter model, such as an X-Cell 60, can pretty much fly hands-off if it is properly trimmed. The other anomaly is that in a continuous, fast vertical climb, the simulator helicopter goes unstable and flips over after a while, because the simple mathematical modeling used inside the program cannot fully capture the dynamics of a real model helicopter.

The NHP 3-in-1 simulator requires that you have an IBM compatible PC with a processor of 486 or greater, one megabyte of RAM, VGA graphics card, DOS 3.1 or higher, and a 3.5-inch disc drive. You can find such a computer system for less than $900. The entire program comes on a single 3.5-inch disc. The simulator kit also includes a cable that connects your transmitter to the parallel printer port. The cable simply plugs into the trainer cord socket in your transmitter. When you purchase the NHP simulator, you have to specify the brand of radio—JR, Futaba or Airtronics—because they have different jacks. If you want to use the simulator with more than one brand of transmitter, there's an adapter plug available to permit switching between different transmitters.

The second reason I like the NHP simulator is that it has 17 different helicopter models pre-programmed into it—you can start flying it as soon as you load the disc onto the PC. It has the X-Cell 60, Hirobo Shuttle and Kalt Enforcer characteristics already programmed in; there are even two different versions of the X-Cell and Shuttle, set up for sport flying and 3-D hotdogging. There is also a generic beginner's helicopter model. This one flies just like a well-set-up entry-level RC heli. For those who like to customize their own setups, you can go in and easily change the following parameters: main rotor diameter, blade chord, blade profile drag, blade weight, helicopter weight, flybar length, paddle size, paddle weight, tail rotor shaft/rotor shaft distance, yaw inertia, tail rotor diameter, tail blade chord, main/tail gear ratio, engine/main gear ratio, helicopter stability factor, cyclic control response rate, hi-lo gyro gains, rotor spin direction, engine rpm where peak power is achieved, fuel tank capacity, gyro motor speed, servo speed, wind speed, atmospheric turbulence, and ground effect aerodynamics. You can even control the sun direction and sun elevation to change the shadow on the ground!

My favorite feature is that you can input the collective pitch travel in degrees. For examine, you can set it up so that at full stick (100 percent) the collective pitch will be at +12 degrees, when the servo centers (50 percent) it's at +5 degrees, and at 0 percent it's at -10 degrees. Then the computer screen can display the pitch angles when you have the idle-up or throttle hold turned on. You have to see it to realize how amazing it is. It teaches one to appreciate how the pitch curves on an RC helicopter work. The simulator also allows you to select the model's position on the ground (tail-in or nose-in) before taking off—great for learning nose-in takeoffs.



The NHP simulator allows you to adjust a variety of helicopter dimensions (left) and setup parameters (right). See text for more details.

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The computer screen also displays the rotor rpm. The sound effects are excellent. As you throttle up, the sound frequency increases just like on a real model. This is great for conditioning your ear to hear what is the right rotor speed. In the Chopper Chatter column I have frequently recommended hover rotor speeds for various models. With the sound effects in this simulator you can *hear* what 1,500 rpm really sounds like. Another unique graphic feature is that the coning angle on the blades changes according to the thrust and loading. As you increase pitch, the blades cone further upward—very realistic!

The third feature that makes the NHP simulator stand out is that it allows you to use your own transmitter, hence, whatever pitch curves, throttle curves, exponential, dual rates and programmable mix features you've programmed for your favorite RC helicopter will apply to the computer simulated model, too.

I've always wanted to learn how to fly an RC helicopter with a single-stick transmitter; the NHP 3-in-1 simulator gave me the perfect opportunity. I used my JR Century 7 single-stick transmitter and my portable IBM color PC. The combination works very well. Some simulators only work on tabletop PCs and not on portables. I tried another simulator on the portable PC; the graphics were awful. The NHP works very well on my IBM portable, and the color rendition is excellent.

I noticed that when I selected the preprogrammed X-Cell 60 model on the simulator and used my JR PCM-10 transmitter (which is already set up for my own X-Cell 60), the feeling of flying the simulator model is just like flying the real model. The pitch curves, throttle curves and programmable mixes that I have carefully set up over the years for my X-Cell 60 are all reflected on the computer simulator model, too. You can almost fine-tune the transmitter setups for your RC helicopter by first trying them out on the simulator.

