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MODEL BUILDER

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KALT CYCLONE II HELI

CONSTRUCTION:
HIGH-Q, VINTAGE R/C BLACKHAWK, R/C HLG

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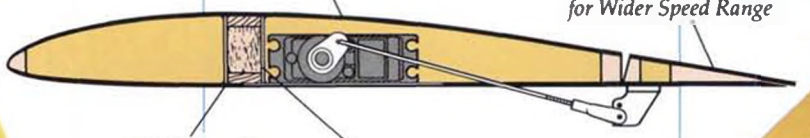
Soar to new heights. Fly the Legend.



Airtronics proudly introduces the next generation in sailplane technology, the Legend.

A New Evolution in Design

The Legend is the latest evidence of Airtronics' ongoing commitment to improving the breed of R/C sailplanes. It combines the responsiveness, speed range, and thermalling ability necessary for any pilot who wants to excel at the art of soaring.

The heart of this design is the Selig 3021 airfoil, selected for its superior L/D and superb low speed handling characteristics.

Bolt On
3 Piece Wing

Kevlar Reinforced
Fiberglass Fuselage

The modified Schumann wing planform not only reduces drag, but it also enhances stability in tight thermal turns. Ailerons are used for roll control to provide precise positive response unheard of in polyhedral winged designs.

A Modern Legend

The Legend is designed for the pilot who seeks the highest level of performance. The graceful T-tailed fuselage utilizes Kevlar reinforcement to absorb the punishment of competition landings. Carbon fiber reinforced wings are fully sheeted on their top surface for further drag reduction. A full house control setup with flaps allows the airfoils' camber to be changed to push the flight envelope to the maximum.

Low Drag
T-Tail
Design

Traditional Quality

Since 1971, the uncompromised design and unsurpassed quality of our aircraft kits have made Airtronics the acknowledged leader in R/C sailplanes. As in all of our high quality kits, the Legend features hand selected wood, fully machined parts with no die cutting, and complete hardware packages. In addition to top grade materials, each kit comes with detailed plans and photo illustrated instruction manuals to guide you through each construction step.

With the Legend, Airtronics has once again elevated the state of the sailplaning art to new heights of legendary performance.

Legend Specifications:	
Airplane Type	Open Class Competition
Wing Span	113"
Wing Area:	997 sq. in.
Airfoil:	Selig 3021

Fuselage Length:	49"
Flying Weight:	70 oz.
Wing Loading:	10.2 oz./sq. ft.
Radio System:	4 or more Channels
Recommended Servos:	94141 Micro

We Set The Standard.

AIRTRONICS INC

11 Autry, Irvine, CA 92718 (714) 830-8769

New book "briefings" from H.A.

ACES AND WINGMEN II, Morris. Over 600 photos, dozens in color, and 55 paintings enhanced a remarkable historical coverage of the 8th Air Force's exploits in Europe during World War II. It combines recollections, stories by 13 combat pilots, and official documents recently declassified to produce a panorama of the air action. Much other data including group histories of all 15 of the 8th AF Fighter groups, plus the 354th group of the 9th AF, Aces lists, and a chronology of 8th AF's major events. 256 pgs., 8 1/2" x 11", sfbd. 12398 **$39.95**

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

FIGHTING COLORS Glory Days of U. S. Aircraft Markings 1930-1990, Dorr. A look at the markings, insignia and nose art of the combat fighter. Once bright, vivid, splashy colors decorated these planes, gave courage to their pilots and evoked fear in the enemy. Today these markings have given way to drab, low visibility paint schemes so the combat pilot can hide in the invisibility of the vast sky. But occasionally a pilot dabs on a few splashes of brightly colored paint even on today's high-tech jets. Sfbd., 9" x 10 1/2", 128 pgs., 80 color ill. Books shipped 4/15/90.....3187B **$19.95**

WARBIRDS WORLDWIDE DIRECTORY, Chapman and Goodall. A truley monumental compilation of the whereabouts and previous ownership of warbirds known to exist throughtout the world. Notations indicate model aircraft, serial number, N-number, location and dates of ownership of each. Thousands of listings. Wonderful reference volume, a must for warbird buffs. 100 photos, half in color, 321 pgs., 6" x 8", sfbd. 1533D **$24.95**

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RECREATIONAL FLYING, Taylor. Aimed at the new category of pilots, the recreational licensed flyer, this book features the specific regulations, requirements and limitations on where, when and which aircraft can be flown. Offers easy-to-follow guide for obtaining the recreational certificate. 37 line drawings, 288 pgs., 6" x 9", hdbd.....3133C **$24.95**

WARBIRD CHECKOUT #10. Running time 1 hour 50 minutes. **"How To Fly The B-17 Flying Fortress."** This is a comprehensive pilot training film made by the Army, Air Force and the Boeing Airplane Company for training new pilots about to enter combat with the B-17. Walk with the pilot as he does his pre-flight. Sit in the cockpit as he checks all systems, runs up the engines and takes off to perform flight operations - Learn emergency procedures - Lose #4 engine on take-off or put out a fire on #4 engine. (B & W 1 hour 28 minutes.) **"Fortress In The Sky."** Story of the B-17 Flying Fortress from design concept, engineering, to production. Witness early test flights and fly off to combat in "Glamour Girl" (Color 22 minutes).....V8077C **$29.95**

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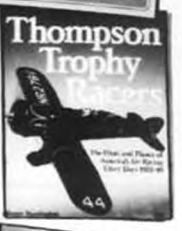

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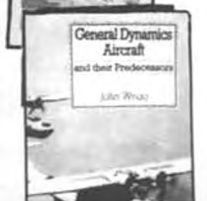

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MODEL BUILDER

WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

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JUNE 1990 • VOLUME 20 • NUMBER 220
898 West Sixteenth Street • Newport Beach, CA 92663
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DEPARTMENTS

FEATURES

CONSTRUCTION

ON THE COVER

At last year's IMS Atlanta Show, winner of "Best of Show" and of corse, First Place in it's category, Giant Scale, was this K-10 Shoestring Formula I raceplane built by Greg Waits. He used Bob Morse plans (now sold by Bob Holman Scale Plans). Power is Sachs Dolmar 4.2 cu. in. engine on C.H. throttle, coupled ignition, with 6-volt, 900 mAH battery, all turning a Zinger 22 X 14 prop. Radio is IR RCM9, with Futaba 9201 and 9231 coreless servos.

MODEL BUILDER (ISSN 0194 7079) is published monthly by RCMB I NC., 898 W. 16th St., Newport Beach, California 92663. Phone (714) 645-8830. Subscriptions: $25.00 per year, $47.00 for two years. Single copies $2.95. Subscriptions outside the US (except APO & FPO) $38.00 for one year, $68.00 for two years. All payments must be in US funds, drawn on a US bank.

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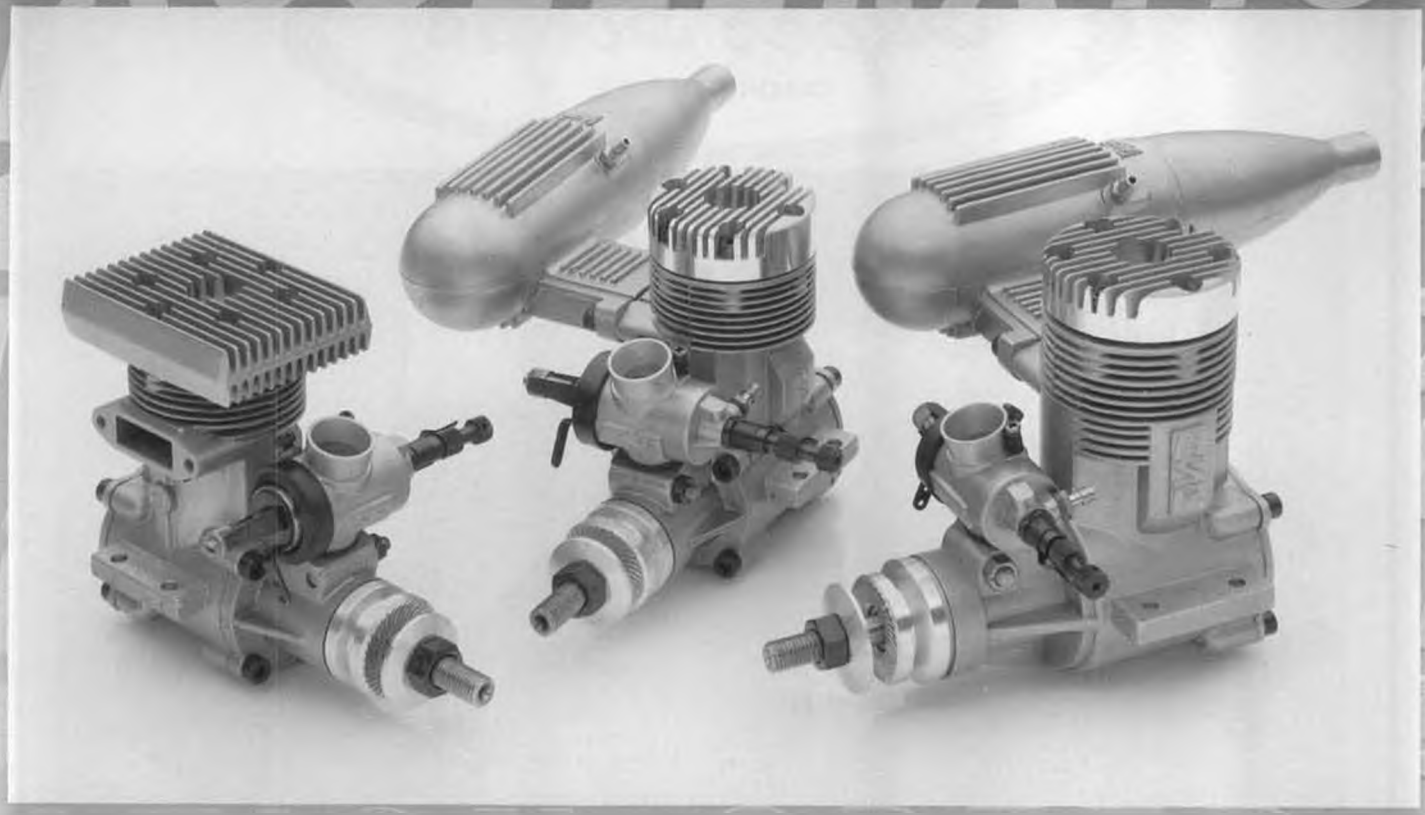

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WORK BENCH

BY BILL NORTHROP

Recently we received a letter canceling advertising in *Model Builder* because "... we have found that your magazine does not reach a significant section of the type of market that we are after. We feel that your magazine is geared more toward the Free Flight, Control Line, and Old Timer modelers than the Radio Control market."

Obviously, we are not going to disclose the source of this letter, but we sure as hell intend to say something about it!

First of all, so what's new? Our format has always been based on the assumption that modelers, real modelers, the hard core of the hobby that is here to stay and not just passing through, makes up the majority of our readership. This hard core is mostly into radio control now, but a large portion of its members cut their fingers building free flight and control line aircraft, and they still want to read about these facets of the hobby, not just to keep in touch, but also to pick up building and finishing tips that might not appear in R/C articles. And as for Old Timer... surprise, surprise, most of the old timers being built and flown these days are radio controlled!

Another interesting fact is that many newer modelers, who came into the hobby through their initial interest in radio control, which really is the most publicly visible facet of the hobby, have discovered free flight and control line through magazines like ours. Those new R/Cers who have been open minded and perceptive enough, soon realized that having a well aerodynamically trimmed aircraft was of primary importance to their success in flying R/C. They also learned that the best way to gain experience in properly trimming a model for stable flight was to understand the basics of flying free flight. In other words, quite a few new free flight modelers came into the hobby through R/C, and now share their interests between the two. We can also think of some prominent control line modelers who have gone into R/C, but still maintain an active interest in control line. The bottom line is; once a modeler, always a modeler, and a true modeler is at home with, and wants to keep up with, all that goes on in the whole model airplane hobby, not just one part of it. We have received many letters and have been told by many modelers who we see at the various trade shows, that we must not change the format of *Model Builder*, that they like it because it covers other activities besides R/C modeling. We acknowledge these requests and also base the magazine's content on their recommendations. The big problem now, is to make the advertisers, who pay our freight, understand what we are doing. This is where our readers come in.

We always say to ourselves, after receiving a complimentary letter or a verbal approval of what we are doing, that, "It's too bad those blankety-blank advertisers couldn't have seen or heard that compliment." Well, starting now, we are collecting all letters of written testimony in our favor (fortunately, that represents the majority). No, we're not the self-ordained preacher on TV who's asking his listeners for a million dollars by such-and-such a date in order to save his life, but we would certainly appreciate your assistance in building a file of testimonials that will prove the point about our readership... that R/C modelers want to read about all facets of the hobby, and that's what they find in *Model Builder*, along with a whole bunch of advertising! So keep them cards and letters a'comin'.

Now, will somebody please help me down off this soapbox?

"Name That Modeler." From the copious photo files of the late Bev Smith, who brought epoxy finishes and glues to the modeling community through the Pettit Paint Company, under the Hobbypoxy title, we have a fascinating collection of old photos. Many of them feature well known modelers from the historic growth days of the hobby... some still here... some departed. Don't call, but send us a letter or postcard telling us who you think or know they are. It's mostly for fun, but as an incentive, the earliest postmarked correct answer will earn an Uber Skiver knife set for the sender.

CHARLES SPAIN VERRAL

Another giant from the Golden Era of

A group of modelers assembled at Lake Elsinore for the first ever flying model aircraft meet to be sanctioned by the California State Department of Parks and Recreation. In this case it was in cooperation with the Lake Elsinore R/C Club. See text for more details.

model aviation has passed on. This gentleman was not known for his unique model airplane designs, nor his contest record, nor his accomplishments in the growing model hobby industry... he was the creator, under the pen name of George L. Eaton, of the long-running series of fictional air adventures featuring Bill Barnes, which appeared in *Air Trails*, one of the leading vintage model airplane magazines.

Born near Toronto, Canada, in 1904, Verral attended Ontario College of Art, and began work as a commercial artist in New York in 1927. He was Art Director and Editor for Clayton from 1930 to 1935, and began the Bill Barnes stories in 1934. They produced such an avalanche of mail that Street & Smith (publishers of *Air Trails*) had to designate a staffer to handle the load. He wrote most of the series into 1943, and after 1939 was also script writer for the "Mandrake the Magician" radio show and continuity writer of the "Hap Hopper" adventure cartoon strip syndicated by United Features. Up to the time of his death on April 1, 1990, he was still active as a writer, having done more than 200 magazine short stories, more than 50 juvenile books and about 25 Golden Books, and several biographies, including one on famed rocket pioneer Dr. Robert Goddard, which made the New York Times list of best juveniles of 1963. He was currently a sports-columnist for "Youngperson," an illustrated news journal.

We wish to thank Bud Overn, Santa Ana, CA for the above information.

HONORARY MEMBER

We learn from Art Johnson, newsletter editor for the Gold Coast Radio Controllers, West Palm Beach area of Florida, that Vern MacNabb has been made the first honorary member of the club. A mere 86 years young, Vern, who most vintage R/Cers will remember as the owner of Citizen-Ship Radio Corp., produced some of the earliest R/C equipment. He has remained active, building and flying since retiring some years ago. He's presently getting out of the high powered aircraft stuff, and is converting a sailplane to electric.

ONE-TO-ONE SCALE

Anyone active in R/C since the fifties, especially scalers, should remember Hale Wallace. We remember flying against him in Scale at the 1965 Nats, when his push-pull Cessna Twin insisted on running with only one engine. He always earned high scale and workmanship points. By the time you read this, Hale will have retired from IBM, and is getting back into "REALLY BIG" giant scale... he has acquired the Steen "Skybolt" program, and will be selling plans, kits, etc. For scale modelers, he can help with three-views and photos, as the design makes a great scale model. Several kits are already on the market. Hale's address is 779 Ottowa Dr., Rock Hill, South Carolina 29732.

MR. DIESEL'S DIARY

That's the name of a 38-page, soft cover book by Eric Clutton, 913 Cedar Lane, Tul-

continued on page 61

ADVICE FOR THE PROPWORN—BY JAKE

Dear Jake:

The debate seems to be heating up in the model mags about whether or not biplanes are suitable for AMA and FAI pattern competition. Some say "yes," some say "no," and others say "maybe" or "depends."

Seems to me you already said in an earlier column that biplanes were no good. In light of the continuing discussion, do you still feel that way?

Bipe Liker in Little Rock

Dear Bipe Liker:

As the old saying goes—two heads are better than one, except on a beer.

Well, two heads may be better than one, but two wings aren't. I've had two bipes, an SE-5 and a Tiger Moth, so I speak from experience when I say that neither one of them would do AMA or FAI pattern worth a darn. The Moth had so much adverse yaw, it about fell out of the sky whenever I used the ailerons. A roll was out of the question, and inverted flight would have been catastrophic.

So spare me when you start raving about how wonderful biplanes are. If biplanes are the answer, why don't we have bi-birds? When I see a double-decker pigeon with two sets of wings doing loops and rolls over a statue, maybe I'll reconsider.

Jake

• • •

Dear Jake:

The Tournament of Champions will be held in Las Vegas in November, true? Have there been any significant rule or format changes this year?

The T.O.C. has always been a great show. I hope they stay with the scale airplanes and Aresti aerobatics.

Fan in Fresno

Dear Fan:

Aircraft eligibility, scale, engine, and weight regulations will remain relatively unchanged from 1988. The biplane bonus is gone. A 10 percent bonus will be awarded, however, to anyone whose name is Hanno or Chip.

Aresti is still the aerobatic format, but the new Aresti handbook will be in use. Flight programs are going to be even tougher with reverse rolling circles and many snap rolls on vertical up lines. The Freestyle program will be replaced by a second Known program. The 3-Minute Free program will be replaced by the 3-Minute $1.50 program.

Competition should be keen this year, and Prettner may not win, unless he shows up. Rumors from Europe indicate that Hanno's 3-Minute program will be amazing. It is said to include music, skydivers, fireworks, the Radio City Rockettes, and a monoplane that converts to a biplane while performing a lomcevak.

Through some error, I have been excluded from the list of invited contestants again. Mr. Bennett will no doubt correct this oversight before the T.O.C., so you can expect to see me piloting my Bucker Dungmeister to victory in November.

Jake

• • •

Dear Jake:

Sailboats are called "sailboats" because they have sails. So how come sailplanes are called "Sailplanes"? They don't have any sails. Shouldn't they be called "wingplanes," or "longskinnywingplanes"?

Ralph in Dayton, OH

Dear Ralph:

Sailplanes would have been called "gliders," except that name was taken for porch furniture.

Not everything has to literally be what it sounds like. "Boxing gloves" are not worn for packing cartons, and "boxer shorts" are not underwear for dogs. So stop being so literal and remember that a rose by any other name, would still need fertilizer.

Jake

• • •

Dear Jake:

Does the commander of a flying boat need a ship captain's license or an airline pilot's license, or both? Does the FAA or the Maritime Authority oversee flying boat operations? The potential for confusion appears to be great.

Who controls takeoffs and landings, the air traffic controller or the harbor master? And what happens to the stewardesses while the flying boat is taxiing on the water? Do they become social directors? Do the passengers have lifeboat drills? Do they discuss procedures for emergency landings on land?

If a ship outside territorial waters can have a gambling casino, why not an airplane? How about dinner at the captain's table? What about shuffleboard? Inquiring minds want to know.

Martin in Mechanicsburg, PA

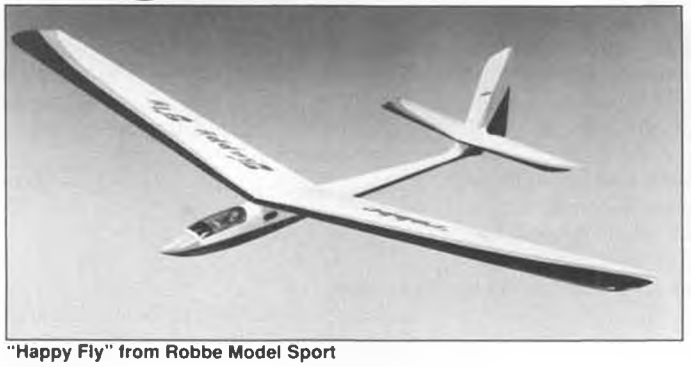
Dear Martin:

Airships like the Hindenburg tried to take the stately elegance and lavish opulence of ocean liners into the air. They succeeded, but they were too slow. Flying boats had to sacrifice the casinos and the orchestras in favor of weight savings and speed, thereby paving the way for today's airliners which have all the ambience and amenities of the toilet in a dentist's waiting room, but with less room and fewer magazines.

I'll assume the rest of your questions were rhetorical.

Jake

OVER THE COUNTER



"Happy Fly" from Robbe Model Sport

"Bingo E" from Robbe Model Sport

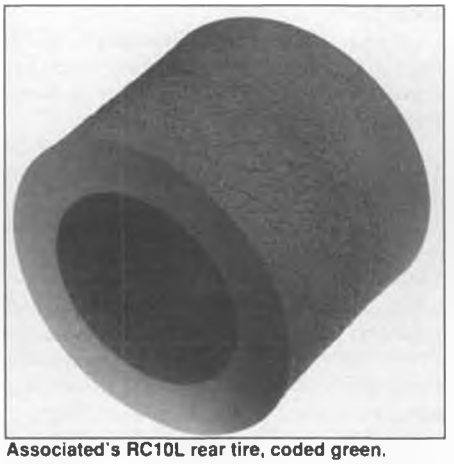
Composite materials surely represent some of the products that are gradually working their way into the construction of models, both in kit form as well as scratch-built. Unlike cyanoacrylate glue, first introduced and still being pioneered by Satellite City's Bob and Bill Hunter, composites have been a little slower in gaining popularity, partially from unfamiliarity, from reluctance to change, and from everyday unavailability. Several forward-looking companies are trying to ease all of these "bottlenecks," including K&S Engineering, 6917 West 59th St., Chicago, IL 60638, phone (312) 586-8503. K&S is now offering a card package of stranded Kevlar 49, a synthetic fiber that for equal weight is five times as strong as steel. It has a tensile strength of 400,00 lbs./sq. in. and a tensile modulus of eighteen million lbs./sq. in., or in other words, negligible stretch.

An obvious use for the stranded material is to reinforce a wing spar. Applied to the top and bottom of a spar, it can increase its strength by 200 percent. It can also be used as a wrap for dihedral joiners and wire landing gears. Gluing it perpendicular to the grain of balsawood prevents splitting. The more it is used, the more applications will come to mind. The individual fibers are finer than hair, so that a single multi-filament strand along a spar flattens out to practically nothing in thickness when applied with thick CyA glue rubbed in with a plastic wrap-protected finger. As the package warns, the fine filaments can break off and float around like cat hair, so must be handled with care.

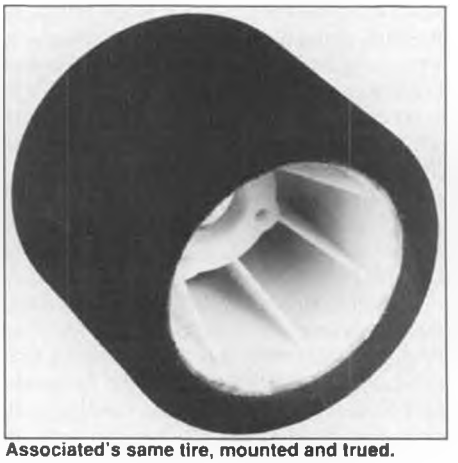
• • •

One of the leading United States R/C car manufacturers, who advertises in another of our publications, *R/C Model Cars* magazine, Associated Electrics, Inc., 3585 Cadillac Ave., Costa Mesa, CA 92626, phone (714) 850-9342, (Fax 850-1744), is now offering a Ford T-Bird 1989 Stock Car body for its own RC10L chassis, as well as other make 1/10 onroad race cars. The company also markets 1/8-inch carbide differential balls for the RC10, in sets of 8. Not to be used in your slingshot except for emergencies, the balls are a dollar apiece! Also for the RC10L, Associated has rear wheel/tire combinations, mounted and trued, and labeled

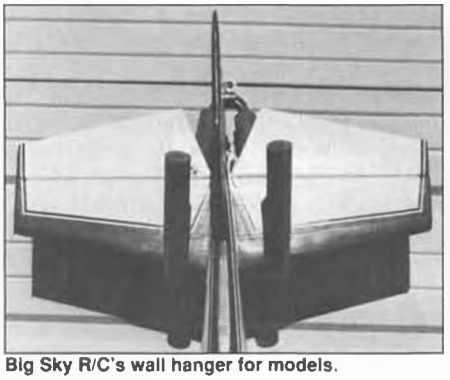
Ace R/C's DJ's Multi-Stripe



Associated's RC10L rear tire, coded green.



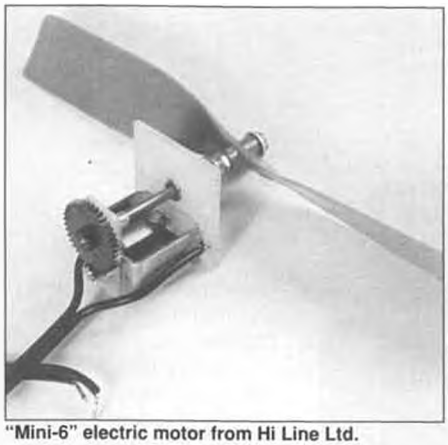
Associated's same tire, mounted and trued.



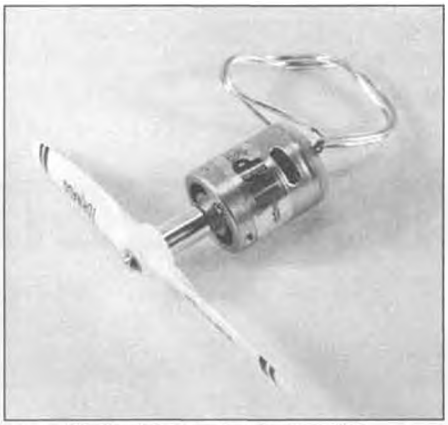
Big Sky R/C's wall hanger for models.

Big Sky R/C's ceiling hanger for models.

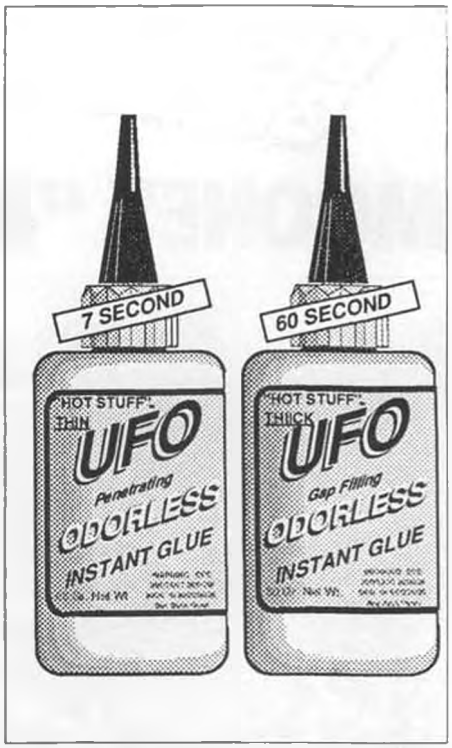
KDI's power handle and coiled cord.



"Mini-6" electric motor from Hi Line Ltd.



"Imp-30" electric motor from Hi Line Ltd.



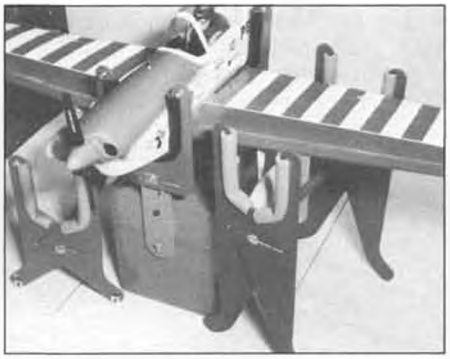
"UFO," odorless cyano glue from Satellite City.

Carbide differential balls from Associated Electrics.

Associated Electrics' 1/10 Ford T-Bird 1989 stock car body.

KDI's Stabilizor transmitter holder.

Cad-Cycler by RF Tronics.



Model cradles by Big Sky R/C.

Green for maximum traction. They also fit many other onroad cars. Rear tire donuts only, again coded Green for maximum traction, are also available. The combos list at $17.00 a pair, while the donuts are $8.50 a pair. The T-Bird bodies retail for $18.00.

• • •

Coincidences happen. We just announced a new kit from Ace R/C called the "Bingo," and now guess the name of a new kit from Robbe Model Sport... sure, it's the "Bingo E." From there, the similarity ends, starting with the "E," which of course, stands for electric. The Robbe Bingo E is a 47-inch span cabin model with taildragger gear. It's of all wood construction and designed to be a perfect electric beginner model. It will be available as a plane kit only, or with an electric motor, spinner, prop, and prop adaptor.

"Happy Fly" seems to be the right name for another new model from Robbe. This is a 71-inch span R/C glider for two-channel radio. Because of its low weight, it can easily pick up thermals, and makes an excellent slope flier for those almost calm days when other ships have to land. It also converts easily to electric power. It features a molded Plura (TM) fuselage, along with built-up wings and tail surfaces.

Both models are available from your hobby shop, or contact Robbe at 180 Township Line Road, Inc., Belle Mead, NJ 08502, phone (201) 359-2115.

• • •

A flat, pin-holding surface for building models over plans has always been a desirable item, sometimes not easy to come by for the discerning modeler who wishes to at least start out with flat structures. Big Sky R/C, Lander Indust., 1005 - 19th St. Ct., Havre, MT 59501, phone (406) 265-6529, has such an item available in two sizes; 24 x 48 and

continued on page 64

BIG BIRDS BY AL ALMAN

MOONEY "MITE" REVISITED

What a pity! Al misplaced the info on this great looking Grumman F8F Bearcat. Will the builder please check in with details and to receive proper credit?

Like most folks, I don't mind spending bucks for a product or a service as long as I feel I'm getting my money's worth. I expect to get the kind of quality I pay for, and this includes everything—not just R/C.

Unfortunately, a few who sell products and services are only after the quick buck and have little or no concern about the quality of their product or the impact this lack of quality has on their customers. They just peddle what they can as fast as they can, and then quick as a bunny disappear into their holes until a new scam brings them back to prey once again upon unsuspecting consumers.

That's why I appreciate the guys who do care enough, who take the time and effort to straighten out problems and eliminate the mistakes that often creep into that first production run. These people know the meaning of pride and integrity.

In this particular case, I'm referring to Marv Reese, who sells the Mooney M-18 C55 plans I mentioned some months ago. I hadn't seen his drawings at that time, but knowing Marv's work there was no doubt in my mind that they were first class.

Since then both Marv and I received letters from the same individual pointing out errors in these plans, and even though this was the only complaint about the Mooney, Marv wasted no time in correcting the mistakes. He writes:

"Hi, Mr. Al:

"I did find some errors. All I knew before checking was that I had already built two more Mooneys from these same exact plans without any problems—but that very well could have been because I'm so familiar with the design.

"The main side stringers are only partially shown and their location is mislabeled, and this on the side or plan view. Also, the arrow pointing to the 1/4x1/2 stringer is pointing one stringer too high.

"The formers are showing notches for stringers correctly. The only error I could find with the formers was that F-2 appeared to be 3/32 inch too short (vertically). The width is fine. F-2 should be eight inches tall.

"Forward of the vertical fin the plans show two vertical spars contained in the fin. Their lengths are incorrect and don't coincide with the proper length on the plan view. This is a gross error.

"The only other error I could find was at the top of the fuselage plan, where we show the top view. Here the center line is 3/32 inch too high (the width of the sheeting in error).

"Everyone who has received plans since these errors were found has had them corrected, and the mylars are also being corrected.

"Other than that one letter, I've had no other complaints and have now sold 33 plans. Two more and I break even.

"The only change I would make in future Mooneys would be the main landing gear location. They are shown in the scale location but in my opinion they're too far aft, so I would move them forward maybe as much as an inch, making rotation easier and sooner. I usually take off with about 30 degrees of flaps and that solves any minor rotation problems.

"This hobby is the most fun when learning

Would you believe this is a Sig Kadet Senior? Charlie Townsend modified it to twin-tail to take the sweat out of towing gliders.

and designing. I just can't seem to get a kit built—they're boring."

Marv is also working on two other plans. One is an Australian joined-wing homebuilt called the Ligeti Stratos (Scale Model Research has three-views). This great flying bird has 50 flights on it so far.

And then there's Marv's beautiful 18-foot powered sailplane. The second prototype of this original design is under construction and he hopes to have the plans available within a year.

If you'd like more info on any of these birds, contact Marv Reese, 329 N. Milstead, Wichita, KS 67212.

DGA DESIGNS

Bored with all the look-alike Cubs but would still like to have a nifty-looking, high-wing aeroplane? Then one of the new plans from DGA Designs (135 East Main St., Phelps, NY 14532) may be just what you're hankerin' for.

How about a quarter-scale Funk B-85-C that spans 105 inches, has a wing area of 1500 sq. in. and flies like a dream with a 1.2 four-stroker.

This bird features plug-in wing panels and exact scale outlines, and DGA sez she's aerobatic but stable enough to be a scale trainer. Two sheets of drawings and a building booklet are shipped in a sturdy tube for $25 ppd.

Or you can opt for their Clipped Wing Taylorcraft. This 76-incher (they also have a 61-inch size) is a sport-scale design and, like the full-size bird, is a tremendous flying machine. According to DGA, it'll do anything you want and still slow down to a walk for landings. The one-piece 1100 sq. in. wing makes it fast and easy to set up at the field and a 1.2 four-stroker hauls her around with authority. Developed three years ago, the ability of this 12-pound airplane to perform has been proven at a number of airshows. Plans and instructions are shipped rolled for $25 ppd.

DGA has a catalog available for one buck and, in case you didn't know, they also have a plan copying service and custom supplies.

THE OLIVE DRAB DILEMMA

If you're a Way Stand-Off Scale type like I am, the confusion over five different shades of Olive Drab isn't gonna bother you at all. On the other hand, if you love being a nit-pickin' scale buff, then these five shades of O.D. could cause some sleepless nights.

Ken Gulliford built his Fokker DR-1 from Nick Ziroli plans and a kit by Hangar One. Flies fine with a Quadra 35 up front. Photo by Al Wehman, Jr.

According to Hobbypoxy, which has developed 56 different formulas for mixing authentic scale colors these past five years, there are five matte Olive Drabs: pre-1964 #34087, post-1964 #34087, March 1979 #34087 (which is the wrong color), 1984 #34087 and 1984 Change Notice 7 #34088 (which are the *same* color).

Hobbypoxy's Don Typond advises: "If you order a 3x5-inch color chip of 34087 from GSA, they will send you 34088, with no explanation. If you question this they will advise you of 1984 Change Notice 7. However, if you look at the back of color chip 34088 you will see that it is dated January 1968 with (June 1984) in parentheses. This raises the questions: Is the January 1968 34088 the same color as 1964 34087? How come 1968 34088 doesn't appear in the 1979 595A? Was 34088 a 'non-color' between 1968 and 1984? How do you document a paint job when your reference material specifies 34087 and your color chip says 34088? Should we all build Navy aircraft and forget about Olive Drab altogether?

"Anyway, if you have FS595A dated March 1979, 34087 is the wrong color. If you have 595A dated January 1984, 34087 is the correct color but the number should be changed to 34088.

"A telephone call to GSA this morning (February 5, 1990) brought the news that Federal Standard 595B is being printed right now, so you might want to get on line for your new book. Let's hope it has the correct colors in it."

continued on page 68

Al's looking for the address of the folks who made this lightweight, well-balanced 6" tyre.

Being an Old-Timer himself, Ken Rowe figured that a Dallaire would be just right for him. That's an O.S. 48 four-cycle in the nose.

HIGH-Q

WINNER OF THE 1953 U.S. AMA NATIONAL CHAMPIONSHIP R/C WINNER

DESIGNED, BUILT AND FLOWN BY JACK PORT

BY BILL NORTHROP

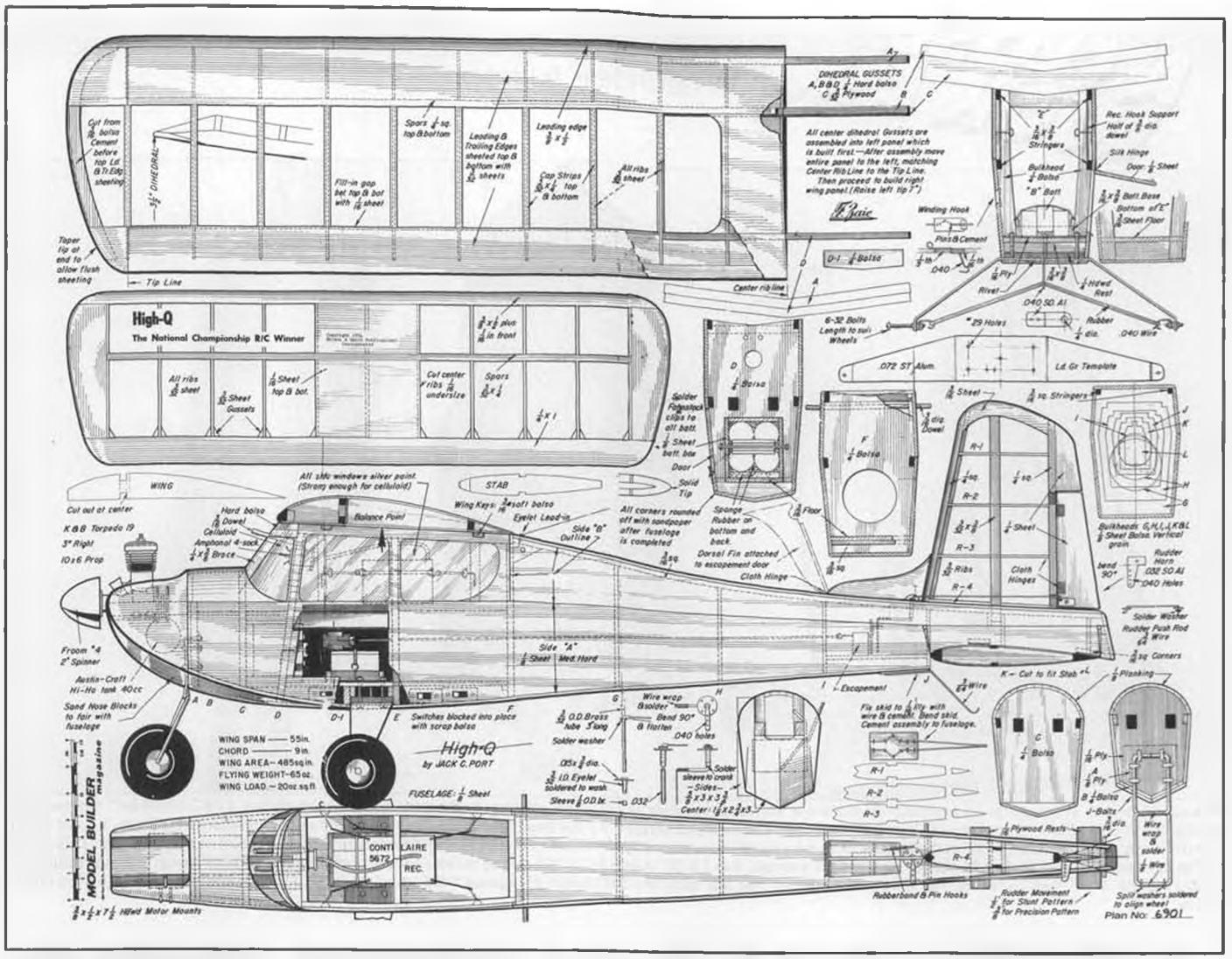
ILLUSTRATION: DOUGLAS ROLFE

Turning point in competition rules normally occurs when someone comes up with a design innovation which immediately obsoletes the current rules, requiring a dramatic rules change. Ironically, Jack Port, with his High-Q R/C model made history at the *time* of a turning point in radio control aerobatic competition, but was not directly instrumental in bringing it about. In fact, if anything, you could almost say that Jack and his High-Q almost upset the apple cart of progress!

By 1953, improvements in R/C electronics had made it more and more obvious that rules would have to be created to separate R/C models into more than one basic category for competition. For most of the years leading up to 1953, nearly all R/C flying was accomplished using one single control... of the rudder. Only advanced experimenters were accomplishing somewhat reliable control of more than one function on a model, so there was no real need to separate the rudder-only flier from those few who were able to enjoy the luxury of also moving the elevator and controlling the engine speed, none of which could be done simultaneously.

However, by 1953, it was obvious that multi-control radio equipment and multi R/C aircraft were becoming more common, and rules for separate classes were just over the horizon. Meanwhile, a few skilled designers and fliers were getting amazing results from aircraft that flew rudder-only and could still hold their own in competition against the aircraft with more, but not yet as reliable control systems. And so it was that Jack Port made history. In the last year before R/C competition was separated into three classes; Rudder-Only, Intermediate, and Multi, Jack took on all comers at the 1953 AMA Nationals and won the R/C event with his rudder-only controlled High-Q. We say "THE" R/C event, because at that time, pattern was the only R/C event. There was no Scale, no Pylon, no Soaring, no Helicopters, or what have you. The rule book was much thinner in those days!

In 1953, R/C competition also allowed two flights; one for precision pattern, the other for aerobatics (none of which you could really call "precision... "recognizable" was a better term!). The name "Pattern" has stuck to this day, though, of course, the "school" maneuvers are long gone, replaced by properly named "precision aerobatics." Typically, as with Jack Port and his High-Q, the expert pattern fliers using rudder-only control back in the early '50s trimmed their ships differently for each type of flight. For precision pattern, the stab was shimmed for less decalage between wing and stab, getting as close to 0-0 as possible without losing all ability to recover to level flight from a nose-down attitude. The engine was detuned by partially plugging the intake so that altitude gain was very gradual, and finally, rudder throw was reduced slightly. This allowed the model to go through the precision maneuvers with as little altitude change as possible, controlling the climb



FULL SIZE PLANS AVAILABLE: SEE PAGE 106

with minor applications of rudder, which as explained before, was always to immediate full deflection... no proportional... and of course, no throttle control. The engine ran at one preset speed until it emptied the tank... period! The High-Q drawings, according to the construction article by Jack Port in the March 1954 issue of *Air Trails* magazine, and reproduced herein from the full-size plans (copies of which we are making available, see page 106), show the flying surfaces in the Precision Pattern trim. For more lively aerobatic performance, as called for in the Stunt Pattern, shim the leading edge of the stab down for one degree more negative incidence.

Note that the main gear is located just *ahead* of the balance point (Bless you, Jack! You named it correctly, instead of calling it the C.G.!), which was a departure from the normal position back then, as it is now, for trike gear configurations. In days when the takeoff as well as the landing were judged as maneuvers, having no elevator control made for some interesting compromises in effecting takeoffs and landings. With the nose gear short and the main gear aft of the B.P., a model would usually remain stuck once it landed and the negative angle of the wing took control of things. But then there was the matter of getting *unstuck* during takeoff! For non-competition flying, this was the age of the hand launch. But if you wanted takeoff points... . Fortunately, most contest runways were rough enough that sooner or later, the nosewheel would bounce off a foreign object on the ground during the takeoff run, which would suddenly put the wing at a positive angle of attack, and if the model had flying speed, it was up, up, and away. By today's standards, such a takeoff was worth about two or three points, but at least it made a score! Many crafty rudder-only pilots judged their model's takeoff run so it would hit a grass-filled expansion joint on a paved runway just as it reached flying speed! Except for the additional drag, grass runways always worked better... lots of bumps!

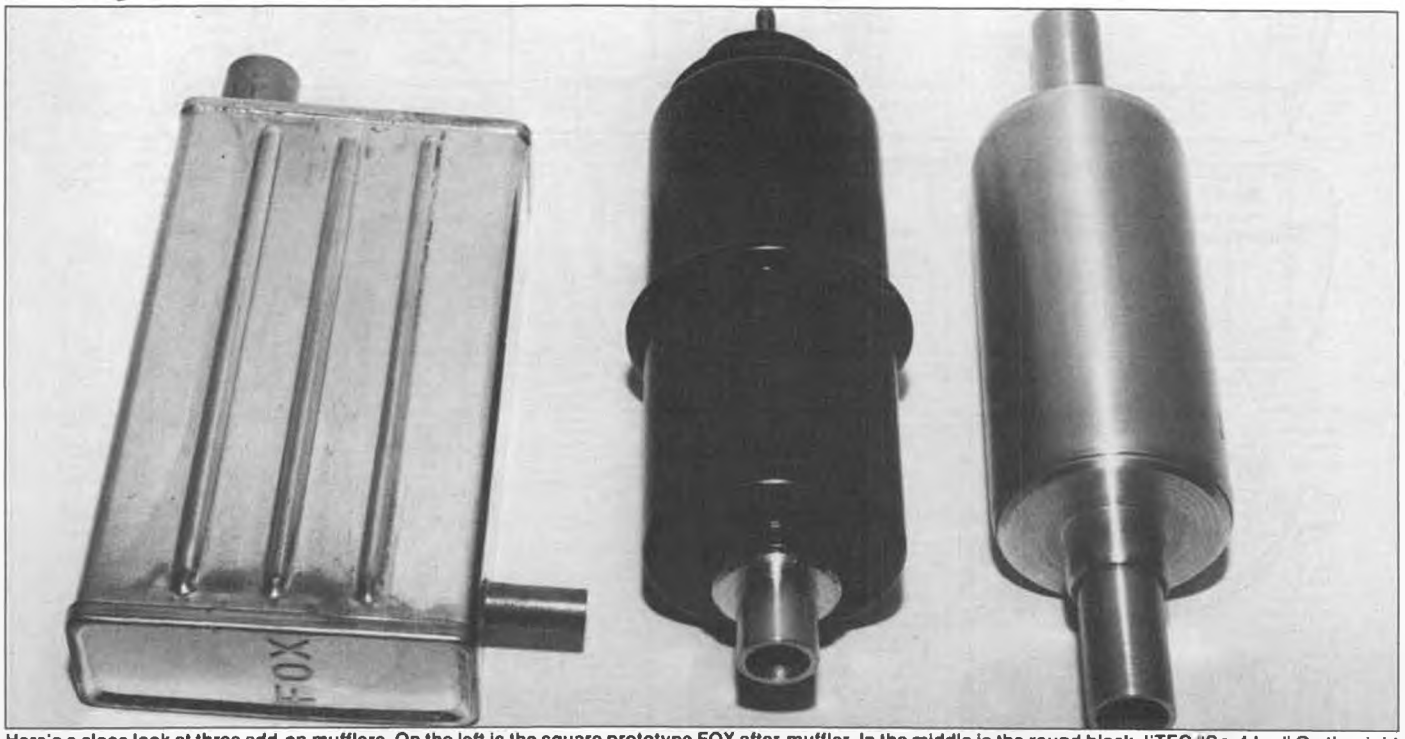
With Jack's landing gear arrangement on the High-Q, the model actually rested on a tailskid and rolled up on the nosewheel during takeoff, still having a slight positive angle of attack. Upon landing, the wheel positions all but eliminated bounce. As we pointed out previously, a rudder-only model could be made to flare for a smooth landing by keying the rudder one way to create a slight dive, then hitting opposite and neutralizing to bring the nose up just before touchdown. A bit tricky, but very satisfying when you timed it just right.

Construction of the High-Q is very conventional, even by today's standards for a sport/trainer type of R/C model. The plans are quite self-explanatory for the average builder, and should be no problem to scratch build. Note that the drawing was made by one of the best all-time model aircraft draftsmen, Frank Zaic, who John Pond talked about in his "Plug Sparks" column last month, and some more in this issue. To keep within the same power range as the original K&B .19 "Greenhead" engine, we'd suggest the slightly more powerful K&B Sportsman 20.

Jack's model was equipped with his own "Controlaire" radio. The receiver used a single CK-5672 hard tube, and was possibly the forerunner of his kit radio, the SM-1, which was this writer's first, and quite reliable kit radio. A Sigma 4F relay reacted to the radio's current change upon receipt of a signal, keying a self-neutralizing rubber band-powered escapement. Jack was later to produce radio equipment for John Maloney's World Engines company. Many vintage R/Cers remember the "Mule." Jack passed away at a very much too early age, and his wife, Mary, tells us that a reproduction of the High-Q is etched on his gravestone. ***MB***

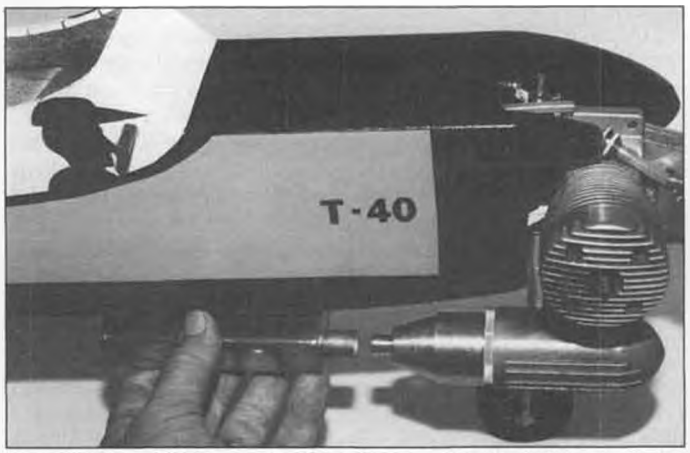
A CLOSE LOOK AT...