Finally, the NHP 3-in-1 simulator has a great feature called a "freeze" function which is ideally suited for beginners. By selecting "position hold" and "height hold," the model is frozen at a head-height hover, but you still have control of the tail rotor. If you select "height hold" only, you have the cyclic and tail rotor controls. If you select "position hold" only, you have the yaw and height controls only. This system lets you learn one control at a time so you don't get frustrated trying to master all four commands at once. This is also ideal for learning switchless inverted hover or nose-in hover.

In conclusion, I give the NHP 3-in-1 simulator two thumbs up. For people who have a 486 PC at home or at work, this simulator is worth its weight in gold! ***MB***

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FREE FLIGHT *cont. from page 62*

down will meet with good results if the current parameters are followed.

"My thanks to Jack Hamilton, the NFFS Central Representative, who encouraged me to submit the Baby Cirrus for approval for the Nostalgia class. Jerry Bowman is also thanked for his original and current encouragement. They are both, in the true sense, 'Brothers of Balsa and Tissue.'"

Copies of the full-size Baby Cirrus plans are available directly from Joe Kehr, 7504 E. 82nd Pl., Tulsa, OK 74133-4253; (918) 495-1616. The cost, postpaid, is $7.50 per set.

COTTAGE INDUSTRIES

I recently received a couple of really nice kits from Tom Herr of Herr Engineering. Tom produces a number of rubber-powered scale models that are exquisitely engineered and feature laser-cut parts that are so nicely cut that you'll forget all about historic die-crunching. For example, the wing ribs in the J-3 Cub kit look like miniatures of the real thing, with the diagonal bracing and spar slots cut neatly and crisply into each rib. I strongly suggest these kits for anyone interested in building a nice rubber powered scale free flight model. With a bit of work, these kits could also be modified to accept CO_2 or small diesel or glow power. Take a look at them!

The Herr Engineering catalog lists eight kits, all with spans in the 30-40 inch range. Kit prices range from $29.95 to $36.95. Contact Herr Engineering at 1431 Chaffee Dr., Suite #3, Titusville, FL 32780.

Klarich Custom Kits produces some wonderful high-quality short kits of Old Timer and Nostalgia models. These hand-cut kits feature all of the ribs and curved parts plus a complete set of full-size plans for well over 250 Old Timer and Antique class models. The kits come boxed with all parts marked and bundled together for easy identification. They also have a growing list now containing about 20 Nostalgia designs and are capable of custom cutting from plans you supply. Kit prices run from around $30 to $120. The price list costs a buck. Send to Klarich Custom Kits, 2301 Sonata Dr., Rancho Cordova, CA 95670.

In the January column I mentioned Bill Northrop's *Scratch Builder's Almanac*, an illustrated plans catalog that includes several FF power, rubber and scale drawings. I also mistakenly wrote that you could get a copy "for a mere $1 bill." Make that "a mere two $1 bills." Bill says he's been getting a bunch of catalog orders with only a buck enclosed, and has been tempted to send out only half a catalog! Sorry about that, Bill. All 32 pages of the *Scratch Builder's Almanac* can be had for 2 (TWO) dollars from Bill Northrop, 2019 Doral Ct., Henderson, NV 89014.

FAI MODEL SUPPLY MOVES

When I first became interested in FAI FF competition, I discovered New England Wakefield Supply, Ed Dolby the proprietor. After a number of years he packed up and moved the operation to Arizona, and began doing business as FAI Model Supply, later moving again to California. Now comes word that Ed has sold the business to John Clapp, who resides close to the eastern shore.

According to information from John, the company will begin business officially as of January 1, 1996. You can receive a copy of their new and expanded catalog for $2. Contact John Clapp at FAI Model Supply, P.O. Box 366, Sayre, PA 18840-0366. Phone/Fax at (717) 882-9873.