BY GEORGE P. BURDELL

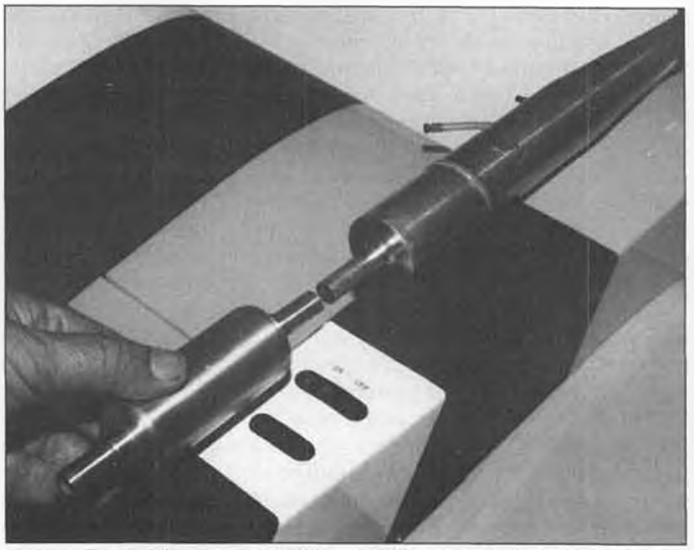


Here's a close look at three add-on mufflers. On the left is the square prototype FOX after-muffler. In the middle is the round black J'TEC "Snuf-ler." On the right is the silver round "SM-4" from Davis Diesel Development. The Fox unit weighs 2.2 ounces, has 15/32" inlet and 7/32" outlet, measures 7/8" wide x 2-1/4" high x 4-1/16" long. Internal volume is 8 cubic inches. Unit may not be commercially available at this time, but demand could again result in manufacture. This after-muffler is easiest to mount. The "Snuf-ler" weighs 3.6 ounces, has 11/16" inlet and 11/32" outlet, measures 1-1/2" diameter and 3-3/8" long. Internal volume is 6 cubic inches. The "SM-4" after-muffler weighs 2.1 ounces, has 3/8" inlet and 3/8" outlet, measures 1-3/8" diameter x 3-1/8" long. Internal volume is 4-2/3 cubic inches.

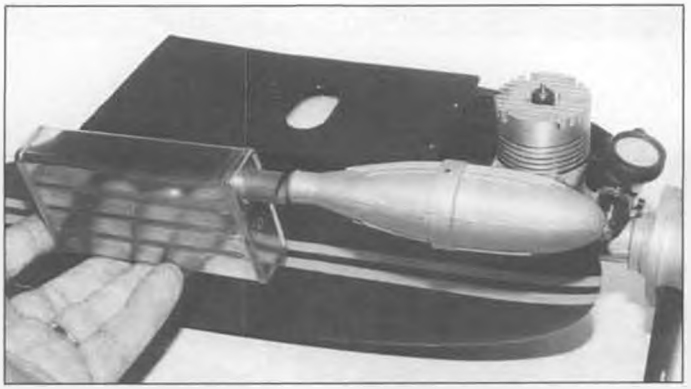
ADD-ON MUFFLERS



The FOX after-muffler was connected to a Webra .61 muffler that was very harsh sounding when mounted on a K&B .65 SPORTSTER engine. Engine idle was unchanged at 2300 RPM and the top end was also unchanged at 13,800 RPM... *for absolutely no RPM losses!* But the sound reduction was dramatic! The model flew just as well, but *all observers* thought they could see a major power loss in flight. This graphically points out that we modelers tend to equate low sound with low power... and that we are wrong! Less sound does NOT mean less power! This same Fox unit was tried on a sport pylon racer with a Rossi .40 turning 19,500 RPM with a MACS tuned muffled pipe and the engine immediately "fell off the pipe" to a figure below 15,000 RPM.



Both the Fox and the J'TEC units caused the 19,500 RPM Rossi to "fall off" the tuned pipe. The DAVIS DIESEL DEVELOPMENT "SM-4" was added behind the MACS muffled tuned pipe and the sound reduction was dramatic! The inlet and outlet of the "SM-4" is the same... and the addition did NOT change the engine's performance appreciably, as the RPMs are basically established by the pipe length as long as tuning is not interrupted.



This FOX .50 has been fitted with a header pipe from MACS Products. Then a "Snuf-ler" has been added with silicone hose and the after-muffler is attached to the fuselage with a silicone/steel mounting strap. The "SM-4" could be similarly mounted. Another way to use the "Snuf-ler" would be to knock out the roll pins of the FOX muffler and discard the rear half. The "Snuf-ler" would then mount onto the front half of the original muffler with a supplied long bolt.

The rear outlet of all FOX mufflers is flared to accept a hose and clamp. You can see how easily this prototype FOX after-muffler fits behind this FOX .40 engine. Unit is supplied with two solder-in-place straps/clamps that are then bolted to the model's side. These prototype after-mufflers are simply sweat-soldered together and need airflow on all surfaces to keep seams from melting open from exhaust temperatures. Some after-mufflers use internal swirling actions to absorb the energy of sound... some use flow reversals to dissipate the energy... some use a series of holes to decelerate the exhaust velocity and dissipate energies. The muffler supplied with the K&B SPORTSTER engines uses a combination of these actions.

NOBODY SEEMS TO WANNA BUY QUIET MODEL ENGINES! But there IS a huge market coming for add-on after-mufflers that will dramatically reduce sound from our present engines. K&B Manufacturing should be given a big gold medal in recognition of the ultra-effective muffler packed with each of their new SPORTSTER R/C engines... they work!

I fly R/C next to a commercial landfill (dump) and if the wind is right, the sounds of the landfill's earthmovers at work drowns out our model engines. Due to the presence of the dump there is no nearby housing to complain about our model flying... most flying areas aren't so lucky.

At Toledo one year I spoke with Duke Fox, who said he could easily build model engines that, if the huge hall was totally quiet, couldn't be heard on the opposite side of the hall running at full throttle. All you'd hear would be the prop. But then he told me much of the customer appeal and aura would be lost without the harsh sound... and the engine would probably sell poorly.

Today we're seeing renewed world emphasis on sound (I hate the word "noise") reduction. Three and four-blade props are coming fast (Tom Dixon, 1938 Peachtree Rd., Suite 401, Atlanta, GA 30309 and others sell them) and their diameters are smaller so their tip speeds are lower. Most prop drag comes off the tip in the form of audible sound. Slower tip speeds mean less sound. Davis Diesel Development (P.O. Box 141, Milford, CT 06460) imports and sells a line of fine European mufflers which include the "SM-4" which appears in the accompanying photos. The "SM-4" makes an ideal after-muffler for .40 to .60 size engines. J'TEC (164 School St., Daly City, CA 94014) sells their "Snuf-ler" which is basically a Briggs and Stratton engine muffler to which a precision machined exhaust orifice is added... the unit simply doesn't work without the orifice. The "Snuf-ler" is ideal for .40 to .60 size engines too. About fifteen years ago Fox Manufacturing Co. (5305 Towson Ave., Fort Smith, AR 72901) did costly experimental after-muffler design work, prototyped a small batch, placed magazine advertising, and sold fewer than TEN of the square after-mufflers. Duke was fifteen years ahead of time with the project! He saw the sound reduction needs coming long before the modelers did. MACS Products (7935A Carlton Rd., Sacramento, CA 95826) also has suitable after-mufflers.

This is the unit you'll most likely find in your local hobby shop as you read this, along with a ruler for size comparison. It's planned the O.S. in Japan will send to J'TEC in California the front sections of their various mufflers for mating to a variation of the "Snuf-ler." Then you'll be able to buy the hybrid at your local hobby shop to fit your favorite O.S. engine.

And finally... a bit of Yankee ingenuity used with an ice pick for hole punching can give you a no-style, no-class (but effective) sound reducer. It's fun to experiment.

R/C pylon fliers and ducted fan pilots are seeming offenders, but at the 1988 Florida Tangerine scale contest, Bob Violett's winning F-86 was making an official flight while Bernie Fields' beautiful quarter-scale PT-17 was doing the same on the other flight line. Except for Bernie's three judges, it was apparent all eyes were on the sleek F-86 super flight... but all ears were hearing the raucous gas burner in the PT-17... the jet was quiet!

The R/Cers are spending money on sound reduction. Control line fliers and free flighters will hopefully follow if our close-to-people flying sites are to remain useable for engine powered model flying. If we don't start action now we'll only be flying those beautiful Peanut models built from *Model Builder's* monthly centerfold..and only in our own yards!

Check out the sound control products in your local hobby shop. And for a large self-addressed envelope with two 25-cent stamps on it sent to the addresses in this article, the manufacturers will send you their catalogs.

continued on page 68

ELECTRIC POWER

BY MITCH POLING

Roland Schmitt's JN-1.

Roland and his JN-1. Nice weather for the end of January in Texas.

Bob Kopski wrote about connectors in the March issue of *Model Aviation*. That made me think about changing the connectors I use. I have been putting this off for a long time. I knew the results that Keith Shaw had found for connectors, but the four-pin Deans connectors have served me faithfully for sixteen years with no problems. I fly small planes (four to six cells) a lot, and the small Deans connectors fit in the limited spaces very well. So why change? I decided to do my own testing to find out just what gains could be made by changing connectors. I used the same setup as Keith. My digital voltmeter has clip-on probes. I slid the insulation back from the shank of the connector and measured the voltage drop from shank end to shank end of the connector. The current was supplied by a 12-volt automotive battery running through a 100-foot extension cord to a LeMans 360 PT motor turning a 7x4 prop. This gave a steady 10.37 amp current as measured by my Elenco DVM. The 100-foot cord was used as a resistor to drop the current down to the ten amp level. Later, with a little thought, I realized that wasn't necessary! All I needed to do was put a smaller prop on the motor and use the regular wiring. Oh, well!

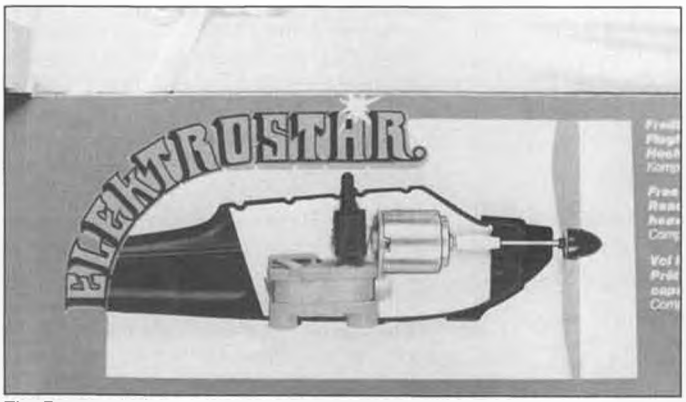
Anyhow, take a look at the table of results with the connectors I tested. My results match Keith's and Bob's pretty closely; the differences are probably due to different measuring methods and DVM calibration. The best connectors, as Keith and Bob have already shown, are the Sermos. I use four connections in my small planes: battery to switch; switch to motor. If I used Sermos connections I would have a total resistance of 1.12 milliohms, compared to 4.12 milliohms for the Deans. The loss (current squared x resistance) is about 1/4 watt for the Sermos, one watt for the Deans. The small planes fly on 30 to 60 watts input, so one watt *can* show up in power level. I am going to replace the Deans and see if there is a difference.

CONNECTOR COMPARISONS

Item	mv drop	milliohms
spade lug	4.2	0.41
bullet	6.0	0.58
train	5.3	0.51
Tamiya	25.7	2.48
Adams	4.7	0.45
Sermos	2.9	0.28
RC Prep	12.2	1.18
Deans 2 pin	10.7	1.03
Homemade	3.1	0.30
Mod. Tamiya	4.5	0.43
19cm SR #16	30.5	4.72 mohm/ft

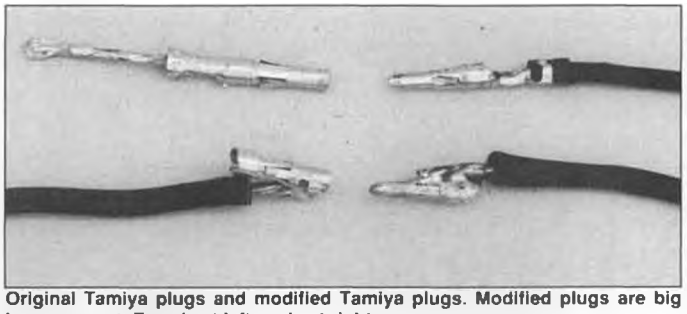
The results on the other connectors are interesting. Let's talk about these. The spade lug connectors look very good, and they are readily available and cheap. However, I rarely see them used. The exception is for holding fuses; the female spade lug is a perfect fit for the automotive plastic type fuses. I seriously considered using these connectors in my planes. However, these connectors fit together with a lot of force, and the effort to pull them apart can result in a sudden yank as they finally pull loose. This could do a lot of damage to a plane (flying fists!). I do use the spade lug connectors a lot for charger lines and for holding fuses.

Now for a very important point! The spade lug connectors are designed for crimp fastening. Bob measured the resistance of a crimp connection at 12.8 milliohms. I measured a crimp connection at 2.05 milliohms. As you can see, crimp connections vary widely, and in all cases their resistance is very high compared to soldered connections. In fact, I measured 29.3 millivolts for a 19.8 cm piece of wire, then cut it in the middle and soldered it together again. The

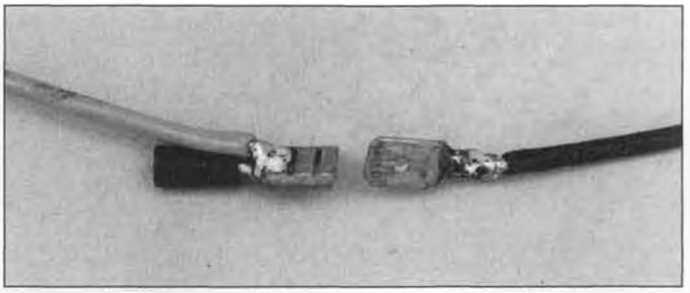


The Electrostar drive is very simple, direct drive with a rubber coupling. Flies well.

Victoria Poling and the Electrostar.



Original Tamiya plugs and modified Tamiya plugs. Modified plugs are big improvement. Female at left, male at right.



Close-up of soldering on spade lug connectors. Note soldering to back of connector (female) or shank outside (male).

new reading was 29.5 mv, with a new length of 19.0 cm. This comes out to .020 mv for a solder connection, a hundred to six hundred times less resistance than a crimp connection! The point is: NEVER use crimp connections. More on this later.

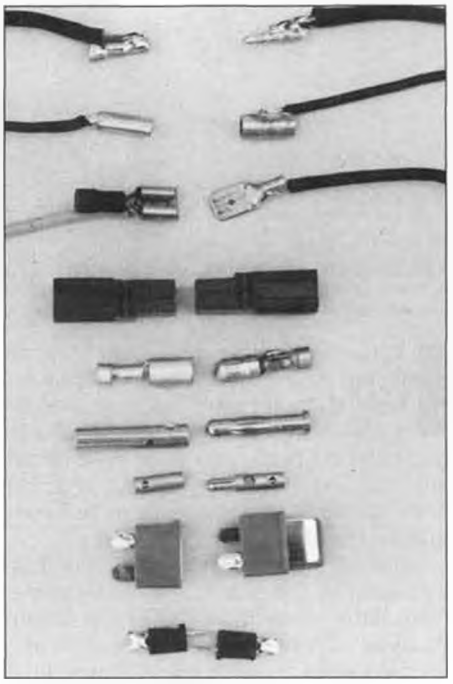
The spade lug connectors come either bare or with a plastic housing. The plastic housing is a real pain, as it prevents soldering to the connector, and the housings come in many different shapes. This means one brand will not fit another. Another problem is the shank. Often it is too small inside to accommodate the heavy duty wire we use. No real problem there: I just solder to the outside of the shank on the male connector, and to the back of the female connector. Then I use shrink wrap for a nice clean and compact insulation.

I have a dual-range heat gun; it has a low setting of 300 degrees Celsius, a high of 500 degrees. The low setting is ideal for shrink tubing. Most hardware stores sell heat guns for paint stripping. Any will do, and they are reasonably priced. This is far superior to any other method for shrinking wrapping, and you will find it a handy tool for making your own battery packs too. Heat-shrink tubing is found in electronics stores such as Radio Shack. The larger shrink wrapping for battery packs is found in hobby stores that handle R/C model cars.

The bullet connectors have the same virtues and problems as the spade lug connectors. They are manufactured in much the same way, except they are round instead of flat. I have seen these used in offroad cars. They are very inexpensive and have a low contact resistance. Both these and the spade lugs can be made easier to take apart by prying the female contacts up a little, but this will also increase the resistance loss.

The train connectors are very well made and are easy to take apart. They are very compact as well. Howard Lazerson sent me some samples a couple of years ago and recommended them. They are available in any store that has model train supplies, and are made in West Germany. Again, they have small shanks for the size of wire we use; soldering to the outside of the shanks solves that problem. They need more heat than the other connectors—I recommend a 40 watt iron to do the job right. Use a holder so the connectors will not move while the soldering is done. Alligator clips should do a good job. These connectors come with a plastic sleeve and a small bolt that is intended to hold the wire. Discard these, and use heat-shrink tubing for insulation. Lightly sand the connectors after soldering so the contact surfaces will be fresh. The heat from soldering can cause the surfaces to darken; this is an oxide that can jump the resistance up considerably.

The Tamiya connectors are the "bad guys" that are always held up as being a worst case example. This is true, but it doesn't have to be! The Tamiya (or Molex, and all the others designed like these) come in a plastic housing and use crimped wiring. The crimping throws an immediate loss into the system. Worse yet, even new connectors can show some corrosion. The connector I tested had a black-brown discoloration where the copper wire met the shank of the connector.



Top to Bottom: Modified Tamiya, homemade connectors, spade lug, Sermos, bullet, Adams, train, RC Prep, and two-pin Deans.

It tested out at 2.48 milliohms, twice the value Keith had. This was a new connector and had never been used! The history of a connector has a lot to do with this, as it may have been exposed to humidity and air that had sulfur dioxide in it (a common pollutant). The point here is: bare copper is an invitation to corrosion. Soldering coats the

continued on page 68

Pit scene at Third DEAF fun-fly. Kirk Massey's cobalt 40 powered Christen Eagle and 60 cobalt powered Clipped Wing Cub.

Kirk Massey and straight drive, cobalt 15 powered Corsair (possibly Sterling kit). Flew great until glitched into the ground.

PLUG SPARKS

BY JOHN POND

2. Frank Zaic presents 50th Anniversary Wakefield Trophy to SAM President Jim Adams, at Taft 1986 Celebration.

1. Frank Zaic gets real kick from seeing Reg Parham's reproduction of Frank's early Wakefield, Reg holding prop. Jack Morris at left.

If you don't know who Frank Zaic is, then you are not truly an old-timer! Frank Zaic, recently inducted into the S.A.M. Hall of Fame on the first ballot of ten, has long been associated with model airplanes, manufacturing, writing, and plan drawing. Frank has truly made quite a contribution to history!

When this columnist first wrote to Zaic asking for his opinion of the model game, Frank rather modestly replied that he did not consider winning contests as the main benefit of model aviation. From his viewpoint, if we're not in the model airplane game, we would have missed the odds and ends that popped up along the way.

As a matter of fact, Frank says his main interests were the design and construction of his models to see how they would fly based on his ideas and theories. For that reason, the amount of wins on record was rather sparse.

If memory serves this writer correctly, Zaic placed third in the 1934 Wakefield Championships in a driving rain. As it was, times were quite close, wet models being a great equalizer. The winners all used return-gear setups to get long motor runs. The day was definitely not for thermals as was 1935, where Gordon Light won with his outstanding model.

Photo No. 1 shows Frank Zaic with a group of English boys looking over Frank's design of 1934. Jack Morris and Reg Parkam are looking over and discussing the merits of this design. Frank Zaic was guest of honor at a SAM 35 model gathering. One will note the typical elliptical fuselage and sweepback wing favored by Frank in those early days.

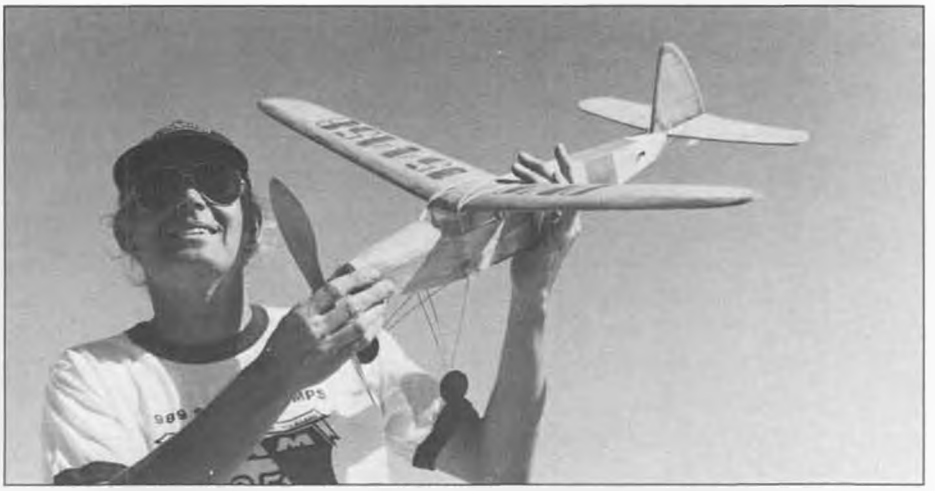
Seeing this design reminds this columnist that he first ran into a new idea, a book of plans by Zaic, which was actually a booklet with about ten plans. There was a model with a triangular fuselage and the same swept wing design. In redesigning the fuselage to suit Junior Birdmen rules and using Vernon Bochle-type tail, Pond was able to set the Junior Birdmen cabin model record of 15 minutes plus. This writer always felt a lighter fuselage would improve the performance which it did. Incidentally, this small booklet of 1933 was incorporated into the "new" 1934 Zaic Year Book recently. This book also incorporated some 1938/39 designs which arrived too late to be added to the 1938 book.

Zaic has had a most interesting career. In setting up a woodcutting business, Junior Aeronautical Supply Co (JASCO), he so earned the enviable reputation for the finest cut wood. Zaic set the standard for wood grades; i.e., 4 lb., 6 lb., etc., also Type A, B, and C cuts.

Between running the wood business, in connection with his brother, John Zaic, Frank found time to put out another Year Book, the 1934, which was easily double the size of the first. Success followed success as Frank continued to put out books up to 1939 when the impending war put an end to non-essential items.

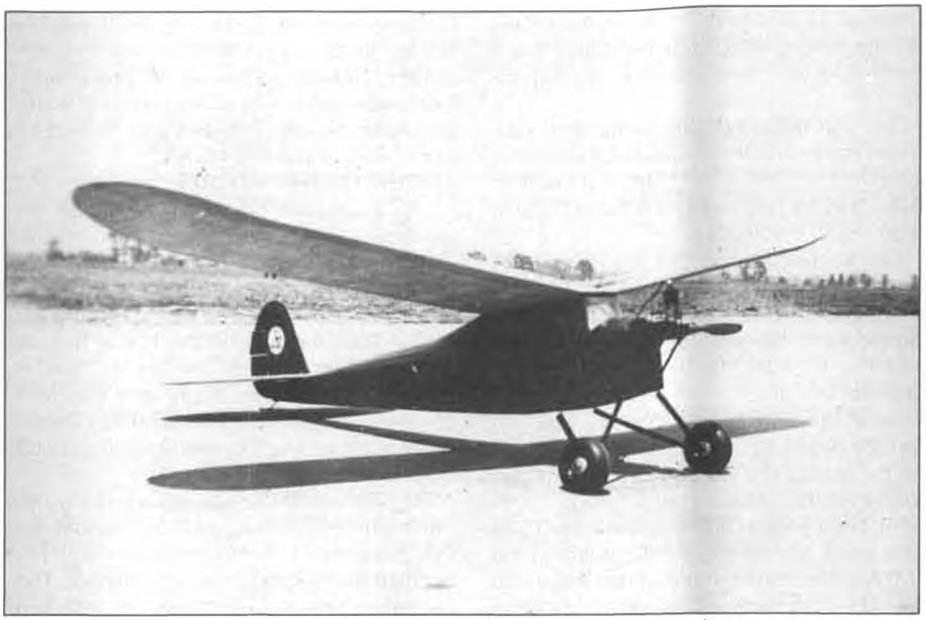
At a time when most of us modelers could only dream of meeting world-wide modelers, Frank was able to travel to England and the continent meeting many different nationalities. One of Frank's anecdotes is that he almost met the heads of the most powerful nations at that time: USA and

3. Camera catches Frank off guard in middle of chat with Dave Baker, from England's SAM 35.



4. Ben Strauss, Edmond, OK, holds his model of little known Zaic design published in Aug. 1936 issue of *Popular Science*, the "Thermal hunter." Looks like it "found-" some broken rubber!

5. Winners at the Second Annual Old Timer meet in Santa Barbara, May 17, 1964: John Pond with Playboy Sr., Sal Taibi with Brooklyn Dodger, and Johnny Johnson with Zomby.



6. Leo Vartanian's "Old Reliable," sometimes called VB-3. See text for clarification.

Germany. To quote Frank: "Sometimes I wonder about the achievements in the contest etc. as being the main benefit of the game. From my viewpoint, it is the odd and ends that happen along the way that would not have happened if we were not in the model game. It is particularly so in my case. It may have happened to others, but we do not hear about them. Take for example the meeting with Kurt Hammerstein on the bus while going from a Detroit Meet. If I had not been on the U.S. team (being the manager) in 1937 I would never have had the experience of meeting people who were so involved with Germany during that time. You might say that I was one person removed from Hitler. We visited Kurt in 1982. He showed us newspaper clippings of him with Hitler as well as private photos. As you may know, his father was commander-in-chief earlier.

"Back in the states, it must have been during the 1935-36 era when Lt. Alden was trying to get the future AAMA on its own and away from the NAA wing. He asked me to come to Washington with him. I guess he wanted to let me have an inkling of what he was trying to do... and also to meet the NAA people. He paid the train fare as well as the hotel. But what I remember most was that one evening we visited one of his shipmates. The name escapes me at the moment. But it is Admiral McIntyre who was FDR's physician at that time. So, again, one person removed from FDR.

"J.P. Glass was quite helpful with the year book contribution in way of rubber tests, etc. After the war he started a machine shop business. Gradually got into doing synchro and small motors. At one time he could not get credit from the bank. Others wanted share. So I helped him out. This may have made it possible for him to go on. I was also a key several times in his progress. I was designing an automatic stat or winder machine, and I had a machinist all to myself. Well, after begging me for six months to meet a girl, I weakened... Carmen was the girl."

Jim Adams deserves credit for the photos of Zaic. To that end Zaic is seen in Photo No. 2 presenting the 50th Anniversary Wakefield Trophy to Jim. This was a part of the

7. An underrated performer, the Cleveland Wakefield "Gull," held by builder and SCAMPS newsletter editor, Gene Wallock. Johnson pic.

8. Ed Smull, Littleton, CO, test glides his Spook 72 on the street. You could do that kinda thing back in 1940!

9. Roy Nelder and Bob Milligan, with Bob's winning replica of Fred Bower 1939 Wakefield which placed second to Korda's famous flight.

12. Mike Cook caught John Pond toward the end of the Lawrenceville SAM Champs looking a little worse for the wear.

13. Still active as ever, Brainbuster Club member Joe Boyle, Hampton, VA, with his 020 powered Strato Streak.

joint British and American Wakefield celebration held at Taft in 1986.

To back up a little, the idea of a 50th Wakefield was dreamed up by Dave Baker, a tremendous dynamo of action in organizing the SAM movement in England which has become known as SAM 35. Dave is seen in Photo No. 3 intently listening to Frank Zaic. At this time, Baker was the manager of the competing British Team.

The idea had its origin in Britain when Baker was able to induce members of the SCIFS and SCAMPS to attend the first 50th Anniversary Wakefield Annual. Since then, with the site alternating between England and America, the annual has grown in stature with every passing year.

So it was that Frank was the Guest of Honor for the 1986 Anniversary. This was a long way from 1926 when he and his brother, John, discovered models. Starting with an Ideal hard wood Taube kit, they were able to fly across the street. When AMLA came along, they were more or less prepared. Time for model building was quite limited as Frank went to work at 14 years of age. "My own fault as I somehow did not relish high school, nor was it required. I did start night school at 15 and took mech. drafting. This got me into patent drawing. Later on, I enrolled for full five-night weeks of academics."

Zaic was quite a prolific writer and submitted many articles to various magazines. Seen in Photo No. 4 is a "Thermal Hunter" as designed by Frank and published in August 1936 *Popular Science*.

Ben Strauss, builder of the model, hails from Edmond, Oklahoma, and is a member of SAM 25, the VAMPS of Las Vegas. Ben spotted these designs on the Pond list and built the Thermal Hunter as it seemed to have the best lines. In all, there must have been at least sixteen articles by Zaic for *Popular Science*. This is only a sampling of the numerous articles and plans Frank has done over the years.

His latest endeavors have been the 1934 Year Book (previously mentioned) and the AMLA collection of articles from *American Boy*. The latter shows plans and building tips from 1928 to 1932.

Frank has long since retired from Litton Industries. He has taken to retirement like a duck on the pond. He has, in addition to his books, taken up oil painting but found it entirely too demanding. In his preoccupation with health, Frank has taken up walking. As Frank sez, "I have only picked up 44 cents along the way." Haw!

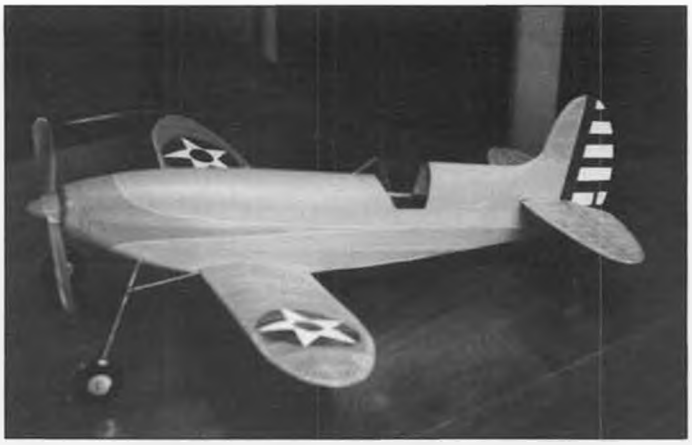
ENGINE OF THE MONTH

As usual, we like to acknowledge the generosity of engine collectors everywhere; this time, Walt Parker, of Salinas, for the use of his engine, the 1947 Black Case Bullet.

This particular model appeared before the Bullet 100, the last of the Bullet line as illustrated on page 77 of Vol. I, "Model Engines of Yesterday." Right after the close of WWII, Bill Atwood sold off all his engine designs, Phantom, Torpedo (2 versions), and Bullet.

The post-war Bullet as produced by Miniature Motors (a division of "Fearless Camera Co."!) was every bit the same as the 1939 Hi-Speed Bullet with a few minor changes. The backplate was now rectangular, attached with four screws. Although appearing to be

10. Bob Fenske builds Stanzel Sharks in all sizes, even this P-60 which is a rubber powered control line version.



11. A couple of energetic SAM 21 Hand Launched Glider contestants: Ted Kafer and Steve Roselle. Johnson photo.

14. Don Nordlund at Jean, Nevada SAM Champs with Super Cyke powered Ehling Contest Winner. Later hit only fence post for miles around!

16. The late John Nogy at the SCIF Fall Texaco meet with Mighty Midget powered Lackey Zenith. Mikkelson photo.

nickel or cadmium plated, the castings were actually magnesium with a glass parting material.

The tank, in this particular model (the later model we are illustrating) had a cast metal streamlined type of tank. This tank owed its parentage to the Atwood line of Plantoms and Torpedo. This type tank had no mounting flange, rather employed a long screw into the crankcase back plate.

The 1947 Bullet we are featuring this month was painted with black wrinkle finish and advertised as the "New 1947 Model" for $12.75 in M.A.N. Sept. 1946. Actually, outside of the black paint, the 1947 model was the same as the earlier 1946 Bullet. The 1947 model was raised in price to $15.00 in Dec. 1946. The Model 100 follow-on model was announced at $15.00 in the Feb. 1947 issue.

This model engine also featured cast aluminum parts rather than magnesium. Most of the small parts, i.e, timer bracket, needle valve assembly, etc., were nickel plated as in previous models.

The Bullet engine, despite its fragility, was a fine running motor of .275 cu. in. displacement with a bore of .75 inch and .625 in. stroke (an "over-square engine"). Mehanite pistons and honed steel cylinders were used as were all Atwood engine designs.

Most all Atwood engines ran well, ranging from 7,500 to 9,500 depending on pitch and diameter. In the days when no weight rules were employed, a modeler could build a light model that would perform well.

TWENTY-SIX YEARS AGO, I WAS...

It is absolutely amazing the way time gets away. Just recently this writer received some old photos taken at the Santa Barbara Modelers 2nd Annual Old Timers Contest at Santa Inez on May 17, 1964. That makes 26 years ago!! This old-timer idea started back in 1960 (30 years!), and the original Old Timer Contest has been held ever since!

Photo No. 5 shows the winners at the Santa Barbara meet; Non-Ignition Event: John Pond with Playboy Sr; Ignition Event: Sal Taibi with Brooklyn Dodger; and Beauty Event Winner: Johnny Johnson with Super Zomby.

As excerpted from this reporter's report on the meet in his "Gas 'n' Oil" column in the May-June 1964 issue of the Engine Collectors Journal, we quote:

"Due to Gus Sundberg's excellent publicity program, the contest enjoyed an excellent turnout, C.D. Stan Hill ran an excellent meet with timers available at all times.

"It was truly a shame that the contest was plagued with winds of 25 mph and better. Retrieving five minute flights was a real chore in the hilly countryside. Many contestants who came, hoping to test their models, did not enter, preferring to save their models for another day. Despite this, the entry list was still well above last year's turnout.

"Facilities provided by the Santa Barbara club were excellent, with hot coffee and doughnuts being available in the morning. Thereafter, cold soft drinks were the order of the day. A huge 8 ft. high scoreboard was provided so the contestants and spectators

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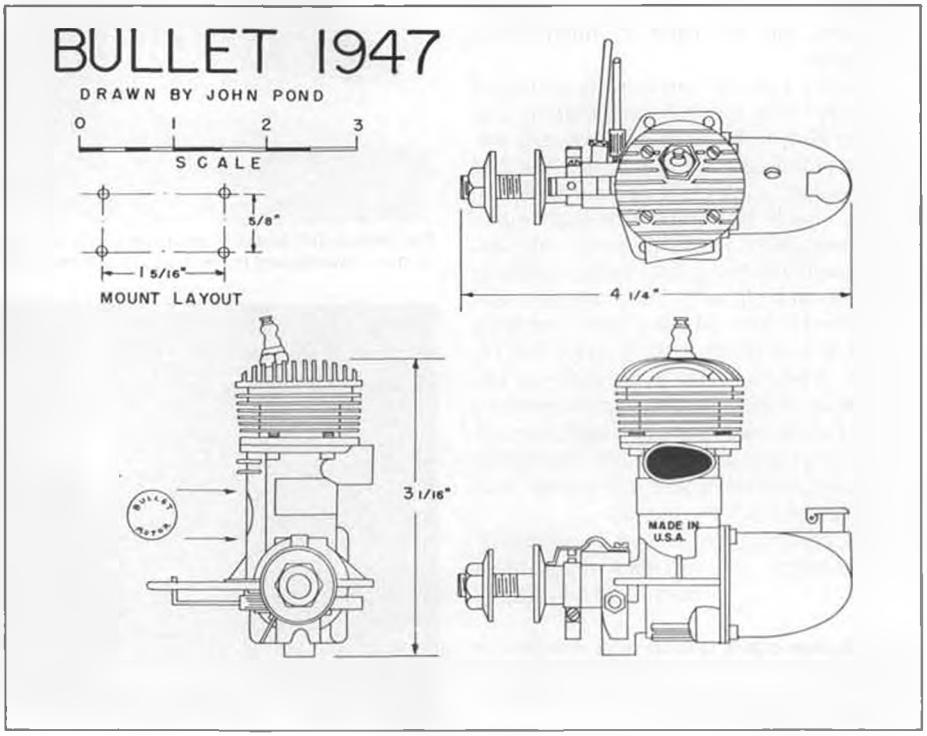
15. John Abbot, Australia, in 1983 with his Modelcraft "Miss Tiny."



BLACKHAWK

Hand Launch Flying Wing R/C Glider

BY KEITH SHAW

When hand launched R/C gliders (HLG) first came out, I was fascinated by them, as they rekindled my enjoyment of FF HLG. However, I've noticed that most existing designs fail to reliably reach peak altitude due to poor transition. Since standard FF launch patterns don't seem to work very well (probably because of the higher roll moment), a straight out 45 to 60 degree launch with down elevator transition is normally used. An early transition or a stall and recovery can easily lose 15-20 feet of altitude. Other objections were the tiny wing area, fragile structures, and the need for microscopic radio gear.

HLG is a game of aggressively searching for every little thermal perturbation and fighting with it. Here in the midwest, low level thermals are very small in size and quite violent. Great L/D or low minimum sink is much less important than quick maneuverability. The flying wing configuration was chosen because of the low pitching moment and virtually instantaneous stall recovery. High tip dihedral angle and large rudder action result in very quick roll response. A 60-inch span flying wing has lots of area, so a robust structure and mini-sized radios can be used while still achieving a 4 oz./sq. ft. wing loading. The Blackhawk can maneuver quicker and circle tighter than any other HLG on the market.

This performance did not come easily. The prototype was modified many times

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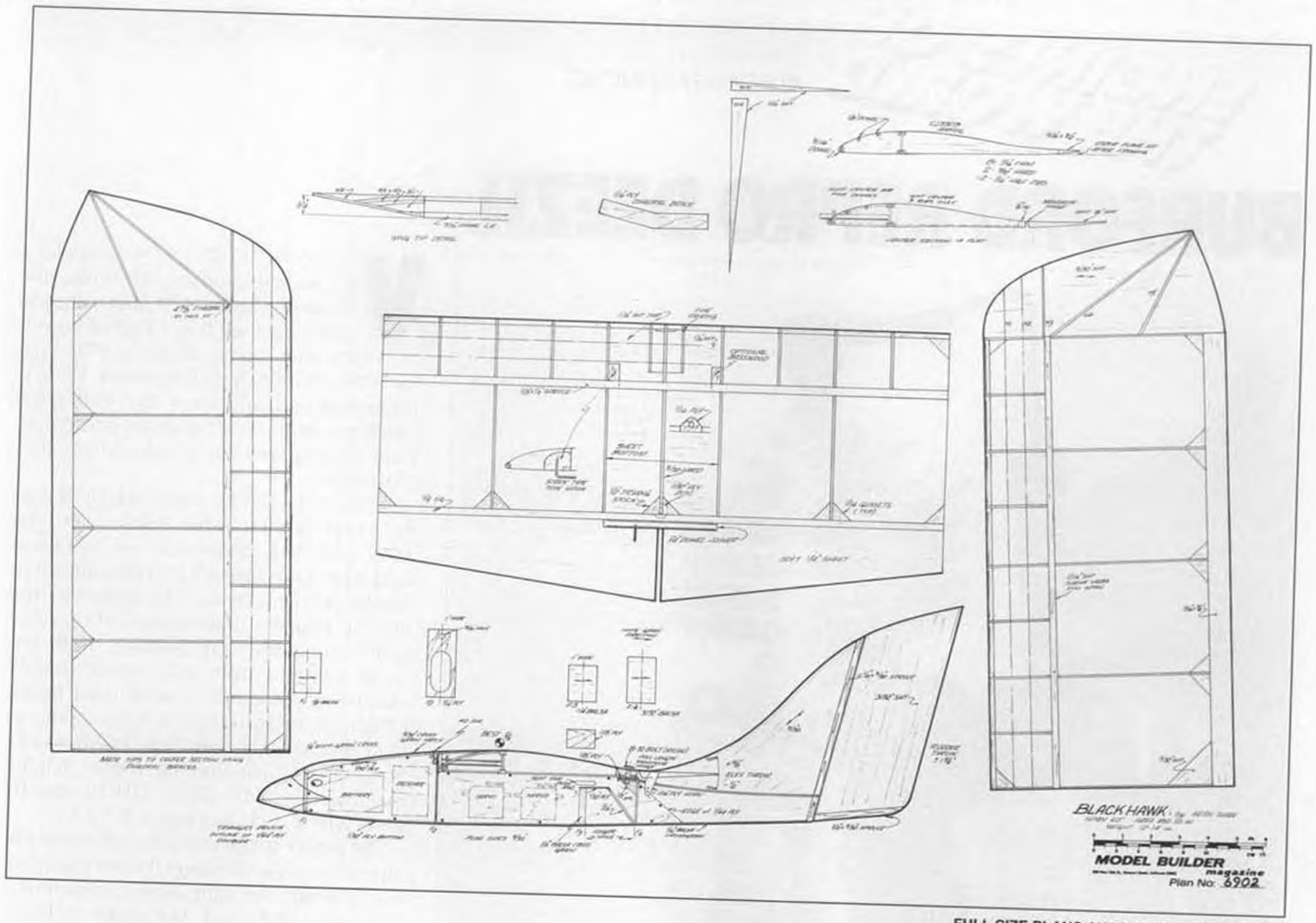
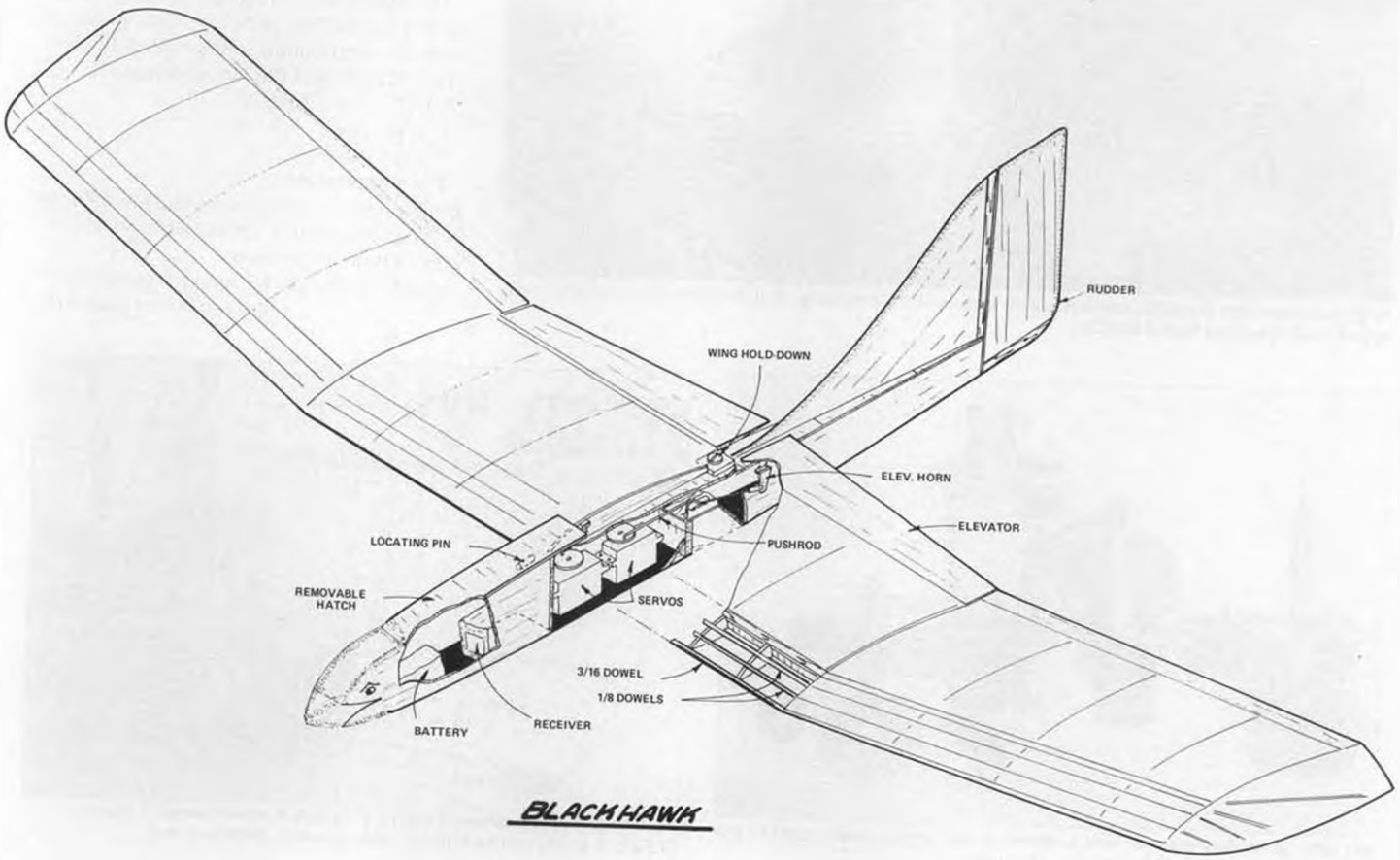
The ultimate R/C fantasy... your own hawk for hunting (thermal hunting, that is!). Also, no feeding, no perch, no dirty newspapers to clean up, very tame, and usually very obedient!

A motley crew of bird fanciers, with variations on the theme (l to r): Keith, Ken Bates, Bob Domeier, and Rick Lake. Model presented is the best compromise for hand launch use.



FULL SIZE PLANS AVAILABLE: SEE PAGE 106



BLACK HAWK

ENGINES OF THE WORLD

BY STU RICHMOND

BURFORD REPRO DEEZIL

Engine design from the 1940s combines with ultra-modern metallurgy and precision machining of today in this SAM approved Repro DEEZIL.

VITAL STATISTICS: 3-1/4 inches long to the prop driver, 2" across the mounting lugs, 3-1/2" high to the top of the cooling fins. Original bore is .473 inch and original stroke is .708 inch for .125 cubic inch displacement. Weighs six ounces and will turn a 10-6 with good climb power for 2-1/2 minutes of running. Runs equally well clockwise and counterclockwise.

UNIQUE FEATURES: Original DEEZIL sold for $1.95 in 1946 when introduced. The 1947 and 1948 models had fuel tanks and sold at prices as low as $2.95 through ads in *Model Airplane News*. The makers of the DEEZIL and the (in)famous G.H.Q. early ignition engines were brothers. Both engines suffered from quasi-questionable machining standards. The Burford Repro DEEZIL is made today in tiny quantities to ultra high quality standards by Australia's now-retired high volume model engine manufacturer. Stu's Repro DEEZIL usually starts with 2-3 chokes and 2-3 flips!

The power stroke of the model diesel engine is poorly understood. When you mention a diesel, the right away comment is... "Oh yeah, they turn big props at lower speeds... they got lots of torque!"

The model diesel engine operates on the same engineering principle that gives us auto air conditioning... it's called Boyle's Law of Gases and the fancy formula is:

V1 P1/T1 = V2 P2/T2

V = volume

P = pressure

T = temperature

and the formula simply says that the volume of a gas at constant temperature varies inversely with its pressure.

In our car, the gas is Freon... it is mechani-

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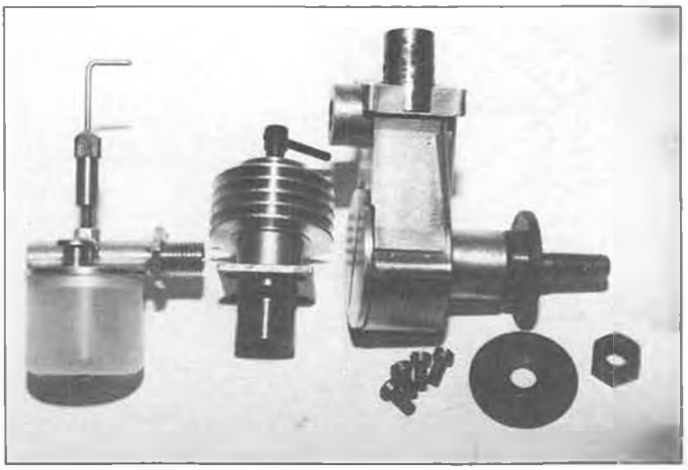

Stu tells us in this column how a model diesel engine *really* works. The explanation, like this month's engine, is simple.

Background in this photo is from a 1946 M.A.N. advertisement. Repro DEEZIL in photo can be ordered from Australia. Details in text.

ELECTRONICS CORNER

BY ELOY MAREZ

Differential throttle control in the form of Terry McGill, of Beaverton, Oregon, and his Canadair CL215 is back with us. Terry's problem was discussed and three different solutions were offered in our March EC column. Terry wrote back to say:

"I was pleased by your immediate response to my differential throttle issue. You guessed right, I am installing the Ace Switch Boxes and using Channel 7, but I'm rewiring the knob (deleting it, really) and installing a sliding switch on the back of the transmitter case, under the first finger of my left hand.

"I am also removing the bellcrank aileron system and putting servos in each wing—I want to be able to dial in (or out) my differential ailerons. I flew another Canadair at Lake Havasu that flew better than mine; I have too much mechanical differential, I think. Question: I will be using servo leads of about 30 inches on each side. I read of someone using shielded cable, rather than the 'glitch beads' I've heard of others using. Would I need to ground that shielding? To what? Is it necessary to shield for that 30 inches? Suggestions?"

One of my recommendations to Terry was to use Channel 7 on his transmitter to control servo-operated micro switches to cut the signal to one or the other throttle servos. On his Futaba 7UAP transmitter, Channel 7 is operated by a rotary knob located in a rather inconvenient place. Terry's idea to delete it and replace it with a simple switch has a lot of merit and deserves some discussion, as the same fix can be applied to all similarly equipped transmitters, the only consideration being where to locate the new switch and finding room for it. I'd like to discuss the existing and new wiring for this worthwhile modification.

As one might assume from the many features now tagged on to many R/C systems, the modern day transmitter encoder is more than slightly complex. Though actually, a lot of the complexity is included in a couple of ICs, winding down to a potentiometer connected in a common voltage divider circuit (see Sketch A). As the flier moves the stick, or in this case, the knob, he is varying the voltage available at the center contact of the pot. In the case of Terry's 7UAP transmitter, the pot is a 10K unit, connected across a 5-volt source.

Let's review briefly the action of a simple voltage regulator such as this one. Mechanically, we tend to look at a pot as a single unit, but circuit-wise it is actually two resistors, one on each side of the wiper, designated in the diagram by the arrow. When a voltage is applied across the pot, it is divided in the same ratio as is the resistance. That is, if the 7UAP pot in our example is set at its exact electrical center, we would read 5K on either side. Since a total of 5 volts is being applied in this circuit, 2.5 volts would appear across each resistor. Now, let's move the wiper off center (Sketch B), to 75% of its electrical value *away* from its grounded end. The resistance will now read 7.5K from ground to the wiper, and 2.5K from the wiper to the top or ungrounded end. Since the voltage divides proportionally, the voltage from ground to the wiper would read 3.75 volts from ground to wiper; 1.25 volts from wiper to the positive end. Note that you always read the voltage from the positive *towards* the negative supply.

In this last example, were the wiper moved towards the ground end to its 25% position, the voltages would be 1.25 from ground to wiper, and 3.75 from wiper to positive end.

The same voltage-to-resistance relationship continues as the pot wiper is moved from one end of its travel to the other. In R/C applications, the ultimate result of this relationship is the position of a servo. So, in any requirement for which we don't need a proportional servo, it is now obvious that we can simply switch in the correct amount of resistance needed to divide the voltage as necessary to command the servo to certain fixed positions. Look now at Sketch C, in which we have substituted the pot for a 10K fixed resistor and double pole single throw (DPST) switch. Throwing the switch from one position to the other is now the same as moving the pot from one extreme to the other—both resistance and voltage-wise. The servo would simply follow from one extreme position to the other, with no intermediate stops.

Now, suppose we don't want the servo to move completely from end to end, as in some application where we want a little faster action. By proper selection of resistors, we can select intermediate stops for the servo. In Sketch D, we have divided all respective values to operate the servo over 50% of its normal travel at its center; that is, from 25% off center in one direction to 25% off center in the other. I'm sure you can take it from there, and be able to pick resistances that will drive the servo to any portion of its travel you might need. In fact, with the proper switch and resistance values, you can make the servo stop as many times as you want to for some of those on-off scale functions. Just remember that the total circuit value has to equal 10K, or as close as standard value resistors will allow.

There is more to voltage regulators than I have explained, such as current drains and wattage values of the resistances involved, but I have kept the discussion down to this particular application. For the resistors required here, the common watt variety will fill the need completely.

Long servo leads, as referred to by Terry, are also the subject of another letter. This one is from Park Abbott, of Santa Rosa, California, who asks:

"I'm getting ready to build a model with a 7-1/2 foot wingspan and I want the aileron servos to be near the ailerons. I'm not exactly happy with running aileron pushrods for long distances. I feel the same way about long pushrods for the rudder and elevators, too—especially when the pushrods are about three feet long or so. I want to mount the aileron servos right near the ailerons but am afraid the leads are too long and may act to pick up various radio signals. Do long leads do that?

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Leisure Electronics' automatic dual rate charger. See text for more information.

ALL ABOUT ARFS

BY ART STEINBURG

Those of you who read this column regularly are aware that in the December, 1989 issue I did a report on the Skyward 40 and the Skyward 60, two models which are identical except for size. They were both found to be excellent flying airplanes, and even though it was difficult to choose one over the other, the Skyward 60 was finally selected as the "ARF of the Year." Just as that issue was going to press, the manufacturer released yet a third Skyward, the smallest of the series, called the Skyward 25. It was regrettable that our deadline prevented us from including this diminutive model in our evaluation, and ever since that time I have had a feeling that our report was incomplete. Therefore, when I finally did obtain a Skyward 25, I enlisted the aid of one of my most dependable flying associates, Chuck Thompson, of San Clemente, California. Chuck was just recovering from a health setback and was looking for an interesting project to help him relax and pass the time. After undertaking this job, Chuck was kind enough to write the following short evaluation for us:

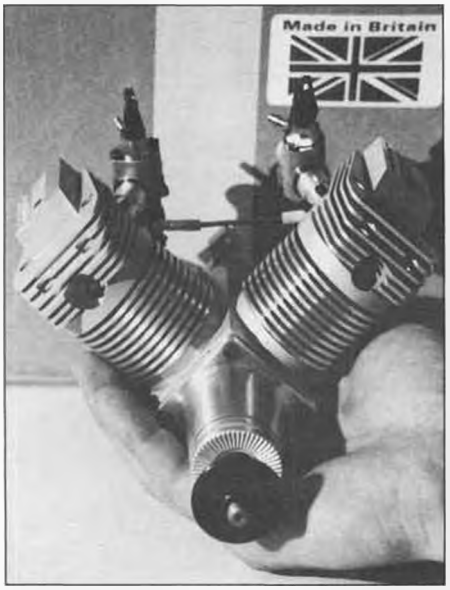
Chuck Thompson displays Skyward 25 with its big brother, the Skyward 60. The columnist's dog, Madeleine, the Wonder Whippet, seems unimpressed.

THE SKYWARD 25

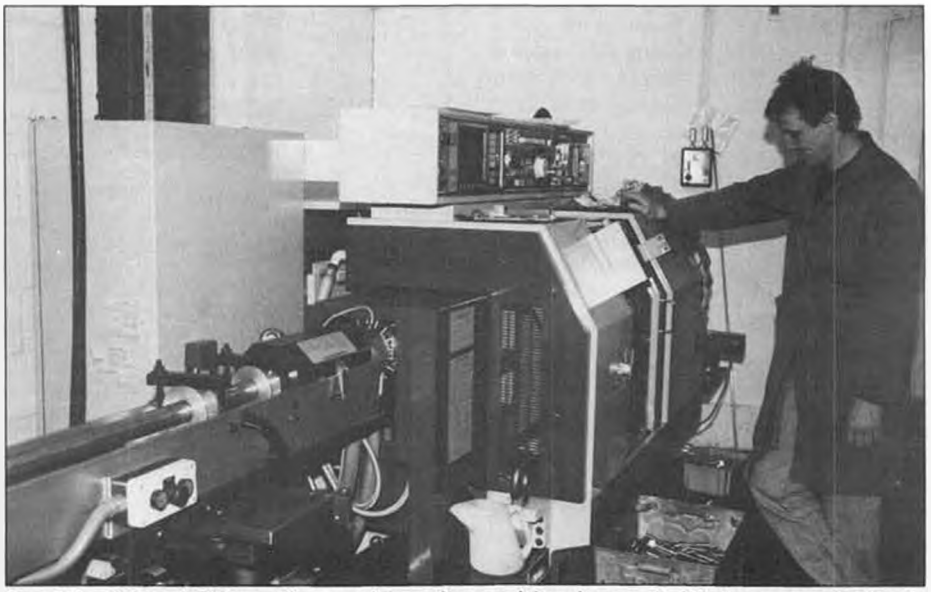
"I'd been anxious to put together the Skyward 25, as I had flown both the .40 and .60 models and found them to be very good flying airplanes. Manufactured by the Skyward R & D Laboratory, 466 Decarie Blvd., Montreal, P.Q. H3X 2H5, Canada, the Skyward 25 came in a very attractive box, with all items well protected and very complete. Only an engine, radio, and adhesives were required to finish the model.

"The Skyward 25 spans 52-1/2 inches with a length of 39 inches. A wing area of 449 square inches combined with an all up weight of 3-1/2 pounds give it a wing loading of 18 ounces/square foot. Any .20 to .25 two-stroke engine would be plenty of power, or alternately, a .30 to .40 four-stroke would be fine. We powered our Skyward 25 with a K & B .20 Sportster, which provided ample power and is very quiet.

"So let's get on with the construction. The illustrated assembly sheet was quite complete. However, the lack of step-by-step instructions would probably make assembly difficult for a person new to the hobby. A neat touch was a sheet describing how to tighten the covering using a heat gun. Many of today's ARFs are covered with this new material. Beginning with the wing and following instructions for a previous ARF, I first epoxied the wing joiner to one wing half. When dry, I test fit the two halves together. In both chord and thickness there was quite a discrepancy between the two halves, and it required some extra work to get them to mate properly. If I were to undertake this job again, I would put epoxy on each wing root and the joiner, then assemble the two while everything was in a flexible state. I would then hold it down with weights and/or pins until dry, thus assuring a more true wing. (Note: Shame on you Chuck, for not doing a



The crown jewel of the British engine-making industry, the Laser vee twin four-stroke. In very limited production, this one is 1.5 cu. in. size.



One of the high-tech CNC machines used to produce model engines, part of the Laser assembly line in England. The machine is made in Japan, of course.

The K&B Sportsman 20 nestles so naturally in the nose of the Skyward 25 that it could pass for a factory installation.

The Mirage IIIC, an all foam 1/2A ARF. It not only looks beautiful, but it also flies magnificently on only two channels.

The Skyward 25 drifts gracefully over dry California scrub, affording the lucky pilot another fun-filled flight.

complete trial assembly before epoxying—A.S.)

"Hinging the ailerons and setting up the aileron servo came next. Hinging was no problem, but I found the plywood servo support assembly was a good half inch too high. So that the servo would not intrude too far into the cabin area, it was necessary to cut the legs of the mount down and cut away the two root ribs to accommodate the servo. A beginner might find this difficult to do properly. (Note: Chuck assured me that this did not significantly reduce the strength of the wing center joint, but I would have preferred to mount the servo off center so as not to cut into the center ribs—A.S.)

"Completing the wing, we then proceeded to the fuselage. A word of caution here. One must be certain there is clearance between the rear of the engine case and the wheel collar fixing the top of the nose gear. I had to drill new mounting holes to move the engine forward. Then too, the nose gear was about an inch too long. With the wheels supplied with the kit, the tail only cleared the ground by one half inch. It was therefore necessary to cut off the axle of the nosegear and rebend it. Now the airplane had a much better stance, but it was still necessary to substitute larger wheels on the main landing gear. All this resulted in less than desirable prop clearance, so I'd have to recommend flying from hard or paved surfaces whenever possible, or else stick to hand launching.

"The tail surfaces were hinged and installed as per the diagrams, and the radio was installed without difficulty. The push rods for the rudder and elevator were made up at this time. Dimensions for these were given in millimeters, which might be a problem for some builders.

"With the engine mounted and fuel tank installed, I found it impossible to route the throttle push rod past the tank without binding, using the original holes drilled in the firewall and the first fuselage former. So new holes were drilled and this solved the problem nicely. In setting up the push rods for the elevator and rudder, there were two slots on either side of the fuselage for the elevator (where only one was needed), but none on top for the rudder. A hole was cut in the top and all controls were then hooked up.

"When putting the final touches on the fuselage, I found the rear clear cabin fairing and the windshield could be fitted without any difficulty. But the molded side windows were so far out of alignment and size as to be impossible to use. (Note: In assembling the Skyward 40 and 60, I found the side windows to be an excellent fit, but perhaps tolerances were more difficult to maintain in a reduced size Skyward-A.S.) Flat clear stock was substituted and glued to the inside of the window framing. After the model was weighed and balanced, it was time to be off to the flying field.

"The first flight was made and required only minor adjustments on the trim settings. Sporting a flat bottom wing, the Skyward 25 is as smooth flying as its larger brothers. In other words, a real pleasure to fly. With help during assembly, and a check out at the field, this model would make a good second trainer." (Note: This concludes Chuck's evaluation—A S.)

Well, Chuck seemed to like this airplane a lot, and he did seem to enjoy flying it more than building it. However, as I was in on the flying end of it, I have a few remarks I would like to add to his report.

My regular readers know that I am not thrilled with using smaller airplanes as trainers, and this is for many reasons which we can't enumerate here. Check my columns in the back issues of the last two years of *MB* and you will find I have had plenty to say on that subject. However, small trainer type models do have a place in the sport of R/C flying. The key is in the word "sport," because these little airplanes are so much fun to fly and there are very few complications in getting them to the field and into the air. For example, the wing can be left on the airplane just about all the time, so a small model can be taken off charge and tossed into the car intact, instantly ready for a day's flying fun. On family vacations it is usually impossible to find room for a conventional

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This unobtrusive building is the London home of A.G.C. Sales, Ltd. This company produces the innovative line of Laser four-stroke engines.

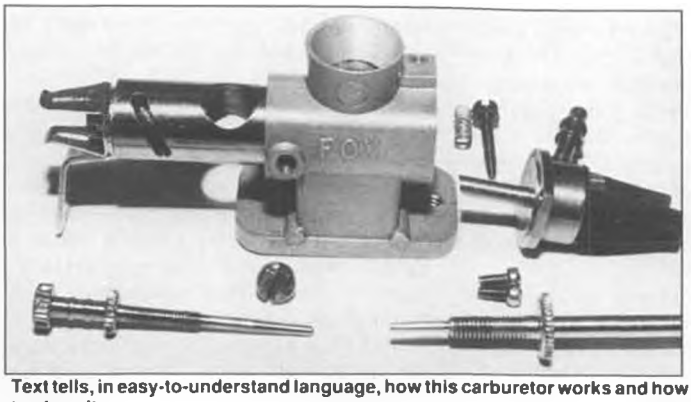
INSIDE ENGINES

BY STU RICHMOND

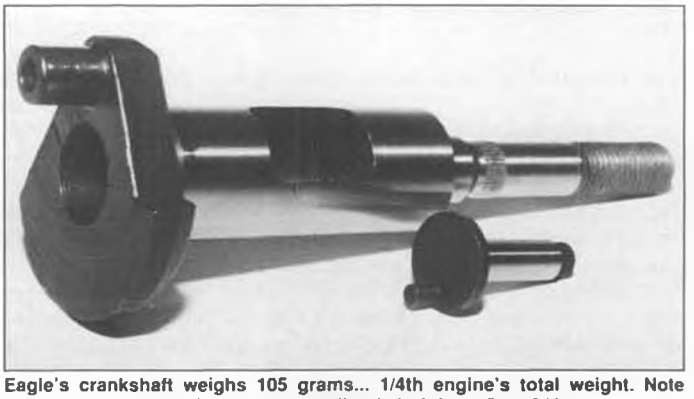
FOX EAGLE IV .74

My American national pride has been pin-pricked and deflated! They've just announced the best selling car in the USA is... the HONDA ACCORD... of Japanese origin!

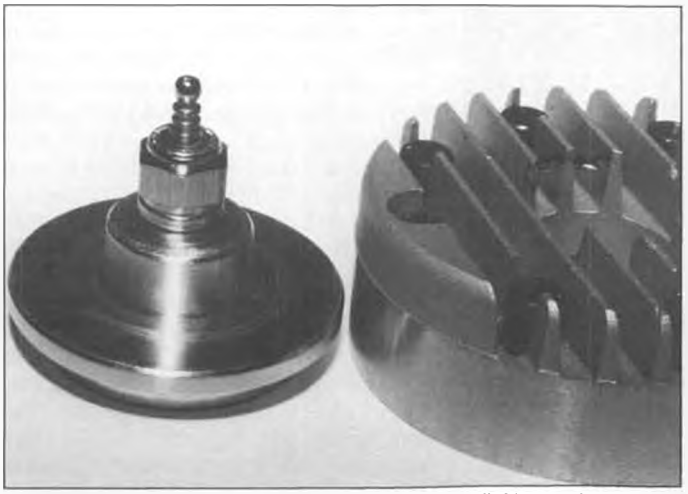
So it's with great personal pleasure and matching pride that I lead you to this review of an ALL-AMERICAN new model engine that's sure to become a world-respected powerplant... one that the Japanese R/Cer cannot now buy due to their one-way trade barriers! Unless Japan, Brazil, and India quickly decide to dismantle their trade barriers like the Berlin Wall fell, the provisions of the Omnibus Trade Act of 1988 requires the USA to drop the equivalency of a third atomic bomb on these countries' economies by starting retaliatory trade barriers with them June 16, 1990. The "TM" model engine I have from Brazil is total trash; Indian production is little better. Unless trade walls fall, Honda's dominance will falter, along with the Japanese model industry.



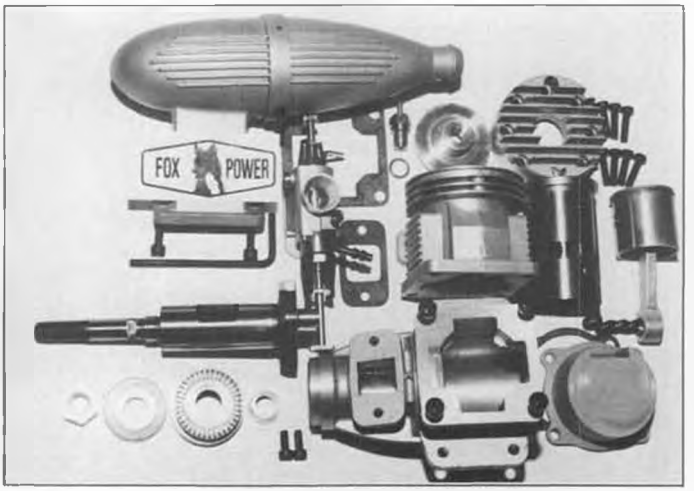
Text tells, in easy-to-understand language, how this carburetor works and how to clean it.



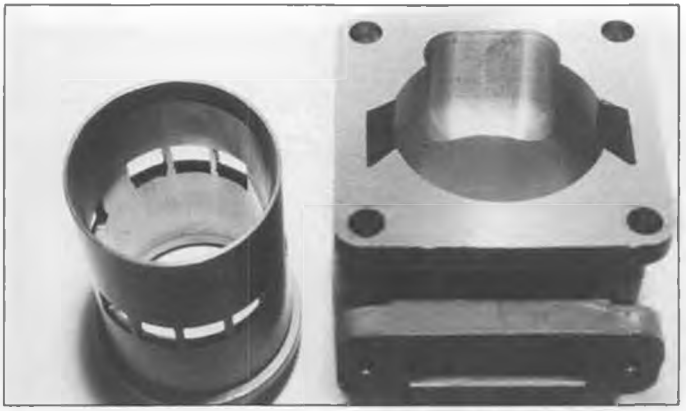
Eagle's crankshaft weighs 105 grams... 1/4th engine's total weight. Note splines on front end. Small 5-gram splined shaft from Cox .049.



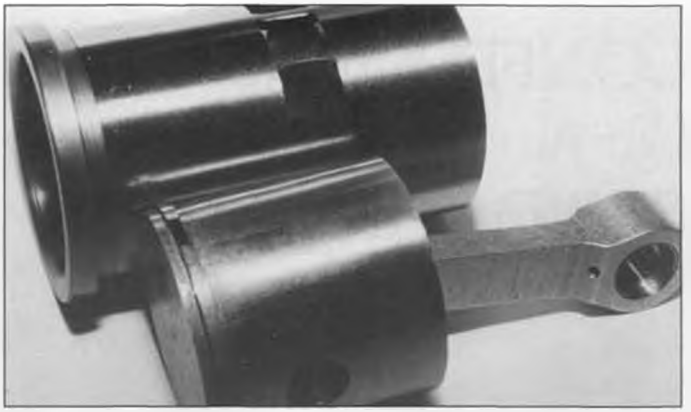
The glow plug threads into the machined button head (left)... casting on right clamps the button head in position.



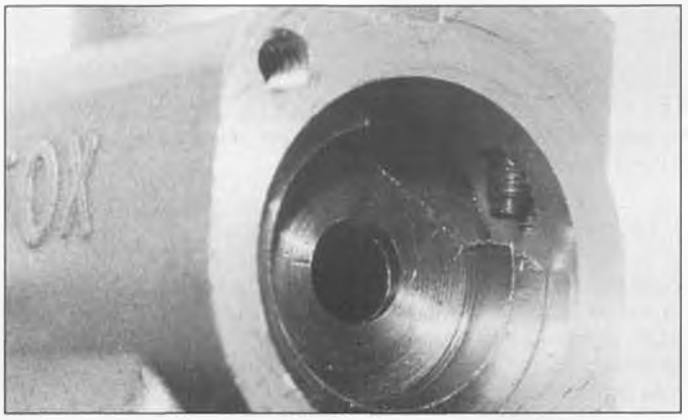
Teardown shows three paper gaskets. Text tells about bolt "snugging" when machine screws pass through paper gaskets.



Bottom view of cylinder and its finned casting gives a good look at porting intricacies for modern Schnuerle engines.



Stu tells us the benefits of buying ringed engines versus ABC types. Lubrication holes on both ends of connecting rod tough to drill.



Extreme close-up of carb shows how tip of idle speed adjusting screw stops barrel rotation for precise low speed adjustment.

Parts for Fox engines, like this lower crankcase section, just a phone call away. Flange mounting of carb being copied by "Fangine 100."

New Fox Eagle IV is entirely "Made in USA." Note threaded access hole for crankcase pressure take-off.

Table 1

PROP SIZE	LOW SPEED	HIGH SPEED	RICHMOND SPEED RATIO
11-7	2,800	12,700	4.54:1
11-7/2	2,550	12,550	4.92:1
12-6	2,050	12,200*	5.95:1
12-8	2,000	11,500	5.75:1
13-6	1,900	10,500	5.53:1
13-8	1,800	9,400	5.22:1

*The 12-6 with the muffler removed, turned 12,800 rpms.

Of the new EAGLE IV, Duke Fox says it "pulls like gangbusters"... and it sure does as you'll see in the performance figures. Model builders in Japan, Brazil, and India (as well as around the world), know well of the Cox, Fox and K&B American engines. Duke has been building big model engines for 45 years and this new EAGLE IV series represents his finest engineering to date. This month's review engine is the .74 size which started shipping in December '89... the .60 size should be shipping February 1, 1990, and these will probably be followed by upscale true ABC versions unless the trade walls fall... in which case Fox Manufacturing will have its hands full trying to meet demand for these two single-ringed engines worldwide.

The .74 has only been to the field twice, and each time modelers have said "Is that the new Fitzpatrick engine?... It sure is pretty!" Duke has done some nice exterior surface machining that doesn't affect performance one bit... but we model builders seem to all want prettiness and shine. If the internal visible surface of the carburetor casting's intake throat were to be highly buffed, the illusion would be complete.

The Fox engines seem to consistently have the best ratios of high speed to reliable idle speed (the Richmond Ratios) so let's first review how the Fox carburetor works. The high speed needle valve (the big one) has a taper from .070-inch diameter at its big shank diameter down to .050-inch diameter at its tip. The tapered distance between the big diameter and small diameter is only 3/16 of an inch, or about seven full turns of the high speed needle valve. Fuel metering actually takes place at the forward threaded end of the black double-ribbed fitting on which your fuel line fits. As you screw in the big high speed needle it increases the resistance to fuel flow at the orifice for a leaner setting. As you screw out the needle it offers less restriction for a richer setting by allowing more fuel to flow. After the fuel is metered by the big needle... it simply flows into the spray bar whose end extends only half way into the carb's throat. The lower tip of the spray bar is beveled off (not seen without disassembly) at a forty five degree angle... the Perry carb's spray bar is similar. Low, or negative atmospheric pressure on the downstream or bottom of the spray bar's beveled tip is what causes the fuel to flow to the engine. The fuel is pushed by the normal atmospheric pressure in the fuel tank which may have a slight internal positive pressure boost if the tank's vent line is attached to the muffler's pressure tap. To slow the engine down, the throttle servo retards or pulls back the throttle arm which is bolted to the steel throttle barrel. As the arm pulls back and rotates the barrel, the air inlet hole in the carb's barrel is turned out of alignment with

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CONFESSIONS OF A FIXED-WING PILOT OR... AL GETS VERTICAL

BY AL ALMAN

The first successful hover of Al's Sport 500 helicopter from Hobby Lobby Intl., after discovering incorrect installation of gyro that made it go crazy! See text.

Exposing myself is not easy... but I'll try.

Y'see, I never intended to get involved with rotary-winged things because there was still one helluva lot I hadn't done with fixed-wing aircraft... and besides, during the past 15 years I'd seen too any choppers destroyed on their first liftoff.

But last summer a casual phone conversation with Hobby Lobby's nice-guy proprietor, Jim Martin, ended with him soft-selling me on the Sport 500, a helicopter kit he imports from Great Britain.

One minute we were talking about the "good old days" (26 years ago, to be exact) when my B-47 used to belly up behind his KC-135 tanker at 18,000 feet to take on a load of fuel... and the next minute he was touting the 500.

I remember the conversation well. He had recently built and successfully flown the 500 without any help and was literally bubbling over with enthusiasm.

"You've gotta try this one, Al... it's not your typically complicated hi-zoot chopper. She really is simple and easy to build and fly because she was designed for the rank beginner... and since you're at least as rank, if not ranker, than any one I know, you should be able to take on this whirlybird with no sweat."

Sensing that his smooth talking had me nibbling at the bait, Jim went on to extoll the virtues of the Sport 500.

He pointed out how simple this heli was because she had fixed pitch; how she could be flown with any generic .40 to .45 two-stroker and any four-channel radio; how tough and resilient she was; how stable she was; how, by following her simple and easy-to-understand instructions you could successfully learn by yourself; and how her seven pounds was an ideal flying weight.

There was no doubt in my mind that Jim was honest and sincere. But I still couldn't forget that most whirlybirds never seemed to survive that first hover.

And these crashes had been horrifying to behold because in every case it looked like suicide. The skids would barely clear the ground when the chopper suddenly became a horizontal blur as tail rotor and cockpit tried to be in the same place at the same time. And then it'd flip over and crash... and proceed to flail itself with its own rotors.

But even when you thought is was all over, the miserable mangled mass of metal would spastically thrash again as if trying to find a more comfortable and dignified position in death. Those pitiful, eye-watering sights were etched into my memory.

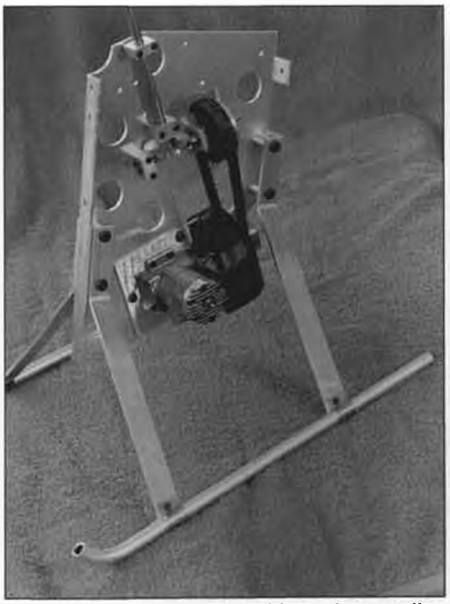
Well, Jim proceeded to gently pump me up a little more, reminding me that the 500 was a piece of cake to build and fly... and that it was an experience not unlike getting your very first airplane off the ground.

I listened and found myself wanting to believe, but the BIG question was... would an ex-tanker pilot lie to an ex-bomber pilot? Well, had it been anyone else I probably would have chewed on it for a while but found it impossible to resist Jim's sincerity. Before I knew it he had me primed and hot-to-trot.

When the kit finally arrived I couldn't open it fast enough. But then a strange thing happened... I just sat there fingering all the big parts and the many bags full of little parts wondering why this seemed so different. Finally I realized that it was less like any airplane kit I'd ever built and more like the Erector Set I had when I was eight years old. And so I came face-to-face with Helicopter Absolute #1: You Don't Build A Chopper, You Assemble It.

After reading the instructions over a few times and comparing odd-named and shaped parts to the photos and the parts list, I was ready to start putting it together.

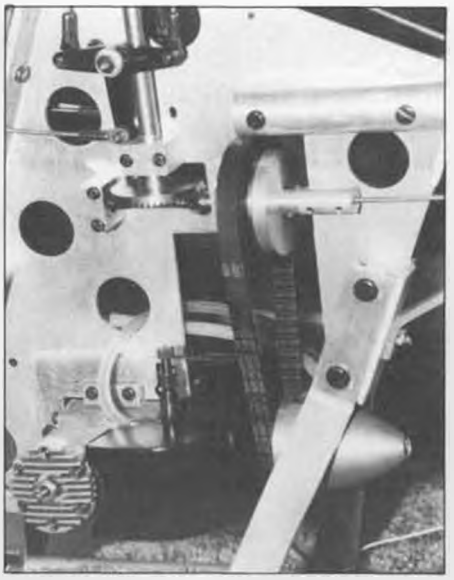
Before long my small container of Loctite



The Sport 500's chassis, with engine, cooling shroud, and main gears. Very simple and very rugged machine. Perfect for beginners.

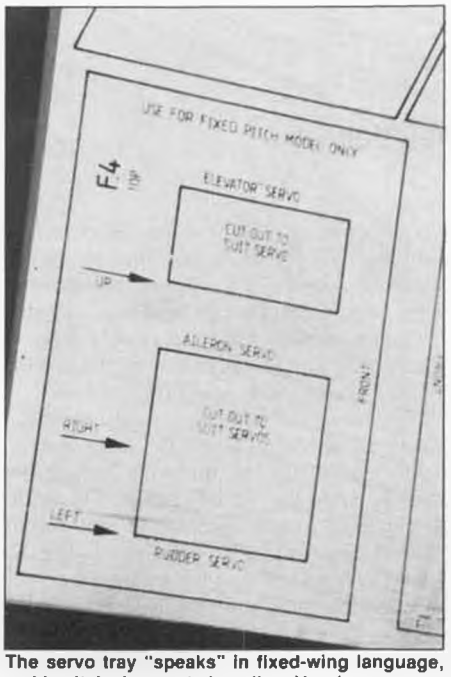
Main rotor head and control hookups are kept simple as a result of its being a fixed pitch helicopter.

Al bushed the forward end of the tailboom tube with a wood dowel to prevent distortion when tightening the mounting bolts.



Chassis, engine, main gear, and tail drive coupling. Note grooved V-belt pulley replaced by 1-3/4" CB spinner, for easier starting.

Close-up photo of tail rotor, tail drive coupling, and gearbox. See James Wang's review in September 1989 issue.



The servo tray "speaks" in fixed-wing language, making it duck-soup to install and hook up servos. You don't have to know beans about heli controls to get this right the first time.

had to be replaced because Helicopter Absolute #2 states: All Heli's VIBRATE. Therefore, every nut, bolt and screw on the machine must be generously coated with a locking compound.

As this was my very first chopper I was kinda worried about a lot of things... like installing the cooling shroud, aligning the mainshaft and tailshaft, balancing the rotors, getting the coning angle (dihedral) of the main rotors and pitch of both rotors right... but followed the instructions and came out smelling like a rose. Looking back there's no doubt that dealing with unfamiliar parts and procedures made me a little skittish.

The instructions recommend using a gyro to help stabilize the tail rotor, which in turn makes flying much easier for a beginner. Well, I fretted about this for a while, but only because the 500 is supposed to be an inexpensive way to get your feet wet; no special engine or radio are needed. And had my reflexes and eye-hand coordination been up to snuff I probably wouldn't have been so concerned... but because my reaction time has slowed down so much I figured that a gyro would be invaluable.

But those prices... Wow! As $150 seemed way out of line and this was supposed to be a low-cost project, I went for the least expensive (a $64 Gorham) gyro I could find. As it turned out the weight of the gyro helped bring the 500 into perfect balance.

Because this was my very first heli I can't make any comparison to other kits... however, from a rank beginner's standpoint, the Sport 500 went together with no wringing of hands or gnashing of teeth.

The fact is that this heli is BEGINNER FRIENDLY because it doesn't intimidate. I don't know who to bless for this but someone made sure that the kit "speaks" in fixed-wing language, eliminating the usual beginner's confusion about which pushrod goes where to do what.

The ply servo trays are clearly marked "Elevator," "Aileron," "Rudder," and "Throttle," with arrows showing which side of the servos and the direction pushrods must go in order to achieve left, right, up, down and idle, The point is that with this bird you don't have to know diddley-squat about rotor direction or heli controls in order to get the installation right.

After reading and rereading a page in the instruction booklet called "Set-Up" I finally realized why so many choppers have been wrecked the first time out. Guys went straight to the field to fly with no thought or knowledge about going through an alignment and trimming procedure... and by taking this shortcut ended up in deep do-do.

Which brings up Helicopter Absolute #3: Choppers Are Not Forgiving. You can get away with some lousy workmanship and dumb stuff when building and flying airplanes but you can't do that with helis. Sloppy work habits are guaranteed to bite you right in the tush. My Sport 500's third flight proved that... and also demonstrated how rugged this machine is.

But first, lemme tell you about her maiden hover and how what I didn't know about gyros almost did her in.

I followed the "Set-Up" directions and got the 500 trimmed, which included adjusting the needle valve for a "rich" max power setting. This initial setup procedure took a while because I was being extremely cautious... and as recommended, it was accomplished with the gyro off.

Then I topped off the tank, turned on the gyro and was ready to try my first hover. The plan was to put three whole feet of daylight between the skids and Mother Earth. My hands were shaking a tad from the excitement but deep down I was confident. After all, I'd followed the "Setup" directions... and besides, hadn't Mr. Jim assured me that it'd be a piece of cake?

I stood about ten feet away at a 7 o'clock position, slowly added power and watched, with fascination, as this rotary-bladed Erector Set came off cleanly and started her ascent. But as soon as she broke ground she went ape, spinning around like an unbalanced top. I'd apparently lost control so I did the only sensible thing... I panicked.

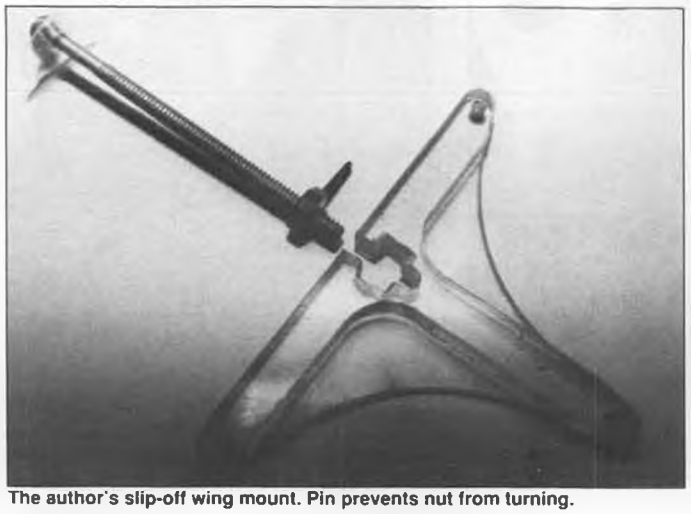
She was about a foot high when I finally unfroze and yanked the throttle back to idle. Lady Luck smiled and the whirling dervish landed squarely on her skids, rebounding a number of times but remaining upright. I couldn't figure out what had gone wrong but it was obvious that I needed help... badly.

So I turned to Walt Hale, a local hobby shop dealer and competent jack-of-all-trades type pilot, who responded to my plea probably because he couldn't stand to see an old

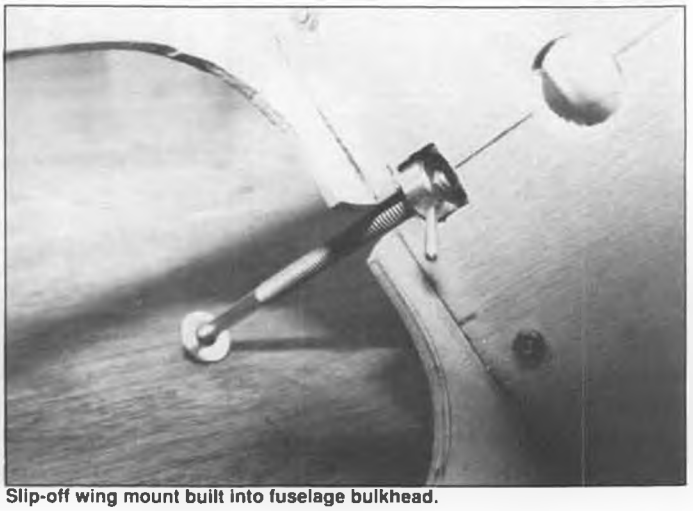
continued on page 84

MODEL DESIGN & TECHNICAL STUFF

BY FRANCIS REYNOLDS



The author's slip-off wing mount. Pin prevents nut from turning.



Slip-off wing mount built into fuselage bulkhead.

SLIP-OFF WING MOUNTS

"May your wings be with you when you need them, but may they depart when they become a liability."

WING MOUNTS

This column has addressed the subject of wing mounting methods several times in the past. As you may recall, the writer has a "thing" about wing mounts. He has never seen a wing mounting system by any other designer that he liked and his own efforts to design a better one have also fallen short of the mark—until now! This writer has now invented an excellent wing attachment system, but before he shares it with you, he would like to explain his requirements for model airplane wing mounting.

A good wing mount must hold the wing on rigidly during takeoff and flight (including aerobatics, if any), and in normal landings; but it should let the wing separate from the fuselage at relatively low impact forces upon a crash or bad landing, to minimize damage.

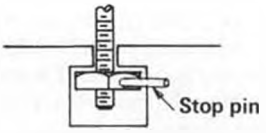
Some designers feel that it is impossible to design a model to withstand crashes, so they don't try. Complete immunity to all crash damage is doubtless impossible, but my experience has shown that we can do much in design to minimize the extent of "re-kitting" during a crash without adding significant weight, cost, or building time.

Speaking of weight, often the more crash-resistant model is actually *lighter* than a more vulnerable one. This isn't surprising, because the forces that damage a model in a crash are inertia forces. If we reduce the weight and therefore the inertia, but keep the strength the same, the impact forces will be less and the model will suffer less damage.

Why have the wing come off on impact? Because if the model crashes on its nose and the wing comes forward easily, the weight of the wing is subtracted from the weight of the airplane in determining the amount of kinetic energy that goes into fuselage crumpling and engine damage. If the plane goes into a tree or between two cars, and the wing is driven back readily, the destructive force on the wing is only that due to its own weight, not that of the entire model. When the model spirals or cartwheels in on a wingtip and the wing pivots easily, there are no wrenching forces to tear up the fuselage and the wing center section.

Therefore, in my book, a good wing mount is one that always keeps the wing on when we need it but lets the wing escape very easily when the model crashes. My models have been known to crash. If *your* models never do, or if you like repairing better than I do, you may ignore the following.

The old and still-often-used method of



Front detail of nut in socket.

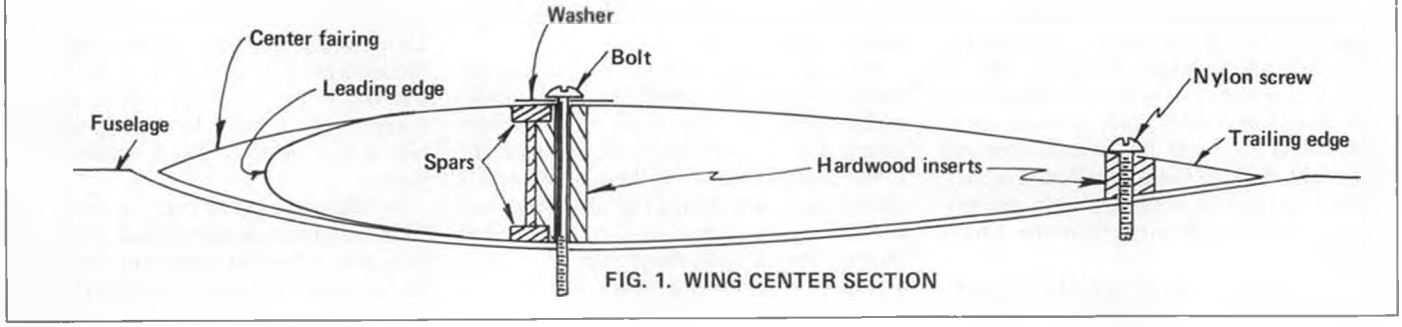


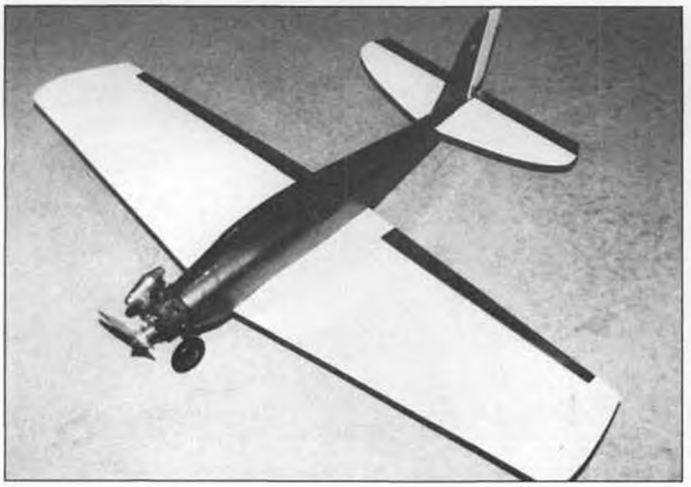
FIG. 1. WING CENTER SECTION

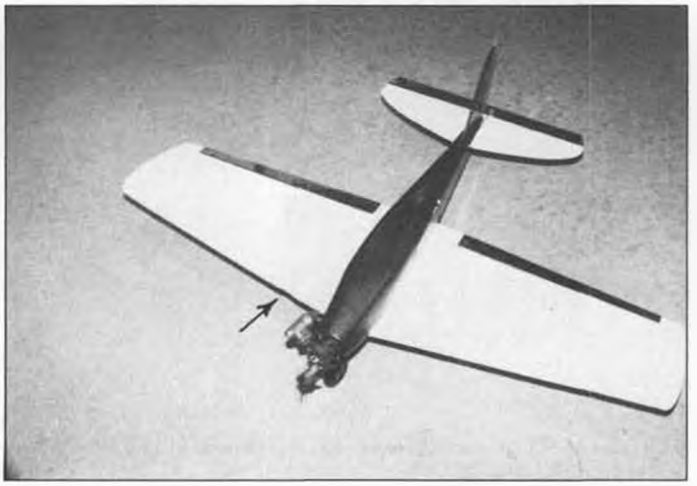
Model dropped straight down from balcony. Fuselage stuck in ground. Scratch one prop... period.

Wing-down heave simulates a spiral-dive crash. Action photo at impact shows wing just separating from fuselage. Why does he seem to be enjoying this?

When thrown hard into a tree, wing came off immediately upon impact. Wing bounced off tree, but fuselage went on through.

"With all your might, Paul!" The plane didn't suffer, but the arrow points to damaged wood fence slat.





BEFORE: Condition of forty-size test model. AFTER (seven crashes). Worst damage is dent shown by arrow. Oh the sacrifices we make for our readers!

holding the wing on with rubber bands actually isn't too bad, since it allows the wing to move at least somewhat in a crash. The problem with rubber bands is that if we put on enough to be really sure the wing won't move in flight, we give up most of our crash protection. Also, rubber bands are neither scale nor craftsman-like. "Mickey Mouse" or "haywire" are better descriptions.

More craftsman-like is the method of wing mounting which uses nylon screws and locating dowels. This one is neat and secure. It usually offers no crash damage reduction, however, because it is too secure. The wing can't move forward without wiping out a fuselage structural bulkhead or the wing leading edge, and it can't move back or pivot because the size of the nylon screws used is usually too large to shear.

Over a number of years of trying to come up with a better wing mount I have tested a number of configurations. The best one, until now, had a single hopefully-shearable bolt in the center of the wing at the spar, and a single light shearable screw near the trailing edge. It was simple and held the wing on fine, but usually didn't separate in a moderate crash as intended.

I lately recognized a contradiction that was common to all of the mounts I had seen. They all had to be inherently much too strong in a crash in order to be strong enough in flight. I also realized that it doesn't have to be that way, because the forces are in different directions. The wing-retaining force we must keep strong is perpendicular to the plane of the wing. The separation-on-impact forces we want to keep low are all at right angles to this main flight-load force.

So we need to design a wing mount that is strong vertically (with respect to the airplane), but has some type of simple connection that releases under low fore or aft forces. I designed, built and flew a model some years ago with a clamp-type wing mount that would slide off. It was heavy, difficult to make, difficult to adjust, and it would release the wing only if the wing was driven forward. Aside from these major problems it was fine!

Fifty-five pound anvil can't pull wing off. Neither can 165-pound author (see text).

THE REYNOLDS SLIP-OFF WING MOUNT

Now you can look at the figure and photos. (You haven't peeked already, have you?) Note that the wing is held on by a single metal bolt at the wing spar. This bolt engages a nut in a socket attached to a structural bulkhead in the fuselage. The only thing limiting the size of the bolt we use is our desire to keep the weight down.

The wing will release from the plane when the nut slips out of its open socket in either direction. The horizontal force required to slip the wing off must slightly exceed the friction force of the nut in the socket, and the friction of the wing on its seat.

We can't depend on these friction forces to keep the wing on in flight, however, so we add a small single shearable nylon screw through the wing trailing edge into another fuselage bulkhead or beam. This aft screw can be very small and weak because there are almost no loads on it in flight; the main bolt is doing all the work.

In a nose-dive crash the inertia of the wing will first shear the aft screw, then slide the nut forward out of its socket and release the wing. In an argument with a tree, the wing may be pushed aft, again shearing the nylon screw but disengaging the nut from the socket in the aft direction. In a cartwheel, the socket won't let the nut move sideways, but the lateral force readily shears the aft screw, then the aft component of the impact force on the wing slides the nut out of the socket as desired. The configuration is simple, easy to make, reliable, and does everything we want it to. It is fortunately equally applicable to shoulder-wing and low-wing models. The weight of the slip-off wing mounting system, about a half ounce for a forty-size model, is as light or lighter than other types of mounts. The weight of the complete model could theoretically be less with a slip-off wing mount, however, because the stresses on the fuselage and wing will be less and they could be built lighter.

DESIGN DETAILS

The photos show slip-off wing mount hardware for a sixty-powered ship, using an 8-32 steel bolt and nut, and a setup for a forty-size plane using a 6-32 bolt and nut. These sizes

continued on page 86

R/C SOARING

BY BILL FORREY

Dave Thornburg's great new soft-cover book will become the Bible for every glider-guider who has graduated from the beginner stage. Follow it, and it'll take you to the top, any way you look at it!

Sunday afternoon at a typical BARCS (F3J-type) competition. Except for "Bird of Time" (BOT for short) models, nearly all are original designs. (All BARCS' pics by Les Sparkes).

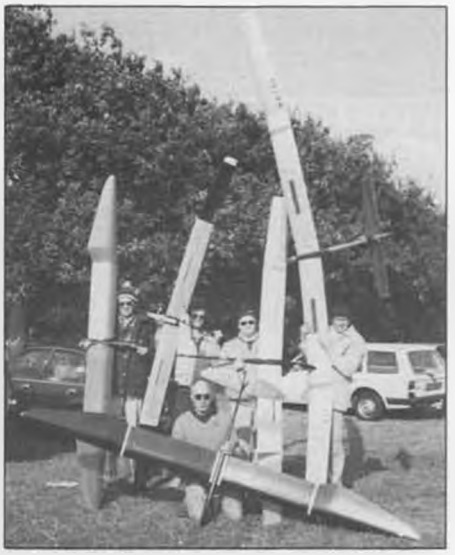
THORNBURG'S BACK! AND HE BROUGHT THE BUZZARD WITH HIM!

Back in the early eighties, one of this nation's best loved soaring writers "ran out of steam" and disappeared into the backwoods of New Mexico somewhere near Abuquerque. It was a disappearance which left many in a state of bewilderment. Some said he retreated there to build his dream house. Others said he vanished in an old Studebaker convertible after picking up a hitchhiking buzzard with a concealed weapon. However it went down, the net result was no more words of soaring wisdom from one of the nicest guys in the world of R/C. The good news is that Dave Thornburg is starting to get active in soaring again.