THAT'S IT FOR NOW

As I look at the calendar, I know that some parts of the country are readying themselves for spring. The outdoor season can't be too far away. Since I was so successful last fall in soliciting photos of flying activity from readers, I'd like to extend the invitation again. If you have some good, sharp pictures of fliers and their models, please forward them to Bob Stalick, 5066 N.W. Picadilly Circle, Albany, OR 97321. No guarantees, but I'd like to publish a few of them. Thanks in advance. ***MB***

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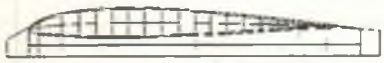

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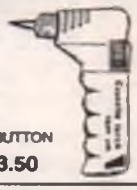

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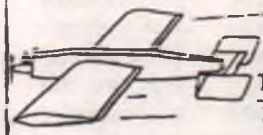

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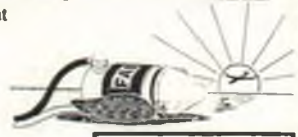

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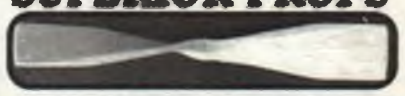

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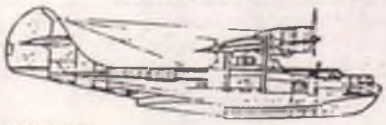

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PLUG SPARKS *cont. from page 34*

thermals! One had to make sure these types had good dethermalizers on them; otherwise, one could spend a lot of time building replacements.

The Korda model was so popular that SAM 100 put on a special Korda Wakefield event at the 1994 SAM Champs. This drew over 60 entrants including the guest of honor, Dick Korda, who flew and placed! This special event is now an integral part of the SAM Champs. For a special rubber power event, this model and event have proven once more the old saying, "If they look good, they fly good."

What are we doing now in the rubber events? Believe it or not, quite a few clubs like to put on contests that limit the wingspans to 30 inches. The most popular has been the Pacific Ace 30 staged jointly by SAM 32 and 21. This originally started with SAM 27 inviting SAM 32 to stage some small rubber powered FF events in conjunction with the SAM O.T. gas events.

Since the Marin County field was lost, SAM 27 has initiated a Gollywock contest at all of their annuals. Inasmuch as the Gollywock is a stick design by Wally Simmers, SAM 27 has also allowed the cabin version known as the Jabberwock to compete.

In the same line, Australian clubs have gotten into the fun by using the Flying Aces Moth as a special rubber event as their SAM Champs at Canowindra, N.S.W. Bruce Abell, not to miss the fun, built and flew the F.A. Moth seen in Photo No. 5. The 1995 model was selected from the Australia Women's Weekly that featured the WW Cabin Model. A nice provincial touch!

Photo No. 5. Small models such as this Flying Aces Moth are popular subjects for one-design events at Australian O.T. FF contests. This particular model was built by Bruce Abell.

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ENGINE OF THE MONTH

When "Doc" Nichols visited this columnist in San Jose, he not only brought the rare Avion Mercury for drawing, but also brought with him what he called the Morton Single, another rare engine. Actually, according to Bob Knutson's article on Morton engines in the *Engine Collectors Journal*, the engine we are featuring is the Morton Vanguard, second model. Probably the most notable features were the movable points and the constant upright straight cooling fin profile.

To eliminate confusion on the early Morton single-cylinder engines, the first one was called the "Conqueror," an advertisement of which appeared in the March 1937 issue of *Popular Aviation*. Trust the engine collector to remeasure the dimensions of 51/64-inch bore and stroke of 53/64-inch (.413 cubic inch displacement) to come up with .778-inch bore and .788-inch stroke to give .375 cubic inch. (Quite similar to the Baby Cyclone from which the Conqueror was derived.)

In reporting this engine, the biggest surprise to this writer and many other modelers in the late '30s era was the IMP engines. Inasmuch as International Model Producer (IMP) was advertising several engines known as the Intermote and the Nimph, these were taken by the majority as being of Japanese manufacture. This was a natural mistake as International specialized in numerous Japanese items such as propellers, CO_2 engines, timers, and other flying items.