In recent months the soaring bug inside Dave has come out of hibernation, managed to reinfect its host, and forced him to return to the sticks (transmitter sticks, that is). He has recently gone as far as to: 1) design, build and fly a hand launched glider; and 2) enter a soaring contest, the Southwest Regionals in Tucson. Perhaps it was inevitable. As Dave admits, "Once a balsaholic, always a balsaholic."

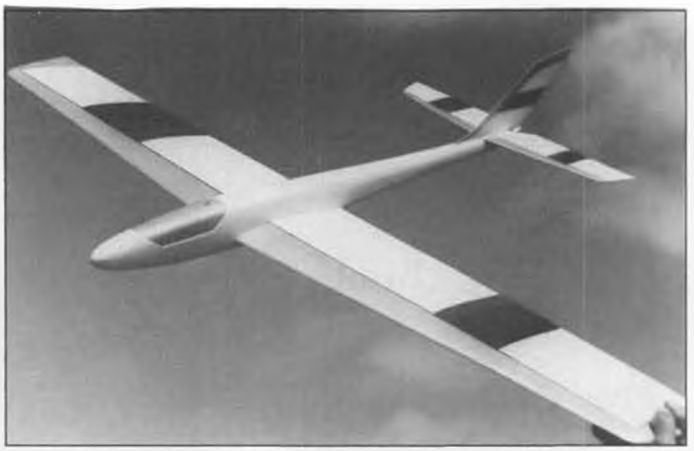
I recently received a package from Dave containing a letter and a press release pertaining to a book he has authored, called *Old Buzzard's Soaring Book*. The press release consisted of a note from the publisher, a reprint of the author's note, a table of contents page from the new book, and a photo of the new book's cover (actually a mock-up). Many of the chapters will remind *Model Builder* readers of shorter stories they

George Chastell and his last BOT variant with 14-foot span! Certainly plenty of room in fuselage for servos. Original Thornburg BOT kit still available from Dynaflite.



Les Sparkes (kneeling) and group of BARCS' fliers. The two 12-foot BOTs inspired by Dave Thornburg. A "Selestra" with V-tail also present, plus a 16-footer!

Doug Hertzog with his wares: Douglas Aircraft Quicksilver (left) and Silhouette. Two quick little slopers for fun at the cliff.



Close-up showing clean lines of Quicksilver. Modern airfoil and foam core wings make it extra fast and aerobatic.

have read in this publication in years long past, but much material is new.

If you are interested in the official press release for this new work of Dave's, you will find it in Bill Northrop's "Workbench" column starting about page eight of this issue. It will give you an excellent idea of what you will find inside the book. There is no need for me to repeat that message here. However, to give you the flavor and intent of the *Old Buzzard's Soaring Book,* I will quote Dave's "Author's Note."

"This is not a book for the rank beginner to R/C soaring. It won't tell you how to cover a fuselage or take a warp out of a wing or put together a high-start. There are good books already on the market that describe these things better than I can.

"This book presupposes your ability to fly. It addresses your desire to fly longer and higher... to be less at the mercy of gravity... to advance toward the ideal of staying up until you decide to come down. And so, necessarily, it's a book mostly about the air we fly in, and especially about thermals, those invisible winds that blow neither north nor south, east nor west, but straight up.

"The thermal is nature's elevator: a magic bubble of warm air that breaks loose from the earth and floats casually, amorphously upward toward those cool gray regions at the base of cumulus clouds. A million thermals a day make this silent and invisible journey alone; only a lucky few find themselves accompanied by a hawk or a crow or a buzzard, by a dandelion puff, a piece of stray newspaper—or an R/C sailplane.

"I was ten when I met my first thermal. It captured not only my heart, but a brand-new folding-wing glider worth two weeks' allowance—lured it up into the sky in those same tight circles it had always used to descend. The day was warm and sunny and—in memory, at least—nearly calm. Over and over I had shot the little plane up like a missile and watched it spread its wings and float softly back to earth. But this time something odd happened. Instead of spiraling down, it tossed and tumbled strangely, and then suddenly it began to spiral... up! A God I couldn't see, a God who could annul even the Law of Gravity, was lifting my glider—MY glider—into the heavens! I felt honored. Certainly that was the most magic I'd ever commanded for fifty cents. As I watched, the little model grew smaller and smaller, a dark, bobbing speck against the blue. Finally I could no longer see even the flash of sunlight off its aluminum wing roots each time it circled. It was gone.

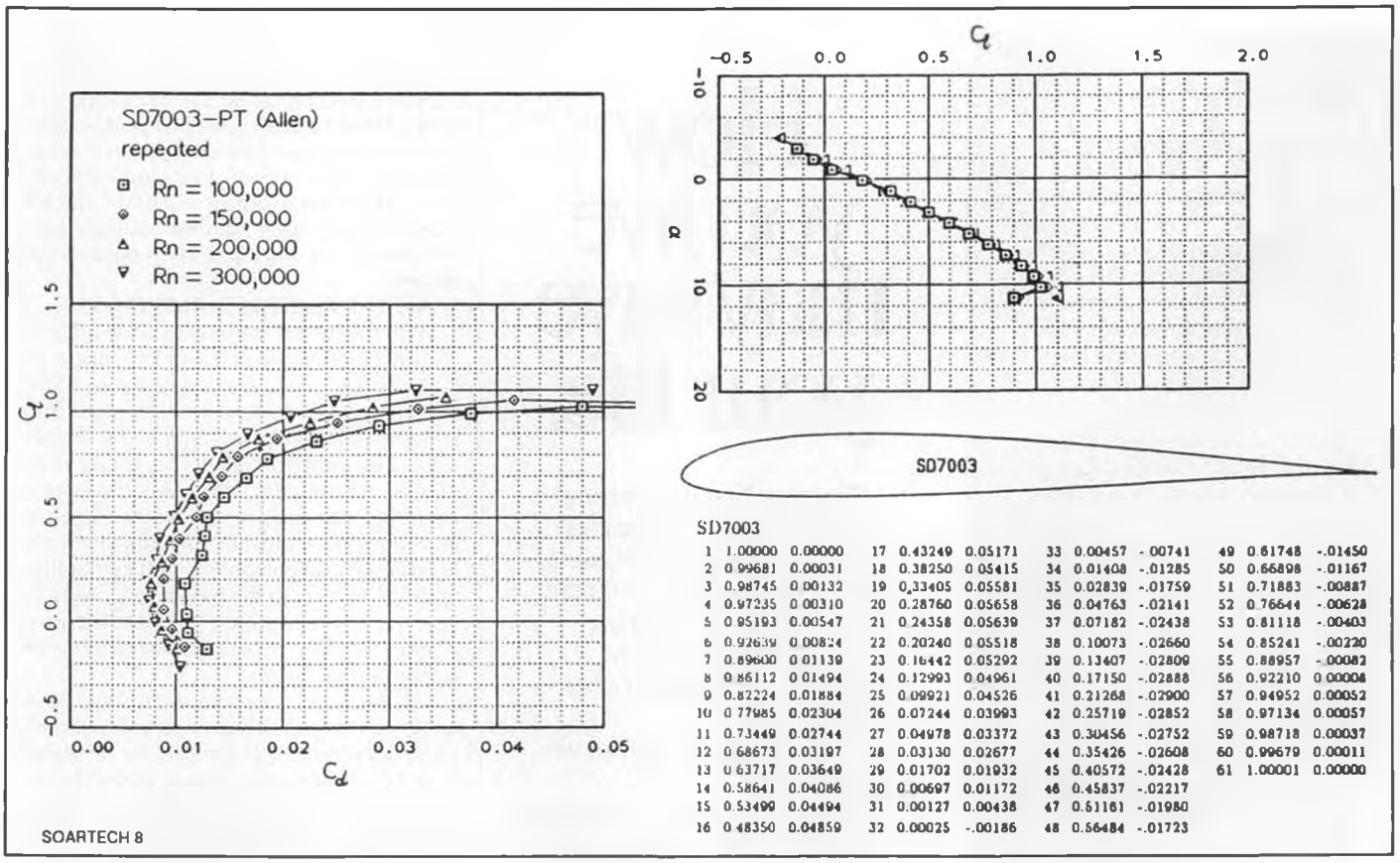
"What it left me was a bittersweet memory—and a lifelong fascination for things that ride the invisible wind: birds and kites and sailboats and gliders, both large and small. If you share this love, then maybe you'll enjoy reading this book as much as I've enjoyed writing it.

"I hope you do. Dave Thornburg, Carnuel, NM, January 1990."

Saving the wing center sections of a crashed 12-foot BOT, Les Sparkes built this modern-looking V-tail, pod-and-boom soarer.

George Chastell prefers to have two models; one for light air (left) and one for windy conditions (right). Both are V-tail 12-foot BOTs.

Stiletto, designed by Harry Weitz to check performance of the Eppler 195 airfoil.



SD7003

1	1.00000	0.00000	17	0.43249	0.05171	33	0.00457	-.00741	49	0.61748	-.01450
2	0.99681	0.00031	18	0.38250	0.05415	34	0.01408	-.01285	50	0.66898	-.01167
3	0.98745	0.00132	19	0.33405	0.05581	35	0.02839	-.01759	51	0.71883	-.00887
4	0.97235	0.00310	20	0.28760	0.05658	36	0.04763	-.02141	52	0.76644	-.00628
5	0.95193	0.00547	21	0.24358	0.05639	37	0.07182	-.02438	53	0.81118	-.00403
6	0.92639	0.00824	22	0.20240	0.05518	38	0.10073	-.02660	54	0.85241	-.00220
7	0.89600	0.01139	23	0.16442	0.05292	39	0.13407	-.02809	55	0.88957	-.00082
8	0.86112	0.01494	24	0.12993	0.04961	40	0.17150	-.02888	56	0.92210	0.00008
9	0.82224	0.01884	25	0.09921	0.04526	41	0.21268	-.02900	57	0.94952	0.00052
10	0.77985	0.02304	26	0.07244	0.03993	42	0.25719	-.02852	58	0.97134	0.00057
11	0.73449	0.02744	27	0.04978	0.03372	43	0.30456	-.02752	59	0.98718	0.00037
12	0.68673	0.03197	28	0.03130	0.02677	44	0.35426	-.02608	60	0.99679	0.00011
13	0.63717	0.03649	29	0.01702	0.01932	45	0.40572	-.02428	61	1.00001	0.00000
14	0.58641	0.04086	30	0.00697	0.01172	46	0.45837	-.02217			
15	0.53499	0.04494	31	0.00127	0.00438	47	0.51161	-.01980			
16	0.48350	0.04859	32	0.00025	-.00186	48	0.56484	-.01723			

There's a glimpse of what's in store for you when you purchase what is surely to become a classic work on the subject of soaring. If you wish to order one, write or call the publisher, The Pony X Press, 5 Monticello Drive, Albuquerque, NM 87123, (505)299-8749. The price is $14.95, plus $1.50 shipping and handling, dealer discounts on ten or more copies, MC-Visa card, or COD's welcome.

NORTHEAST SAILPLANE PRODUCTS

And speaking of things you'll want to sit down with and read in the ol' easy chair... I never thought I'd see the day that a catalog would have almost as many interesting articles to read as things to sell, but the NSP catalog does. Sal DeFrancesco (no relation to Louis Jr. at *Model Airplane News*) has put together a very informative and entertaining magazine-catalog which details many different sailplane designs in kit form and quite a few articles related to building and designing sailplanes in general. It's seventy-two pages long printed as an 8-1/2 X 11 book.

To receive the catalog, send $3.00 to Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 05495. The $3.00 can be applied as a credit toward your first purchase. If you'd like to talk to Sal, he'd welcome your call at (802)658-9482.

BIRD OF TIME VARIANTS FROM ACROSS THE POND... OR WHAT SOME BRITS FLY IN F3J MEETS

Getting back to Dave Thornburg and his influence on the world: Some time ago (early December 1989 to be exact) I received a very nice letter from Les Sparkes of Essex, England. Les and his friends fly BARCS (British Association of RC Soarers) rules 10-minute slot thermal duration, which has recently become a proposed world-class event called FAI-F3J. Seeing how this event is very likely to become accepted as a bona fide FAI contest format, it also seems appropriate to include Les's comments on the development of one successful FAI-F3J design. It just happens to take up where Dave Thornburg left off about 1980! Les writes:

"In *Model Builder* of August 1989 I was surprised to look at a photo of George Chastell with one of his Bird of Time models. Then upon reading your article, I realized you most likely got it from Sean Walbank.

"What persuaded me to write to you was that you and your readers might be interested in some information on George's BOT and its variants.

"Thornburg started it out for us when his idea and plan of the Bird of Time was published in one of your national model magazines. Three were soon built in our club, one of which was George's, and it was quite successful.

"However, George, being the type with an I-think-I-can-improve-it mentality, decided to make his mark in the world by using a (at the time) proprietary pod-and-boom fuselage consisting of a Rony tube boom and a glass fibre front end. He then increased the wing inner panels to give it an increased total span of twelve feet. The all-moving 'V' tail was operated by a Du-Bro Mixer.

"The inner panels were all sheeted, top and bottom, and the outer ones sheeted to the main spar forming a 'D' box construction. This was a very strong wing, and aided by two quarter-inch diameter wing joiners, each side of the main spar was capable of fast tows with a good 'ping' of the towline.

"This was a good model, but it lost out at 'scratching' in light wind conditions, so along came BOT the second.

"This was the same layout as before (i.e. pod-and-boom, 'V' tail, twelve-foot wings), but the wings were built with close spaced ribs with two turbulated spars out to the tips. The wing section was changed to a thickened Windrifter shape (a 12% flat bottom airfoil). The first four root ribs were sheeted in to give a bit of strength to the joiner area. All models mentioned, by the way, were covered in 'Mica Cover,' and what good stuff it is too!

"This second model was right on the ball when it came to flying in nil wind conditions, helped when you see that it had a 5.5-ounce wing loading.

"George did very well with these models in thermal comps, and was always well placed in our BARCS League system, nearly always in the top ten. The year 1987 saw him as Midland Champion which was quite an achievement.

"George had an idea for a fourteen foot span model, and used a glass fibre fuselage which had a sheath type nose section. This one had the 'V' tail mounted on a small fairing which totally covered the elevator mechanism. A Selig 3021 section was used on the wings, and braking was by Multiplex spoiler.

"With a wing area of approximately twelve square feet, it was very good at handling all types of lift conditions, also the wing section enabled him to speed up the model and cover large areas looking for better air.

"Unfortunately, this model tried to mate

with a tree and was severely damaged, so George had to revamp the model with a new fuselage, and went back to the original BOT tailplane and fin setup. As it happened, this proved to be an improvement because the turning ability was much better in tight thermals.

"My own efforts with the BOT consisted of a standard fuselage lengthened at the nose to keep the radio gear forward instead of the weight needed for CofG adjustments.

"The wings were the twelve-foot, close-rib type like George's light model, but I mounted the wings and joiners through the fuselage instead of banding them on top. This gave me better access to the ballast area.

"The tail was as the original BOT. Air brakes were home-brewed 'letter box' type operated by a servo in each wing. It was a good model, but I forgot to switch on in a comp, and it was 'bent' quite badly. The inner wing panels were saved and revamped into another model. This is the one in the photos with George holding it.

"The photos are of clubmates, myself, and George. I've marked the backs to give an idea of who's who. Sorry about the ink marks on the gloss side, I forgot they were damp with the writing.

"I would like to compliment you on your articles in *Model Builder*. They are informative and interesting. Some, I am afraid, are above my head, but still, keep them coming."

Thanks much, Les. As we are all newcomers to your BARCS style F3J rules, especially the part about hand towing instead of winches, your report on this small aspect of British model design is very helpful. Americans have always preferred thermal duration over other forms of soaring competition. I think the majority will find F3J a lot more to their liking than the multiple-task F3B event. See my April 1990 column for details.

SCALE SAILPLANE KITS AND PLANS

With the recent increase in scale activity comes an increased demand for sources of plans, three-views, and kits of various full-size subjects, including the high-starts and parachutes needed to launch the bigger ships. I thought you might like to take note of one such supplier who has been collecting photos for documentation for 25 years, and can also handle most of your other scale needs. The company name will be familiar to the old timers in the movement: Archaeopteryx Avion Associates (AAA). The proprietor, Jim Ealy, is perhaps less familiar, at least to West Coasters.

For the scale sailplane enthusiast, AAA carries over 1,000 three-views (line drawings), over fifty 1/5, 1/4, and 1/3 scale plans; over 25 sets of mostly vintage glider photos for documentation; four different sizes of heavier-than-commercial grade high-starts, a rip-stop parachute with 100-pound shroud lines, and four scale kits. The kits are a 1/4-scale Tandem Tutor, 1/5-scale Grunau Baby, 1/4-scale Zogling, and a 1/3-scale Woodstock. Currently, Jim is celebrating his 10th anniversary as a supplier with a sale. Give him a ring at (609)448-8726 for a catalog and sale price sheet. Tell him *Model Builder* sent you.

F3B/USA NEWSLETTER UPDATE

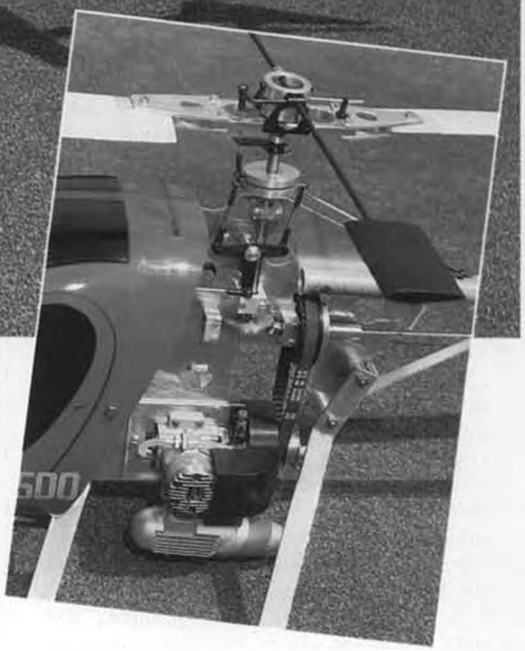
The F3B/USA newsletter has undergone a couple of "evolutions," according to newly appointed editor Randy Reynolds. It now has a more permanent home and a more stable outlook for the future. This newsletter will have as its emphasis the perceived "middle ground" of R/C Soaring, namely the Multiple Task Soaring (MTS) or Sportsman Multiple Task (SMT) groups.

It is my hope these groups will succeed in improving the popularity of the F3B genre of competitions, thus providing a "seed-farm" from which future world champions will emanate. These "middle ground" events (there are many different types) place limitations on aircraft (weight, expense, commercially available kits, one-design aircraft, etc.) and thereby reduce the time and money expense for interested competitors. They are a great way for many to naturally progress from thermal duration to something more challenging.

It is fun to fly the F3B distance course because it demands a different kind of skill and concentration. It is exhilarating (if not downright scary) to fly speed. There are those soaring enthusiasts who get turned on by the adrenalin rush they get from this kind of excitement. And as long as the thrillseekers don't force themselves upon the Sunday

continued on page 91

HERE is the very best R/C helicopter for the modeler who has never built or flown an R/C helicopter!



HLA400 Hobby Lobby/MFA

SPORT 500 HELICOPTER $199.00

List price $249 50

Here are the reasons that SPORT 500 is the best helicopter for a beginner helicopter flyer:

It flies well!

SPORT 500 is **lightweight,** has a **proven Hiller teter-rotor control system,** and was designed by an active RC helicopter flyer and engineer — Chris Baker — with **beginning helicopter flyers in mind the whole time.** Its light weight means that SPORT 500 is never marginal — it flies easily and lightly, not just barely and "on the edge"

Construction is easy.

For example: Instead of a special adapter to fit the cooling fan, drive takeoff, and starter pulley to the engine shaft, they simply mount like a propeller — the shaft goes through the holes (which can be drilled larger to fit any conceivable engine) and the whole works is held with the prop nut.

Another example: Every construction step **(there are only 31 steps!)** is described in very few words and accompanied by one or more **photographs** that show that step!

It works well:

SPORT 500 is "over-designed" — there are **ball bearings** instead of the more maintenance prone bushings in almost every possible shaft support. The clutch is all steel (except the lining) for **durability.** The chassis, engine mount, landing gear, rotor head, and other assemblies are **so strongly made** that minor accidents and jolts will not "ground" your SPORT 500.

Starting the engine is easy because of the sensible engine location and the use of a simple starting belt.

Adjustments are easy because the cabin only encloses the radio gear — all the mechanics are open and reachable.

The fixed-pitch rotor head is **damage resistant and easy to adjust.**

The engine cooling shroud fits close to the engine head and eliminates engine cooling problems.

The rotor runs at about **half the speed** of other helicopters because of the belt reduction system. This not only makes **clutch engagement more progressive** and **puts less strain on the mechanics,** but also makes SPORT 500 **sound more realistic** in flight.

The teter damper is spring steel not unpredictable plastic or rubber and you'll notice **more predictable control response** because of this. The rotor blades are preshaped, predrilled, composite hardwood and balsa and are supplied in matched pairs. The tail rotor blades are preshaped and drilled hardwood.

Because SPORT 500 uses a fixed-pitch head it does not have auto rotation capability. However, few beginners could use auto rotation even if their helicopter was equipped to do it, and the gain in **simplicity and durability** makes it worthwhile **not** to have it.

SPORT 500 takes any .40 or .45 2-stroke model airplane engine (Schnuerle ported engines are recommended), and any 4 channel radio (a gyro is recommended). Rotor diameter is 42". Flying weight (including gyro and oversized receiver nicads) is only 7 pounds.

In stock for IMMEDIATE shipment!

Call (615) 373-1444 and order SPORT 500 now!

(Charge it to M/C, Visa, American Exp., Discover)

HOBBY LOBBY INTERNATIONAL, INC.®

5614 FRANKLIN PIKE CIRCLE — BRENTWOOD, TN 37027 — (615) 373-1444

Greg Milosevich of GMP shows new "All-American Made" heli parts, no longer bought from Hirobo in Japan. Also on display, the new Rebel for beginners and Legend Elite for experts.

Miniature Aircraft Supply's very professional looking booth. All products neatly velcroed to the display board. Also showed composite tube drive, Delta-3 mod for main rotor, and powder coated frames.

HELICOPTERS AT IMS PASADENA

BY JAMES WANG

In January, I attended the annual Pasadena International Modeler Show. As far as I can remember, I have been going there for the last 12 years. Pasadena is a suburb of Los Angeles, where the annual Rose Bowl game is held. It is also the home of California Institute of Technology. This year all the major helicopter companies had a big booth. There were also many helicopter shops and aftermarket product manufacturers represented. I will now tour you through the show. The order will basically follow the way that I saw the show.

The first booth I visited was Robbe/Schluter simply because they were located near the entrance. Vince Canzanese, Robbe's helicopter manager, was manning the booth. National Champion Mike Mas was also there to help him. Vince displayed Robbe's new Magic Ranger model. In the March and April issues, we reviewed the Magic. I gave the Magic very high marks in quality control, design, and handling qualities. The only complaint was it flew too slow! After the review, I took the Enya 60 out and replaced it with the new Enya 80H. Whew, what a difference! The Enya 80H has the same outside dimensions as the 60H, but it puts out 1.9 hp instead of 1.7 hp. The stroke is the same, but the bore is bigger. With the 80H the Magic moves about 10 mph faster, and now it climbs at a faster rate. I highly recommend the 80H for the Magic, however, make sure you do not exceed 1500 rpm on the main rotor. And make sure the engine is running very rich with plenty of smoke, because mine was either running too lean, or the rpm exceeded 1700 in aerobatics, as the engine connecting rod broke after 10 flights. (The Magic has 10:1 gear ratio, and Enya recommends the 80H should never exceed 17,000 rpm). But I have to say, I enjoyed every minute during those 10 flights. It's a great feeling to have when you punch the power and it's there. By the way, the Enya importer, Altech Marketing, is extremely efficient at repair turn around. David Ramsey and I both have sent engines back for repair to Altech, they returned the engine in less than one week, and at no charge!

Vince's Magic looked immaculate. The fuselage is available by itself, or as a complete Magic/Ranger kit. Besides the Magic, Robbe displayed its new Heim mechanics for the Ecureil fuselage. This Heim mechanics is an improved version of the old Heim mechanics. The servos are mounted right on the plastic frames. Another new model from Robbe is a 60 size autogyro. Vince says it will be available in the U.S. in April. It is called "Whopper." It is about the same size as the Scout, and uses the same rotor head as the Scout. The blade pitch can vary for cyclic control purpose, not for collective purpose. The average pitch is set at negative one degree. The autogyro also has aircraft style elevator and rudder controls. A five channel airplane radio is necessary.

The Whopper is different from the older Kalt autogyro in that Whopper has a spin-up mechanism that uses the engine power to spin up the main rotor to flying rpm before takeoff. That is why a five-channel radio is required. The fifth servo is for engaging the spin-up mechanism. The Kalt autogyro and most real autogyros start the rotor spinning by running down the runway and letting the wind windmill the rotor up to speed before takeoff. Only the sophisticated real autogyros have power wind up mechanism like the Whopper. The advantage is that it reduces the required length of runway for takeoff. (This technique is called jump takeoff.)

Vince Canzanese of Robbe Model Sport holding new Schluter .60-size Magic Ranger.

Hobby Dynamics' Kalt Omega Professor, Cyclone II, and new .30-size Enforcer that will be out this summer. Enforcer has 46-1/2 inch rotor dia., weighs 5-1/2 lbs.

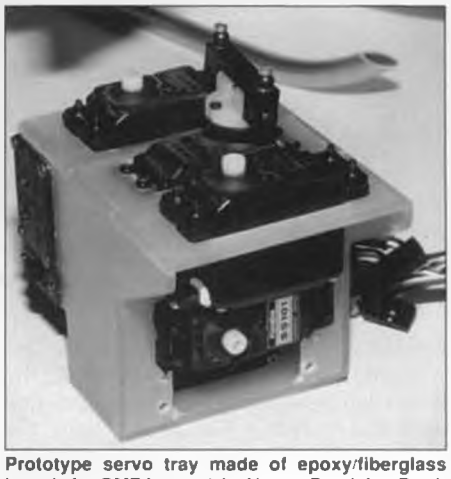
Yellow Aircraft's Ron Kemp with three prepainted fiberglass fuselages he imports from Hong Kong. More details in text.

Hobby Lobby's Jim Martin looks very satisfied with the collective pitch conversion kit for the MFA 500 Sport helicopter.

New flywheel and 10mm steel shaft from Hobby Hutch for balancing rotor head and blades on High Point or similar balancers.

An autogyro differs from a helicopter in that the helicopter rotor is always powered by the engine. Helicopter rotors tilt forward in forward flight to pull the helicopter forward. An autogyro's main rotor is not powered by the engine, it spins in forward flight because the wind turns it like a windmill. An autogyro's rotor must tilt backward to achieve the windmilling effect. It flies forward because the engine with the propeller pulls the model forward. The Whopper will be here in April, and retails for $499. Stay tuned, we will review this interesting rotorcraft as soon as it comes out. Then, I will explain in detail the theory and flying techniques of autogyros, and the interesting history of how Mr. Juan de la Cierva, from Spain, invented the autogyro in 1920. I will also explain how Cierva invented the famous articulated, flapping rotor head design that is used on almost all the real and model helicopters. That should make a very interesting review; filled with plenty of historic anecdotes and scientific facts.

The next booth I visited was Hobby Dynamics. Mike Ciolli, Jerry Kaplan, and Kevin Burner were there to greet us. Kevin showed me the new Kalt 30-size "Enforcer." It is designed by Concept 30's designer, Mr. Taya, thus I see a number of parts that looked like Concept parts. Of course, Kevin said they are not the same parts. As the picture shows, the Enforcer has a very different layout from any helicopter on the market. The engine is mounted almost vertically, at a 30 degree angle. It uses a planetary drive gear system, a hingeless rotor head design, cone start, crossover swashplate control system, and all the pushrods are straight. Very innovative, indeed! I am impressed by this fellow, Mr. Taya. Every time he designs a new helicopter, it includes innovative layout and features. The guy is imaginative! Word is that the Enforcer will arrive in the U.S. around summer. The rotor diameter of the Enforcer is 46.5 inches. The weight is 5.5 pounds. Gear ratio is 9.8:1:4.9 (engine:main rotor:tail rotor). It is to retail for $429.



Prototype servo tray made of epoxy/fiberglass boards for GMP Legend, by Vortex Precision Products. More details in text.

Besides the Enforcer, Hobby Dynamics displayed the Kalt Cyclone II and Kalt Omega Professor. Kevin also showed me their new JR 347 radio system. The 347 means three programming capabilities (for airplanes, gliders, and helicopters), four model memories, and seven channels. It will also be available around summer. The JR 347's transmitter has that new, slick, compound curve design. It felt very good in the palms.

Coming around the corner is Miniature

Century Import/Helicopter World displayed new line of black anodized tuned pipes and mufflers. In center is prepainted .30-size Airwolf fuselage that will be out in Spring.

Mark Smith, of Dr. J's West Coast Hobby Warehouse, surrounded by whole slew of new helicopters for sale at show. Just show him your plastic! Dr. J is a regular at IMS Pasadena.

Airtronic's new SG-X gyro. It even includes a special tail rotor control servo. One of the least expensive electronic yaw rate gyros on the market.

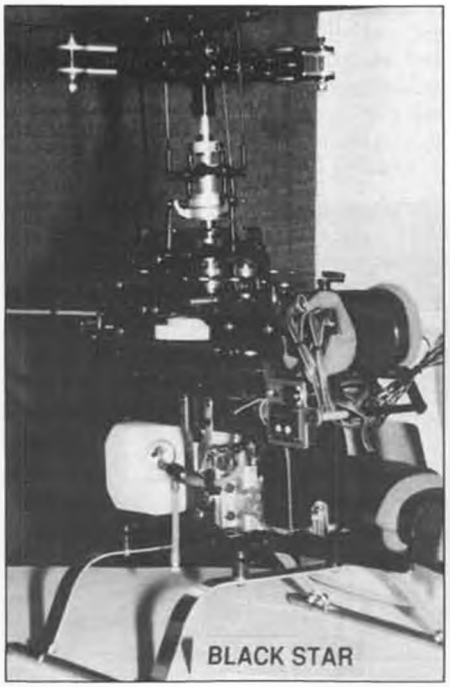

Robbe/Schluter .60-size autogyro. Uses Scout rotor head and a unique spin-up mechanism for jump takeoffs. Uses helicopter-style Bell and Hiller control system.


Andes Hobby displayed world's smallest R/C heli. Less than 12 inches long, powered by two 280 electric motors. Unpainted Bell 222 fuselage.


Author checks out Andrew Sutton's new Hirobo Shuttle ZX. Has his modified OS 32 engine. Flies great. See text for more description.

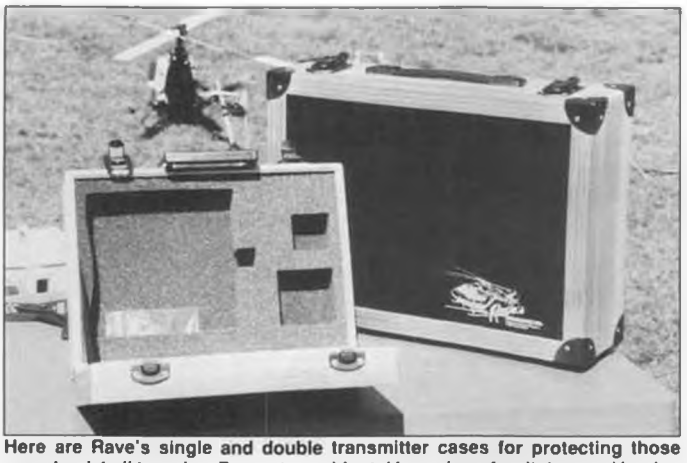
Aircraft's booth. Ted Schoonard and his wife, and my friend Jeff Lastofka, were at the booth. Jeff showed me the new engineering work that Miniature Aircraft was doing. For instance, there is a new Delta-3 modification to improve the gust response of X-Cell model helicopters. Hmmm, sounds very familiar. It looks like about 10 degrees of positive Delta-3 angle. Jeff said he definitely noticed an improvement in stability in the wind. I believe Jeff, he is a very honest fellow, and a good pilot. Jeff also showed me MA's new torque tube tail drive system. Instead of using a 2mm wire for driving the tail rotor, he said it is replaced by a carbon graphite tube about 1/4-inch in diameter. It is similar to what modern arrow shafts are made of, in fact, they might be arrow shafts. At each end of the torque tube is a universal joint. Ted says these joints are all done by C.N.C. machining. The tube is supported by two ball bearings. The torque tube drive system is available for X-Cell and Schluter helicopters. It costs around $50 a set. It is a luxury item. My friend describes these luxury items as similar to things that you see in Sharper Image catalog, "All the things that you wish you had, but you don't really need." Who knows, maybe the torque tube drive will provide more constant tail rotor rpm and improve yaw control. I am presently installing one of these torque tubes in the Magic. After I put in a few gallons of fuel I will let you know how this hi-tech system works. By the way, the Army has spent a lot of money researching on composite torque tubes for real helicopter tail drives, and here we have tube drive operating on model helicopters already!

Other new items from Miniature Aircraft USA include white color side frames and tail boom. These frames are white powder coated and baked at 400 degrees in an oven. They looked very pretty. It's an industry first to have baked white frames. I am now flying a set of MA's symmetrical airfoil fiberglass main rotor blades on my Kalt Excalibur. I was using the Len Mount/GMP reflex fiberglass blades before, but the MA symmetrical blades improved the hover, but slowed down forward flight slightly. If you are into scale and smooth flying, then these symmetrical airfoil fiberglass blades are great. They are $139 a pair. I have not tried MA's reflex airfoil fiberglass blades, I suspect that they



TSK Black Star mechanics. Top quality machining, and top price. Limited production.

For the heli nut who thought he had everything, E&G Enterprise's vinyl landing pads! Great for shooting autorotation spot landings. Plastic Jet Ranger fuselage also by E&G.



Here are Rave's single and double transmitter cases for protecting those megabuck heli trannies. Prevents accidental bumping of switches and knobs, too.

All pushrods on Hobby Dynamics/Kalt Enforcer are straight, to prevent buckling. Cone start from top. Frames and struts are glass-filled nylon. Plastic swashplate. Hingeless main rotor head with steel flexbeam.

should give similar aerobatic performance to Len Mount's reflex blades.

Rave's Manufacturing had their display adjoining to Miniature's. Rave's displayed the Heim and Vario product line, and Rave's tool kits and transmitter cases. If you have any questions regarding X-Cell or other MA products, give Ted or Tim a call. They are there to help you. They are there 9 a.m. to 5 p.m. (eastern), five days a week. Other Miniature Aircraft exclusive product lines include: Graupner/Heim helicopters, JMW gyros, NHP carbon fiber tail rotor blades, Peacemaker, Supertune, and Magna-Pipe exhaust systems, Rotorsport blades, Power Concepts engine blueprinting services, Hobby Kingdom products, and G.E. Model products. MA's technical hotline number can be found in the ad.

On the next aisle was the GMP booth. It is at the same location every year. The focal point was their new "Made in the USA" display board. As of 1990, GMP no longer distributes Hirobo helicopters, and GMP no longer buys some of their parts from Hirobo of Japan. Instead, John says all the parts are now made in USA to reduce cost and provide even better quality control. Greg Milosevich, a top GMP pilot, showed me the new molded tail rotor gear box, new main and tail blade holders, new drive gears, new in-line swashplate, and other made-in-USA parts. The helicopters on display included the Cobra, King Cobra, the new Legend Elite

Here's a real useful tool available from Bondhus. High quality metric socket wrenches and Allen drivers from Wiha of Germany. We need 5.5 and 7mm. The 8mm is also good for accessing glow plug on Schluter and other helis.

for serious fliers, and Rebel for total beginners. As we reviewed the Rebel in April issue, we will move on. At the end of the show, John told me that 25 Rebels were sold at the show. Well, at less than $250 a kit, it is an inexpensive way to start in this hobby.

At the Futaba booth, Steve Helms said nothing was new in heli radio. The successful 1024 9UVH and 7UH remain their top selling products. So, if you want a Futaba radio, might as well buy now, because they will not be introducing new heli radios this year. By the end of the summer, Futaba may bring out upgrade software to further enhance the features of the programmable 1024 radios. For existing owners, you just need to send in the transmitter and about $80 to upgrade the software. There will be features like reversing direction rudder mixing. Steve also said he was testing some new YS helicopter engines. In the summer, Futaba will announce their 1991 radio exchange program.

Down the aisle, Bob Renaud, president of Airtronics, showed me the new programmable helicopter Vision radio. It was only a demo model, the actual product will not be ready until summer. Unlike Futaba and JR radios, the Vision is completely designed in the USA. It has a 32-bit microprocessor, I forgot how many Ks of memory, but I remember it has more memory than my first Apple II computer! It is a 10-channel system. Of course, it has five pitch curves, idle-ups, exponential and dual rates, throttle hold, and all the features that a top pilot needs, and much more. The neatest feature is a

continued on page 93

Rave Mfg.'s tool kit for helis. Includes metric Allen and nut drivers, pitch gauge and flybar lock for setting main rotor blade pitch angle.

Donna Zimmerman holding new heli training gear unit with machined aluminum center hub for four dowels. Gear is a must for beginners.

CHOPPER CHATTER

BY JAMES WANG

Concept 30 with Hughes 500 body. Aerodynamic shape of fuselage tends to pitch the model's nose up in forward flight. Note tiny GMP base-loaded antenna on landing strut.

Columnist's friend, Peter Cooke, flying Jimmy Carter's Concept Jet Ranger. No, it's not "Peanuts" Carter! Peter is a natural pilot, can perform loops, rolls, and all FAI maneuvers with the Ranger.

In the June 1989 issue of *Model Builder,* we reviewed the Concept 30 model helicopter. Since that review, we have gone through at least fifteen gallons of fuel on that machine. After all these flights, I still think it is probably one of the best little helicopters on the market. Due to the success of the Concept, almost every major model helicopter company now has a 30-size machine; X-Cell 30 is already out for half a year, Kalt will be shipping the new Enforcer 30 to the U.S. this summer. Maybe GMP will be joining with an original design, too.

For each helicopter that I reviewed in *Model Builder,* I will try to have a full updated article after I put in a couple of hundred flights. After so many flights I will be able to tell you some things that I may have overlooked in the first review. By the way, the title of our series, "500 Flights Update," is chosen because it is a nice round number. I might not have done exactly 500 flights since the first review, which was just a year ago, but my conservative estimation is at least 200 flights. I figure 15 to 20 flights per gallon, and well over ten gallons of fuel were burned on my Concept. And my friend, Herman, borrowed my Concept and fed it another five gallons. If you compare the pictures of my helicopters in the first review and the update review, the models in the update article always look older and usually have some bruises. The bottom line is, I like to push my helicopter to the edge of the flying envelope, and I like to fly fast! By the way, spare time is running scarce in my schedule, but we are still working on setting the new R/C helicopter speed record. Hopefully, when summer comes on the East Coast, we will resume exhaustive flight tests.

This month we will go over numerous new accessories to soup up the Concept. Some are useful, and some are not. In this issue we have also prepared a report on helicopter products exhibited at the January International Modeler Show in Pasadena, California. Next month we will look at Kalt's Excalibur and offer a technical article on helicopter control sensitivity. In subsequent issues, we will discuss airfoils for helicopters, and

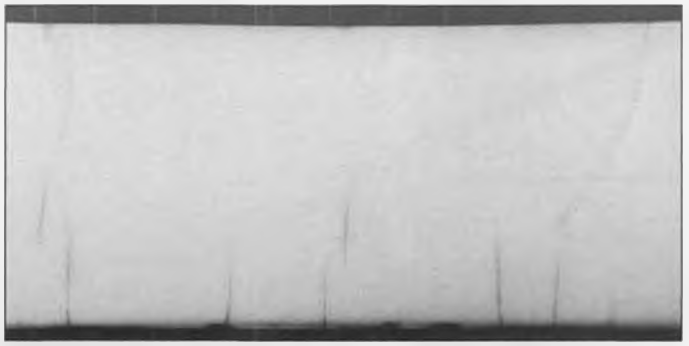
Tim Lampe's Hughes 500 with optional green stripe decals. Below it are some Concept accessories and four types of Kyosho blades, on exhibit at IMS Pasadena.

Kyosho Jet Ranger kit comes in three pieces. Extremely easy to put together. Columnist did it in three hours. Includes white landing struts and large decal sheet. Other decals optional.

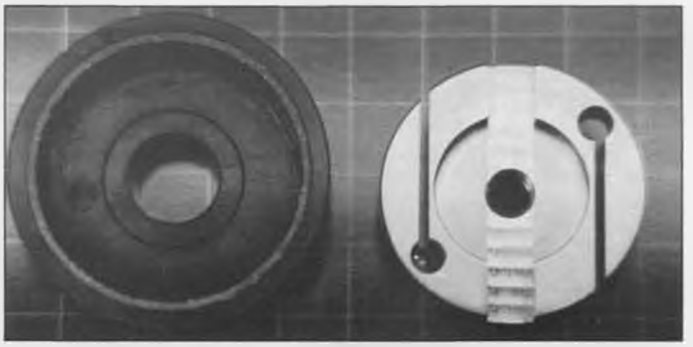
Hughes 300 kit is quickest way to convert Concept 30 into a scale ship. Not very scale close up, but looks very good in the air. Flies well, but big canopy slows forward speed a little.

Author's Concept still flying great, right side up or inverted, after more than a couple hundred hops. Red box on right contains an electronic stability augmentation system developed five years ago by author. It's like an autopilot.

If you should break the tinted windscreen on your Concept, a quick substitute can be cut from a two-liter soda bottle. Each bottle will make two. Tim Lampe suggests using double-sided tape for mounting, so it will pop off in crash. Think positive, Tim!



Hairline cracks developed on stock foam blades, after many flights and a few turnovers. Read text for more comments.



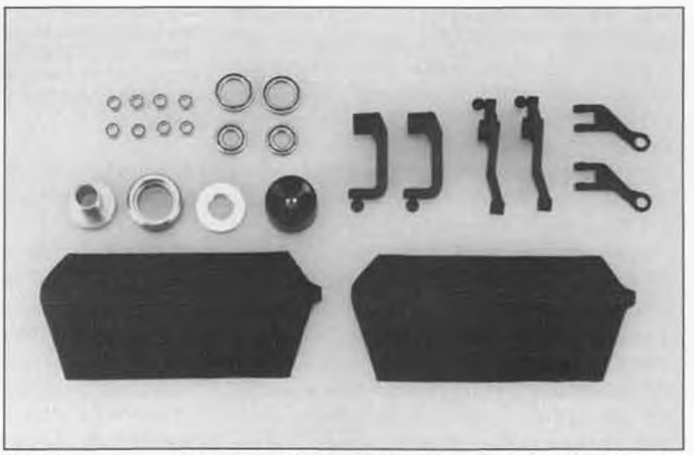
Old clutch and plastic drive gear. New clutch has more meat where shoes spring out, making clutch last longer. New drive gears have two removable plastic bushings.

then helicopter acoustics. If I can find time to build a new X-Cell 60 Custom, then we will even have a review on that.

Mark June 9th and 10th on your calendar. *Model Builder* magazine and Great Planes, the U.S. importer of Concept, and other helicopter manufacturers, will be sponsoring the First Annual Kyosho/Model Builder 30-size only helicopter contest in Champaign, Illinois. Champaign is about 200 miles south of Chicago, and is the home base of three of the largest model product distributors in the U.S.: Great Planes, Hobby Dynamics, and Horizon. The contest will have four categories; scale, beginner, intermediate, and FAI. AMA rules will be followed. All helicopter manufacturers have been invited to attend and do demos. It should be an outstanding helicopter event. There will be great prizes, trophies, free flying sessions, and a dinner picnic at the flying field on Saturday. I asked Tim Lampe if we could also have 30-size helicopter pylon racing for fun. At the 1989 Rave's Funfly, Gary Frank, Jim O'Brien, and I were doing pylon racing with our Concepts and Shuttle. That was the most fun I have ever had with model choppers. It really gets the adrenalin going. Helicopter pylon racing is far more exciting and enjoyable to watch and participate in than helicopter drag racing. Well, Tim, how about it? For more information on the contest, or any technical question on Concept 30 helicopters, please call Tim Lampe on Great Planes' Helicopter Hotline. The number is (217)398-2834. Either Tim, Dave, or their associates will be glad to help you out on the Concept 30 product line.

Before we start on the Concept, the first advice for this month is; always start out by building the model helicopter according to kit instructions. After you have flown it, then you can try new accessories, or do the modifications that we, or other people rec-

Vortex Precision Products' imported tune-up accessories; tail blades, metal tail pitch plate, K&S paddles, tail rotor control rod bracket, metal starting cone, steel feathering spindle, K&S exhaust system, tail rotor drive tube, head button.

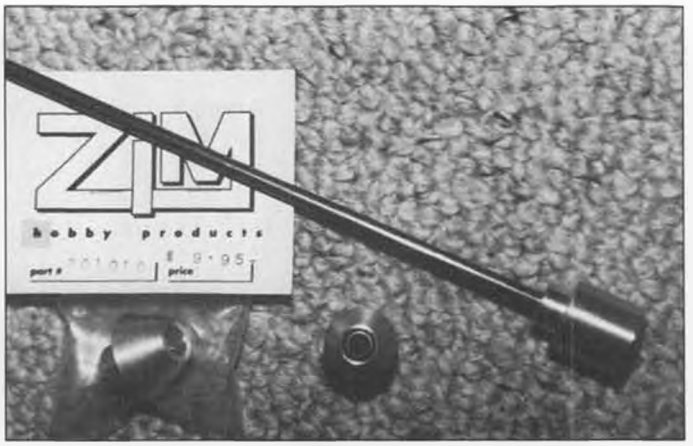


All parts necessary to convert a Concept DX to SE. Part numbers listed in text. Conversion costs $139.60. Some are useful and some are not...

EZ Brand Bell 222 distributed by Global Hobby. Has more detail than Kyosho, is lighter, but a little more fragile. EZ fuselages are the only ones that come with windows pre-cut.

Kyosho's balancer for main and tail rotor blades. Costs $38.95. Text explains how to achieve quick blade balancing for any helicopter.

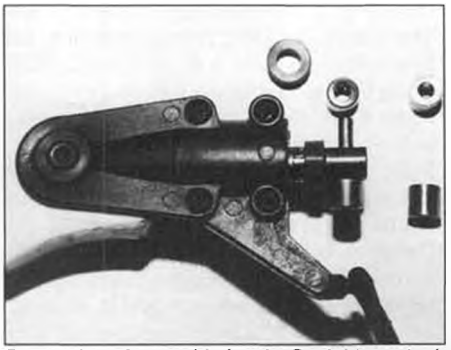
Author's Concept 30 after crash from inverted flight because of insufficient negative pitch. But it does fly great inverted!. Note MACS 30-size aircraft tuned pipe system. Works better than MACS 30 heli pipe system.



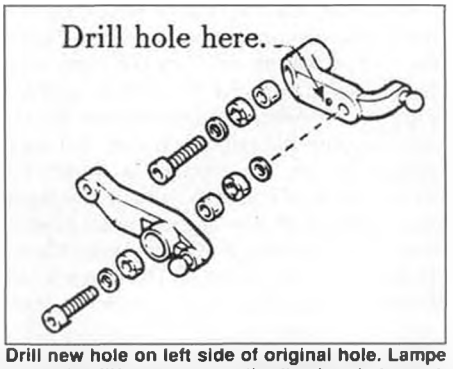
Zimmerman engine starting cones and shaft from Hobby Hutch. Inside cone is Torrington one-way bearing. Great for Concept scale fuselage.

ommend to you. Not every accessory or modification will benefit your style of flying. For instance, if you do not fly helicopters inverted, then there is no need to modify the Concept for 20 degrees of collective throw. The second advice for this month is for people who are doing forward flight already; when you lose orientation of your model helicopter because it is too far away or for other reasons, the solution is to INCREASE POWER and PUSH THE CYCLIC STICK FORWARD. The rationale is that you want to gain altitude, and forward cyclic will start the helicopter moving forward again. Once the model gets moving forward, you will recognize which way the model's nose must be oriented. For people who also fly fixed wing model airplanes, this may be opposite to their habit. Inexperienced airplane fliers tend to chop power and pull up when in doubt.

I have been flying model airplanes and choppers since 1973. Sometimes I still get confused and input airplane type commands when flying helicopters. For example, to fly a chopper upside down, you can use the invert switch which automatically reverses the collective pitch, rudder and elevator signals, so the chopper will handle the same as if it is right side up. In other words, pulling back on the elevator stick will cause the model to climb. However, when I am using the invert switch to fly my helicopter upside-down, I have the residual thinking from airplane days that pulling back will cause the nose to dive. Thus, I sometimes gives forward stick while inverted, and that wakes me up real fast because the model starts diving!



Concept's main rotor blade grip. On right are stock brass bushings for feathering spindle. Replacing them with KYOE5010 needle bearings is negligible improvement. Red O-ring KYOE515 on left is harder rubber damper that slightly quickens cyclic controls.