No such thing! As could be expected, tough competition from Baby Cyclone, Ohlsson, Bunch, and Dennymite led to the discovery that the quality control was inferior to the large manufacturers with their automatic screw machines, hones and turret lathes. To boost sales and distribution,

continued on page 86

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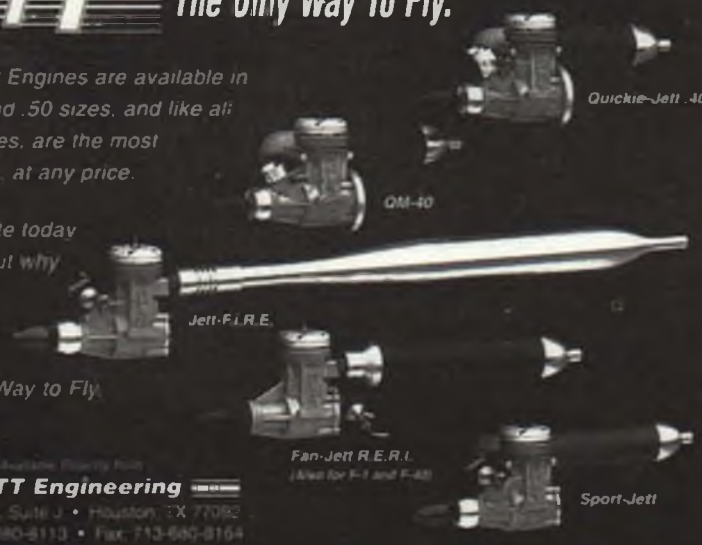

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THE BUZZER 100 *cont. from page 44*

blanks (7/16 x 2-3/4 inches), stack and notch them for the T.E., then glue them in place.

Now comes the nifty part. Remove the panels from the plan, and with a sharp pair of scissors, cut the rib blanks from the spar toward the L.E. in an approximate airfoil shape—ditto from spar toward the T.E. Then, using a good straight sanding block, sand each wing panel and the center section to final airfoil form.

Add the tips to each wing panel. Glue the wing panels to the center section with the proper dihedral angle, and install the gussets. Also add gussets where the spars join the center section. With this method one can build a strong and light wing very quickly. Use a similar method to construct the stabilizer.

The fuselage is a standard box using hard 1/16 square longerons and uprights. The front section is 1/16 medium sheet, as is the main former at the wing L.E. station. The firewall is 1/16 plywood. Add gussets as you see fit to add strength at crucial points. The landing gear is made from two separate pieces from 1/16 music wire, sandwiched between the main fuselage former and pieces of cross-grained 1/16 sheet. The wheels are sandwiched balsa circles glued to aluminum tube bearings.

There is a small piece of 1/16 plywood near the landing gear to support the CO_2 loading pip. This must be firm to resist the fair amount of force used in loading; note that it is offset to one side to bear against the edge of the balsa fuselage side. Mount the motor, tank, and loading pip before covering. Use a piece of balsa to wedge the tank in place. I used 0-80 machine screws to mount the motor. No nut is needed if you drill the plywood slightly undersize; the screws will thread into the plywood. Use small balsa shims under the motor to get thrust settings.

The fin is standard 1/16-inch thick stick construction. Add a trim tab mounted with copper wire. Add a 1-inch wide stabilizer platform of 1/16 hard balsa (cross grain); set the platform so that the right stab tip is 1/2-inch above a level reference line. This stab tilt will give a nice right turn glide.

I covered the entire model with gift-shop tissue, the kind found on racks with many different colors. Cover the bottom of the wing and stab first, then the tops. To shrink uniformly, spray water on both top and bottom. Allow the wing and stab to dry while clamped to your building board to ensure they will be warp-free. The whole model was brushed with one heavy coat of 50-50 nitrate dope.

FLYING

Find a place with a lot of room because this design has a good glide ratio. Be sure the CG is located as shown on the plan. Test-glide the model on a calm day and make adjustments as needed. Shim the

wing to adjust the glide—a bit under the T.E. if it stalls, a bit under the L.E. if it dives. When you have a solid glide with a slight right turn tendency, you are ready to enjoy the pleasures of CO_2 power.