Drill new hole on left side of original hole. Lampe says this will increase overall collective pitch travel, but with a slight reduction of Bell-Hiller feedback effect.

The in thing to do now is to learn to fly helicopters inverted without using any invert switch on the transmitter. People like Mike Mas, Curtiss Youngblood, and some of my friends, are self-trained to reverse the helicopter controls mentally (just like flying airplanes upside-down). I am also practicing that now. It is challenging and fun! Yesterday, while doing inverted flight, I flew too far away and lost orientation. Naturally, I did half a loop which made the model right side up again. However, it was too far away and I just couldn't see it. The model got into a hovering mode a couple hundred feet away. I committed the cardinal sin... I did not push forward nor increase power at the same time. I got into a brain-lock mode. Less than two seconds later, my Competitor bit the dust. Therefore, condition your brain to automatically punch full power and add slight forward stick when you lose orientation. I usually do that, except I must have

ALL THE LATEST ACCESSORIES FOR YOUR KYOSHO CONCEPT 30

	Retail
KYOE1160 Pro main blades (foam)	$35.95
*KYOE4220 Red decals for Hughes 500	17.95
KYOE5010 Feathering shaft bearings	25.95
KYOE5020 Black tail boom	15.95
KYOE5032 *Expert* weighted laminated wood blades	42.95
KYOE5023 *Deluxe* pre-weighted and covered one piece blades (w/lightening holes)	37.95
KYOE5034 *Sport* one piece wood blades weighted	19.95
KYOE5050 Tail link guides (hold outer rail tube to boom)	4.95
KYOE2052 Main gear shims (10 pack)	1.60
KYOE2170 New drive gear w/metal lining and plastic bushings (same "N" as old)	11.95
KYOE5044 Ball bearings for new drive gear (2 per pack)	24.95
KYOE3052 White tail gear casing	8.95
KYOE5017 Canopy only for Concept (windshield)	6.95
KYOE3090 One piece tail blade	7.90
KYOE5038 Metal joint set	7.25
KYOE5054 Servo ball link set	14.35
KYOE5015 Red dampers (hard, 10 pack)	7.95
KYOE5035 Aluminum starter cone	14.95
KYOE5036 White pull starter knob for scale fuselages	11.95
KYOE5052 Tracking tape	5.95
KYOE4177 Optional decals for Jet Ranger - blue	18 30
KYOE4178 Optional decals for Jet Ranger - red	18.30
*KYOE4179 Optional decals for Jet Ranger - green	18.30
KYOE5031 Heat shrink for wood blades (enough for two sets of blades)	3.90
*KYOE4065 Optional decals for standard Concept body (blue,orange,yellow)	12.30
KYOE5037 Recoil starter	39.95
KYOE5080 Stabilizer rod set (2 pcs. no. 8 stabilizer rod, one pc., no. 30 aileron link rod)	2.50
KYOE5070 Elevator link rod (2 pcs. no. 31 elevator link rod	1.60
KYOE5060 Cyclic lever link (2 pcs. no. 24 cyclic lever link)	1.60
KYOE5055 Ball end set (11 pcs. no. 10 ball end [m], 2 pcs. no. 90 ball end [s])	4.79
KYOE5018 Feathering shafts alone (2)	7.55
*KYOQ1000 Trim sheet - red	4 70
*KYOQ1005 Trim sheet - light blue	4.70
*KYOQ1010 Trim sheet - yellow	4.70
*KYOQ1015 Trim sheet - white	4.70
*KYOQ1020 Trim sheet - royal blue	4.70
*KYOQ1025 Trim sheet - orange	4.70
*KYOQ1030 Trim sheet - black	4.70
*KYOQ1035 Trim sheet - light green	4.70
KYOQ1050 Military decals - small	7.90
KYOQ1055 Military decals - medium	7.90
KYOQ1060 Numbers assortment decals	7.90
KYOE6000 Blade balancer (C.G. and weight)	38.95
KYOE5085 Kyosho muffler for use with scale bodies	49 95
KYOE5095 Starter extension w/one way bearing	53.95
KYOE5100 Titanium main shaft	28.95
KYOE4095 Landing gear braces only (white)	13.95
*KYOE4225 Optional decals for Hughes 500 - green	17.95
KYOE5090 Metal swashplate	77.95

**Sticks very well to the plastic used in Kyosho fuselages. Goes well around curves.*

30-SIZE FUSELAGES

Manufacturer	Model	Material	Color	Retail	Telephone
Kyosho	Jet Ranger	Same as	White	$179.95	(217)398-2834
Hughes	500	Concept	White	159.95	
Hughes	500	Canopy	White	74.95	
EZ	Jet Ranger	Special Plastic	White	119.99	(714)963-9634
	Bell 222	Plastic	White	139.99	
E&G	Jet Ranger	Clear Acetate	Transparent	99.95	(714)859-2030
Hughes	530	Clear Acetate	Transparent	119.95	
	Bell 222	Clear Acetate	Transparent	119.95	
Century Import	Airwolf	Special Plastic	Prepainted	129.95	(408)436-1325
RC Systems	Hughes 500	Clear Acetate	Transparent	69.95	(513)575-HELI
	Jet Ranger	Fiberglass	Unpainted	129.95	

been hungry yesterday and just brain locked. *(Third advice; always eat before flying! wcn)*

Since the introduction of the Concept 30 to the U.S. in 1989, Kyosho worked very quickly to come up with a long list of accessories for the model. Rather than spending paragraphs explaining all the new stuff, they are all listed in Table 1. I have tried most of them. Some are more useful and functional than others. I will go over some of the more functional ones here. The recoil starter is a nice gadget. It simply bolts on to the rear of the Concept 30 and allows you to start the engine like a lawn mower; by pulling on a spring-loaded rope. It works great! But make sure that you have a well broken-in engine before you install this unit. You should put in at least 20 to 30 flights to loosen the engine, then install the recoil starter. Otherwise, it may be difficult to pull-start a tight, high compression engine.

The one-piece bearingless tail rotor blade is now available in the U.S. It is $7.90 and I like it very much. However, I noticed that it reduces the tail rotor control sensitivity slightly because the pirouettes are slower now. Kyosho now has four different main rotor blade designs for the Concept. From the least expensive to the most expensive, they are: one-piece wood SPORT rotor blade, stock foam PRO blades that come with the kit, DELUXE wood blades with lightening holes at the trailing edge, and EXPERT wood blades made of multi-laminations of different weight wood. I have tried them all, and my favorite for all-around flying is still the stock foam blade that came with the kit. But the foam blades only weigh around 65 grams each, which makes the control very lively, and there is not enough inertia to stretch out a poorly planned autorotation. But the 27% forward chordwise cg location of the foam blade improves the helicopter stability. All three other wood blades come with lead weight. The Sport blades weigh 70 grams, the Deluxe and Expert weigh about 80 grams. Alex Gauss, of IBS Corporation, makes nice white, gelcoated fiberglass blades for the Concept that weigh 95 grams each. They come prebalanced and ready to fly for $69 a pair. Considering the extra work in manufacturing these weighted fiberglass blades, it's worth that extra $20. Call Alex at (803)485-4210 to order. Alex also makes those fancy three-airfoil, swept tip rotor blades for Magic and other 60-size helicopters.

There are now many 30-size fuselages for Concept 30 and other 30 size model helicopters. Again, to save space, I have listed the ones that I know, or have flown in Table 2. I have flown the EZ fuselage and all three Kyosho fuselages, and surprisingly, the fuselages do not degrade Concept 30's performance. In the January 1990 issue, I said the E&G Hughes 530 fuselage made the Shuttle fly slower and less aerobatic. However, the Hughes 500 fuselage did not make the Concept any slower or more sluggish. But on both helicopters, the Hughes 500 egg-shaped fuselage made the model pitch nose-up in forward flight. This is due to the aerodynamic shape of the Hughes 500 body. The solution, as pointed out in the January column, is to angle the horizontal stabilizer at about 10 degrees positive incidence (like down elevator on airplanes).

The Kyosho fuselages are very easy to put together. They have less parts than EZs, but EZs have more scale details. Kyosho's fuselages are made of polyethylene, which is the same material as the Concept canopy. To paint Concept's canopy or scale fuselages, Tim Lampe, of Great Planes, recommends wet sanding the body with 400 grade sandpaper. Make sure the corners are sanded well. Then spray the body with Formula-U polyurethane paint or any other enamel or epoxy spray paint. Wet sanding means wetting the sanding surface and sandpaper in water, and keeping them wet while sanding. There are special wet-or-dry sandpapers. They have a waterproof backing which is usually black. Wet sanding technique is used because it cuts into the surface faster and without clogging up the sandpaper. Wet sanding is great for sanding down fiberglass fuselages. It also prevents fiberglass powder from flying everywhere.

To save time, both Kyosho and EZ fuselages come in white, and include a large colorful decal sheet. Table 1 shows there are other optional color scheme decal sheets. Both Jet Ranger fuselages added only about 13 ounces. But as a canopy is not used, you only add about 8 ounces in reality. The bottom line is, the resulting Concept still does loops and rolls. But on the Hughes 300, I did feel the large frontal area reduced the

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PRODUCTS IN USE

BY JAMES WANG

KALT "CYCLONE II" JR MAX 5H FM

HELICOPTER HELI R/C SYSTEM

Conclusion

A new JR MAX 5H FM helicopter radio was installed. At first, I was using an ancient wideband JR Unlimited 8 AM radio. Occasionally, I was getting glitches. With the new narrow band MAX 5H, the glitches disappeared. Originally, an eight year old JR-100 gyro was installed. But flight tests showed the gyro was too sensitive. At large gain setting, the tail is twitchey, at small gain setting, the gyro is useless. Maybe that's why the old JR-100 gyro was never popular! An inexpensive GMP gyro was then installed and worked beautifully. The new JR-120 gyro that was introduced last year is a quantum improvement over the old JR-100 gyro. Besides improved mechanics, I suspect internal electronic damping and low-pass filtering may have been added, because the new gyro does not cause the helicopter's tail to hunt at any gyro setting. We will talk about the 120 gyro in our Excalibur review.

Five JR-507 servos were used. These are JR's standard servos. For sport flying, non-ball bearing servos are sufficient. Some of my old 500 series servos have seen over a thousand flights, survived umpteen crashes, and still tick. They are economy, no-frills work horses. By the way, JR and Airtronics servo arms have identical splines, so you can interchange them, but not with Futaba. However, JR servo plugs will fit Futaba, but will not plug into Airtronics radios because the plus and minus wires are reversed.

A praising feature of the MAX 5H is that it comes with five servos and a 1000 mAH receiver battery pack. The 1000 mAH Ni-Cd pack is ideally suited for operating both the servos and the extra electronic rate gyro. Even though I have tried the Cyclone II with the gyro switched off, and it is one of the more stable models in yaw without a gyro, a gyro improves the yaw handling tremendously. The technical reasons why some models are more stable in yaw than others depends on the tail rotor size, airfoil shape, location, and rpm. In general, large tail rotor diameter improves yaw stability in hover because when there is an unwanted heading change, the large tail rotor disk sees a bigger aerodynamic inflow change. Large inflow change causes large tail rotor thrust change, which aerodynamically damps out the yawing motion. The airfoil shape only plays a minor role. The higher the tail rotor is mounted, usually the better. On the full-size S-60 Blackhawk and AH-64 Apache, the tail rotor is mounted at the top of the vertical fin. This minimizes the roll and yaw control coupling. Thus, you can perform a slow, level pirouette with less pitch and roll corrections. High tail rotor rpm quickens yaw control. Low rpm reduces yaw sensitivity to gusts and perturbations.

The MAX 5H is designed for the beginners, so it does not have all the bells-and-whistles. It does have the essentials, such as servo reversing for all five channels, high and low end pitch curve adjusts, throttle hold, electronic tail rotor mixing, and JR's exclusive double rachet trims on the transmitter. As Cyclone is not intended for heavy-duty aerobatics, the MAX 5H makes a nice combination. With a retail price of $399, it is one of the least expensive helicopter radio systems, and it comes with five servos. And, it meets AMA's 1991 narrow band requirements.

Now, let's talk about the Cyclone II flying qualities. The center of attention of this new kit is the K-5 rotor head design. It is very well engineered. The entire rotor head is made from injection molded parts. The blade grips strongly resemble X-Cells. K-5 has one of the highest Bell-Hiller mixing of all the collective pitch rotor head designs (I measured about 90%. January 1990 *MB* explained the Bell-Hiller principle). The K-5 may be molded from plastic, but it has ball bearings at all the crucial areas. The head alone has 14 ball bearings. Each blade grip has two radial bearings and one thrust bearing. Even though the K-5 is a Japanese design, it has some European flavor. It does not use the traditional Japanese style of a single rubber bushing for main rotor stiffness. Instead, K-5 is like the now popular floating axle design found on Heim, Schluter, X-Cell, and Shuttle, all of which use an O-ring at either end of the steel cross shaft for head stiffness. When the blades flap, the O-rings are compressed to give the "spring stiffness effect." This spring stiffness is needed on all helicopters for good control response. Soft spring gives soft control, and stiff spring gives quick control responses. (Note, please use the technically correct jargon, "rotor stiffness." The common saying such as, "adjusting the rotor damping," is incorrect! The rubber damper acts like a spring, not like a damper!) K-5 uniquely differs from the floating axle design by also having a traditional Japanese style teetering pin at the center of the cross shaft. Thus, the cross shaft is not really floating inside the rotor hub. I think the K-5 is a very good design. The K-5 will fit any model helicopter with a 10mm main rotor shaft. That means it can be fitted to GMP, MAS, Hirobo, and Schluter machines. (See the rotor head illustration.)

If you put your hands on a GMP rotor head, and try to tilt the rotor head, you would feel a deadband of slop first, then the rubber damper's springing action suddenly comes in. This is the drawback of a pivoting teetering rotor system. On the other hand, if you try to tilt a Schluter or X-Cell floating axle rotor head, you will feel very even spring restoring force. There is very little deadband. However, the floating axle design is, theoretically, slightly dynamically less stable than the underslung teetering design. Thus, both designs have their advantages and disadvantages. K-5's combination of pivot and O-rings seems very novel. It has the advantage of teetering rotor with a true teetering pivot location, and it also utilizes

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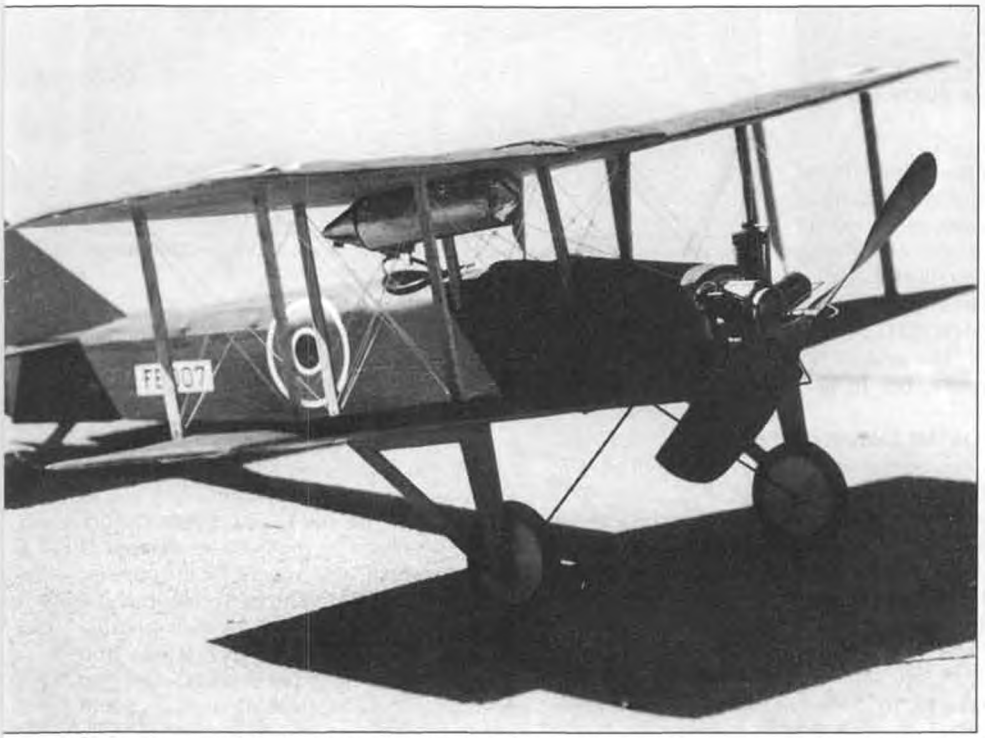
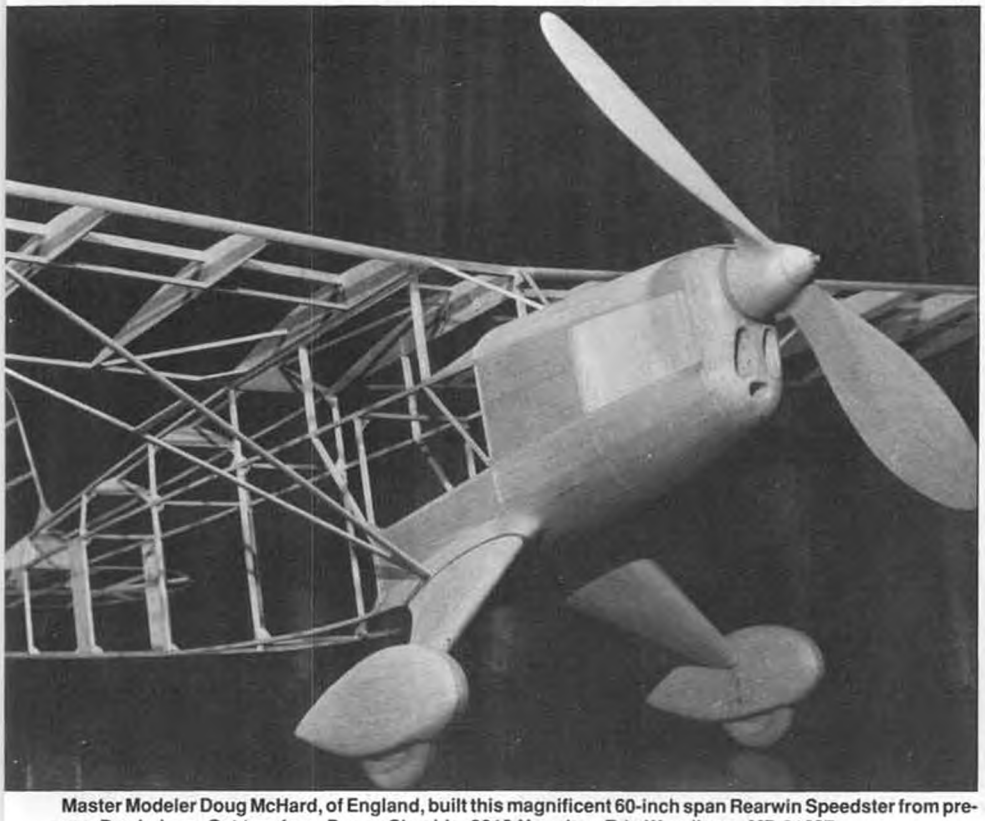
HANNAN'S HANGER

BY BILL HANNAN

"Our experiments have been conducted entirely at our own expense."



Jake Larson, from Florida, built this highly detailed Peanut B.A.T. "Baboon," from Walt Mooney plans in *Model Builder*.



Master Modeler Doug McHard, of England, built this magnificent 60-inch span Rearwin Speedster from pre-war Burd plans. Get 'em from Danny Sheelds, 2318 Noonhan Rd., Woodlawn, MD 21207.

Our lead-in line this month, via Herb Weiss, is by Wilbur and Orville Wright, originally appearing in *The Century Magazine* of September 1908, and reprinted in the book *Early Flight*, during 1987.

Most model builders also conduct experiments at their own expense—which might contribute to the satisfaction involved. If no one else is paying for the project, one is totally free to make every decision.

A similar sentiment was expressed in a letter published in *The Aero*, June 1909 issue (the year after the Wright's quotation) from which we have extracted: "The inventor or enthusiast—you will generally find both go together—who cannot build or make a model embodying and illustrating his particular invention does not deserve to be listened to, for the cost of model making is not great, a few lengths of timber, a remnant of cloth, an elastic or clockwork motor, perseverance, and a little leisure, are all the ingredients necessary, and if one has to spend a few shillings now and then, surely the pleasure of seeing one's inventions realized is worth the outlay."

Incidentally, the foregoing is, by far, the longest single sentence ever to appear in this column!

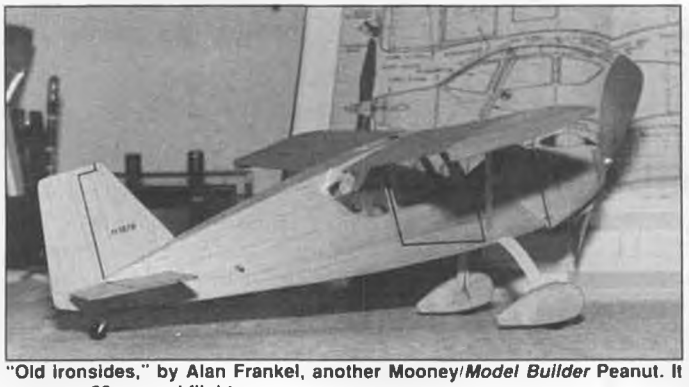
SPEAKING OF EXPERIMENTS

Herb Weiss recalls that during the pioneer era of aviation, there were contests conducted for bicycle-powered aviettes. One variety featured propellers, however others did not. The idea was to pedal furiously with the bicycle's wings set at a non-lifting incidence, then to quickly stop pedalling, increase the wing angle and soar off the ground. Herb would like to see the concept revived in miniature form. The model aviette would rely upon wheel traction only for propulsion—no catapults, no assisted takeoffs, no inclined ramps—with the objective of hopping from one card-table to another. Sounds to be quite a challenge. Any takers?

FLYING WINGS, ANYONE?

Certainly flying wings, both model and full-size, represent a continuing challenge, and have fascinated experimenters since the dawn of aviation.

Serge Krauss, Jr. has collected wing information for many years, and has recently compiled his *Tailless Aircraft Bibliograpy*, cross-referencing about 1500 documents which have dealt with subsonic flying wings. Among the listings we noted were some from *Model Builder* and other model publications. The volume presents a brief review of tailless aircraft developments, and mentions designers ranging from early genius Alphonse Penaud through Alexander Lippisch, Jack Northrop, Charles Zimmerman, and Waldo Waterman, as well as currently active proponents such as John Dyke (Dyke Deltas) and Al Backstrom (full-size "plank"



"Old Ironsides," by Alan Frankel, another Mooney/*Model Builder* Peanut. It averages 30-second flights.

Dick Johnson, Texas, created this "Lo-Cal" version of the Vought/Zimmerman V-173 "Flying Flapjack," one of Dick's favorite subjects.

configurations and a multitude of models).

Compiler Krauss defines tailless aircraft in a broad sense, including references to such unconventional platforms as the Lee-Richards annulars and the Julian Wolkovitch joined-wings. We enjoyed the description of the highly motivated and tireless experimenters down through the ages: "... ranging from naively enthusiastic amateurs to some of the most able and resourceful aeronautical researchers ever, who carried the tailless idea forward against heavy resistance."

This rather specialized bibliography may, as its compiler suggests, "... provide a key to new knowledge, inspiration, and adventure." Copies of the 121-page, spirally-bound book are available from Serge Krauss, Jr., 3114 Edgehill Rd., Cleveland Hts., OH 44118, for $20 postpaid in the U.S.A. Please tell him *Model Builder* sent you!

BOO-BOO DEPARTMENT

Robert Wynne, of Mercer Island, Washington, wrote in to gently chide us that the quotation employed in our March 1990 column ("It is so simple even a child could do it. Unfortunately, no child was around so I had to do it all by myself.") should have been credited to him, rather than Lee Spencer, editor of *Sportsman Aviation Booster,* in which the item appeared.

Then, in our April 1990 column, in the FUN, NOT OVERREGULATION item, the quotation from Ron Moulton should have closed at the end of the first paragraph. The remainder of the item was a part of our editorial, except for the other brief quotations. Apologies all around.

THOUGHT FOR THE DAY:

"The end of science is not to prove a theory, but to improve mankind." Manly Hall.

FORTHCOMING EVENTS

This year promises some especially exciting contest opportunities. Even non-competitors should attend as spectators to be inspired! The World Championships and U.S. Indoor Nationals, June 4th through the 9th in the marvelous Johnson City, Tennessee Mini-Dome will include everything from Pistachio Scale through microfilm models. Complete information is available from A.J. Italiano, 1655 Revere Drive, Brookfield, WI 53005.

If outdoor flying is your specialty, consider the July 13 through 15 Flying Aces Nationals in Geneseo, New York, which traditionally attracts more flying scale models than any other contest anywhere. Low-cost lodgings, an aviation museum to explore, and events to suit almost any taste make this a unique event. Full details may be obtained from Lin Reichel, 3301 Cindy Lane, Erie, PA 16506.

October 16 through 20 are the days for the AMA and National Free Flight Society Outdoor Championships, Society of Antique Modelers, and another Flying Aces contest. Write to USOC, 4760 N. Battin, Wichita, KS 67220 for descriptive literature.

Eastern United States indoor fliers may care to send for information concerning future activities to: Fred Dippel, 2 David Court, Glen Cove, NY 11542. One category being promoted in the New York area is Comet/Megow Ten-Centers, for the popular prewar kit designs. The performance now being extracted from the tiny stick-and-tissue fliers is nothing short of astounding. Bob Bender's winning Comet Corben Super Ace posted a three-flight duration total of 266 seconds. (We sure couldn't make them fly like that when we were youngsters!) If you would like to try one, contact: Bob McDow, 305 Carle Rd., Westbury, NY 11590.

When writing to any of the above contacts, please be certain to enclose a stamped, pre-addressed reply envelope, and it would be appreciated if you would also mention that you heard about these events from *MB's* Hangar.

THE LONG ISLAND AVIATION COUNTRY CLUB

continued on page 100

Bill Hannan formerly built control-liners. This ficticious Fokker Flying Wing was based on a Frank Ehling design from the '50s.

Enthusiastic Junior girls Holly (with Stringless Wonder) and Jesse (with Peck R.O.G.) Campbell, during Pax River contest. Tom Schmitt photo.

CONTROL LINE

BY JOHN THOMPSON

Charlie Bauer's electric powered, zooted up Piper Cub, seen in Sport Scale at the 1989 Nationals in Richland, WA. Took Second Place.

A few years ago some people were making gloomy statements such as "control line is dead!"

Well, OK, maybe it had a cold.

But the mail that flows into *Model Builder's* control line headquarters—much of it in the form of excellent club and special interest group newsletters—indicates that control line is blossoming all over the country.

As one of those specialized sectors of a broad-ranging hobby, it is more common in some pockets of the country than others. There have been some changes—detailed in past editions of this column—in where we get our materials and information about the hobby, but there's activity going on at some level almost everywhere. If isolated fliers use some of the tricks mentioned in past editions of this column to track them down, they'll find all kinds of fellow fliers.

The above is mentioned because your columnist's "In" basket is brim-full with encouraging bits of mail—new products, new contests, new fliers looking for information, etc. What follows is some of the highlights of a very busy month in the mailbag. What an exciting year 1990 has turned out to be!

GERIATRIC COMBAT, ETC.

In case there were doubters about the "Geriatric Combat" concept featured in the February edition of the *MB* control line column, a report from Neil Simpson, in Leicester, Massachusetts, should help convince them that it's an idea worth considering.

The February column detailed efforts by some New England fliers to revitalize combat in a couple of ways. First, they started an excellent and regularly published newsletter called *New England Combat News* to spread the word about regional activities. Second, they invented a new kind of combat that was designed to interest new fliers as well as to provide a little more relaxing form for the "old-timers." A new kind of matching and scoring and a speed limit were designed to cut down on collisions and make officiating as well as flying a little easier. See the February column for complete details.

Here's Neil's report on the early experiences with the new event:

"In the months that have passed since I last wrote you we have had four additional Geriatric contests (now often referred to as Formula GX) and interest in New England is definitely on the rise. Some of the ingredients that have been responsible for this renewed interest in control line combat are:

#1. The newsletter, *New England Combat News,* which has opened up a communication link between parties throughout New England. It has a readership... including combat people in four New England states.

#2. The 'Geriatric Combat' event (Formula GX) which for many reasons discussed previously appeals to a wide spectrum of participants, both veteran and novice.

#3. The simplicity of the Geriatric rule structure which (I know it seems complicated at first glance) allows a match to be officiated by one judge without any great difficulty. The judge uses one stopwatch to time the match. It is a running watch that is not stopped and started during the match. When both airplanes are in the sky the judge does not have to focus on the watch and can devote his attention to the airplanes principally to keep track of the number of cuts for and against each pilot. Two judges make this task a little easier; however, one judge is adequate.

#4. The ease with which a match is officiated, which has led to a judging system we call 'co-judging' by the participants. Three or four volunteers from the contestant ranks share judging duties and responsibilities in those matches in which they are not participating. This is not a perfect system but it does work well enough and definitely has let many contests come to fruition that wouldn't have otherwise. I'm not sure about anywhere else, but in New England, people willing to judge a combat contest are not easy to find.

#5. The cumulative scoring portion of the Geriatric rule structure, which has quickly provided us with a database from previous

Bill Rich was PAMPA Rookie of the Year in Precision Aerobatics at the 1989 Nationals. It's the "Vigilant," and he placed 12th.

contest results through which we could and did evaluate pilots' scoring history and classified them into three classes—those being novice, intermediate and expert. Beginning with the contest held on September 10, 1989, we began to give award(s) to the highest finishing flier(s) in each class. This is much like what PAMPA has done with the control line stunt event. The idea has been received well in New England.

"All of these aforementioned ingredients have led to increased interest and activity. There are nine New England combat contests already scheduled for 1990 and five, that I know of, are in the planning stage. The majority of these are Formula GX contests."

Fliers who would like to get in on the New England combat contest scene can do so by getting on the mailing list for *New England Combat News*. The newsletter is distributed free of charge—donations are accepted to cover costs—and includes the contest schedule, contest results, articles, letters and the advertisements for many kinds of control line supplies. To get on the mailing list, write to Neil Simpson, 87 Lake View Drive, Box 221, Leicester, MA 01524.

Heading all the way across the country to Southern California, we have news of a successful start to another contest series, which was detailed in the March control line column. It's the Southern California Foxberg Series, a yearlong six-contest series designed around the Fox .35 stunt engine and the Goldberg profile airplanes—Shoestring, Cosmic Wind, and Buster. Each contest features racing, stunt and balloon bust with the same airplane.

Kenn Smith reports that... "the warm-up contest was held January 4, and the series itself was scheduled for February 18, April 22, June 24, August 12, October 14 and December 2. The June and October contests are scheduled for the Whittier Narrows site in the Los Angeles area, and the August and December contests will be at Sepulveda Basin. Permanent trophies are planned."

Also in the planning is a newsletter intended to provide contest results, points standings, calendar and "secrets."

Kenn also announces that the very active Knights of the Round Circle plan to host their first annual Knights Joust on June 10 at Whittier Narrows.

"We are hoping to develop this meet into one of the nation's major control line contests," Kenn writes.

In other news, Kenn indicates that he plans to manufacture and sell metal fuel tanks similar to the Veco, Fox, and Taffinder styles but... "geared toward current modeling needs and those used in Old Time Stunt." They will include standard wedge, oval wedge, and profile tanks with standard, uniflow and pressure venting. Also planned is a custom tank service.

Kenn planned to have the business set up by the time you read this. For information, write Kenn Smith at 521 Jansen Ave., San Dimas, CA 91773.

One final product note from Kenn:

"About a year ago I started putting together 1/2A scale racer kits for the local fliers. Several others, namely George Hubschmidt and Bill Hopkins, of Custom Models in Dallas, got wind of them and placed orders. I still have several kits and would special build to order. My template assortment includes the Shoestring, Cosmic Wind, Bonzo, Long Midget, Estrellita, Cassutt, LaJollita, T-Tail Rivets, Owl and a couple of others I can't think of.

"I have kits ready to ship for the first five in the list above. They are $14.95 retail and include machine cut and sanded balsa and basswood parts, bellcrank/control horn, pushrod/leadout wires, aluminum landing gear with axles, Williams Bros. 1-inch streamlined wheels and retainers, engine mounts/hardware for both Tee Dee and reed valve engines (basically everything except engine, tank and finish).

"In the past 2-1/2 to three years since I've been back into model airplanes, I've seen a steady growth in control line model flying in this area. I anticipate this growth to continue."

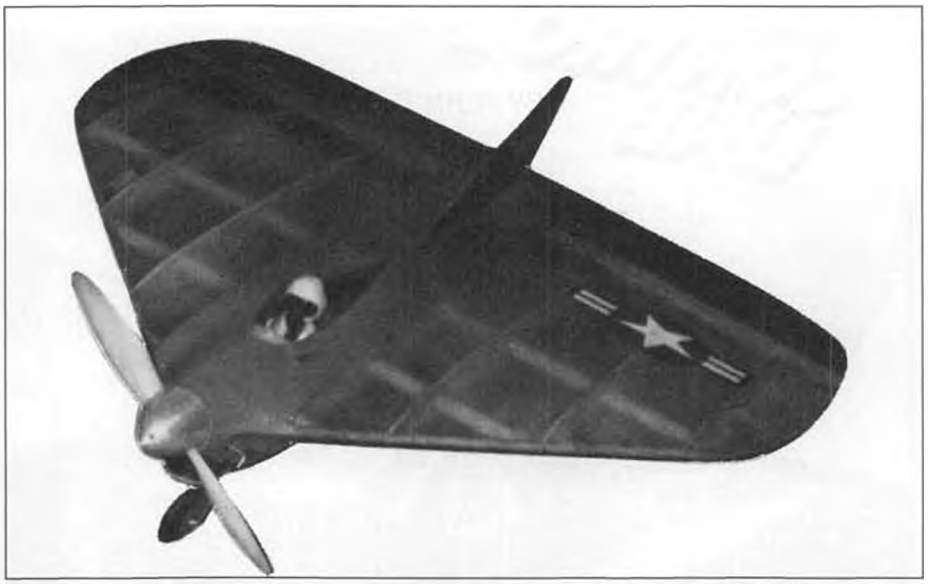


Photo from catalog of Vern Clements plans. He has plans available for this 1958 sport model design called "Safire." Was that Kingfish's girlfriend's name?

MORE AND MERRIER

Another new club has popped up, this one in Eastern Washington: the Columbia Basin Balsa Bashers.

Joe Just, writing in the *Skywriter,* the newsletter of the Seattle Skyraiders, reports:

"For the past 18 months, control line activity has been picking up around here and it has culminated in our forming a new control line/free-flight club in Eastern Washington. The club is called the "Columbia Basin Balsa Bashers" (Most members) are residents of the Tri-Cities area. We have applied to the AMA for a club charter.

"This past week we flew control line for a school near Pasco. For two hours the whole school complex turned out, from elementary grades to high school. This school dis-

continued on page 101

The Gee Bee Z, "City of Springfield" racing plane on the "Spitfire" strip at Old Croydon Aerodrome, 1987. Model and photo by Bernard Sexton. Plans from Vern Clements.

In Memory Of Walt Mooney... A Reprint Of His First Peanut Scale Design For Model Builder, Which Appeared In Volume One, Number One, Our First Issue.

Peanut Jodel by Ron Stoner and Clarence Mather. Plans courtesy of Bill Hannan's "Plans & Things," all photos by Fudo Takagi.

PEANUT SCALE JODEL `MASCARET´

BY WALT MOONEY . . . This is the first in a series of models to be presented by a gentleman whose name is synonymous with free-flight scale aircraft that DO fly. FULL SIZE PLANS on next two pages!!

●This little model was designed as a simple scale airplane suitable for flying indoors or out, in a field, or from the street corner. It can be a little disappointing for a designer sometimes and this Jodel turned out to fly far too well for the local street corner. Built according to the plans it is capable of flights of between 30 and 40 seconds indoors and outside it has done more than two minutes, and more than one builder has been worried about losing his in a thermal.

Construction of the model is about as simple as they come and still remain in the built-up category. About the only things that are different from straight forward rubber model construction are the wheel pants and the canopy which may be formed over wooden block molds with the aid of a Mattel "Vacu-form" toy. If you have a "Vacu-form" you'll know how to use it and all you'll have to do is carve balsa block molds to the shapes desired and then form the plastic to shape around them. If no Vacu-form is available you can make the pants out of balsa laminations. The canopy can be made out of two pieces without the bubbled contour on the windshield without hurting the appearance very much and without hurting the performance at all.

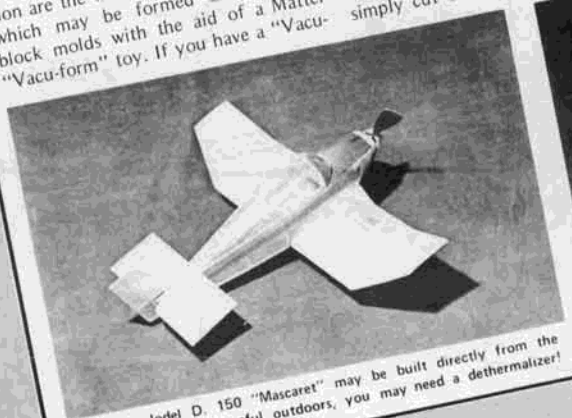
Use medium weight balsa for the sticks and light balsa for the sheet cutout items. The blocks at the nose can be harder and therefore heavier balsa.

I recommend the Northern Pacific products "Sleek-Streak" as a source of both the propeller and the wheels. They are both light and efficient. The tail wheel need not roll and thus can be simply cut out of sheet and cemented in place.

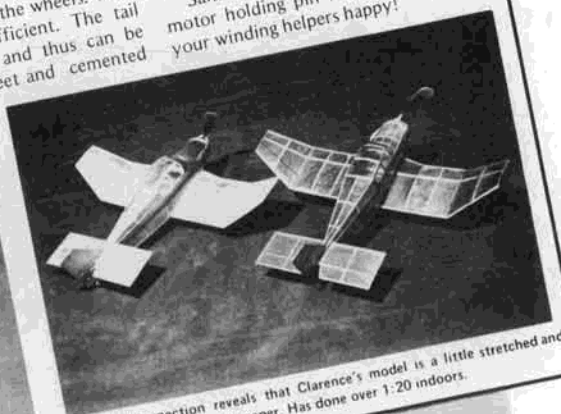
The model should be covered with your favorite colors of lightweight tissue. Superfine tissue is best. It should be shrunk with a very lightly sprayed on fog of water and when dry brush on a thin coat of clear dope. (2 parts thinner to 1 part of dope). The wings and tail should have only a single coat applied whereas the fuselage may have two coats with perhaps a third coat on the balsa parts at the nose.

Flying adjustments are noted on the plan. The power for indoor flying can be slightly heavier for a more snappy climb. Experiment but don't over do it. Remember that adding more rubber will move the balance point aft, so if you do, be sure to rebalance accordingly.

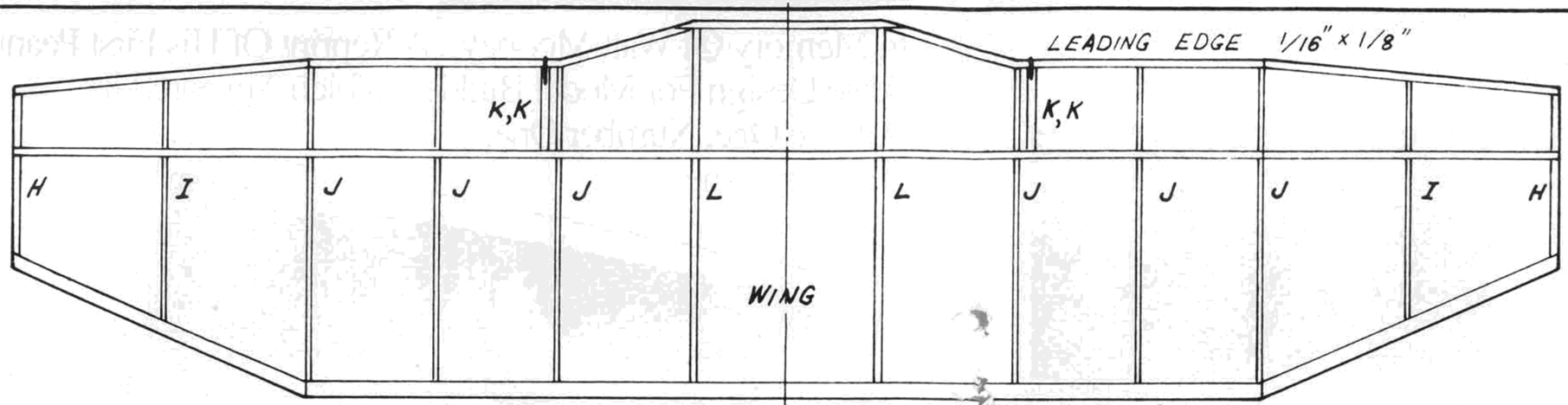
Sand or file the point off the rear motor holding pin if you want to keep your winding helpers happy!



The little Jodel D. 150 "Mascaret" may be built directly from the magazine plans. Be careful outdoors, you may need a dethermalizer!



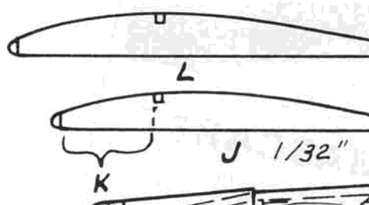
Careful inspection reveals that Clarence's model is a little stretched and covered with condenser paper. Has done over 1:20 indoors.

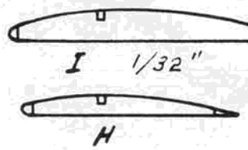


- MODEL MAY BE FLOWN WITH ONE LOOP OF 1/8" FLAT RUBBER 9" LONG.
- BALLAST TO GET C.G. AT POSITION SHOWN.
- TRAILING EDGE OF WING TIPS SHOULD BE 1/16" HIGHER THAN LEADING EDGE (WING SHOULD HAVE WASHOUT).

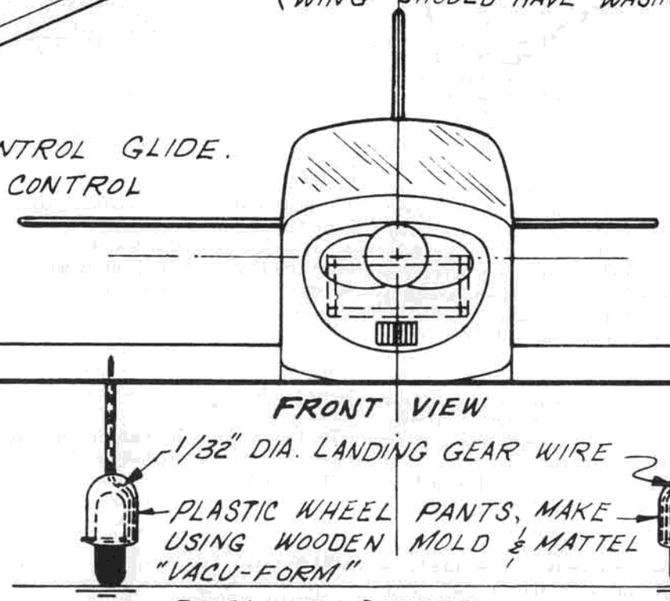
TRAILING EDGE 1/16" x 1/8" TAPERED

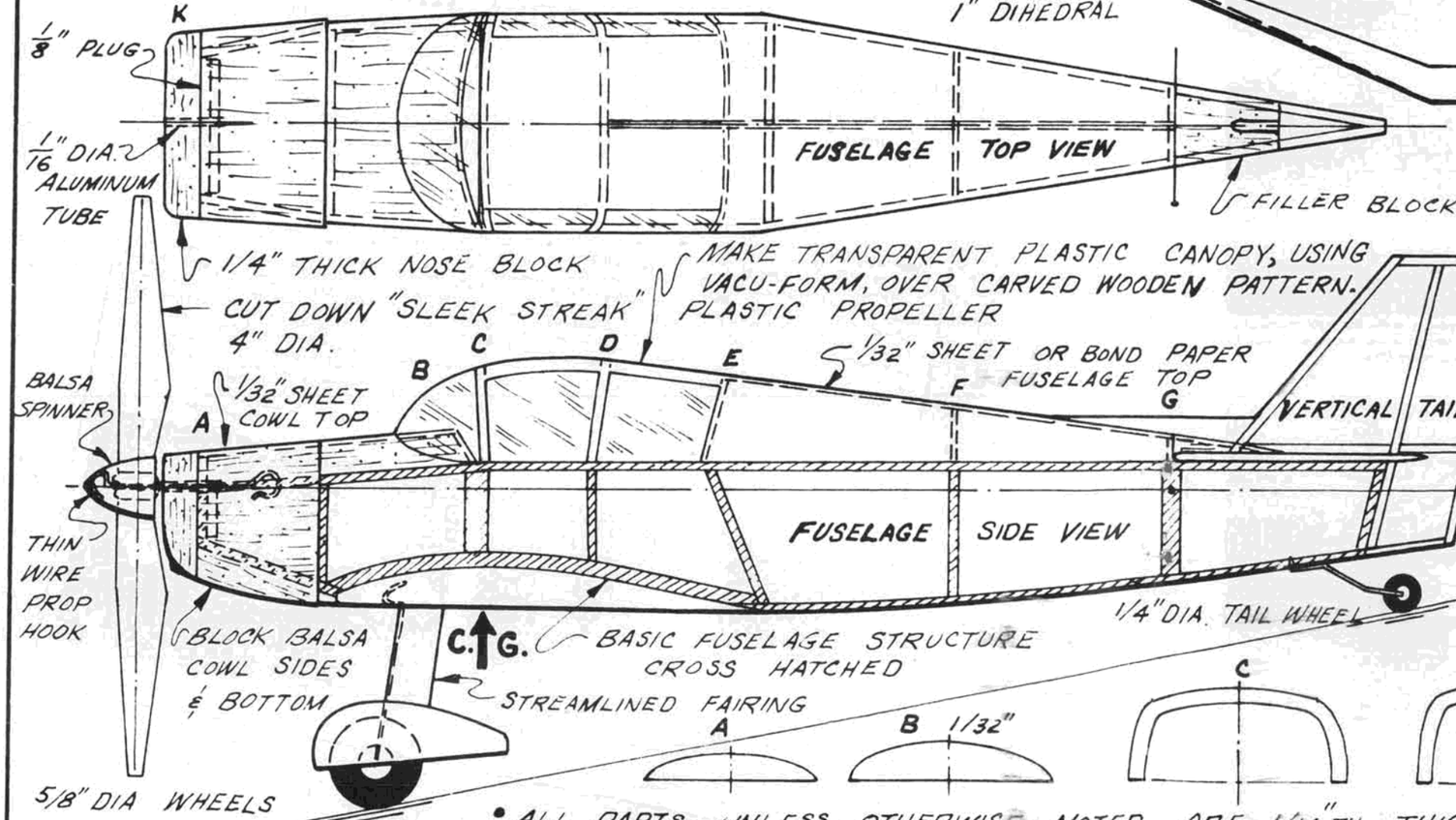
- WARP TRAILING EDGE OF TAIL TO CONTROL GLIDE.
- USE DOWN AND/OR SIDE THRUST TO CONTROL POWERED FLIGHT.

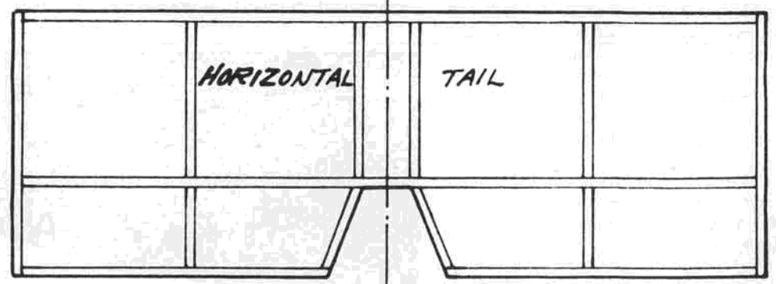




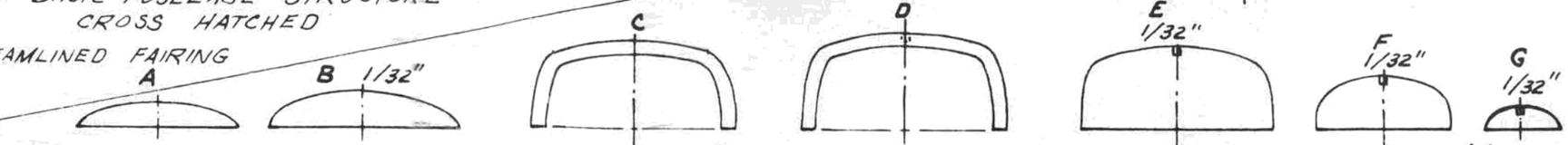
1" DIHEDRAL







BALSA IF DESIRED.