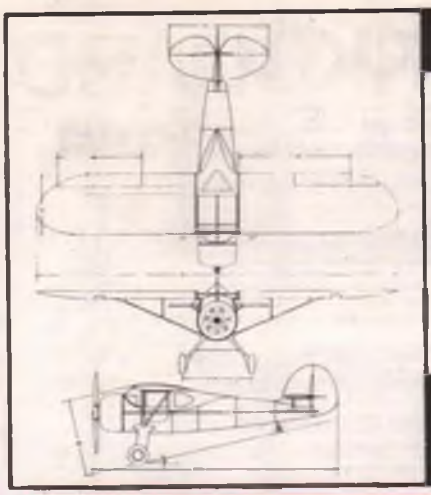
Load the tank with a *gas* charge (note: the charger tip above the supply tank gives a gas charge; the charger tip below the supply tank gives a liquid charge). With a gas charge, your CO_2 motor is like a compressed air motor but at a higher pressure. With a liquid charge, it's like a steam engine, the liquid CO_2 boiling at ambient temperature to produce gas, hence a longer run.

Start the motor and rotate the cylinder to give a slow tickover. I use a Sonic-Tronics 6x4 folding prop designed for electric powered RC sailplanes. It seems ideal for this motor and model—the motor runs well with it, and it folds for a neat glide. You can start a CO_2 with such a prop by holding one tip, rotating the prop clockwise against the gas pressure, then releasing it. The motor will start and run in the proper (counterclockwise) direction. Don't try that with a glow or diesel engine!

After you can load and run your motor on a gas charge, and have a slow speed setting, load and start it, let it run until there's about 15 seconds left, and launch the model as in glide testing. You should get a slow toodle to the right. With this as a base point, and continuing to use short gas charges, gradually increase power by rotating the cylinder and launching. Don't go to higher power until you are getting good flights at the present setting. With full power and the final flight trim now dialed in, the initial power burst gives my model a straight-out run before turning into a steady right-hand climb under power. Such a pattern seems ideal to me.

Set power trim with thrust adjustments and possibly a little bit of rudder. Mine flew best with a right power pattern and right glide. If yours wants to go left naturally, that's fine too. Lube your motor with a drop of light machine oil in the cylinder and behind the prop driver every half dozen flights. Try to keep your motor runs short for this phase of trimming. Remember, your Buzzer 100 is a creature of the air and will fly away at the slightest excuse.

I get motor runs of about 30 seconds maximum on a gas charge. If the air is cold and inactive, one can have nice sport flights on gas charges. For some *real* action, load a liquid charge, *be sure to set your dethermalizer fuse,* then let 'er rip. You will get motor runs of around 2 minutes. I recall one flight in particular early in my trimming and testing when, on a liquid charge and a calm day, the 'ol Buzzer climbed majestically to about 100 feet in graceful circles, cruised around at that altitude for 4 minutes, then landed perfectly right at my feet as if it had been piloted by a leprechaun. Who says aeromodeling is a hobby? When one experiences flights like that, I would say instead that it's a way of life! ***MB***



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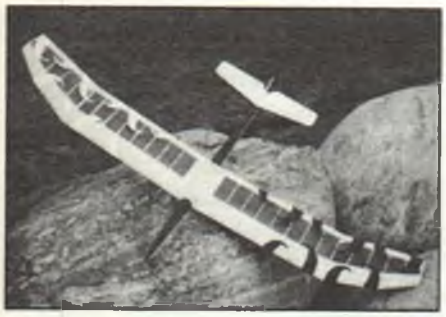

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PLUG SPARKS *cont. from page 82*

Morton entered into an agreement to provide engines to IMP for export to many nations, including England, France, Belgium, Sweden and South Africa. Although records are not available, it is estimated that about 500 were shipped to IMP for sales and distribution.

Judging from the IMP ads in *M.A.N.*, one would assume this partnership folded up in the spring of 1938. Glen Morton had moved in April/May, ceasing production. Morton took a position at Wichita, Kansas, becoming associated with Swallow Aircraft Corp.

CLEVELAND MODEL SUPPLY

This is one of the oldest (and still active) model airplane supply companies as organized by the three Pachasa boys in the late '20s. We are indebted to Stephen E. Kanyusik, 4067 Brookfield Blvd., Sterling Heights, MI 48310 for his letter about E.T. Packard.