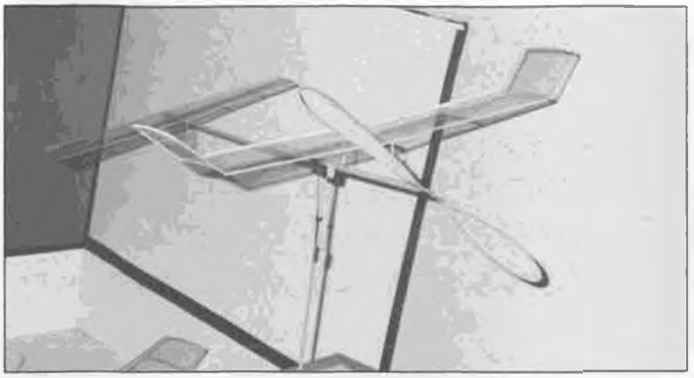
- ALL PARTS, UNLESS OTHERWISE NOTED, ARE 1/16TH THICK BALSA BY THE SHAPE SHOWN
- COVER WITH "SUPERFINE" OR "JAP TISSUE".

PEANUT SCALE
JODEL D. 150 "MASCARET"

Walt Mooney 6-20-68

INDOOR

BY KEN JOHNSON



Easy B aircraft by Bob DeShields, Los Angeles. Bob's models are expertly crafted, neat as a pin, and fly unusually well.

A great flying ornithopter built from Lew Gitlow Indoor Model Supply kit by California modeler Tony Gialick.

Have you ever built a tailless model? These are called *flying wings*. This type of aircraft looks hard to build and hard to fly. For this reason I believe many modelers shy away from them. Actually they are easier to build than conventional models because you don't have to build a stabilizer. A vertical fin (rudder) is still necessary, but that's all.

The other thing that is different about flying wings is something called *reflex*. This is an area at the trailing edge of the wing (on each side) that is swept up. It is usually found at the wing tips. It's advisable to make this reflex area as a separate unit so that it can be adjusted up or down.

The center of gravity is usually found forward of the leading edge of the wing. Many times the wing is a swept-back design.

The Blacksheep Squadron Model Club, with which this modeler flies, has been holding indoor and outdoor contests for flying wing models for many years. There seems to be a great deal of interest in this type of craft. Perhaps some of this is due to the famous Northrop flying wing planes that were developed in the Southern California area in the 1940s. Once each year an outdoor "wing" meet is staged, directed by Carl Hatrak. Rubber and gas powered wings are flown as well as towline and flying scale types.

The indoor flying wing event is called "Hawthorne." The rules are as follows:

1. Flying wings only. No tails or canards or other types of surfaces.
2. Model must fit into a box measuring 18x18x18 inches with no part protruding. (Flying condition.)
3. Model must not weigh less than 14 grams less the rubber motor.
4. Covering may be paper or wood. Condenser paper is not allowed.
5. Multiplane configured aircraft are allowed if all wings are identical and have no stagger.
6. Scale aircraft need not comply with rules 2, 3 and 5.
7. Plastic propellers only.
8. Geared, or multi-extension motors are prohibited except in scale.

FLYING

1. Unlimited attempts for six official flights.
2. Best two flights for points.
3. Ties broken by simultaneous launch, last model down is declared the winner.
4. Ten seconds airborne is considered official.

If your indoor group is looking for a new fun contest to try, perhaps this one is perfect. Our local Hawthorne meet is coming up in about two weeks. I just finished my model for it.

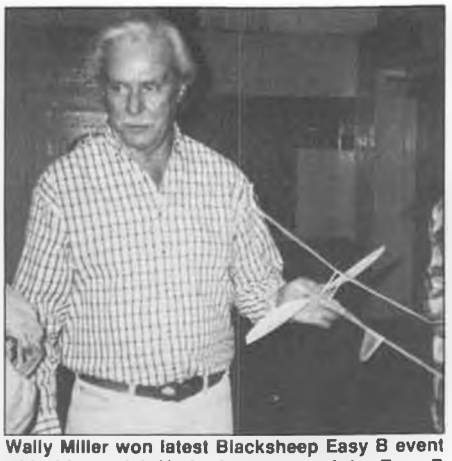
The Dyke Delta 12-inch scale flying wing model featured in this column several years ago is ideal for the scale part of this event. Mine is still around in a box and, with a little patching, it will be ready to do its thing again.

RETRIEVING

How perplexing it is to get your model caught in the ceiling beams during a contest. You want to get the plane back in your hands (undamaged) as quickly as possible. What

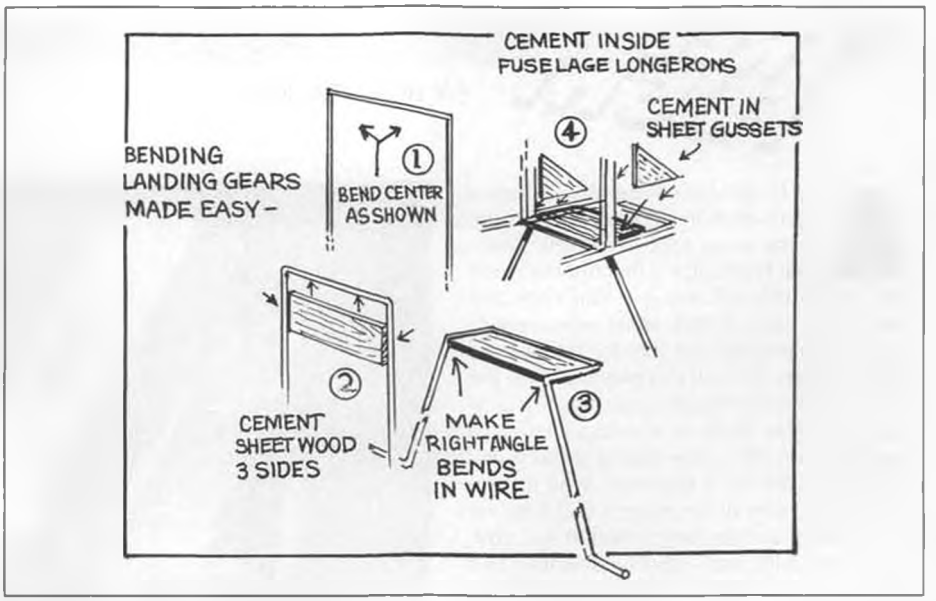
Phedon Tsiknopoulos waits for right moment to throw his hand launch glider. He's one of leading HLG builders in western USA.

Scale models by columnist and son, Chris. From left; O-38 profile scale, Christmas Bullet Peanut, and Dh-6 Grapenut.



Wally Miller won latest Blacksheep Easy B event with this model. He is the creator of the Easy B event.

Dave Ganzer with beautiful Pennyplane model. Relax, Dave, we won't blow on it!



to do? The first thing I look for when entering the flying site is someone with a fishing pole with a balloon attached. That's assuming I didn't think ahead enough to bring my own balloon and pole. I ask permission to borrow the balloon when my plane hangs up.

It is wise to have a partner for retrieving. Send the balloon up under the model and allow your partner to stand off to the side and spot where to nudge the craft. It is almost impossible to have a clear view from under the balloon. If the propeller is wound around a cable your helper can easily advise which motion will free it. You may also find it more comfortable to go through this exercise while lying on your back on the floor. It doesn't take but a few minutes of looking up while standing to develop a powerful pain in your neck. If the model breaks loose only to wind its prop up around the balloon string, lower the string and plane very carefully so as not to jerk the model and damage it. Your helper can now move in and help to separate the model from the string. Some fliers use one or more poles, taped together at the ends, to steer and dislodge their models in low ceiling rooms. Care must be taken not to whip the pole end into the aircraft; this can quickly destroy the model. Telescoping aluminum poles can be found at your local building or paint supply store. Window blind sticks work well, as do bamboo fishing poles. I like the fishing poles with casting reel attached because the balloon string can be stored on the reel.

SAD PASSING

It is with sadness the we report the death of free flighter Carl Fries. I remember exchanging letters almost weekly with Carl, Dick Black, and Hardy Broderson, during the sixties before the birth of the National Free Flight Society. Carl and Dick came up with the idea for the NFFS. Dick printed a piece about it in his VTO column. I developed the bird logo, newsletter masthead, and the decal emblem. I had several meetings with Carl Fries at various Nationals and painted signs for the first NFFS meetings. Carl was a good friend and a great free flight modeler.

POLY FILM COVERING

Several modelers new to indoor have asked how to cover with Microlite and Ultrafilm. First, do not attempt to lay the film over the wing or tail to cover. This does not work. Instead, tape a length of the film to a sheet of clean artist's illustration board. A small strip of Scotch tape at each corner will hold the film to the board. Spread several large pieces of opened newspaper on the floor. Do this in a ventilated area. Place the wing face up on the newspaper. The wing must not yet have dihedral built into it. Spray the wing outline lightly with Spray Mount adhesive (from your local art store). Immediately place the wing face down onto the plastic film. Press down lightly on the wood to secure it to the film. Use a new razor blade to trim the film. Run the blade around the outside of the wing, being careful the cuts are complete. Now add the dihedral breaks.

Write and send photos and information on your indoor activities. Send to Ken Johnson, 16728 Bermuda St., Granada Hills, California 91344. ***MB***

Dave Ganzer, Mojave, CA, readies indoor cabin model for flying. He works for Rutan Aviation.

Doug Border hooks up the rubber motor to his super flying ornithopter. This canard flapper is a Kurt Stevens design.

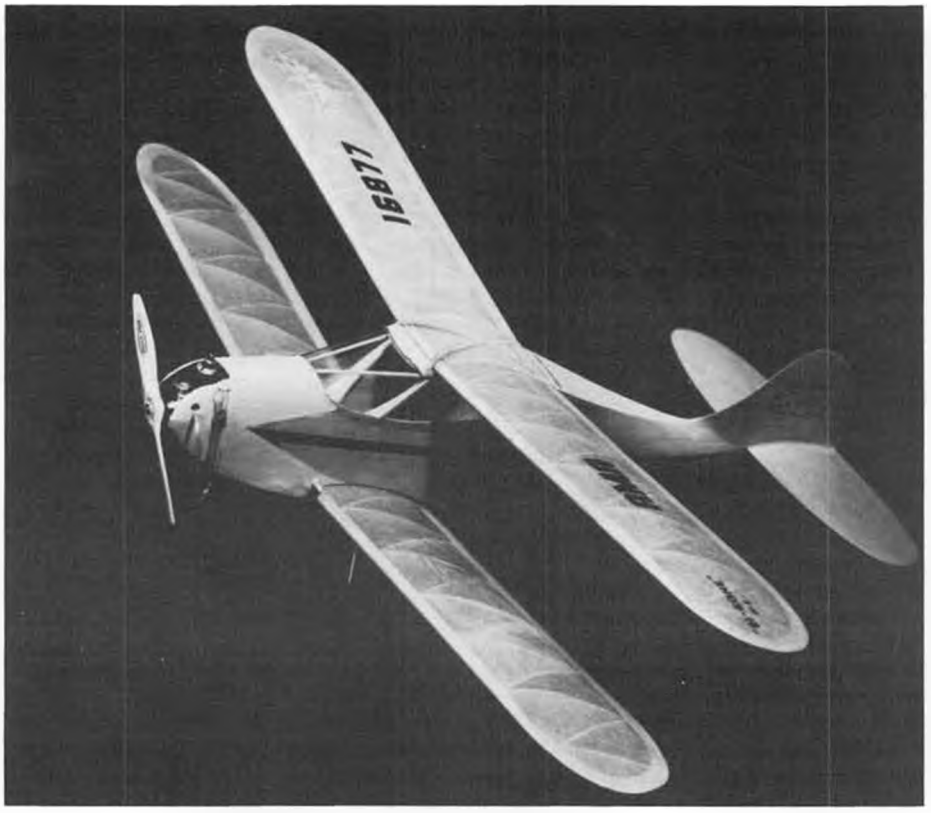
FREE FLIGHT

BY BOB STALICK

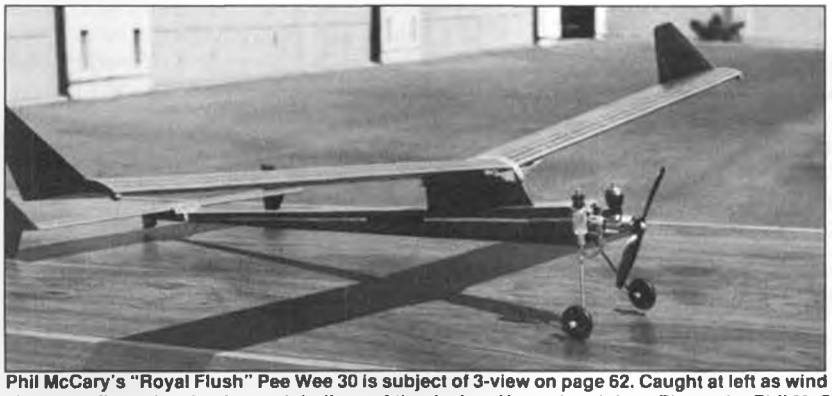
As a long-time columnist, an amazing revelation steps up and hits me in my smug face every few years. That revelation is that not everyone who reads this column is a long-time free flighter as I am. In fact, some who write to me are just getting back into the hobby after a long absence (I call this phenomenon the "Rip Van Winkle effect"), and they are curious as to the kinds of changes that have appeared on the scene during these years. Another is the adult beginner, who is curious about many of the aspects of the hobby that most of us take for granted. It was with some curiosity that I received within two days of each other last month, two letters, one from a classic Rip Van Winkle and the other from an adult beginner. The questions were similar and sensible. So, in an attempt to address some of the questions raised in these letters, I will devote a portion of this and next month's column to supplying some answers. Future columns will contain further information of a similar variety, because I am certain that for every person who takes the time to write in and ask, there are many others who don't bother. This way, perhaps all of us can help others share in this wonderful hobby. But first, fans, here are the regular features.

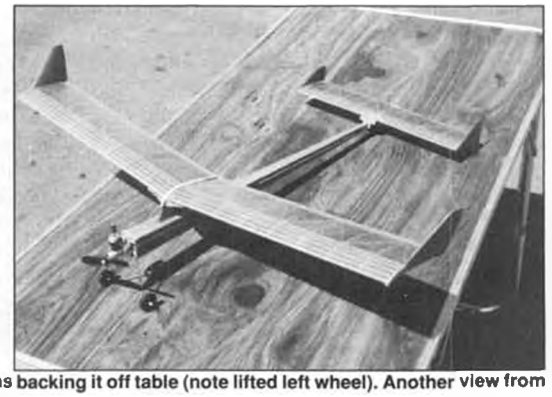
JUNE MYSTERY MODEL

Just when I was getting back into the free

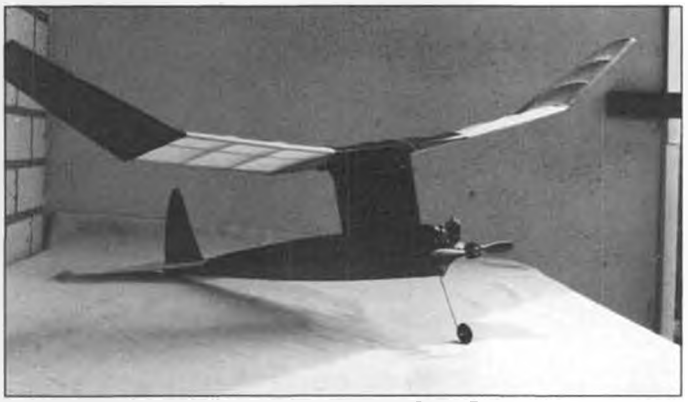


Vern Clements, the Gee Bee plans guy, designed this Bi-Gone free flight cabin ship originally published in M.A.N. in mid-'50s. More on this model, and Vern, next month.





Phil McCary's "Royal Flush" Pee Wee 30 is subject of 3-view on page 62. Caught at left as wind was backing it off table (note lifted left wheel). Another view from above confirms the simple, straight lines of the design. Note wing tiplets. Photos by Phil McCary.



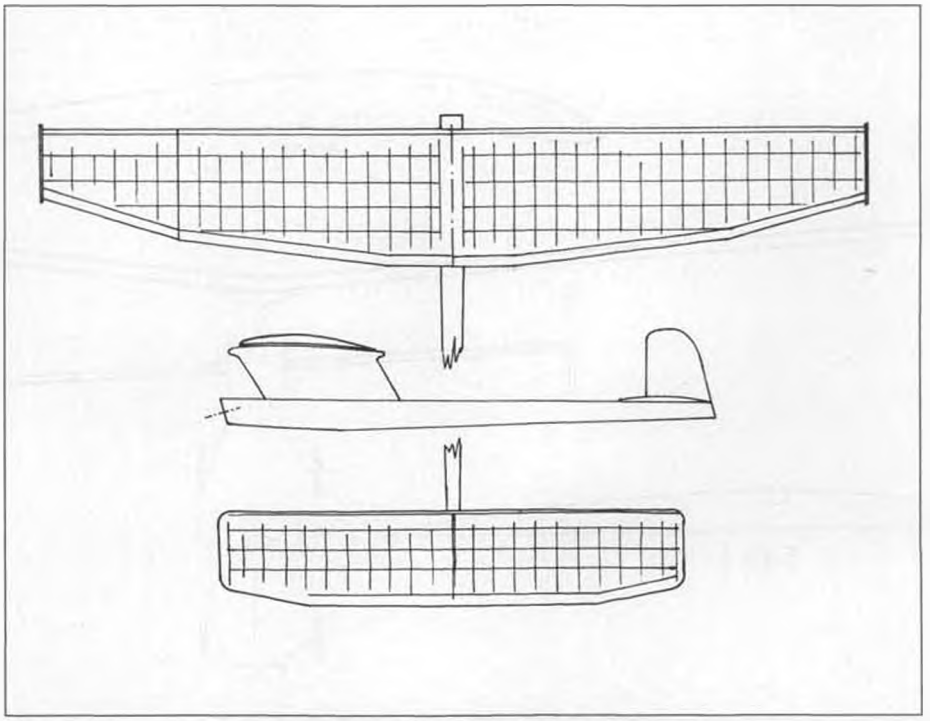
Featured as a 3-view in this column years ago, Frank Ehling's "Little Twister," powered by Wasp .049. Jim Moseley built this Pee Wee 30 version.

Another Pee Wee 30, original design by Jim Moseley, of Canada, is a bit more traditional than McCary's.

flight hobby in the early 1960s, one of the models that I had read about in the magazines was this one. The story behind this ship is that it would "outglide everything on the field." It was a C class lightweight that continued to place high in regional and national competition throughout the 1960s. During one of my forays to find an unusual Nostalgia model to fly here in the Northwest, I came across this ship again. Unfortunately, it does not qualify as a Nostalgia model, but just looking at it got my memory banks re-energized. This model is presented for your identification as the June Mystery Model. If you know the name of the ship, jot it down on a letter or postcard and fire it off to Bill Northrop, c/o *Model Builder* magazine. The first one in line with the correct answer wins a free one-year subscription.

JUNE DARNED GOOD AIRFOILS—
Hyvarinen's A-2 Wing and Stabilizer Sections

Reino Hyvarinen was one of Finland's outstanding A-2 fliers during the pre-circle tow era. For your consideration this month, I am presenting both the wing and stabilizer sections that he used during the late '50s. Of note on the wing section is the sharply pointed leading edge with the entry at the extreme bottom of the airfoil. With this arrangement, no special kind of turbulation is needed, as the leading edge shape and location provide self-turbulation, but the model gives up some stall recovery range as a compromise. However, a good look at the stabilizer airfoil reveals an extremely thin and slightly undercambered section. This airfoil combination allows for good stall recovery. I recommend them as a combination, however, if you do not care for the wing airfoil, allow me to recommend the stabilizer section for your next glider or rubber model.



JUNE MYSTERY MODEL

JUNE THREE-VIEW—
Phil McCary's Royal Flush Pee Wee 30

You may remember that I referred to Phil McCary some months ago as the modeler who was producing special Pee Wee .020 engines for the Pee Wee 30 event. Well, Phil also flies these little critters, and here is the model that he uses when he does so. Phil says, "It is a design, as you can see, employing the so-called 'high tech' theory. I know nothing about modern free flight for I am strictly an antique and old timer free flighter. I decided, after reading your article on high tech Pee Wee 30s, to give it a shot. This ship has the ability to do two minutes on about 14 seconds of engine run. This assumes that the engine run is strong and the power pattern is good. I have found thus far that the ship is sensitive to trim adjustments and requires left and downthrust. I currently fly it at 1.5 degrees decalage and 70% C.G. I am going to move the C.G. back to around 85% and reduce decalage to one degree or slightly less and attempt to eliminate the down and side thrust. I could shorten the nose and add ballast for my all-up weight. Without ballast, it is only 85 grams. At any rate, I thought you might enjoy another Pee Wee 30 ex-

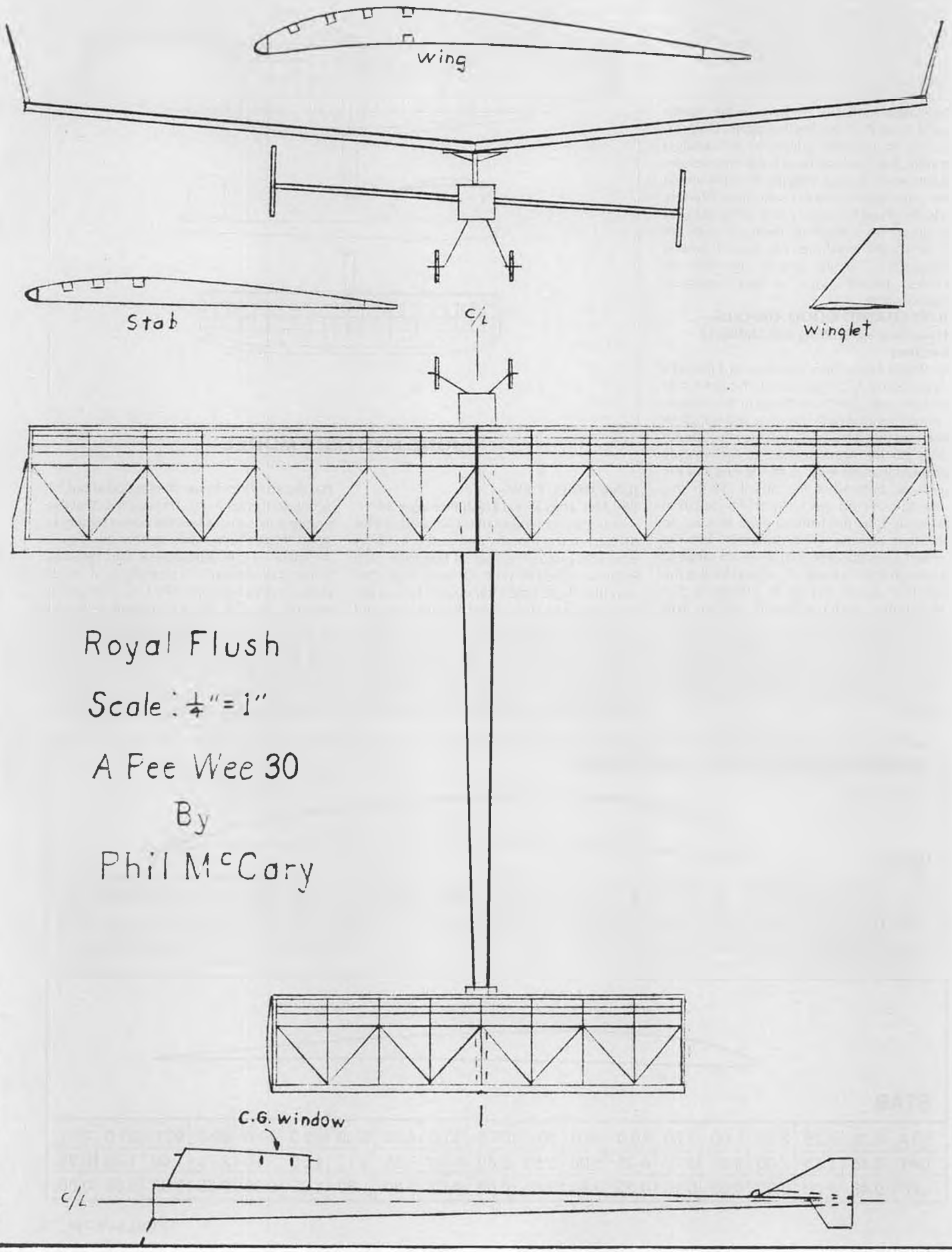
DARNED GOOD AIRFOIL – HYVARINEN

WING

STA	0.00	1.25	2.50	5.00	7.50	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100.
UPR	0.00	2.00	3.30	5.00	6.30	7.15	8.45	9.20	9.65	10.0	10.0	9.65	8.80	7.55	5.80	3.40	1.90	0.00
LWR	0.00	0.02	0.10	0.30	0.45	0.55	0.90	1.25	1.50	1.85	2.20	2.50	2.45	2.25	1.75	1.00	0.45	0.00

STAB

STA	0.00	1.25	2.50	5.00	7.50	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100.
UPR	0.45	1.50	2.00	3.00	3.75	4.35	5.00	5.50	5.80	5.90	5.55	5.10	4.50	3.70	2.75	1.60	1.00	0.25
LWR	0.45	0.00	0.00	0.02	0.10	0.25	0.40	0.50	0.60	0.70	0.80	1.00	1.02	0.90	0.65	0.30	0.05	0.00



Royal Flush

Scale: $\frac{1}{4}$" = 1"

A Pee Wee 30

By

Phil McCary

periment." Phil then sent along the following specifications. You will need this information if you decide to build the model:

Wing area: 116 square inches flat, 115 square inches projected.

Aspect ratio (wing): 7.25:1.

Airfoil: 8% thickness, 27% maximum camber.

Stab area: 39 square inches, 33.9% of wing area.

Aspect ratio (stab): 4.33:1.

Airfoil: 6% thickness, 30% maximum camber.

Winglets: Area 5 square inches each, 8.7% of wing area both winglets.

Winglet airfoil: Flat bottom, 25% max camber, built from 1/8 sheet.

Winglet settings: Angle from top of wing airfoil to top of winglet airfoils is 108 degrees. Toe-in is 3 degrees on each tip.

Incidence angles: Wing +1/2 degree, stab +1/2 degree, pylon +2.5 degrees, stab platform: +1 degree, Net decalage = +1.5 degrees.

C.G. range: 65% to 87% root chord.

Moment arm: 18 inches (1/4 wing chord to 1/4 stab chord).

Dihedral: 6 inches each tip.

Total weight: 85 grams without ballast (15 grams ballast needed to qualify).

Wing loading at 100 grams: 5.45 oz./sq. ft.

So, there it is fans. A new Pee Wee 30 from Nevada. You might consider it as you look toward the contest season this year. The three-view contains full-sized wing and stab ribs and is drawn to 1/4 scale. You can scale up your own, and using the specifications above, build your own in about one weekend. Cover with Japanese tissue and fuel proof it, then go out and fly. Pee Wee 30 is a terrific event packing more fun per ounce than any other F/F gas class. Besides, the things are practically expendable. Build several and fly the heck out of them.

INDOOR TIPS FROM JACK McGILLIVARY AND KEN GROVES

By the time you read this column, you will be informed that *Model Builder* has reinstated an indoor column as part of its regular feature. As stated last month, I will continue to carry certain indoor topics in the Free Flight column as I see fit. This month, I thought I'd present the following information, which came from the *Vegas Free Flighter*, the newsletter of the VAMPS:

• • •

Covering Peanuts and Bostonians

Make a frame out of 1x2-inch lumber. Attach the tissue to the frame (rubber cement is OK). Water shrink the tissue and let dry. Repeat at least once more. Apply one or two coats of clear Sig Lite Cote dope thinned about 50/50 with thinner. If colors are required, apply Floquil (pigment only—from the bottom of the bottle) mixed with nitrate thinner and sprayed on with a fine airbrush. The pigment in the thinner seems to etch into the doped tissue quite well. The Floquil pigment is very fine and colors up the tissue surprisingly well. It doesn't have to be very thick and is quite light. The Lite-Cote dope is plasticized and is a low-shrink butyrate. If lettering or decoration is required, now is the time to do it, using masking materials and techniques as required to apply a final coat of thin clear dope on the tissue, particularly where it will be subject to handling on the model. The pieces required for covering are then cut from the frame and allowed to relax for several hours. Iron them at medium heat with linen under the tissue just prior to applying them to the model. The object is to have the tissue in as dry a state as possible. Next, apply to the framework, getting it as even and smooth as you can without excessive stretching. Jack (McGillivary) uses diluted Titebond for tissue application. Don't do any more doping or shrinking. He says that he would sooner have the tissue on the slack side rather than introduce a future warp problem.

Coverings with tissue: If you are looking for places to save weight, the tissue you select becomes important, because it's surprising the difference you can get in various tissues. A good light tissue should weight about .6 grams per 100 sq. in. Many of the readily available ones weigh about 1 gram per 100 sq. in. The porosity of the tissue is important too. A super lightweight brand is of dubious value if it is very porous and requires a great deal of dope to seal it. You can assess the "air-tightness" of the tissue before and after doping by putting it to your lips and trying to draw air through it to see how well it's filled. Jack brushes on the clear dope, two or three coats of 50/50 Lite-Cote, to fill the holes in the tissue so that it doesn't breathe too much. He tends to use white tissue primarily and colors it as required.

Covering with plastic films: For EZBs, Pennyplanes, Novice Pennyplanes, and other endurance type models. Most people have switched from using condenser paper to one of the very thin polycarbonate films available, e.g.: Ultra-Film, silver Microlite, or Absolite. These films don't have the humidity instability problems that condenser paper has, they are now approved for use on such models, and they are lighter than condenser paper. In fact, they are like heavy microfilm in that you can see spectrum colors in them. Ray Harlan's Ultra-Film is now available from Micro-X and Indoor Model Supply (see ads for these firms elsewhere in *Model Builder* magazine) as well as from Ray Harlan himself. I believe Absolite is available from Old Timer Models. The film comes in a roll and instructions are supplied with it. There are also instructions and helpful hints in Ron Williams' renowned indoor book. He advocates using an MEK solvent to trim the film on the structure, or alternatively a hot wire device. He managed to locate a cautery used by surgeons for eye operations and modified it to suit. Colin Raymond-Jones advises that his eye-surgery associates have told him that they do not use disposable cauteries.

I use a low-voltage miniature soldering iron from a variable voltage source to control the temperature at the tip of the iron. 3M

continued on page 105

WORKBENCH *continued from page 7*

lahoma, TN 37388, phone (615) 455-2256. Eric is the proprietor of PAW/USA, the U.S. supplier of P.A.W. diesel engines. The book is available direct from Eric for $10.00 plus $1.00 for postage, and like the cover says, it contains "All you wanted to know about model diesels."

Actually, the biggest mystery about diesels is their lack of popularity, which can only be attributed to the modeling public's lack of knowledge about them. Here's an engine that needs nothing... nothing but fuel to start it and make it run; no batteries, no plugs to burn out, not as much heat, not as much fuel, not as much noise, but a whole lot more torque and the ability to turn big props. The best way to describe Eric's book is to list the chapter titles. They are; History, Old Favorites, How a Model Diesel Works, Fuels and Systems, Exhaust Systems, Compression, Diesel Propellers, Starting a Diesel, Diesel Conversions, Making a Diesel Conversion, Hints and Tips, and Diesel Compatible Finishes. If you've never owned a diesel, you'll wonder why after reading this book.

PATTERN'S BACK

That headline should grab the attention of Pattern fliers, who are already to jump on us and say, "It never left!" You're absolutely right. We're only saying that it's back in *Model Builder* on a more regular basis. Dick Hanson has been carrying the ball on a somewhat irregular schedule, being heavily involved in his business of constructing and marketing precision-built aerobatic R/C aircraft for many of the top competitors.

Taking over the column, beginning next month, and under the more fitting title of "R/C Precision Aerobatics," is Rick Allison, whose writing should be familiar to NSRCA (National Society of Radio Controlled Aerobatics) members, as he is the District 8 V.P. of this organization, and as such, writes a report of the district's activities for the Society's newsletter, "K-Factor."

Rick pretty well introduces himself to our readers in his first column, to appear in the July issue. As with any columnist in any publication, he will be able to tell best what directions to take based on reader reaction, so jump in there any time and let him know what you want. Judging by his work in the "K-Factor," we're sure he won't be at a loss for words, but photos and comments can be very helpful.

THINGS TO DO

The AMA will hold its third annual National Model Airplane Rally on June 1-3, 1990, in Houston, TX at Scobee Field in Cullen Barker Park. The park's model airport was named in honor of Challenger Astronaut Dick Scobee. The Rally, which is cosponsored by the Houston Area Modelers Council, in addition to non-competition flying of R/C, FF and CL aircraft, will also feature static model displays, manufacturer exhibits, a swap shop, prize drawings, concessions, and a picnic area. For more info about the Rally, contact Events Coordinator Chip Smith at AMA Headquarters, 1810 Samuel Morse Dr., Reston, VA 22090, phone (703)435-0750.

• • •

The AMA will hold its 64th Annual National Model Airplane Championships on July 14-22, 1990 at Mid America Airport, Lawrenceville, IL. That is to say the Radio Control and Control Line Championships will be in Lawrenceville on these dates. The National Free Flight Society will hold the indoor championships in the Mini-Dome at East Tennessee State University in Johnson City, TN, site of the 1988 World Indoor Championships, on June 7-10, 1990, and the outdoor free flight championships will be held in Lawrenceville on October 1-5, 1990. Again, for further information on these events, contact Chip Smith, as mentioned above.

• • •

Two events will take place on the Labor Day Weekend, September 1-3, 1990 (among many others), but these two are well spread out. In the East, it will be a reunion of the historic Selinsgrove, PA R/C Get-Togethers that date back to the mid-fifties, when many R/C pioneers and interested followers gathered together to compare notes and exchange ideas in this relatively new hobby that was just beginning to branch out to the average model airplane enthusiast. For further information on this, contact Bob Bingaman, R.D. 2, Box 348K, Sunbury, PA 17801.

The other event will be on the West Coast; the 1990 Torrey Pines Scale Fun Fly. In case you need to be told, that's slope soaring scale, and Torrey Pines is a famous Pacific Ocean shoreline slope site; a favorite spot for soaring birds, full-size gliders, R/C gliders, and hang glider enthusiasts. Charlie Morey, publisher of "Slope Soaring News," is the Publicity Chairman, and for now, you can get 'hold of him for information on the proposed official hotel, a Saturday night banquet, a Friday night get-together, and other stuff. His base of operations is 601 E. 19th St., #29, Signal Hill, CA 90804, phone (213) 494-3712.

• • •

May 19 and 20 may be a little tight for this notice, but there will be a repeat on November 3 and 4, which gives you a little more time... to put floats on your landlubber-type model aircraft, that is. On those dates, the California State Department of Parks and Recreation will repeat their first ever sanctioning of a flying model aircraft meet, in cooperation with the Lake Elsinore (California) R/C Club. Reason for the floats is that the runway for this R/C-type affair is under some of the water in Lake Elsinore! The site, to be exact, is the eastern-most beach of the State Recreation Area located off Riverside Drive near Lincoln. Lake Elsinore, incidentally, is located about halfway between Los Angeles and San Diego, about 20 miles inland of the Pacific Ocean. It is a well-known site for ultra-lights, full-size gliders, and a very active sky-diving center. It's a three-ring circus every weekend!

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No short cuts have been taken in the design of the new **Hobbico Avistar 40** ARF trainer. After brief assembly, it offers you an ARF with hand-crafted quality. Boasting premium all-wood construction, pre-covered with strong and impressive red, white, and blue polyester film, the Avistar 40 is one of the most attractive fliers at any airfield.

When the hard work has already been done, and all the required accessories are included right in the box, there's really only one thing left to do. Have some fun learning to fly!

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The 60" span Avistar 40 flies slowly and gently, so your early flights are very much under your control. Excellent recovery characteristics offer the margin of safety most new pilots appreciate. This trainer also practically lands itself. The Avistar 40's durable construction and smooth flying qualities will allow you, with practice, to take full advantage of its semi-symmetrical airfoil and perform some aerobatics.

Only with the new Hobbico Avistar 40 can you get hand-crafted quality in a trainer that takes only a few leisurely evenings to complete. Best of all, this ARF really flies!

High-quality pre-built parts assemble quickly for an ARF trainer that looks hand-constructed.

The Avistar 40's wing is all-wood, pre-covered with strong polyester film for added durability.

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SQUEEZERS CALLING!

What could be the oldest model airplane club on this earth, the St. Albans Cement Squeezers, of England, which started with a public meeting in the town in 1910 (!), is hoping to find some of its members who may have moved to the "Colonies" (that's us) over the years. The club is attempting to collect historical information about the club, including personal anecdotes and photographs, with the idea of producing a booklet later in the year to be available to anyone interested. If we've found someone, would they please contact the club secretary, Bill Mills, phone Wheathamstead 058 283 2626, or write to 3 High Ash Road, Wheathamstead, St. Albans, Herts, United Kingdom. ***MB***

COUNTER *Continued from page 9*

24 x 72 inches. Each consists of a 1/2-inch, durable, high-density surface that holds pins time after time, bonded to a 3/4-inch laminated, warp-free base. The prices, including freight, are $44.95 and $58.95 respectively.

Big Sky may also have the answer to "Big Birds" columnist Al Alman's prayers with two different types of airplane hangers... right, not hangArs. These items are for hanging up your pet models out of harm's way. One, which fits all sizes, suspends the model on the wall, hanging by its stab. The other hangs the model from the ceiling, and comes in four sizes; small, medium, large, and quarter-scale. Prices range from $9.95 to $14.95. All are shaped from strong metal rod and padded with heavy foam tubing.

When your plane is down from the wall or ceiling, Big Sky also has a variety of cradles for different uses. They're made from a 1/4-inch material that is easy to paint, much better than plywood, and are adjustable in width from 3-1/2 to 6-1/2 inches. One set attaches to your field box, another is short legged to sit on your workbench for doing construction or repairs, and the other is on longer legs for chair-height working level. All cradles are padded with heavy foam split tubing to protect your model. Hmmmm... boaters, we'll have to talk to Big Sky about your needs! The Cradles range in price from $15.95 to $23.95.

• • •

Hi Line Ltd., P.O. Box 1283, Bethesda, MD 20817, is a relatively new enterprise catering to the sport flier, especially those interested in the new trend of compact electric powered models. The product line includes electric motors, plans for electric powered models, and other electric power accessories for modelers who wish to enjoy the exciting new world of electric powered aircraft, both R/C and free flight.

One Hi Line motor is the "IMP-30," which replaces the so-called 020 sport motor. It is inexpensive, and a perfect match for sport and free flight scale models up to 10 ounces in weight and 250 square inches in area. It only requires two or three cells, and can turn a 6 x 3 prop at 10,000 rpm. The bare motor weighs 55 grams (28 grams to an ounce), and with switch harness, prop, and three-cell 275 mah battery, the system weight is 115 grams. The IMP-30 can also be used with small R/C models. The price of the motor alone is only $10.95, and a complete system, as listed above is $26.95. To order, add $1.50 for the motor, or $2.70 for the system (Maryland residents add 5% sales tax).

Hi Line's "Mini-6" is an even smaller motor for free flight models in the three to five ounce range having wing areas from 100 to 150 square inches. The 6-watt, geared motor, with propeller, 100 mah battery, switch, and charging jack only weighs 47 grams. The motor and prop alone costs $15.95, and the complete system as described costs $26.95. Add 10% for postage, and 5% for tax if you live in Maryland. A catalog of Hi Line products, which includes additional technical information, is available for $1.00.

• • •

At the beginning of this column we mentioned that Satellite City continues to be a pioneer in the development of cyanoacrylate glues for the hobby consumer. To "continue" after the twenty years since cyano glue was first introduced to the hobby... by Bob and Bill Hunter of Satellite City... means that the company didn't sit back on its, er, laurels, but continued to develop new derivations of the original "Hot Stuff," a name

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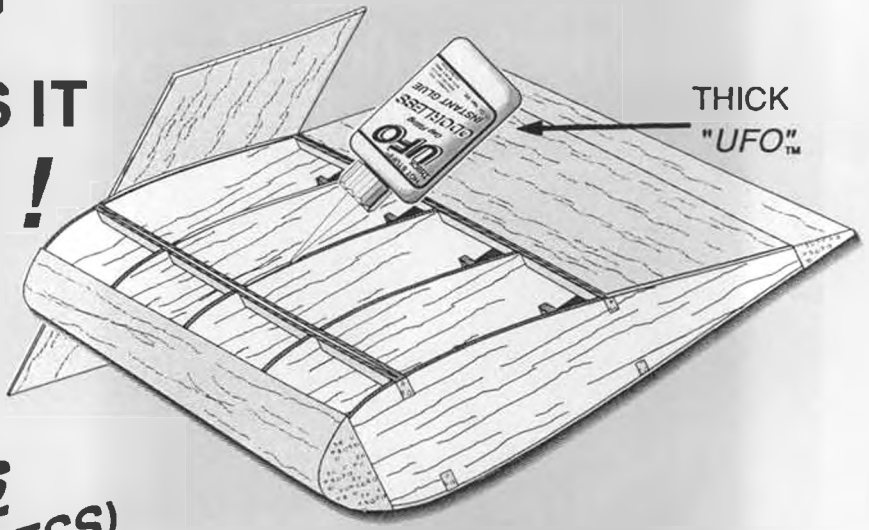
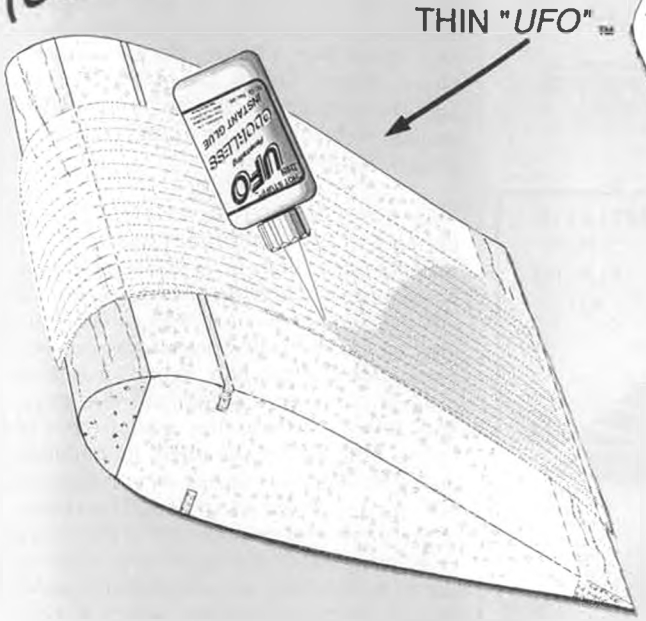


Conventional Balsa construction
use HOT SHOT or KICK-IT to speed cure.



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that has almost become generic when referring to any of the brands of cyanoacrylate glue that came along later. The most recent innovation from Satellite City is the introduction of UFO (TM) thin and thick cyano, for which many modelers who found they could not tolerate the fumes from ordinary cyano as it "went off" or cured, are eternally grateful. UFO, or "User-Friendly Odorless" Hot Stuff cyano, is just that... odorless, and does not emit annoying fumes as it cures. Not only that, it won't eat into foam cores often used in model construction. In fact, it is a perfect bonding agent for gluing foam to foam and wood to foam, using UFO Thick, and for fiberglassing direct to foam, using UFO Thin.

Incidentally, it's almost a joke to mention this, but if the regular or UFO Hot Stuffs don't cure fast enough for you (50 to 60 seconds for the Thick, and 7 to 10 seconds for the Thin), you can spray the joint with Kick-It (TM) accelerator, which speeds up the cure time!

Also, by the way, it may be of interest to some of you who have come into the hobby in more recent years, to know where the name "Satellite City" comes from. For many years prior to introducing Hot Stuff, the father and son team of Bob and Bill Hunter were top modelers in free flight competition, winning much national and international recognition with their very hot gas-powered "Satellite" design, which they built and flew in all classes, ranging from Half-A up to the huge 1000 sq. in. Class D models. The name "Satellite City" came to be when they developed a line of kits for the much-desired model, in various sizes. Being a fast climbing design under power, the model had to be trimmed right to the hairy edge to get the most altitude out of the short engine runs that are allowed in competition, so it's easy to imagine how an adhesive like Hot Stuff was badly needed, as a slight error in trim could mean serious destruction of the model and the early end to a day of flying. The Hunters' almost instant and magical in-field repairs of theirs and other crashed free flight models, using their Hot Stuff, quickly convinced the modeling public that the long waits for normal glue to dry were soon to be a thing of the past.

• • •

Ace R/C, P.O. Box 511, Higginsville, MO 64037, phone (816) 584-7121 (Fax 584-7766), has taken over production, as well as distribution of the well-known DJ's Multi-Stripe Products. The line now includes 3/8-inch wide tape and new colors, nineteen in all. The widths range from 1/16-inch up to 3/8-inch in the basic Black, White, Red, Blue, and Yellow colors; 1/16 to 1/4 in Gold, and Silver; and in 1/16, 1/8, and 1/4 in Charcoal, Sky Blue, Met. Silver Blue, Met Med. Blue, Met. Dark Blue, Orange, Burgundy, Met. Green, Brown, Cream, Tan, and Met. Copper. The material is fuel proof, and flexible enough to take sharp turns; the narrower, the smaller the radius.

• • •

KDI, 10426 SE 206th Pl., Kent, WA 98031, phone (206) 854-8053, has two items to make life at the flight line a little easier. First is a power handle and coiled cord, which, when attached to your 12-volt gel-cell battery, provides a resting place for your electric starter and glo plug lighter. It is also available with a gel-cell; priced $45 with, or $20 without battery. The second item is called a transmitter Stabilizor. It combines the transmitter tray convenience so popular in Europe, with the wrap-around hand grip of the transmitter as preferred in the States when using a traditional neck strap. It allows access to all the bell and whistle buttons and toggles on the transmitter, which is held safely in place with velcro. It retails for $40.

• • •

R F Tronics, P.O. Box 718, Agawam, MA 01001-0718, is offering a series of deep discharge units called Cad-Cyclers. Each unit, designed for a particular number of cells in a battery pack, discharges the pack to a precise 1.1 volts per cell before recharging. In this manner, the pack will be fully cycled and will not develop a "memory" that can shorten its normal potential capacity. The units are color coded to match the number of cells in the pack, and are available for four, five, six, seven, and eight-cell batteries. The four, five, and eight-cell units discharge at 500 Ma, while the six and seven-cell units discharge at 600 Ma. You can contact the company for further information. ***MB***

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The LeMans AP36L motor delivers plenty of power for climbouts while a scimitar-shaped folding prop reduces drag.

Proof that a superb design makes all the difference.

Ask a select group of the very best American electric sailplane fliers what model they'd prefer to fly, and they'd likely answer the **Kyosho Stratus 2000**. They know it's built for outstanding performance, because they designed it themselves—with all the capabilities that new and advanced fliers want in an ARF electric sailplane.

The Stratus 2000 incorporates features already proven successful in the best European models. A Selig airfoil, 75.6" span Schumann-style wing, and scimitar-shaped folding propeller contribute to a sophisticated low-drag design. Powered by a direct drive system utilizing a 540-size motor, the Stratus makes powerful climbs and soars with absolutely minimal resistance, quickly reaching the most elusive thermals.

High-quality construction with ARF ease.

The Stratus 2000's elegant looks and ARF simplicity are icing on the cake. The main wing and tail are pre-built of balsa and spruce, with an already-applied film covering adding a strong, attractive finish. The blow-molded polypropylene fuselage is also rugged and lightweight. For easy transport, the main wing is designed in three pieces for fast removal and assembly at the field.

With a 3- or 4-channel radio and 6- or 7-cell battery, Stratus takes you to the height of sailplane performance. Once there, you'll never want to come down.

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Send to the address above for your FREE copy of Kyosho's Mini Catalog from Great Planes.

BIG BIRDS *Continued from page 11*

So there you have the latest skinny about the Olive Drab Dilemma. Hope you're not too terribly confused.

NEW TIRE COMPANY?

Thought you might be interested in a new lightweight six-inch tire I'm using on my Robinhood 99.

Although these tires do have a limited amount of wear and tear on them so far, they seem to be doing quite well in spite of many touch-and-go's on a hard, rough-surfaced runway. Also, besides being exceptionally light, they're well balanced and do not have a tendency to develop a flat spot if left sitting too long in one position.

Unfortunately, I don't know who the manufacturer is. Y'see, I'm not sure when and where I got these tires, how much they cost and what other sizes are available. All I can tell you is that they're made by the Cheapskate Tyre Company—whoever they are.

So, if anyone can help with an address and/or phone number I'd really appreciate the input. And so would most other readers, I'm sure.

BIG BIRD SOCIAL CALENDAR

June 22-24: Come to the Big Sky Country where The Billings Flying Mustangs (IMAA Chapter #203) will be hosting their Annual IMAA Regional Fly-In. There are six motels within ten miles of the flying site and plenty of RV parking available. Enjoy three days of noncompetitive flying.

I've got flyers, or you can get them from Donald Herington, P.O. Box 22406, Billings, MT 59104.