To avoid confusion, the gossip chain reports that Ed Pachasa, who was running Cleveland Models in 1935, was so taken by the looks and performance of the Packard Motor Car, he changed his name to the more Americanized name of Edward T. Packard. It has remained that way for so long, most of the old modelers have forgotten the early model mag articles written by him under the name of Edwin Pachasa.

Stephen concludes his letter by saying he spent over two hours at the warehouse noting the tremendous amount of bags and boxes of balsa cowls and wheels. Rather amazing he had kept these parts over the last half century.

MODEL OF THE MONTH

This month's model is a little-seen 1938-39 model known as the Nomad Convertible, first published in June 1940 *Model Airplane News*. This very interesting design by Sidney Struhl combined landplane and float types, and could be changed quickly as the weather and site permitted. This 51-inch span model was an ideal size for those modelers who loved to put models in the back seat or truck to fly as the mood struck them.

Model Airplane News was fortunate in having three top-notch designers of rubber powered flying scale models: Earl Stahl, Sidney Struhl, and Herb Weiss. The first two produced free flight gas designs such as the highly popular Fokker D-8 by Earl Stahl and Sydney Struhl with last month's model, the Chickadee, the Nomad Convertible, Curtiss O-52, Ercoupe, and others. All the aforementioned flying scales were good performers.

John Pond, P.O. Box 90310, San Jose, CA 95109-3310. ***MB***

maneuvering. Jet fighter designers know this and this is why they want gobs of thrust in a dogfight airplane; the thrust is not to go fast straight but to maintain speed in turns under high G-loading situations. Think about it, a fighter turning 6 Gs must produce 6 times as much lift as when in level flight. If the speed is the same, where did the lift come from? Bingo! Pulling a higher angle of attack. (Read that 'Cl' in aero terms.)

"Skogh's last two bullets are just flat out wrong. Weight has nothing to do with induced drag (other than creating the requirement that you must produce more lift) and the lift coefficient is right there in the middle of it (*squared* no less). Furthermore, the statement that the Cl is the ratio of the wing loading to the dynamic pressure is another piece of good algebra but bad aero. The lift of some 'thing' is proportional to the dynamic pressure applied over some area. The lift coefficient is the result of dividing these things out on both sides to get a relative measure of what angle of attack you are flying at. Cl=0 is at a real angle of attack of 0.

"Most airfoils won't stall up to a Cl of 1.2-1.4 or so, corresponding to an angle of attack of about 10-12 degrees. The Cl does represent how hard you are working the wing. Induced drag is the direct result of working the wing hard (increased angles of attack). High angles of attack are required *to maintain* L=W at either heavy weights or low speeds; but the effect is due to the fact that you have to work the wing hard to stay flying. One more point is that null drag is not just airfoil related. What Skogh refers to as null drag is composed of form drag due to the airfoil and also due to twist, etc., and parasite drag which includes skin friction, Reynolds number, etc.

"Aerodynamics is not intuitive and difficult to simplify. Attempts to simplify it for the common person are OK if we don't make the wrong assumptions, but in the September 1995 article several bad ones came from good algebra but poor aerodynamics. Many years of theoretical analysis and empirical study combined with wind tunnel and aircraft verification have proved the above as it is presented."

But not all disagree with Jörgen Skogh. My modeling friend, Paul Weston, who reviews this column for me every month, likes Jörgen's aerodynamics better than that of the objectors. Paul and I have argued at great lengths on induced drag and other points of aerodynamics, and will probably never agree. Paul felt that some of the differences of opinion

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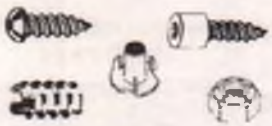

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between Skogh and this month's guests boiled down to definitions. For instance, he thinks (and I agree) that the big fuss over whether or not "lift equals weight" goes away if we substitute the word "load" for "weight." Load is always the force equal and opposite to the "lift," and is the resultant of the gravity force component (weight) and the centrifugal force component in a turn. We also need to remember that "lift" is the aerodynamic force normal to the airflow, and is not necessarily straight up.