June 28-30 & July 1: Four great easy and relaxed days at IMAA's 10th Annual Rally of Giants, held this year at Oshkosh, Wisconsin. Don't miss this one—it's gonna be outstanding. You can get a brochure with all the info from me or by writing to Les Hard, 2909 W. Michigan Ave., Lansing, MI 48917.

July 14 & 15: The Puget Sound Rocs (IMAA Chapter *N*108) 8th Annual Big Bird Bash will be at their new field. Lotsa RV parking and nearby motels, and two full days of easy flying. Come fly and enjoy. Write to me or to Bruce Gale, 811 9th Ave. SW, Puyallup, WA 98371, for flyers.

THOUGHT OF THE MONTH

Two boll weevils grew up together. One worked hard and got to be a big shot. The other didn't—and remained the lesser of two weevils.

Al Alman, 1910 154th St. Ct. South, Spanaway, WA 98387, (206)535-1549. ***MB***

CLOSE LOOK *Continued from page 15*

Tell 'em you're interested in sound control products and that *MB* sent ya'.

And finally... please remember that every new engine deserves a break-in WITHOUT A MUFFLER OF ANY TYPE! All heat should be allowed to escape from a new engine as easily as possible. The new engine should be run with plenty of oil in the fuel... it's okay to add an extra ounce or two of castor oil to the first gallon of model fuel through the new engine for added safety. Make a series of short (10 to 20-second) high speed rich runs and allow 100% cooling between each run. Gradually increase the run time until the engine holds rpm settings while running slightly rich. NEVER-*never* turn the needle valve in to get maximum rpm. If you need more power, buy a bigger engine. Then enjoy the fun and creativity of experimenting with after-mufflers to make your engine sound more sociable. ***MB***

ELECTRIC *Continued from page 17*

copper and protects it. Strike two against crimping!

I decided to get rid of all the handicaps the Tamiya plug was saddled with. I removed the plastic housing. This is easy to do; use a piece of tubing just large enough in diameter to slip over the pin. This compresses the barbs that hold the pin in the housing, and it is easily slipped out. Then I soldered to the shank of the pin, and used heat-shrink tubing for insulation. The drop across the connection was now 19.6 millivolts, 1.89 milliohms. This was an improvement of about 30%. The shank is thin and looked like it was contributing to the resistance, so I resoldered, this time to the area right at the barbs on the pins. This bypassed the shank. Now

robart robart robart

New from Robart

Now make your good-looking smaller model look even better! These new retracts from ROBART give the flyers of .15-.40 size (2-6 lbs., gas or electric) planes the ability to "get the gear up" and fly right! Retractable landing gear add stability, speed, greater maneuverability, and more realistic appearence to any aircraft.

.15 -.40 Size Retracts

- Positive Locking Up and Down
- Virtually Crash-Proof, Light-weight Glass-filled Nylon Construction
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- Weigh Only 1 oz. each, 2 oz./pair
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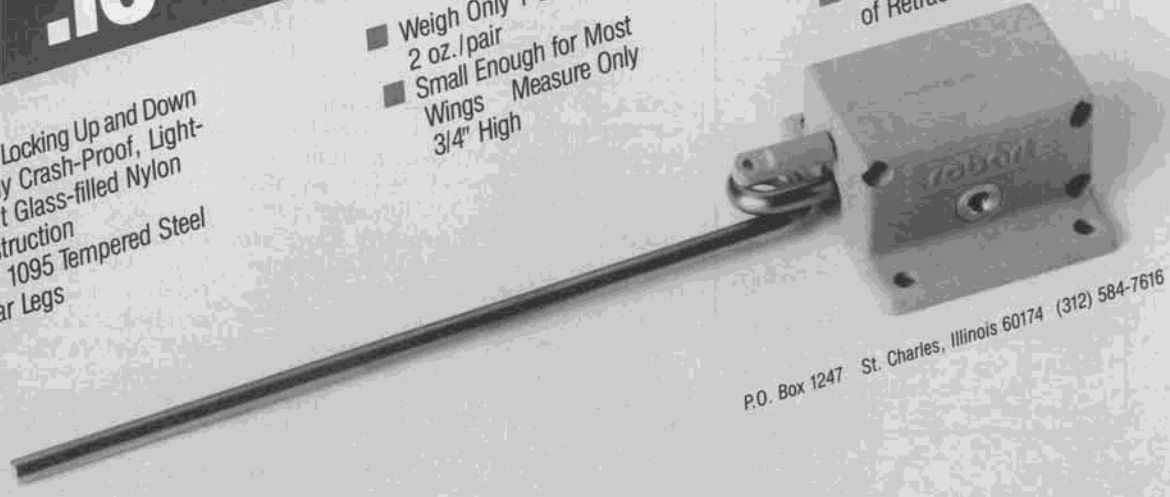
- Operational From Either End of Retract Unit



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the drop was 4.5 millivolts, or .43 milliohms. Suddenly the Tamiya plug looked very good!

Since the shank was no longer necessary, I cut it off, and used heat-shrink tubing for insulation. Done this way, the connector is tiny, no larger than the Deans, and much better. If you have a lot of Tamiya connectors, you might consider this modification. It is surprising how much loss is in the shank. Since there is now no housing, you might worry about the polarity of your connections. I use a female pin for the negative from the battery, and a male pin for positive. This keeps the leads from accidentally getting reverse connected. The motor will have the female for plus, the male for minus, and so on.

The worrisome part of all this is that all of the ready-to-fly planes and the motors that come with kits have crimped connections and Molex or Tamiya plugs. What is happening out there? My concern is that many will get turned off from electrics because they will have such poor performance due to the connectors.

If you are using such connectors, it is easy to make them much better without any major modification. Pull the pins from the housing, then flow solder into the crimped joint. Do this for most of the shank length. I see that many manufacturers now run the bare wire through most of the shank, so with the solder, this should cure the shank losses as well as the crimp losses. After soldering, sand the surfaces lightly to get rid of any oxide coating. Now put the pins back into the housing. You should get performance from these connectors that is as good as most of the commercial plugs available. with the exception of the Sermos plugs, which are in a class by themselves. Well, there is much more to say, but I am running out of column space! I will talk about the remaining connectors next time, along with additional information about the do's and don'ts of connectors.

• • •

Roland Schmitt sent pictures of his very pretty little JN-1 powered by an IMP-30 motor available from Hi Line, P.O. Box 1283, Bethesda, MD 20827. The model weighs 13.75 ounces, 36-inch wingspan, 194 sq. in. It uses a Futaba micro receiver, two S-33 servos, a Hi Sky on-off controller, and a four-cell 100 mAH receiver battery. Roland tried the plane first on a Mattel geared motor (no longer made) and three cells, but it was underpowered. The IMP 30 does a good job of flying it for sport flying. For even more power, Hi Line now has the IMP 50, which would make a plane this size really zip. The original JN-1 is an ARV homebuilt weighing 320 lbs. empty. It is powered by a 38-horsepower Kawasaki engine, and was designed and built by James E. Peris. It is a very attractive little plane. Thanks, Roland, for the info!

Last but not least, here is a photo of my daughter, Victoria, holding the Elektrostar, a little free flight model sold in Germany by the Gunther Corporation. It uses a little Mabuchi motor, probably a 260, and three 70 mAH cells. It is direct drive, a change from most ready-to-fly free flights, which usually use gear drives. It charges from a common six-volt lantern battery (dry). The kids and I had fun with it for a few flights, then it suddenly decided to make a break for freedom, and we did not get it back. Oh, well.

Till next time, make the electric connection, and have fun! Mitch Poling, 7100 CSW/MC, Box 734 PSC 2, APO NY 09220-5300, or in Europe: Normannenweg 20, 6200 Wiesbaden-Biebrich, W. Germany. ***MB***

PLUG SPARKS *Continued from page 21*

could see at all times the leaders of the events. Ample takeoff facilities were available.

"A considerable number of 'new' old ships were noted: Quaker Flash, Super Buccaneer, Scientific Mercury by Frank Swaney; Buc. Std. by Les DeLine; a Ray Heitt 'Scram' by Pond; a Garami 'Colibri' by Sundberg and many others. Quite a few of the above suffered from test flights in the wind. Most of them resulted from looping under power in the high winds.

"In the Ignition event, Sal Taibi proved he still hasn't lost the touch by winning handily with his Brooklyn Dodger. Jim Medsker suffered bad luck with his Spitfire powered Bombshell, losing it on the first flight. Gus Sundberg finally got his Ohlsson 60 New Ruler flying right for this contest. Repainting it yellow did it, according to Gus.

"Besides the plentiful crackups (does anyone want a slightly 'used' Scram?), the number of lost models was surprising. By dint of intensive searching in a group, the Santa Barbara boys were able to retrieve quite a few ships. Real good sports!

"Also noted was the tremendous amount of engine collectors around Allan Shively's car, which flew a MECA pennant quite prominently. The horsetrading and bull sessions went on all day! A considerable number of movie camera fiends, including Joe Wagner with tripods were also seen throughout the day.

THE RESULTS:

Non-Ignition Event

1. John Pond Gas Champ	15:00
2. Bill Thompson Interceptor	10:30
3. Tom Protheroe Record Hound	9:42

Ignition Event

1. Sal Taibi Brooklyn Dodger	11:20
2. Ed Weiler Interceptor	8:58
3. Jim Medsker Buzzard Bombshell	8:00

Beauty:
Johnny Johnson Zomby

Looking back thirty years, there doesn't seem to be any change in writing style. This writer still tries to keep the column interesting with photos, latest news, reports, ideas, and best of all, anecdotes. More fun!

VARTANIAN VB-3 FOLLOW-ON

Received an interesting letter from Leo Vartanian in answer to our plea of the V-B design series. As this writer wrote, I do have

the correct series; VB-1 (crashed), VB-2 plans on hand; VB-3, sketches on hand; and the cabin model erroneously identified as VB-3 is the "Old Reliable" (also called "Old Faithful"), plans on hand.

In short, all plans VB-2, and Old Reliable are available from the Pond archives. One of these days, we will draw it up for the modelers. Resembles a K-G in many respects.

Photo No. 6 from Leo shows what his original "Old Reliable" looked like in the Chicago area. As previously stated, Goldberg considered this design in 1937-8 one of the most dependable flyers of that age. Note lack of cowl. Didn't seem to hurt the performance one bit.

SNOW IN CALIFORNIA?

Received a most interesting letter from Gene Wallock, Editor of the SCAMPS "Gas Lines" newsletter, wherein he gave a report of the Lucerne Valley Haggard Bowden contest annually staged by the Southern California Antique Model Plane Society (SCAMPS).

After reading the first few paragraphs about the problems in combating the ever increasing wind and the long chases, we pick up the description here by Leon Nadolski, Contest Director:

At 9 a.m., as the wind started to come up, Jim Adams entered his Forster 99 powered Powerhouse in the Bowden event. On his first flight, the ignition timer was influenced by the cold weather and refused to perform its function. After 4"P" minutes of power, Jim's model landed 1/2 mile down wind with a total time of 10:43. A zero for this first Bowden flight. The wind continued to pick up and the temperature started to drop. Old Coloradon, Al Heinrich, kept watching the storm clouds blow over the low hills bordering the dry lake on the West and proclaimed an approaching snow storm; "looks like a Colorado blizzard coming"! However, we all knew it never snows in Southern California.

After the last flight of 2-1/2 minutes and 1/2 mile chase, the contest was over. The wind continued to freshen up and the Colorado blizzard started with snow flakes the size of quarters.

The drive home through the Lucerne Valley was interesting. Heavy wet snow accumulating on the windshield, visibility 200 feet maximum, and the desert white with half an inch of new snow. Only the Joshua trees looked comfortable in that storm. Contest called because of a blizzard!

The foregoing is typical of California this 1989-90 winter as the weather at times has been most unusual and unseasonable. Temperatures have been jumping between 45 and 70 on successive days!

Regardless, we are running Photo No. 7, showing newsletter editor Gene Wallock with a good flying Cleveland Wakefield Gull; taken on a nice day! Might also mention many of the Cleveland Wakefield rubber power designs are excellent fliers (due credit to Joe Elgin) like the Gull, Thermaleer, 30 inch series, etc. Give 'em a try, you'd be surprised!

SPOOK SAGA

Photo No. 8 was taken on the street in a small town in Iowa. Test gliding a Spook 72 by Ed Smull in 1940 is really a lost art nowadays. Nobody wants to take a chance on ruining that old engine, in this case a Brown D.

However, Ed opted for more power and installed an OK 60 before the first flight. Without a single test flight, Ed took the model to the 1940 Chicago Nationals (about a 200 mile trip).

"The first flight of the Spook was an official! I put the Spook at the end of the plywood 'runway,' fired up the engine, set the timer, and let'er go. The model did a nice R.O.G., climbed and glided well, ending up with a safe landing. What's so tough about this free flight gas event? Haw-w!

"Well, I soon found out on the second flight. The model spiraled in and suffered minor damage. Wha' happened? This free flight is a black art.

"During the next year or so, I made enough flights to get the fuselage thoroughly soaked with fuel. Repairs were numerous. It was now getting more difficult to fix the model. I finally ended the Spook saga with a ceremonial cremation! Shades of the Vikings going to Valhalla!"

CANADIAN CAPERS

Peter Mann, 36 Sydenham St., Guelph, Ontario N1H 2W4, writes to report the doings and results of the Jimmie Allen 50th Anniversary Postal Air races using the official 1939 Canadian J.A. design. Results looked like this:

ALL CLASSES

Longest Single Flight: Ken Hanneson	187
OPEN	
Longest single flight (Bortnak)	132
Best 3-flight total (Bortnak)	315
JUNIOR	
Longest single flight (Hanneson)	74
Best 3 flight total (Hanneson)	137

The 50th Anniversary of Fred Bowers' 1939 Wakefield Model was held at the Eastern Canada Open, Gananoque Airport, Ontario, on September 16, 1989. Weather wasn't that great with resulting low times. Results:

1. Bob Milligan (California)	357
2. Gerry McGlashan (Quebec)	297

As can be seen in Photo No. 9, we have a bit of nostalgia with Roy Nelder (left) holding Bob Milligan's version of Fred Bowers' Wakefield model. As an interesting sidelight, Roy Nelder, Bob Milligan, and Fred Bowers flew together in the Toronto area in the late thirties and early forties.

Mann announces another 50th Anniversary meet: this time for Roy Nelder's 1940 Moffett Winner. This contest will run until October 31, 1990. Write to Pete for details. No entry fee!

In addition, O/T Events will be held at the Canadian Nationals June 30-July 8 at Huron Park, Ontario, which is north of London near Antralia. R/C events will be the same as last year, being held on July 3 and 4 at noon to 4 p.m. Contact Vincent Gavegnon, 30 Kathryn Crescent, Stratford, Ont. N5A 2Y7,

The free flight power and rubber events will be held all day on July 2. Pete Mann is the "man" to contact on events. Entry forms can be obtained from the National Coordinator, 21 Chaucer Ct., London, Ontario N6K 1V1. Don't say we didn't tell you!

TIGER SHARK RE-RUN

Another Photo (No. 10) has been received from Robert Fenske, 150 S.W. 2nd Avenue, Box 67, Elgin, Minnesota 55932, who writes to say not many know that Stanzel put out a rubber powered version of his Controline Stanzel Sharks.

The P-60 seen is a rubber powered version that is a completely different "can of worms," according to Fenske, than current models on the market.

Bob goes on to say the P-60 (and other Tiger Shark versions) are beautiful things. He doesn't regret a minute of the time spent building them! His present goal is to build all versions of the Stanzel line. Won't that be something to see them all in a row!!

ADDRESS CHANGE

For those fellows who like the Fred Lehmberg kits of the Feather Merchant and Goon designs, Fred has relocated to 5167 Oak Park Lane, Anderson, CA 96007; new telephone: (916) 365-9470. Fred welcomes all correspondence and visits as he is rapidly getting set up at his new place.

H.L. GLIDERS

We don't talk about Hand Launched Gliders in O/T Free Flight too much as most of us graybeards simply cannot stand the gaff like the younger set.

However, in SAM 21, there appears to be a couple of "health nuts" in the ages of 35 to 45 who thoroughly enjoy the flinging and chasing of gliders. Seen in Photo No. 11 are Ted Kafer and Steve Roselle, a couple of enthusiastic O/T Glider modelers.

Matter of fact, the old Joe Hervat designs fly so well, Steve has won the overall High Point Glider Trophy in NCFFC competition for the last few years.

READERS WRITE

Surprise this time! Mike Cook of 10 Hawthorne Road, Wayne, NJ 07470, writes to send in Photo No. 12 with the comment he caught this writer in a rather fatigued pose (or near collapse).

The pic was taken at the 1989 SAM Champs held at Lawrenceville, Illinois, at the Mid-American Airport. Seen is the old reliable Bay Ridge "Mike" for 1/2A Texaco. This is the second of this series as the first was traded off to promote 1/2A Texaco activity.

From Adolf K. Anderson (Andy to you) of 9661 Rindge Circle, Fountain Valley, CA 92708 comes Photo No. 13 showing one and all that Joseph (Joe) V. Boyle, Jr. is still alive and kicking. The photo was taken on June 20 at the Brainbusters Spring Annual held at Petersburg, Virginia.

Those wishing to contact Joe can do so at 219 Shenandoah Road, Hampton, VA 23361. According to Andy, Joe is still as sharp as ever. He is seen with a dandy flying 020 powered Strato Streak. That will keep the legs in shape!

SAM 8-BALL TROPHY

Here is a fun thing that every club should have... a "goof" trophy. For years the San Francisco Vultures had one followed by an unwanted trophy awarded by SAM 21.

The trophy is given to a deserving modeler who makes a rather glaring error in the handling and flying of models. The Vulture trophy was a little hard to get rid of once acquired as the recipient had to catch the next "victim" in the act. None of this hearsay. Needless to say, this writer had it more than once!

The SAM 8 newsletter brought all this to mind with the "8-Ball" Trophy. The trophy was awarded to Don Nordlund for outstanding efforts during 1989. The trophy came with a ribbon with the following inscription:

"I, Don Nordlund, did crash my Ehling into the only fence post in all of Jean Dry Lake (SAM Champs) and for many miles in any direction, causing considerable damage to the airplane, not to mention the post. Retriever Ed Lamb was put to a great deal of trouble in having to gather up all the pieces and carry same on his bike. Other club members were seen to waste valuable time jumping up and down waving arms and laughing while trying to figure out how anyone could do such a thing. Finally, they all agreed if anyone could do it, Don could, at the 1989 SAM Champs, Jean, Nevada."

Guess what? This writer wants to horn in on the fun with a photo taken by Harold

Johnson before Nordlund's historic flight! The reader will note the day is still fairly young and the model is in good shape (one piece, to you!). Treasure Photo No. 14 Don, as it is the only one!!

AUSTRALIA

We waited a long time to find a slot for the poem as submitted by John Abbot of Australia. Seen in Photo No. 15 is John with a Miss Tiny at a contest at Dapto (near Wollogong).

We will not print the whole poem entitled "Old Timer Day" as the first part included many names not familiar to the U.S. readers. We feel the following hits the spot:

"I am sure in that Heaven for bygone model fliers they look down on us and say "Goodluck, you triers," and think kindly of us who enjoy this sport of flying Oldtimers - and we're sparing a thought for the original modelers who flew long ago with cranky Brown Juniors and Cyclones and no radio to recall those fabulous kites; the planes they lost, the sleepless nights - rebuilding, redesigning and drawing the plans of the lovely old planes they have left in our hands. So we raise our glasses to you who have gone - "Good Luck, Oldtimers - Your planes still fly on."

THE WRAP UP

Received a short note from "Jasper" Mikkelson who reports that John Nogy died on Sunday, January 21 at his home in Paso Roble. His wife found him in the chair after dinner and found he was not taking a nap but had passed on very peacefully at 73 years of age.

Might mention this writer luckily kept a Mikkelson photo taken at the SCIF Sept. 1989 meet. Seen in Photo No. 16 is John Nogy with an Aero Mighty Midget powered Lackey Zenith. The "Flightplug" as so ably edited by Ken Sykora had an excellent follow-on which we are pleased to quote.

"We first laid eyes on ol' John at an early post-war Nats. He went loping by chasing a beautiful pylon ship. He was dressed in tennies, jeans, and a Roman Toga... white with purple trim... that flowed out in his wake. We were informed, 'he's with that California bunch,' and that answered all questions for a country boy, still green to the ways of big time meets.

"Years later, our paths crossed again at a meeting of the fledgling SCIF club. Here he was dressed more somberly, and we thought perhaps he isn't such a 'character' after all. But that, of course, was just the beginning of our 25 year friendship... .

"His physique was six feet of No. 8 hemp rope, with a complexion of well tanned leather. He had a jutting jaw, surpassed only by a no-nonsense nose (that he claimed could open a Bud better than any made-made tool!). He was passionate in his opinions, and had a temper that could flare... with a tongue that cut down opponents like Cyrano's blade. And yet, in the blink of an eye, there could come that grin, ear to ear, above those twinkling, beady blue eyes, and a roar of laughter that left him falling about. So you could never be sure that he wasn't putting you on. But one thing we did know; he loved a good joke... and he laughed hardest when it was on himself!

"Then one day, John Nogy turned the corner, and was gone. What we will always remember is the last time we saw him. Dusty van leaving Taft, a casual wave and that crackling laughter floating back from someone's last shouted punchline. And that receeding rear bumper sticker that always carried his personal coat of arms: "You Bet Your Dupa, I'm Polish!" ***MB***

BLACKHAWK *Continued from page 23*

over the last three years, trying various panel and tip dihedral settings, rudder size, shape and moment arm, roll spoilers and ailerons. Several friends helped out by building Hawks with their own variations, such as different airfoils, wing structures and tow hooks. The version shown in the plans is the best compromise for HLG use. Other reflexed sections, such as the Seelig 5010 gave better penetration and higher L/D when flown off a hi-start or slope, but exhibited poorer transition and stall recovery from hand launch.

My good friend, Ken Bates, built several Hawks with removable wing joiners and slightly reduced section spans (19-inch), so that the whole airplane, transmitter, and mini hi-start could fit in an airline carry-on case (8x16x20). Great for traveling!

As the structure is so simple and straight-

forward, a detailed building sequence is unnecessary. Start with the balance point as shown and do gentle hand glides to set the elevator trim before trying a full power hand launch. Shifting the balance more than 1/8-inch either way *dramatically* changes the handling characteristics, so be careful! If you decide to use a light-duty hi-start, be sure to use the wing mounted tow hooks and a split tow bridle.

I hope you enjoy your Blackhawk as much as I do mine. ***MB***

ELECTRONIC *Continued from page 25*

"Can I shield the long leads with a braided copper 'tube' similar to the shielding on coax TV cable or the like? I see various types in the electronic stores here where I live—different diameters, different weights and so on. I looked at Jomar's Glitch Busters but they are too expensive for me. But I'd go that way if that was the only thing I could do.

"The leads to the servos on the ailerons would be about 36 to 40 inches long; about the same for the rudder and elevator servos if it is possible to mount the servos in the tail section. Why don't we do that anyway instead of the long pushrods? Frankly, using pushrods seems sort of antiquated. Well, mainly I'm interested in the aileron leads. Eliminating pushrods eliminates a lot of slop in the joints even when you are careful with all the fits and clearances, etc. Any suggestions?"

We all share the same problems, don't we? But look at the bright side: we also share the same great fun and feeling of accomplishment. First of all, I have to stress the fact that systems equipped with double conversion FM and PCM receivers are less affected in this manner than older AM or even new single conversion AM receivers. And for those of you who forgot, PCM equipment uses FM as the transmission mode; it is the encoding that differs. Now for long servo leads; they are generally thought to create problems in four different ways:

1. Supply voltage drop, caused by the resistance of the long leads.
2. RF pickup by the long leads.
3. Signal deflection or reflection by the long leads.
4. Control signal amplitude drop, caused by the resistance of the long leads.

Let's take them one at a time, the voltage drop first. We've all read mention of this phenomenon, with recommendations that all servo extensions be made from heavier wire. But I don't recall ever having read any actual figures, so I decided to gather my own.

Dusting off the old crystal ball... No, seriously, I took a couple of 36-inch lengths of R/C type wire and connected them to a variable power supply. The power supply for this and all subsequent tests was set for exactly 5 volts, read directly at its output terminals. As expected, the voltage at the end of the wire, without any load applied, was also exactly 5 volts.

Now, let's put on a load and see what happens. This was done by soldering a 24-ohm resistor to the free end of the wires. (If you ever do any similar testing, avoid the use of clips, as they will introduce their own resistance and errors.) The resistor created a current drain of 208 milliamps, and the voltage at the end of the wires was now 4.93 volts. A little heavier load was applied, 12.4 ohms, which drew 403 mils. This time the voltage dropped to 4.87 volts.

Let's see now what happens when we load it down to *one amp*. Well, the nearest I could come to the required 5-ohm resistor was 5.6 ohms, with the resulting load being .893 amp (893 milliamps). Starting again with 5 volts, the drop this time was down to 4.62 volts. Let's put all that in an easier-to-see format:

LOAD IN MILS	DROP IN VOLTS	DROP IN PERCENTAGE
208	.07	.014
403	.13	.026
893	.38	.076

Let's consider those current drains for a moment. The exact in-flight drain is going to vary greatly from airplane to airplane, depending on its size, weight, speed, and even the actual maneuver being performed. Poor hinging, dragging control rods, and the use of tight "Z" bend wire fittings will increase current drain and thus decrease your flight

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time per charge. However, the *maximum* current drain is easy to measure; simply stall the servo. When stalled, most servos will consume between 300 and 500 milliamps, so we can feel pretty safe in assuming that even worst case conditions in the air are going to be less than that. Look again at our figures. Notice that the voltage drop for a 400 mil load is extremely small, much smaller than that normally experienced as the system batteries gradually discharge. Many modern servos work well even down to three cells; I really doubt if a drop of .13 volt or even higher is going to affect the servos adversely.

However, knowing that Murphy's Law sometimes seems to take precedence over Ohm's Law, let's assume that we do run into a situation where the voltage is dropping enough to affect the servo. What will be the symptoms, and what is the best cure? The most noticeable symptom will be a hesitation of the servo when it is driven rapidly, i.e., at the moment of greatest current drain. Heavier wires will help, but an easier cure is the addition of a large capacitor at the servo end of the cable. Technology provides the answer here with a new type of cap, small in physical size yet providing a capacity unobtainable not too long ago, high enough to be measured in full Farads. A 0.47F 5.5 volt unit should fill the bill just right. Such capacitors are available from serious electronic suppliers and by mail from Mouser Electronics; it's No. 555-470Z5.5, at $3.70 each. Mouser has an 800 number (346-6873), and branches at: 11433 Woodside Ave, Santee, CA 92071; 2401 Hwy. 287 North, Mansfield, TX 76073; and 12 Emery Ave, Randolph, NJ 97869.

The capacitor should be added, properly polarized, between the positive and negative wires. Its action will be to maintain a large 5 volt charge which the servo can draw from when the supply voltage drops below that value. Believe me, it works.

Now for RF pickup in the long leads. This is much more likely to happen than excessive voltage drop—and don't make the mistake of thinking that it is only long servo leads or your transmitted signal that you have to contend with. It can happen with *any* length leads and be caused by one of *countless* transmitters in the world. What happens is that the wire will pick up RF from whatever source, which will find its way into and upset the decoder IC, dirtying its control pulse to the servos.

Before we go into this subject any further, let us clarify one important point: The length of a piece of wire does not necessarily increase its effectiveness as an antenna, it only determines at what frequency it will be most effective! At 72 MHz, any length approximately the same length as the receiver antenna might produce an RF problem, but only if the receiver is of poor (i.e. cheap) design.

At this point, I have to jump ahead to our last possible long lead problem, signal deflection or reflection by the long leads, because this as well as RF pickup can often be a matter of aircraft-to-transmitter orientation. Deflection of the desired signal can happen if anything metallic is placed *between* the receiver antenna and the transmitter, reducing the strength of the RF signal at the receiver. Signal reflection is caused by a metallic object on the opposite side of the receiver antenna, a secondary signal being bounced back and confusing the receiver. A good example of that is the double picture you sometimes see on your television screen at the same time you hear an airplane flying over. These effects will occur more often and with greater intensity if the metal is close to the same length as the receiver antenna and at a separation distance even to a sub-multiple of its length.

Obviously, the alignment of the three, the transmitter, receiver antenna, and servo leads will be the determining factor in this case, and will also affect RF pickup by the leads. Without much doubt, either or both happen a lot more often than we are aware of, however, since the airplane is constantly in motion, the adverse relationship does not last long enough to have any visible effect.

The test for both RF pickup and lead deflection/reflection is simple. With everything in the airplane in its normal position, connect one servo with normal lead lengths only, and establish a range with the antenna down, walking completely around the airplane to establish any variations as the orientation changes. Then plug in the long

leads and respective servos, one at a time, and repeat the same range test. You will find minor variations, but anything repeatable that reduces range by a third or so should be suspect. Keep adding servos until you have them all connected, and as a final check, make a test with the engine running.

Pinpointing the exact cause of any observed problems can be difficult, and it might be necessary to treat for them all. In some cases of signal deflection/reflection, moving the receiver antenna is all that is necessary. In extreme cases, a vertical receiver antenna can be necessary. For RF pickup problems, the shielding of the leads that Park mentions is effective. It is grounded to the negative (black) lead, and might require connecting only at the receiver end or at both ends—try both ways. First, however, a bypass capacitor, a .1 or .001 ceramic between the signal and negative leads should be tried; it will pass the unwanted RF to ground and is lighter and easier to install.

An RF choke, a coil of wire, can be placed in the line and will inhibit the passage of the unwanted RF, but one has to play with the value to find the correct one, and the RF choke itself can cause an additional voltage drop. A method definitely worth trying is the use of ferrite beads, through which the individual wires are threaded. A complete kit with recommendations is available from Radio Controlled Models Inc., 4736 N. Milwaukee Ave, Chicago, IL 60630; it's RF De-Glitcher # Red 10.

And finally, last but not least, the last possibility, a decrease in the amplitude (strength) of the servo control pulse due to the wire resistance. This is the most likely culprit of all, especially with the R129DP receiver which our seaplane flying friend is using with his 7UAP system. The servo signal out of that receiver is slightly lower in amplitude than most others; add a little resistance in the line, or a low impedance device, and operation can possibly become erratic. What is needed here is a buffer device to maintain the control signal pulse at an acceptable amplitude.

I am presenting two different such devices for you. One is a one-transistor, single-channel unit which can be added at the end of the extension. The other, using an NTE 80C97 CMOS Hex Buffer IC, can be wired for up to six channels. The required connections are simple: one positive and one negative lead from any servo channel, and a signal out lead for every channel to be used. On the output side, of course, normal connections have to made to the servo. Radio Shack has an etched and drilled PC board (276-159) on which the IC can be mounted and all necessary connections made. For dual servo operation, a single receiver output can be wired to two sections, with individual servo outputs. Pin connections to the 80C97 are:

Power: Positive to 16, negative to 1, 8, 15.

Sections:	In	Out
1	2	3
2	4	5
3	6	7
4	10	9
5	12	11
6	14	13

Now for Park's thoughts about mounting all servos close to the control surface they are to operate. The idea is far from new, and a lot of large airplanes are flying around in just that fashion. The servos are usually mounted facing outwards against the side of the fuselage, with only the output shaft and fitting protruding, from which short rods couple to the control horns. Obviously, long servo extensions are required here, and without a doubt, in some cases have caused problems. But once isolated, a cure, one of those described, can be effected.

• • •

Leisure Electronics, one of the pioneers in electric powered flight, now has a new charger for your consideration. The Model 201 12-volt input quick charger is claimed to revive your six or seven-cell flight batteries not only completely but safely. The 201 is a peak detecting charger, and also includes circuitry that prevents damage to either itself or to the battery pack in the event of reversed connections or defective cells. Simple to use, a ready light indicates that everything is OK to proceed with the charge. Another light indicates charging is taking place, with visual indication also after the peak charge is completed.

In addition to electric power system batteries, at the flick of a switch, the Model 201 can be reset to charge airborne system flight batteries at a 1.5 ampere rate, also with the fully automatic testing and charging features. For further information, try your local hobby shop, or contact Leisure Electronics, 22971 B Triton Way, Laguna Hills, CA 92653, (714)581-1198. ***MB***

ARFS *Continued from page 27*

sized model, but these little jobs are easy to take along for an impromptu flying session. Lots of R/C fliers who can manage an hour or two break during the working day can grab a quick couple of flights when they are toting a conveniently compact model in the

trunk of the car or in back of the van. When at the field, they seem to get in more flights than the bigger, more intricate models, doing all this on small engines which are very economical to run. If you like zippy, spirited performing models, then smaller airplanes are just right. And you don't have to be an expert to enjoy them, just an average flier who has soloed and has a few dozen flights under his belt.

As for the Skyward 25, it served perfectly as a small sport model, responding quickly and nimbly to control inputs, yet because of its flat bottomed wing with generous dihedral, it maintained an excellent stability at all times. Frankly, rudder response was so snappy that one can hardly justify putting ailerons on this type of model. True, rolls are a bit more on the axial side with aileron input, but acceptable rolls can be accomplished on rudder alone. In any event, I can't think of any other important maneuver it will do with ailerons that it cannot do with rudder. Spins and snap rolls are almost impossible, no matter what you do. One of the reasons the Skyward 25 flies so well is because it is of light construction, just like the two larger versions, the 40 and the 60. This company has adhered to one of the basic requirements of a successful model airplane design... keep the weight down! By the way, on one early flight we had an elevator servo failure, the ship nosedived in from about 25 feet, and all it suffered was a bent nosegear and a scuffed wingtip. So light construction doesn't necessarily mean weak construction where a crash is concerned. Anyway, I would like to add my hearty endorsement to Chuck's, as the Skyward 25 is a great little airplane for those days when you just need to get out and fly and don't want to cope with a bigger and more complex model. If you buy it you'll fly it a lot!

Back in November, I undertook a trip to England and France, and due to attending a family wedding and spending time with relatives and friends, I was unable to get as deeply involved in modeling activities as I usually do. However, I did have one important mission to accomplish for Charlie Strange. He had requested that I purchase a Laser four-stroke vee twin engine for him. I expected that this would be no problem, as I would just drop into the nearest well-equipped hobby shop and pick one up for him. As usual, what appeared to be an easy task turned out to be of monumental difficulty. After making a few inquiries and phone calls among various dealers, I was told that the Laser engine could only be purchased directly from the manufacturer. A little more detective work located A.G.C. Sales Ltd. on the outskirts of London. I called Neil Tidey, the director of the company, and had a most pleasant discussion with him, but I was chagrined to learn that there was a six month wait for a Laser vee twin. However, being that I was an overseas visitor and all, plus the promise of some copies of *Model Builder* magazine, softened Neil up to the point where he said they would build an engine especially for me, but it would still take them two weeks. Fortunately, I had another two weeks in England, so I asked him to go ahead and build it. Keep in mind that the engine is virtually handmade, as it is quite intricate and requires a lot of hand fitting. If I remember correctly, he said that production was less than a thousand units a year.

The Laser vee twin four-stroke is made in three displacements, 1.20, 1.50, and 1.80 cu. in. I ordered the 1.50, which surprised Neil, as the 1.80 was in much greater demand. The engines were priced at $472.00, $488.00, and $520.00, and that includes the muffler.

True to his word, two weeks later Neil called and said the engine was ready, so I drove nearly an hour to his small factory. It turns out that A.G.C. Sales Ltd. is a small machine shop housed in a small stone building which appeared well over 100 years old. The company contracts to make various parts for a number of manufacturers, and the manufacture of engines is sort of a sideline, a labor of love, you might say. Anyway, I was given a tour of the small factory which employs about eight workers, and finally was presented with the engine I had come for. As this was the first time I had ever seen a Laser vee twin, I was greatly impressed with the workmanship and smooth finish. I was assured that the engine had been bench run and both carbs had been adjusted for idle (final high speed adjusting is left for after

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a few break-in runs by the buyer). After taking a few photos of the operation, I bid the good people who make the Laser goodbye, and headed for the airport with the engine in hand. (For further information about these remarkable engines, contact A.G.C. Sales Ltd., London Road, Apsley, Hemel Hempstead, Herts HP3 9ST, England.)

The handsome little model in the accompanying photo is of the 1/2A Mirage IIIC. It is made of solid foam, with a wing span of 28-3/8 inches, length of 32-5/8 inches, and a flying weight of 22.2 ounces. This airplane is intended for two mini servos with elevon control, and requires virtually no assembly beyond installing your radio and engine and slapping on the decals. The manufacturer recommends a Cox Black Widow .049 engine, but I installed a Cox TD .051 for extra performance. Actually, I have seen some of these with three servos, but it seems rather superfluous to have throttle control, as it flies best on full throttle, then comes down in a gentle flat glide for a perfect dead stick landing. Now that I have you all excited and anxious to buy one, I must give you the sad news, this model is no longer available. It used to be sold by Circus Circus Hobbies for around $39.00, but a few years ago they decided to discontinue it. Lucky for me I walked into their Las Vegas store at just the right moment, when they were clearing these models out at $9.95, so I bought a half dozen. After distributing them to my flying buddies, I held back one brand new one for myself. It reposes in my workshop while I still fly the original one shown in the photo. It is really one of the most enjoyable ARFs I have ever had, and every now and then I haul it out to the field. If any of you readers are lucky enough to own one of these, treasure it! There's nothing available today that compares with it.

When I first began this column I received a scattering of mail, but as time went by, the volume increased to where letters arrive every day. I still answer them all, but I am not receiving enough photos of your favorite ARFs for publication. How about it, you must have something you are proud of and would like to share with the rest of us. Write me at 2267 Alta Vista Drive, Vista, CA 92084-7023 (SASE for a reply, please), or phone me at (619) 726-6636. You can also FAX me at (619) 726-6907.

INSIDE *Continued from page 29*

the air inlet hole in the carb's casting. The engine begins to slow down. As the two holes further mis-align at still lower throttle settings the incoming volume of combustion air is still further restricted and speed is further reduced. As model engines slow down, the ratio of fuel to combustion air is too high (the mixture is too rich) for reliable idle performance. Now the idle speed needle valve (the smaller one on the engine's exhaust side) enters the picture. This smaller needle valve is threaded into the exact center axis of the steel throttle barrel. Also, the front surface of the barrel has a diagonal surface groove cut into it... the single screw on the front of the carb casting has its rounded tip precisely fit into the barrel's diagonal groove. As the barrel rotates, the "screw-in-the-groove" causes the barrel to move laterally or sideways... and as it moves inward toward the high speed needle side, it carries the idle speed needle with it. This smaller idle speed needle valve's tip then starts to stick into the beveled end of the spray bar as lower rpms are called for. The further the tip sticks into the spray bar, the more its increasing outside diameter restricts the fuel flow into the engine. By carefully adjusting the idle speed needle valve, you set the proper mixture at idle speed so the engine will have a lean mixture and readily accelerate from idle speed without hesitation. The carburetor is easily cleaned... simply loosen the two tiny 2-56 x 3/16 inch Phillips machine screws that hold the spray bar (and the big needle valve) onto the side of the carb's casting and remove. Remove both needle valves and flush all openings and surfaces with a can of WD-4O.

Most R/C carbs work in a somewhat similar manner to Fox's... it just seems Duke's mixture of inside and outside diameters, needle tapers, lateral movement, bevel angle and internal smoothness and roughness of machined surfaces... along with many other

design/engineering factors... results in model engines that consistently have better ratios of high speed to reliable idle speed... better Richmond Ratios.

This Eagle IV .74 has a 1.000-inch bore. The Eagle IV .60 is in the same castings, uses the same stronger crankshaft and its bore (inside cylinder diameter) will be reduced to yield the .60 cubic inch size that's only required for AMA pattern flying competition. The Eagle IVs fit the mounting holes of the earlier (1981) series of Eagle engines. The best and most economical way to increase horsepower in a model engine is to increase displacement... that's what the .74 offers over the 60 size... about 350 to 400 more rpms on a given size prop... a lot of increase at the top ranges of rpms.

There's been a major design change in the Eagle IV's combustion chamber (if you have a mechanically good Eagle III that you don't think runs quite right, send me a SASE c/o *Model Builder* and I'll detail to you the simple changes I've made in mine that you can easily duplicate). The squish band is .250 inches wide and the combustion dome is an exact .500 inch hemisphere that has the supplied Miracle plug protrude down inside about .050 inch. The new glow plug's bottom coil extends down about one coil, as I do on my Quickie pylon racing plugs. The combustion chamber measured exactly two cubic centimeters at top dead center and this gives a nice gentle 7:1 compression ratio, although the ring seals so well after break-in that you'd swear the compression ratio was much higher! The head fin casting is held on with eight 6-32x1/2 inch Phillips screws; the rear crankcase cover is held on with four 6-32x3/8 inch Phillips screws and uses a thin paper gasket for sealing. The head fin casting clamps the turned aluminum button head directly in and on top of the cylinder with no gasket present or needed. It's interesting that Soviet glow engines come with a variety of thin soft aluminum head gaskets, or shims, so their compression ratios can be adjusted to match local humidity and fuel in use. My old (1981) Fox Eagle III .60 ran best in Central Florida's 90%-plus summer humidity with the bottom of the button shimmed to be .035 inches above the top of the piston's upper travel... this dimension is called "deck height"... and this month's review engine exactly matches the .035 inch figure! Anyone who flies in an extremely humid summer-like climate (above about 60%) may find that adding a .010 to .025 inch head gasket under the cylinder head may make any engine "less cranky," easier to needle, and easier on glow plug elements too. Most of us select fuel with nitromethane contents of 10% to 15%... if your engine seems too cranky and you don't want to add a shim, try fuel with a lower nitro content but then don't expect a superb idle. The new Eagle castings have a threaded hole that doesn't quite go through the thickness of the rear crankcase cover. If you drill a 1/16-inch hole through the wall and put the muffler's pressure tap in the threads, you'll have access to untimed crank-

case pressure that's far higher than muffler pressure (remove the cover before drilling), and this can be used possibly for an airborne smoke feed system. I've never found muffler pressure to be effective in remedying a mispositioned fuel tank and I seldom use it in acrobatic models. This Eagle IV runs fine without muffler pressure on a 10-ounce tank that's centered up/down on the carb's spray bar. There's an optional "F" size carburetor with a larger .350-inch throat diameter available for still more power, but it'll require an aftermarket fuel pump for good fuel draw... I'm flying this 74 "as is"... and enjoying it on a 12-6 in the 7-1/2 pound test model.

The Eagle IV's carb is held on with two 6-32x5/16 inch Phillips screws and sealing is by a thin paper gasket. All screws that pass through paper gaskets should be lightly snugged before running any new engine... the gaskets tend to compress while the engine waits to be bought. The carb feeds fuel and combustion air through the crankshaft intake window where it then enters the crankcase through a .470-inch inside diameter passageway inside the crank's journal. The journal's outside diameter is a massive .665-inch... the crank's web is .275-inch thick front-to-back... the crankpin is .280-inch outside diameter and is hollow bored to aid balancing. The crankshaft has been lightly splined where the split collet fits to further prevent prop slippage... it's an extra manufacturing step. The prop threads are 5/16x24. The entire crankshaft is hardened and then ground to finish dimensions. The crankshaft's web, as viewed from the rear, is non-symmetrical... it's Duke's creative engineering at work. The crankshaft is so sturdy that it represents ONE FOURTH of the engine's total weight. The shaft runs in a pair of Fafnir (made in Connecticut, USA) ball bearings.

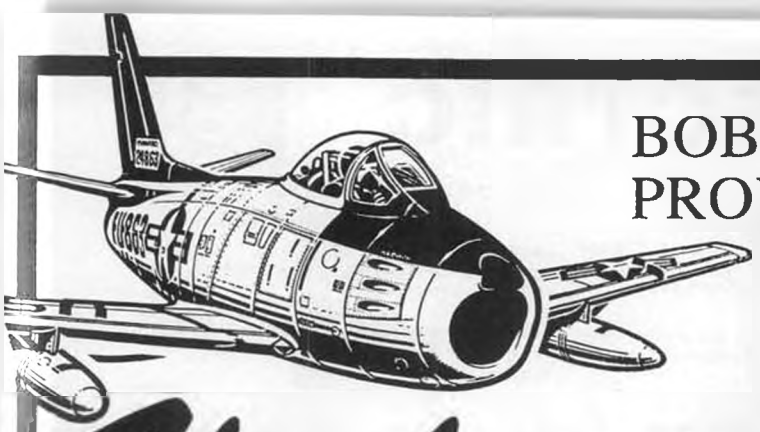
I don't believe in removing ball bearings unless they're going to be replaced. In the same manner, I don't believe most readers buy a new R/C system, take it home, open the receiver, battery pack, and the four servos looking for conductive metal "freebies." Similarly then, I don't think readers should buy a new engine, take it home, tear it all apart and go looking inside for destructive metal "freebies." If you feel you have to absolutely get inside a new engine... I recommend nothing more than removing the glow plug and removing the rear crankcase cover (scratch an "X" on its top first), and flushing through with a can of WD-4O. It's best to recognize that today's engines have very liberal and very valid warranties that protect our purchase. It's also best, I feel, to carefully study the photos with these columns... their focus or aim is to show you what's inside without you having to take things apart yourself! The piston, ring, connecting rod, wrist pin, and circlips assembly weighs only 22.5 grams... light for a .74 size. Fox makes its own piston rings... as I recall they even hold patents on the process of ring making. The single ring exerts above average outward force inside the cylinder walls, but performance sure doesn't suffer.

The two lubrication holes of the connecting rod face forward... and are drilled, through creative engineering, where many people feel is the "right" location... it's a tough spot to drill them. The rod is bronze bushed at both ends, and its cross section is a beefy .300 x .175 inch. If you ever want to remove the wrist pin (like for a rod replacement) you'll need a tool similar to Sears Craftsman #9-45358 to remove one of the circlips that retain the wrist pin. It's best to not reuse the old circlip.

The steel cylinder has three square intake ports as well as a forward and rearward boost port. Even though the cylinder wall is only .060-inch thick, the two boost ports are angled upwards and away from the exhaust ports. The cylinder itself weighs a light 48 grams (28 grams = 1 ounce) and it's an easy no-heat slip fit into its finned casting. The cylinder is clamped in place by a heavy .125-inch thick lip at its top. I'd say the easy slip fit is Duke's way of omitting cylinder distortion problems in a bigger engine with a thin-walled, light weight cylinder. Smart!

This Eagle IV .74 review engine is Fox #27400. It is also available as you read this in the .60 size as #26600 which is also ringed. ABC versions are planned in both sizes as well as a pipe-timed .60 ABC version for contest pattern flying. This engine has conservative exhaust timing of 142 measured degrees... there's lots of time to burn the fuel on each power stroke and the fuel economy is therefore quite good, although none of us buy engines on that basis.

I always choose ringed or non-ABC engines for sport flying and an ABC for pylon racing. Ringed engines take more abuse than ABCs that use an aluminum piston. A tiny hunk of grit can get crushed between an iron piston ring and the steel cylinder and the engine will normally keep on going... with usually only minor vertical scratches. The same piece of grit will often totally destroy an aluminum piston. Many modelers buy ABC or ABN engines for sport flying and think they're better because they cost more. False! A worn-ringed or iron piston engine is much less costly to rebuild. A worn or damaged ABC/ABN piston and



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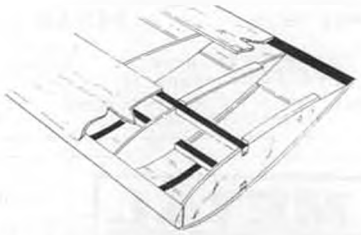

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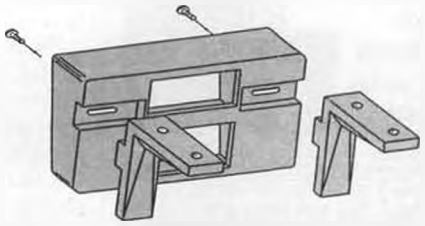

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cylinder may shock you with replacement costs. The cheapest way to increase power is to increase displacement. For those R/Cers who want a little more power for their .60 size models, this new Fox Eagle IV .74 is a great way to go. This is a time-proven, rugged design engine... built into a new set of castings... with a still sturdier crankshaft... with a new and vastly improved combustion chamber design... with everything made in the USA... and with all replacement parts just a phone call away.

The engine was carefully broken in with POWERMASTER's new Golden Break-in Fuel that comes in a half-gallon jug. The break-in directions come with the jug and are very easy to follow... we used a Master Air Screw 11-7 for break-in and the last of the fuel was used for the first test flights too. The original Miracle plug quit the first time the engine fired... a fluke... the second Miracle plug ran over 30 cold starts, hot restarts, high rpms for test data taching, has been flown over two air-hours, and looks like new.

Please be reminded that the ratios of high speed to reliable idle performance (the Richmond Speed Ratios) on a given prop appears to be totally non-related to temperature, humidity and barometric pressure. No matter where you live your Fox .74 should exactly parallel these performance figures. (See Table 1)

The Eagle IV .74 seemed most comfortable running with the 12-6 and is now being regularly flown with that size on the test model.