I also got a comment from frequent correspondent Nat Penton of DeQuincy, Louisiana: "I do not find anything wrong with Skogh's formulas, except I believe he should have said, regarding induced drag, ' . . . multiplied by the *tangent* of the downwash angle.'"

My many thanks to my friend and Aero Engineering Prof. Bob Joppa of the University of Washington (not quoted here), and the readers who wrote: S. Cole of Boulder, Wyoming; Peter Soule of Palos Verdes, California; Daniel Fritz of Hanover Park, Illinois; Mickey Nowell of Longwood, Florida; Nat Penton of DeQuincy, Louisiana; and Paul Weston of Redmond, Washington. Thanks for your letters and for attempting to set us straight.

JÖRGEN SKOGH REPLIES

After the above had been written, I got a letter from Jörgen. Again I must shorten it greatly:

"I have received three letters from readers [of the September column], two positive: George Meyers and one from Nat Penton, who wants to know more about wave drag (I believe he means null drag).

(A letter from Mickey Nowell to Jörgen was negative. Jörgen's response to him included):

"I believe the penchant of aerodynamicists to reduce everything to dimensionless coefficients often serves to hide or obscure important physical relationships. In my article for *MB* I wanted to present the view of the airplane *designer*, rather than that of the aerodynamicist.

"L=W is valid for level unaccelerated flight only. It is made equally valid for any steady-state condition by replacing W with nW, where 'n' is a load factor. [This was Paul Weston's point.] I chose not to do this [to keep things simple].

"Many authors fail to make a distinction between induced drag and induced-drag coefficient. This is a fatal mistake, committed even by such eminent authors as O.G. Tietjens."

Skogh went on to tell Nowell his interpretation of the formulas used by designers versus those used by aerodynamicists, and included the following comments:

"Many people will insist that the induced drag depends on the aspect ratio; but this is not the case. The induced drag depends upon the lift, but lift coefficient is

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not representative of lift, which is independent of the wing area. A low aspect ratio wing stalls at a higher angle of attack than a high aspect ratio wing."

One more paragraph by Jörgen, then we have to stop:

"The aspect ratio has nothing to do with induced drag, but span has. A reduction in wing area [by reducing the chord] reduces *only* the null drag, not the induced drag. An increase in span reduces *only* the induced drag. In both cases the aspect ratio is increased but with different results."

Thanks again, Jörgen. Jörgen Skogh's address is Skogvaktarevagen 12, S-597 41 Atvidaberg, Sweden. Telephone (from U.S.) 011-46-120-35134.

We see things in different ways, and a difference of opinion doesn't invariably prove that one party or the other is wrong. Definitions are frequently the problem. The acceptance of specific theories sometimes changes with time. Examples: flat earth, geocentric universe, and Prandtl. The thing we *do* know for sure is that most of our airplanes fly, and some fly better than others. Why that is true is the subject of many debates such as this one.

THE BEST BOOK

This column has recommended several good aerodynamics books in the past, but the book I and many of our readers recommend most for modelers is the third (1994) edition of *Model Aircraft Aerodynamics* by Martin Simons, Argus Books. This book is very comprehensive and contains a lot of useful charts and airfoil data curves. Simons knows whereof he speaks, both in the theory and in model airplane design practice.

PARTING WORDS

"Knowledge which is acquired under compulsion obtains no hold on the mind."—Plato.

Therefore, since you don't have to read this stuff, you are in a position to remember some of it. I also don't have to write it, which perhaps explains why I learn a lot from this exercise each month.

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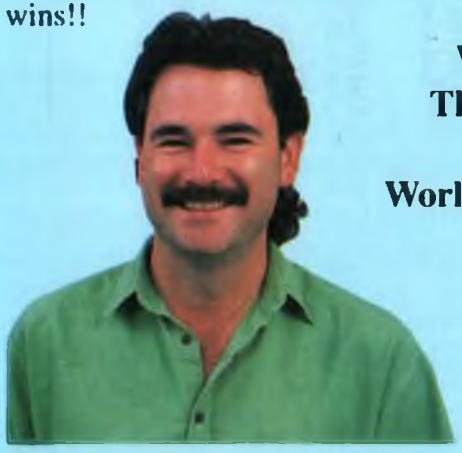

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