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

Bore is 1.000 inch, stroke is .938 inch, displacement computes to .736 cubic inch, deck height is .035 inch, carburetor intake diameter is .325 inch, muffler outlet diameter is .395 inch, exhaust timing measures 142 degrees (too low for a tuned pipe to be very effective, but helps fuel economy). The engine weighs 19 ounces and the muffler weighs an additional 3.2 ounces.

Made by Fox Manufacturing Company, 5305 Towson Ave., Fort Smith, AK 72901, United States of American, telephone (501) 646-1656, Fax (501) 646-1757. Fox product #27400 with suggested retail price of $179.95 at test time. Available now.

AND FINALLY... the long stroke Fox Quickee Sport .40... product #24091 this column reviewed in Nov. '89 *MB* is now available. Duke calls it a "muscle man"... it is! ***MB***

CONFESSIONS *Continued from page 31*

retired veteran cry.

After a careful ground check he put the 500 into a neat gyro-off hover. But a few minutes later when he tried a gyro-on hover my heli once again turned into a mean machine. This time it was his skill that saved her.

"Your gyro's running in the opposite direction," he said.

I was immediately on the defensive. "Hey, I know I hooked it up right. How can it be running in the wrong direction?"

Walt shrugged. "I don't know exactly why... but I do know an easy fix. Just turn it upside down."

Gyros are typically installed using double-sticky sided tape so remounting it inverted was quick and easy... and then we tried again. This time Walt's smile said it all as he kept her in an effortless hover. How nice to see the gyro finally earning its keep.

But then, as I thought about what'd happened, I became upset. The final step under "Installation" in the instructions did not, in my opinion, emphasize enough the importance of confirming, before flying, that the gyro was operating in the right direction to correct the action of the tail rotor, at least not enough for a fledgling chopper pilot. *(A call to Greg Milosevich at GMP indicated that additional clarification of this point is being added to the instructions. wcn)* The point is, before making your first flight attempt, turn on your radio and make sure the "rudder" servo is operating tail rotor pitch in the proper direction. Then, with the radio still on, and the gyro switched on, swing the tail of the heli from side-to-side and check that the gyro is acting in the proper direction to correct the motion.

Anyhooo... after refueling, Walt took her up again and this turned out to be the almost fatal third flight. Minutes after takeoff a sudden burst of power shot the 500 up about 20 feet.

Then, without warning, the engine went idle and my poor bird dropped like a great big rock... followed simultaneously by an equally fast-sinking and nauseous feeling in the pit of my stomach. I remember thinking that flying helis seemed to be nothing more than one kamikaze attack after another... a maneuver that I certainly didn't need any help with.

Even through moist eyes it was a terrible sight to behold. She hit hard, bouncing quite high at first and ricocheting all over the place like a jumping bean until finally coming to rest on her right side.

In despair, I slowly shuffled over to the wreckage. I tried to be brave but found myself squinting in an attempt to block out the awful carnage that lay before me. Hope burns eternal in the breast of man and I was hoping for some kind of miracle... like maybe, just maybe, she wasn't totalled.

Guess I used up my whole miracle allowance right then and there because instead of the expected bent and twisted mass, the only damage seemed to be a broken muffler, splayed skids and a few little nicks in the main rotor blades. Absolutely unbelievable!

A close inspection revealed what had happened. I'd misplaced the nylon part of the ball link that's screwed onto the engine side of the throttle pushrod and, without thinking, replaced it with a similar nylon piece from my parts box.

This turned out to be a really dumb move because the rods and ball links in the kit are threaded for a metric size that's a tad smaller than our 2-56. I was aware that the replacement nylon piece screwed onto the pushrod quite easily but, unfortunately, didn't think any more about it after making a slight pull test.

Well, by the third flight the ill-fitting 2-56 threaded nylon part vibrated loose from the metric rod, freeing the carburetor arm. This loose arm then swung forward, opening the carb and the 500 skyrocketed straight up... but seconds later it snapped back to idle, resulting in a Mach One plummet.

I installed another muffler, bent the skids back in place and inspected the bird carefully. She was ready to go again with only minimum down time.

Since then I've made over 20 liftoffs. Admittedly my hovering technique is still sloppy and needs a lot of refining... but the point is that I've been able to do this on my own, in spite of the fact that my reflexes and coordination have deteriorated lately. Had I known how to cope with the gyro's reverse running I probably wouldn't have needed Walt's help.

But don't get me wrong... I'm not recommending you do this the hard (and expensive) way, because a good instructor at your side is certainly both helpful and comforting. However, if competent help isn't available I honestly feel that by carefully following instructions anyone can learn to hover by himself with this machine.

And don't sweat the small stuff like not having a heli-type radio or a heli-type engine; you don't need or want anything fancy or expensive in this entry-level chopper. In fact the odds are that you already have a suitable engine and radio. My World Engines ASP .46 and Airtronics 4-channel FM worked perfectly with the 500. If I get real serious about choppers maybe I'll consider upgrading to a special radio and engine... but till then, things are fine the way they are.

I did build the Sport 500 stock... except for two modifications, neither of which had any effect on her flying ability.

As you can see in one of the photos, I bushed the forward part of the tailboom with a wooden dowel. Why? Because I felt that the two bolts securing the boom to the mainframe might eventually squeeze and distort the tube, causing a problem. Spacers of aluminum tubing would be an alternative method.

The other change involved starting. The 500 comes with a "V" pulley for belt starting and I had trouble with this setup; couldn't

seem to keep the belt tension right all the time. So I replaced the pulley with a 1-3/4 inch CB spinner and now get instant starts every time.

And in case you get to feeling embarrassed because you're the only grown-up kid in your neighborhood with a fixed-pitch machine, you can upgrade your Sport 500 with a Collective-Pitch Kit from Hobby Lobby.

One final note... I've never heard anyone mention using a buddy-box for those first hovers. Is there a reason for this? A buddy-box setup has helped save many a fixed-wing takeoff and landing... so why wouldn't it be equally effective for a heli?

Jim Martin was right about how exciting that first hover can be. It easily rivals the thrill of your first airplane flight. So why not challenge yourself and spice up your flying with the right kind of helicopter; it'll keep you off the streets and out of the pool rooms. ***MB***

TECHNICAL *Continued from page 34*

are more than adequate. I static-tested both of these and a third assembly, with the nuts in the sockets, to 165 pounds tension. You guessed it, I mounted them on my shop ceiling and hung from them.

None of them showed any damage. One hundred sixty-five pounds would be equivalent to a 16.5 g pullout on a ten-pound model or a fantastic 32 g on a five-pound model. I recommend a 4-40 bolt for planes up to four pounds, 6-32 up to six pounds, 8-32 to 10 lbs., 10-24 or 10-32 to 20 lbs., and a single 1/4-inch bolt for fifty pounds of model. My calculations show big factors of safety for all of these, with the most violent flight loads we could apply. We are talking *steel* bolts and nuts, however. Don't use nylon, brass or aluminum for the main wing bolt.

If you can't find a long enough bolt in the size you want, the weight penalty for going to the next larger diameter is small. I make my own long bolts by threading both ends of a soft steel rod (gas welding rod). Screw a hex nut on one end and rivet it or solder it, to make a hex-head bolt.

Don't overtighten the bolt when installing the wing. "Finger tight" is about all you want. A tight bolt would mean high friction forces between the wing and its seat and between nut and socket. This would increase the impact force required for wing separation and decrease the protection from damage. With the bolt properly tightened (i.e. very lightly) and with the rear nylon screw removed, the force required to slide the wing off should be only several pounds. If you can't push the wing off fairly easily by hand, the bolt is too tight. It must be tight enough to keep the wing from rocking or "working" in flight, however.

If the bolt still *turns* easily when lightly tightened, however, it could loosen in flight from vibration. Therefore, use some kind of locking compound or device on the head. Silicone sealer or Wilhold R/C-56 glue are good choices, except they take awhile to cure. Another answer is to let a very small drop of thin CA penetrate between the bolt head and the wing surface. Don't use much or it will be difficult to loosen the bolt. How about a rubber washer under the bolt head? It would provide friction to prevent loosening. We need a bolt head locking device. I'm still experimenting. Join me.

Don't make the bolt too long. If the tip of the bolt is allowed to bear against the bottom of the socket, tightening the bolt would apply a shearing force to the tabs of the socket, and the wing would not be properly held to its seat.

THE NUT

The nut that fits in the socket must not rotate when the bolt is turned in. A square nut in a sliding-fit socket will work. However, I found it difficult to put the wing on with a square nut, since the engagement of the nut and bolt in the socket is a blind operation. Trial and error taught me that a much easier arrangement employs a special round nut with a pin in the side of it to prevent rotation. The edge of the nut can be drilled and an oversize metal pin driven into the hole. Make sure there are no rough edges or burrs on the nut which could catch on or damage the socket. The nut is first screwed only a couple of turns onto the bolt so it will slip easily into the socket when the wing is installed, then the bolt is made finger tight.

THE SOCKET

The socket should be wide enough so the nut will slip through it freely in both directions, but extra width in the socket would reduce the bending strength of the tabs against which the nut will bear. The slot through which the bolt passes should be just wide enough for the bolt to slide through. Extra slot width would reduce the amount of tab area in bearing.

The *thickness* of the nut socket should be roughly twice the diameter of the bolt. If the socket is too thin the tolerances on the location of the aft screw become more critical. If the socket is unnecessarily thick, the nut must move farther to release the wing. Also, excessive thickness means more weight.

The nut socket is attached to a main structural bulkhead in the fuselage with glue and/or screws. It can be made of any one of a number of materials. In a year or two I hope that one or more of the model supply companies will be offering these nut sockets in several sizes. The logical manufacturing method is to injection mold them from a resilient plastic with good shear strength, such as nylon or acetal.

The larger socket unit shown in the photos is made of birch plywood and maple. The smaller unit was cut from 1/4-inch polycarbonate sheet. When using wood or plastic, make sure the tabs that hold the nut aren't made too thin. The tabs on my wooden one are .3-inch thick, and on the plastic socket, .15-inch thick. I would use aluminum alloy

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Void where prohibited

wing-mount sockets for models weighing over ten pounds.

THE SHEARABLE SCREW

We want the nylon screw at the trailing edge to shear quite readily, so we will make it small. I suggest you use a 4-40 nylon screw for up to a four-pound plane, and work up from there. It looks like the sizes vs. plane weights I proposed for the steel main bolt are about right for the nylon screw also, so refer back to that list. Note you can't use your old familiar 1/4-inch nylon screws until you build a fifty-pound airplane. If some of you would like to second-guess me on the size of nylon screw to use at the trailing edge, here is a little data to base your personal design on:

Ultimate Strength of Nylon Screws at Thread Root

Size	Tensile Strength (lbs.)	Shear Strength (lbs.)
4-40	60	48
6-32	84	66
8-32	139	108
10-32	199	155
1/4-20	317	247

Nylon screw ends broken off in a threaded hole are sometimes difficult to get out. When we used oversize nylon screws and never broke them, that was no problem. Now I hope we will be breaking lots of nylon screws and saving lots of airplanes. Here are some thoughts on the broken-screw-removal problem.

If we use a captive nut we can push the nut out, remove the screw, and reseat the nut from below. Or, with an extra-long nylon screw, you may be able to reach the lower end with pliers and screw it on through. Note: both of these solutions require access to the underside of the fuselage beam the screw enters.

The last broken-off nylon screw I had to remove rotated so freely in the nut that the friction of a small screwdriver blade against the broken end was enough to screw it on through. Hey! That leads me to a bright idea. To get a screwdriver slot of sorts at the break, we can drill a small hole crossways through the screw before we install it. Use the next size larger screw to compensate for the weakening effect of the hole. It will break at this weak spot, so drill the hole where it will line up with the wing/fuselage joint. A small screwdriver can be used to engage the slot provided by the half of the hole remaining.

Another approach is to use a wood dowel peg instead of a nylon screw, and push it into a tight fitting hole. When the peg shears in a crash, we push the broken peg end on through with a punch and use a new peg. The peg diameter should be about the same as that of the nylon screw you would have used. Cotton swab sticks work well for small models. The ones I have are .085-inch diameter, and my tests show a shear strength of 20 pounds. A pushed-in wood peg won't support any load in tension, but there should be no tensile load on the aft shear connection if the main bolt is near the thickest part of the airfoil as it should be, and the mounting surface fits the wing well. Unless the peg fits fairly tightly, put a piece of tape over the outer end so it can't work out under vibration. I used swab-stick wood pegs on the tests to be described, and they worked well.

Another approach to the aft shear connection is to put a small piece of double-back foam tape between the fuselage and the wing trailing edge. Keep it small, though. A test on the tape I have showed an ultimate shear strength of 60 lb./sq. in., so use a square inch or less on a forty-size model. I consider the aft shear connection less completely developed than the main bolt nut and socket. When you develop better aft shear connections, tell me about them and I will publish your solutions.

WING MOUNTING SURFACE

We now need to look at a little geometry problem. If the wing mounting surface or mating plane is flat, the wing can pivot or slide fore or aft freely as described. Theoretically that is also true if the mounting surface is bowl shaped or the section of a large sphere (an unlikely shape for a wing seat).

If the seat shape is a large-diameter partial cylinder, roughly following the shape of the airfoil, the wing can again freely slide fore or

aft with a slight rotation in pitch. Some binding will theoretically be encountered if the wing tries to pivot in the yaw plane on this cylindrical surface. Since the curvature is small and the width of the fuselage is also small, the structure will usually be compliant enough to absorb the minor distortion from pivoting that would occur prior to release of the wing.

But airfoils do not give the wing surface a pure cylindrical shape. The problem comes up near the leading edge. You can visualize that if the mounting surface follows the airfoil forward to the leading edge, the wing will have difficulty in sliding forward, even enough to disengage the nut from the socket. We must therefore either terminate the wing-mating surface not too far ahead of the spar, or build a small fairing onto the center section of the wing ahead of the spar to reduce the curvature of the wing-mating surface in the forward area as sketched in Figure 1.

If you use rubber seating tape, make sure it has a slippery (as opposed to a sticky) upper surface. Nothing must interfere significantly with the sliding and pivoting of the wing on its seat if the crash protection is to be maximized.

PROVISIONS IN THE WING

A little attention must be given to the support of the main bolt and the aft nylon screw in the wing. If the wing is of sheeted foam, it is necessary to put some structure for the bolt at the thickest part of the wing center so the bolt head will not be able to pull through the wing during flight maneuvers (inverted maneuvers in the case of a low-wing plane).

Against each end of a compression tube to receive the bolt, place a 1/8-inch hard plywood washer about 1-1/2 inches in diameter. Using the washers as templates, cut around them with a pointed X-acto blade, and lift the balsa sheeting circles out. Glue the tube and the plywood washers into the holes with epoxy or "UFO" cyano. The strong washers and tube will distribute the concentrated bolt and screw loads into the balsa and foam.

If the foam wing has a spar, do not drill through the spar for the bolt. At the center of the wing we need all of the spar's strength. Cut a side off the ply washers and place them and the tube so the bolt is next to the spar. In a built-up wing, glue a hardwood doubler against the side of the spar and drill it for the bolt.

THE TEST PROGRAM

The photos document some of the tests of the slip-off wing mount that Paul Weston and I just conducted using a retired foam core and balsa forty-size sport plane of mine. The name I had given this original design was "Knockabout." That earlier choice of name turned out to be particularly appropriate for this test use of the model. We really knocked it about! I was first going to fly the plane into the ground and into objects in planned crashes, but that would have been difficult and time consuming. What we did instead was to *throw* the plane into objects and into the ground. The left-hand photo in each case was taken just before or during a crash, while the associated right-hand photo shows the untouched scene of the crime right after that crash.

To prepare the model for this abuse, a slip-off wing mount was retrofitted in place of the original wing attachment system, and an over-the-hill engine was fitted to it. An already-broken prop was used since this wing mount can't save props, unfortunately. The radio gear was removed and one pound of steel was installed in the radio compartment to ballast and balance the model as it was in flight condition. The gross weight as repeatedly "crashed" was 4.8 pounds, or 77 ounces.

The wing either came off or pivoted in every simulated crash, yet the mount was tested to 165 lbs. in tension in addition to the anvil-lifting stunt in the photograph. After seven test "crashes" the plane has some cosmetic damage, but no significant structural damage was found. Wing, fuselage, and tail are still sound. It could still be flown without repair! Look at the "after" photo.

The damage sustained consisted of a bent nose gear (after most of the tests), broken muffler mounting, a nick in a fuselage bulkhead at the wing opening, a nick in the wing fairing from the nose gear strut, a sizable dent in the wing leading edge and a corresponding dent in the stab. The leading edge dent came from a tree trunk, and the dent in the stab occurred a few milliseconds later after the wing came off and the fuselage

went on past the trunk until the tail stopped it. Paul and I believe that the wing panel would have been sheared completely off in this crash if the plane had had a conventional wing mount.

You should have heard the noise these crashes made. I hope *MB* publishes the photo of the crash into the wooden fence. A 3/4-inch fence board broke, but the model didn't! Paul became so enthusiastic as the tests proceeded, that he asked if he could write a paragraph for this article. Here it is:

"What would you think if a good friend of yours invited you over to crash his airplane? When he explained he wanted to test a new wing mount system I relaxed and agreed to help. However, when the first thing he wanted me to do was throw the plane into a tree as hard as I could, every one of the dozens of crashes I have accidentally performed flashed through my mind, and I froze. I finally gritted my teeth and gave a mighty heave. The fuselage went clean through the tree but the wing didn't. After a couple more crashes I started to enjoy it. After seven crashes including throwing it off the roof of his two-story house, and the plane still flyable with no major structural damage, I am convinced this is the mount for all detachable wings."

The photo of the diving launch from the rooftop didn't turn out well, nor did most of the mid-crash photos, but you get the picture. We *abused* that airplane!

THE REAL THING

Since the above was written I have completed and test flown my first new airplane with a slip-off wing mount. I don't have any photos yet, but this is a shoulder-wing, sixty-powered floatplane. Two flights, and the wing didn't come loose or fall off, even though I put the plane through snap rolls, inverted flight, inside and outside loops, sharp pullouts, and every other stress I could think of.

I didn't plan to crash the airplane to test the wing mount, but things don't always go according to plan. On the second flight I had to make a dead-stick landing. To try to avoid a boat recovery of the model I landed toward shore. Oops, I overshot a bit. The wing loudly hit my canoe resting on the beach, while the plane was still airborne. The aft screw sheared, the wing slipped neatly out of its mounting socket, and the aileron and flap cables unplugged themselves. The wing and the fuselage/float/tail assembly ended up separately on the beach.

No postmortem was found to be required because nothing was dead. The plane could have been reflown immediately upon reattaching the wing! The only damage I found in a thorough inspection was a two-inch gash in the wing covering. Oh, yes... and the shear screw needed to be replaced, of course. Paul Weston, who saw the flights, was delighted. We both feel that there would have been considerable damage to the airplane had it used any other type of wing mount.

DISCLAIMER

Although the simulated crashes damaged the test model very little, and the *real* crash damaged the new airplane with the slip-off wing mount not at all, other crashes will sometimes be more destructive, and some models are less rugged than these two models. The slip-off wing mounting system will not eliminate *all* crash damage in model airplanes, but it will significantly reduce damage and subsequent repair time. In many crashes where damage would occur with other wing mounting systems, no damage would be sustained in a similar plane equipped with the slip-off wing mount. And it is simple, easy to make and install, inexpensive, reliable, and light. Try it, you will like it.

DEPARTING WORDS

May your wings be with you when you need them, but may they depart when they become a liability.

Francis Reynolds, 3060 W. Lake Sammamish Parkway N., Redmond, WA 98052. SASE please. (206)885-2647. ***MB***

SOARING *Continued from page 38*

morning recreational fliers, all will be peace and harmony at the flying field.

End of editorial. You can contact Randy at

F3B/USA, 122 East Uintah, Colorado Springs, CO 80903. Subscription rate is $12 per year for six issues.

DOUGLAS AIRCRAFT THRILL PLANES

Speaking of things that yield so many thrills per minute, the Douglas Aircraft Company (no relation to McDonnell Douglas) of Long Beach, California, has a couple of slope gliders that will quicken your pulse. By name, they are the Silhouette and the Quicksilver. Both are aerobatic, two-channel, under-five-foot span gliders. It is claimed by proprietor Doug Herzog that an "accomplished floater pilot" can fly the Quicksilver, and the Silhouette is a glider for when "you've got it all together and want to put something exciting at your fingertips."

The 52-inch span Quicksilver is new. It features the new Selig-Donovan SD6060 airfoil (thinned to 8%) which gives the Quicksilver great speed and acceleration, plus excellent inverted performance for outside loops, etc. It accepts standard size radio gear. List is $78.95.

The Silhouette is smaller at 43 inches, sports a similar airfoil (8.2% thick Eppler 374), and requires micro airborne equipment. With its smaller size comes greater agility and faster control response. List is $58.95.

Both kits feature precision die and machine cut balsa, spruce, and plywood; foam core wings; hardwood leading and trailing edge stiffeners; an extensive hardware package; full-size rolled plans; and a photo illustrated instruction booklet.

Contact your local hobby dealer for availability. Many hobby distributors are carrying this new line of kits, and many more will follow suit. If no local shop can help you, call Hobby Shack mail order (toll free California 800-472-8456, U.S. 800-854-8471). I know "The Shack" carries both.

AIRFOIL OF THE MONTH FEEDBACK

West Coast sailplane designer Harry Weitz, of San Diego, has contributed to this column much experimental feedback on different airfoils over the years. This month he tells us his results with an older Eppler section, the E195. Harry writes:

"I was intrigued by the statement ascribed to Keith Kindrick as quoted in the February 1988 issue of *Model Builder* regarding the performance characteristics of the E195. The performance of a model aircraft is very much prescribed by the choice of the airfoil section. I had never designed a sailplane using the E195, and Keith's statement piqued my curiosity.

"The outcome of my effort is a 2M sailplane I've dubbed the 'Stiletto.' The performance of this model is quite remarkable. It has a tremendous speed range and will penetrate as well as the Selig 3021. The 2M Stiletto has a wing area of 596 sq. in., weighs 38 ounces, and has a very small frontal area and slim side projection. It has a one-piece wing with flat center section with a spoiler servo buried in the middle. The one-piece wing eliminates the need for heavy steel joining rods and makes for a very strong wing. The wing has such a high torsional gradient (oz.-in./degree) that I could not get any washout into the tips. Nevertheless, it will tip stall only under the most extreme conditions and is easily corrected. Spoilers are very effective, and at full up require only slight up elevator.

"Thermal response has to be seen to be believed. Launch from the winch is at a very sharp angle and is as if it were on rails. Overall, it is a very good performer.

I believe that more use of the E195 in sailplane design will reveal some very high performance capabilities in a heretofore seldom used airfoil."

Thank you again, Harry, for your valuable feedback. If anyone else would care to comment on their own experiments with airfoils, I'd love to hear about them, with photos, of course. Common comparisons are welcome in such reports so that we can all quantify your results with our own observations.

AIRFOIL OF THE MONTH: SELIG-DONOVAN SD7003

Attention all you guys who like to go fast! How would you like to fly a section that tested lowest in overall drag of all those tested at the Princeton wind tunnel? Well, here it is: according to the results of the Selig-Donovan-Fraser testing, it's the SD7003.

This section would be darned hard to beat in a slope racer or in an F3E electric multitask model. In either case, the high lift demands are minimal and the emphasis is on speed! The SD7003 has enough lifting power to pull you through a high speed racing turn with no problem. It may be a little shy on thermalling ability, but that's the sacrifice you pay to reduce drag.

This airfoil was designed to keep the drag-inducing laminar separation bubble as small as possible. Indeed, in testing, the polars indicated very little evidence of a bubble. It may exist, but when the airflow was tripped to promote a stickier boundary layer (which is what you can do to help eliminate a separation bubble), no performance improvement was achieved—in fact, it was often degraded.

This section produces especially low drag results way down to a Reynolds number of 60,000. Of all sections tested at this Rn, it was best. This means it is your best choice for those small, aerobatic, quick slope soarers, or typical seven-cell F3E motorgliders, or even F3B aircraft if you build with carbon fiber for strength.

The SD7003 has a thickness of 8.51%, 1.46% mean camber line, and a long, gradual upper surface curve that really does the job of holding the laminar flow attached. Stall comes at a ten-degree angle of attack, and it is not violent at all. It will continue producing near-max CL lift up to an 18-degree angle of attack. Minimum drag comes in at about CL=0.2 which translates to *very*

fast. Max CL, which occurs at about ten degrees, is 1.0 to 1.1 (about equal to the E205) depending on speed or chord length (the bigger the better on each).

I am providing the coordinates for this important section so that you computer types out there can plug them into your Cygnet Software E2F (Eppler to Foiled Again editor & conversion utility) and then plot it out to any size you want. All others may visit your friendly neighborhood copy center and have it photographically enlarged to suit. (Cygnet Software, 24843 Del Prado #141b, Dana Point, CA 92629. Foiled Again program for plotting airfoils is $39.95.)

GOTTA RUN!

Thermals to all. Any questions or contributions may be sent to Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330, (714)245-1702 after 6:30 p.m. but before 8:30 p.m. Pacific Time. I prefer phone calls to writing... I get enough of that once a month! ***MB***

PASADENA *Continued from page 43*

built-in frequency spectrum scanner that scans the R/C frequencies to see who is on. The airplane version may even have a built-in audio frequency spectrum analyzer to measure the audio noise level of model engines. This feature would be great for R/C helicopter use because from the frequency spectrum we can tell exactly at what rpm the main and tail rotors are turning, and at what frequency the tail boom is vibrating. (I will talk more about this in next month's technical column on helicopter acoustics.) I asked Bob to include it in the heli version, but he said helicopter radios require so many features that there isn't enough memory space left to do it! If JR and Futaba do not bring out any new heli radio by this summer, then Airtronics' Vision will be the most advanced on the market. Oh... Vision has a unique transmitter shape, that can only be described as radical. A year ago I suggested to Bob that we need a new ergonomic transmitter shape, and now he has this amazing shape that has no square corners. It is all compound curves. I do not have a photo of it to show you because Bob said it was only a demo, so the final shape will be slightly different.

I finally received the new Airtronics SG-X gyro. Last time, Bob sent me one of the only three existing SG-X gyros for evaluation, but it was so new, there was no electronics inside! So I had to send it back. This time I received one with electronics inside. It works great. At a retail price of $99.95, it is one of the least expensive gyros on the market. The price includes a tail rotor servo. The gyro must be used with this servo.

It is not always true that the more expensive the gyro, the better it is. Electronic integration, different manufacturing technique, and different price markup can reduce gyro price. I think the SG-X gyro works just as well as some higher cost ball bearing units. Furthermore, I wonder why GMP doesn't advertise their inexpensive gyro as ball bearing because I took one apart, and it has ball bearings, too. And, it works great, and even has the stick priority feature. The only feature that these two inexpensive gyros do not have is in-flight selectable gain. Furthermore, these two gyros are the most compact gyros on the market. Next month we will look at the new JR-120 which has different control laws than conventional gyros. The JR-120 behaves almost like a heading control gyro, rather than a conventional rate gyro.

Andes Hobby, of Laguna Hills, California, displayed the tiny Aisonics electric helicopter. It was small! The whole thing was less than one foot long. Does it fly? I don't know. It looked pretty fragile. Call them at (714) 582-5203 if you are interested.

Yellow Aircraft and Hobby Supply now imports already painted helicopter fuselages from Hong Kong. Three styles are available. A 60 size Jet Ranger ($350), a 60 size Bell-222 ($350) not including retracts, and a 30 size Jet Ranger ($140). I examined them closely, and they looked great. Considering that most 60-size fiberglass fuselages cost $200 already, $350 for a pretty painted fuselage that is ready to use is not bad. We do not know when these fuselages will be available.

In the September 1989 issue we looked at the British MFA 500 model that is imported by Hobby Lobby. Finally, Hobby Lobby is bring in the collective pitch upgrade unit for

only $120. The collective conversion kit includes new side frames, fuel tank, rotor head, blades, and so many things that Jim Martin felt you could probably buy just a tail rotor gear box and have a flying helicopter!

One of the very interesting booths was Nick Nicholas' Vortex Precision Product booth. He imports the complete line of TSK high quality and expensive helicopter products. TSK helicopters are probably the second most expensive helicopter kits on the market. Sitar, of Switzerland, holds the most expensive title. The Sitar Ranger is $2000 a shot. Right now there are three TSK models. The Super Kaiser is a complete pod-and-boom kit that costs $1645.00. The regular Kaiser kit costs $1495. The Black Star as shown in the picture is not a complete kit. It includes everything to make a helicopter, EXCEPT canopy, skids, tailboom, tail rotor gear box, rotor head, swashplate, and mixer. Gee, what does it have for $695? It does have side frames, main gear, clutch, and a few other parts. I said TSK is expensive. However, the machining quality is good. Things are precision made. They are designed for the experts. Ishikawa of Japan used a TSK helicopter to win fourth place at the last World Championships. Nick also carries a vast selection of Japanese tune-up accessories for Concept 30. They are discussed in the Concept article in this issue.

While in Los Angeles, I spent the weekend flying with some of my old flying buddies from Gladhill. I also flew with the L.A. City College bunch. Andrew Sutton, of Copter Corner, brought all his helicopters for me to try out, which included Excalibur, Shuttle ZX, Concept with Airwolf fuselage, Concept with Hughes 300 body, and a GMP Legend with many of his customized parts. In the January issue I said that I would have to see his ZX fly to believe that his modified OS 32 really produces 20% more horsepower. His modification for the OS 32 includes changing the stock ring piston assembly to an ABC assembly from OS 32 FSR for aircraft. He also modifies the timing. Well, I flew his souped-up ZX, and it is indeed faster than my Shuttle XX. Is there a 20% increase in power? It's hard to say, I have to fly a ZX with a stock 32 engine to know. But that ZX really moves. I say there is definitely significant power improvement. I did a stall turn on that ZX starting at two feet off the deck, and completed the 180 degree rotation at 20 feet high, then leveled the model out at two feet again. It has plenty of reserve power. Call Andrew at (213) 828-2028 for sending him the engine for modification.

Two of the largest helicopter mail order shops in U.S., Dr. J's Hobby Warehouse and Helicopter World, were both at the show. Mike Johnson of Hobby Warehouse was too busy running around, so I did not even see him. Peter Chow, from Helicopter World, showed us his new prepainted Airwolf fuselage for 30 size helicopters. It is made of automotive industry plastic that is supposed to be able to take a beating. It should be available in the spring. Other products from him includes a new line of anodized black helicopter tuned pipes and mufflers. There is also a new pitch gauge, transmitter case, training stand, blade stand, Concept accessories, and black nylon landing struts. Call Helicopter World at (408) 436-1325 for more details.

Finally, the last stop at the show was at Dave Zimmerman's Hobby Hutch. Dave makes metal accessories for the popular Concept 30, and imports K&S products, Hirobo helicopters, and other Japanese soup-up accessories. A popular item is the starting system for Concept 30 scale helicopters. His starting cone has a one-way Torrington bearing. The cone and bearing, and starting shaft cost $24.95. This system is better than the stock Kyosho starter extension system. My friend says that instead of buying a special starter extension for the Concept 30 with scale fuselage, regular GMP or Miniature Aircraft starter extensions can be used to start the engine with the plastic starting cone. The drawback is you have to cut a big one inch hole at the rear of the Jet Ranger fuselage to insert the long GMP or MA extension. For the Hughes 500, you can simply insert the starter extension through the fake jet exhaust hole.

Another item from Hobby Hutch is a 10mm steel shaft with a massive flywheel weight on it. The shaft is used with a High Point or Du-Bro balancer for balancing rotor heads and blades. Without the massive flywheel, the unbalanced rotor head system will rotate quickly on the steel blade balancer. The flywheel slows it down and facilitates balancing. The 10mm steel shaft has one end reduced down to 8mm for balancing 30-size helicopter rotor heads, and GMP Pro and Custom heads. The shaft and flywheel goes for $28.50. The third item is a beginner training wheel system that has an aluminum center hub. The cost is $24.95. Call Dave at (714) 996-7060 for ordering.

Well, these are just some of the new items for this year. Looks like everyone is working like a bee to bring out new innovative products. It also seems the manufacturers are doing more research and development before the products are introduced. It's the consumer who will benefit.

Last minute press release. I was just informed by Jeff Stone, of Altech Marketing, that this company will take over U.S. distribution of the entire Hirobo line of helicopters and parts in May. For more information, call Jeff at 201-248-8738. Altech's address if P.O. Box 286, Fords, NJ 08863. ***MB***

CHOPPERS *Continued from page 47*

forward speed a little. But the stability was not affected at all. And, I even did autos on the Hughes 300 with the stock foam blades. I have to say that auto was borderlining on not making it. Please use at least 80-gram blades, preferably 90 grams, if you want to do autos with a scale fuselage. Heavier blades also give more margin for correcting

errors while doing autos on the regular Concept.

For people who are still thinking of buying a Concept, I recommend that you choose the SE version, if your financial background allows. The SE may cost $60 more than the DX, but it has ball bearings at all the crucial areas. In the long run, I noticed my SE control system still remains taut, while the DX controls, especially the collective, became sloppy. If you cannot afford that extra $60, the DX can always be upgraded to SE. The following parts are necessary for a total conversion.

One set SE paddles. KYOE1330.
One set mixing lever. KYOE1310.
Two sets of mixing lever bearings. KYOE1320.
One pitch slider. KYOE2260.
One set pitch slider bearings. KYOE2270.
One set stabilizer seesaw bearings. KYOE1300.
One ballraced tail rotor shaft guide. KYOE3200.

The above package adds up to $139.60. But Kyosho has a special DX-SE upgrade package that includes everything listed above, except the ballraced tail rotor shaft guide. The package number is KYOE6050, and retails for $109.75. I agree with Ray Hostetler, that the ballraced tail rotor shaft guide is not that important. The SE paddles are necessary for doing loops and rolls. A total beginner should still buy a DX because it has heavier aluminum Hiller paddles which make the DX noticeably easier to learn on than the SE. DX will almost not be able to execute a roll because of the strong stabilizing feedback effect from the heavy paddles. This is another reason why intermediates and experts should consider the SE rather than the DX. If a beginner has bought a Concept SE, then the SE can be tamed by adding DX's Hiller paddles, or add a set of GMP Cricket's flybar weights. The GMP flybar weight number will be given later.

After hundreds of landings on concrete surfaces, the plastic landing strut will wear out and expose the aluminum skid. Rather than throwing them away and paying $20 for another set, simply buy a set of GMP metal skid clamps for $5.00. Just wrap it around the skid and strut, and drill a hole in the strut, then bolt it with a 3mm bolt. Now it will take another hundred flights to wear off these steel straps. The GMP part number for the steel strap is #110.

The first generation of Concepts in Japan had a three-piece steel clutch like Kalt helicopters. The U.S. version had a one-piece steel clutch similar to Schluter's. However, after much use, or after a crash, the clutch shoes usually spread out enough to make the clutch stick. By now, the new kits all have slightly different machined clutches with more meat where the shoes spread out. The new kits also include a new clutch bellhousing (also called drive gear by Kyosho) that has a metal lining and two plastic bushings. So now the drive gear does not sit directly on the steel clutch, rather it sits on two bushings. This new drive gear has the same part number as the old one, KYOE2170. For the fastidious fliers, the bushings can be replaced by optional ball bearings, the bearing number is KYOE5044 (please see Table 1). At the IMS show, I was told by Century Imports that they will soon be selling an all-metal, machined, drive gear unit. Check with them at (408)436-1325. This should solve many of the problems that people have because the lining was not sticking well to the plastic drive gear.

The plastic starting cone should be checked periodically to ensure it is still round, because Andy's Hobby shop in Chicago said they traced a lateral oscillation of the Concept in hover to a plastic starting cone that became oblong. The out-of-round cone spinning at 13,000 rpm caused the body to resonate laterally. Kyosho, TSK (714)220-2112, and Hobby Hutch (714)996-7060 in California, they all sell aluminum starting cones.

Concept's cooling fan and shroud system seems to work a little better than the Shuttle's. I have flown my Concept in 100-degree-plus summer weather and have yet to overheat the engine, while the Shuttle engine had to be kept rich to prevent overheating. Kalt's new Enforcer seems to have a cooling system identical to the Concept, so it should work equally well. The Enforcer is also designed by Mr. Taya of Japan, so I expect the performance should be comparable to Concept.

Kyosho now has a special polished chrome muffler for the Concept. It performs about the same as regular OS mufflers, but looks great. MACS of California, makes a special tuned pipe for Concept. I think it is quite noisy. However, I then installed another MACS tuned pipe system, which is simply a MACS aircraft header for OS 25-32 FSR engines, combined with a MACS 25-32 size aircraft muffled tuned pipe. This combination is shown in the picture. I noticed it added at least 15% power boost to my OS 28FSR on regular 10% nitro fuel. For 28-size engines, you have to shorten the header to about four inches (distance from the engine exhaust to the end of the header). For 32 size engines, try five inches. This pipe system gives a nice, quiet, whining turbine sound. Very nasty looking, too!

In order to do inverted flight, the stock DX collective slider must be replaced by SE's ballraced slider, to give an extra five degrees of collective throw. Now it becomes just barely sufficient to sustain inverted flight. I crashed my Concept twice from inverted flight because there was not sufficient negative pitch to climb out of tough situations. Tim Lampe says Kyosho is working on a new molded blade grip that has the pitch control arm closer in to the feathering spindle. This will effectively increase the collective and cyclic control throw on the main rotor blades. For now, Tim suggests one way to increase overall collective range is to drill new holes on the plastic washout unit. But the drawback is it reduces the Bell-Hiller stabilizer bar feedback effect. He says the reduction in stability is not noticeable. The drawing shows where to drill the hole. I have not yet tried this technique. I will wait for the new blade holders. If the new holders do not come soon, then I might cut off the plastic ball on the existing blade grip, and replace it with steel balls and bolts from GMP, Miniature, or Schluter. I can then mount the ball slightly inward to reduce the pitch arm radius, which will then give more collective throw.

If you would like to learn more about the theoretical explanation as to why the Concept is so stable and forgiving, please read my Concept review in the June 1989 issue. Ray Hostetler also had an excellent article on the Concept and went through many construction tips in September and October 1989 issues of *RCM*. It is unfortunate that Ray no longer writes for *RCM*. It is tough trying to divide time between a wife, a child, a full-time job, and still write a column every month. Before he quit, he put his cumulative knowledge into a nice paperback book. The second edition has just came out. I highly recommend reading Ray's Helicopter Manual. It teaches you how to set up helicopters properly. And I think he was one of the most dedicated heli columnists.

When assembling a new Concept, the two collective control wires that run along the sides of the main shaft may need some filing and bending at the 90-degree elbow to ensure the collective mechanism is smooth. Spending some time here to make sure the collective mechanism is smooth will reward you with a smooth flying machine.

After many flights, the stock foam blades will develop hairline cracks perpendicular to the leading edge and trailing edge. This is due to cyclic fatigue of the blades as they constantly flap up and down. The blades may still be safe to fly, because it is only the outer skin that gets hairline cracks. Inside there is a strong fiberglass spar that is taking up all the loads. You may cover the foam blades with KYOE5031 heat shrink tubing, which will increase the torsional strength, or just buy a new set of blades. Experienced pilots can probably tell whether the blades are safe to fly or not. That is where experience comes in. For beginners, when in doubt, you should replace the blades or any other part that is questionable. Do not use a blade if it has any questionable damage! By the way, Concept blades have wider chord than Shuttle blades, and putting the Concept blade on the Shuttle seems to make the Shuttle fly quite well.

Recently I have used Kyosho's new blade balancer quite frequently. As shown in the picture, it is simply a teetering scale. I use it to balance 30 to 60-size helicopters' main and tail blades. Usually, if the blades balance statically, then the helicopter does not have much vibration. Upon flight test, if you detect any vibration, just add a 2-inch square of self-adhesive trim tape, or Kyosho's decal, to one of the blades near the tip. (Always add the tape to the bottom side of the blade

and about three inches from the blade tip. Adding the tape to the top surface will trip the air boundary layer on the top airfoil surface, which may lead to premature flow separation and thus degrading lift performance.) If the vibration is gone, then you are lucky. If it got worse, just remove the tape and add it to the other blade. By experience you will soon learn how much tape to add depending on how severe the shake. This method is much simpler and quicker than High Point balancing. However, if adding trim sheet does not cure the vibration, then it means most likely you have a bent part. The main shaft could be bent from a crash, the flybar might not be centered, the Hiller paddles might not be parallel to the swashplate, or the engine starting shaft is not aligned, etc.

The stock Concept plastic main gear can slide up and down by about 1mm. Some may be worse and can cause the white plastic gear to be chewed up by the aluminum pinion gear. The solution is to add some 8mm i.d. metal washers underneath the main gear to shim it up. Kyosho now sells these shim washers 10 in a pack for $1.60 (see Table 1). For beginners who bought the Concept pre-built, in order to remove the main rotor shaft, you must first loosen the four set screws on the 8mm metal collar which is sitting below the top bearing block.

There is one other Kyosho accessory that I think is very useful. It is the KYOE5050 tail link guide. It is a plastic ring that slides onto the tailboom. The ring has a small hole for securing the tail rotor control wire and tube. Each package contains two rings, and they help keep the control wire straight which then gives smoother tail rotor controls.

In Japan, the Concept 30 is selling like hotcakes. Therefore, there are many small independent companies making high quality tune-up accessories to further enhance the model. You may find these accessories at your local hobby shops, or you can get them from Vortex Precision Products. VPP imports many accessories to the U.S. For instance, my favorites are the Yamaya metal tail pitch control plate $5.95, Capital's metal mixing base $16.00, K&S reflexed tail blades $8.95, and K&S thin Hiller paddles $19.95. These paddles are thinner than even the SE paddles, therefore, the control response is excellent. The stability is maintained because it also comes with a set of flybar weights that are about the same weight as Schluter flybar weights. Note: 30-size helicopters have thinner flybars than 60-size helicopters, thus, you cannot use your 60-size flybar weights on them. For beginners who prefer to improve the longitudinal and lateral stability of their 30-size helicopter further, try installing a set of GMP Cricket flybar weights (GMP part #670, $8.50).

The K&S tail rotor blades are very similar to X-Cell's. They are more rigid and have a reflexed airfoil to reduce the airfoil pitch moment, which helps reduce the loading sent back to the entire pitch control mechanism. Stay tuned, we will have a technical article on airfoils for helicopters soon.

Other VPP imported accessories include TSK tail drive wire guide and support. This makes the tail rotor drive shaft run inside a tube, rather than just supported at two plastic disks. By the way, the new Concept 30 comes with two plastic disks to support the tail drive wire. Old kits only had one. VPP also carries Step & Step brand steel feathering spindles, steel main shaft, and servo standoffs for the pitch servo. The standoffs allow you to mount a bigger servo arm to get extra collective pitch throw for autorotation and inverted flight. Instead of using these standoffs, you could connect the collective pitch pushrod to the bottom side of the servo arm. These accessories are all shown in the picture, or you may give Mr. Nick Nicholas at VPP, a call at (714)220-2112.

As shown in the picture, the K&S paddles have a unique geometry. The tip is sawed off to reduce profile drag. Does it really improve anything? Well, it feels pretty good in flight, but there isn't a quantum leap. You may like to try it if you busted your existing paddles. K&S also has the same paddles drilled to fit 60-size flybars. The paddles come with a set of weights that are 50 percent heavier than Schluter's weights. I tried it on the Magic, and this time I noticed the control is softer due to the blunt leading edge, less paddle area, and heavy weight. Very nice for FAI flying. Blunt leading edge reduces control sensitivity aerodynamically. Less area improves stability because now

the flybar feels less aerodynamic force, thus it will stay put and act as better inertial reference. Heavy paddle weights also increase the flybar inertial hold ability to make it a better reference. (Flybar's stabilizing principle was explained in detail in the January 1990 *MB* "Chopper Chatter" column.)

After a couple of hundred flights on the Concept 30, I still enjoy flying it. No matter how hard you push this little machine, it will not be forced outside of its flying envelope. It is always very forgiving. I tried to do a snap roll on it (full right cyclic, full back cyclic, full left rudder, and zero pitch), it just would not do it. In this respect, I think it is probably one of the most forgiving model helicopters. Many beginners like it because its small size and quietness make it less intimidating than 60-size machines.

How does Concept compare to the other two beginner helicopters that we reviewed: Kalt Cyclone II in May, and GMP Rebel in April? Cyclone II is about the same price as Concept SE, but Cyclone is bigger, faster, and has more potential for aerobatics. But when it crashes, it will cost more, too. The Rebel is $100 cheaper than Concept and Cyclone and is easier to put together. It is easier for a total beginner to understand how a Rebel flies because it is fixed pitch and has less parts...And a helicopter radio is not necessary to fly the Rebel, while the Concept and Cyclone must have a helicopter radio system to bring out their potential. All three helicopters are extremely stable in hover. But the Cyclone is the more sophisticated, thus it requires more effort and knowledge to set it up properly. Rebel is the simplest to set up. But Rebel has limited aerobatic potential. There is no way that a Rebel will ever fly inverted, while I have flown my Concept inverted many times. The bottom line is, for beginners, whichever one is available locally, and you can get parts and assistance conveniently, then that may be the crucial deciding factor. For experienced pilots, I think you will enjoy the Concept as a relaxing second machine. A Concept 60 should be out this winter. If it will be as forgiving as the 30-size, then it will be a formidable contest machine.

We were supposed to test the new Super Tigre G-34H helicopter engine in the Concept, but due to shipping delays, the engines are not yet in the U.S. The G-34H has the same physical dimension as the OS 32H, thus, it fits right in the Concept and other 30-size helicopters. It is an ABC engine with a ring. It is Super Tigre's unique design. We will let you know the test results when it arrives in the U.S.

When you buy a Concept 30, do not forget to send in the registration card. Great Planes will send you up to $35 in rebate coupons on your next purchase of Kyosho scale fuselages, and rotor blades. Tim will then periodically send you newsletters on how to improve your Concept, and keep you abreast of new accessories. See you next month. ***MB***

CYCLONE *Continued from page 48*

the floating axle design's O-rings for minimizing the teetering play.

My Cyclone II had a fore/aft oscillating problem in hover and forward flight. The British *Model Helicopter World* magazine also pointed out this problem. They attributed this nodding problem to the rotor head design. They claim it is due to the cross shaft trying to find an equilibrium (floating) inside the hub, but the teetering pin does not allow it. They claim by filing down the teetering pin to a smaller diameter, the steel cross shaft is allowed to joggle for position more easily inside the hub. Well, I am not sure if that is really the source of the problem. If I can get some more teetering pins, maybe I will try it.

At first, I thought Cyclone's nodding was an air-resonance phenomenon caused by the main rotor excitation frequency coalescing with fuselage resonating frequency. Air-resonance can be eliminated by operating the helicopter at a different rotor rpm, changing the fuselage weight or inertia, or tightening the blade lead-lag bolt. To investigate this annoying phenomenon, I reread the instruction and noticed it says to operate the Cyclone at exactly 1400 rpm. The blade pitch was reset, and a MAS optical tach was used to confirm that we were running at 1400 rpm in hover. Indeed, the fore/aft oscillation stopped completely. We then tached the main rotor and found that oscillation would occur whenever rpm went below 1350, or above 1450, which means the rotor dynamic would interact and shake the fuselage. At 1400 rpm, the model is solid as a rock. It hovered very stabley, and forward flight was smooth. However, at other rpms the model shook noticeably. As the Excalibur also comes with the K-5 rotor head, it does not have this oscillating problem at any rpm, thus, the problem is probably peculiar to the Cyclone II fuselage inertia and main rotor shaft height. I took a hacksaw and sawed a half inch off the main rotor shaft. Now the oscillation is less when operating outside the 1400 rpm range. A set of stiffer Kalt O-rings (#02070787) was tried, and that helped quicken the controls, but did not eliminate the oscillation. The stock wood rotor blades were only 150 grams each. A set of 170 gram weighted wood blades was tried, and that helped a little.

Finally, we believe, the culprit is probably the slop in the sliding collective mixer base, and in the collective lever pivot. The one degree blade pitch slop led to local flutter phenomenon that excited the vehicle. Schluter Miniboy also had this problem when the rpm is above 1800. The Excalibur with the same K-5 head does not have this problem at any rpm because of the precision, tight collective mechanism. Some Cyclone IIs do not seem to have this nodding problem because their collective mechanism may have less slop, or more friction. This also explains why weighted blades help, because the lead weight moved the blade chordwise c.g. forward to alleviate

flutter tendency.

The reason we wish to speed up the main rotor rpm slightly is because the 9:1 (engine to main rotor) gear ratio does not allow the engine to operate at its peak power curve. Most 50 to 60-size Schnuerle model engines normally peak at 14,000 to 16,000 rpms. With a 9:1 ratio, at 1400 rotor rpm, the engine is lugging at 12,600. If the main rotor rpm can be wound up to 1500, then the control response would also quicken because you get more cyclic inputs per second. Well, the conclusion is: the Cyclone II is supposed to be a soft and docile model, and we better keep it that way. My attempt at trying to rev up the main rotor to make it more aerobatic and operate at the power peak has failed.

As the Cyclone flies so well at 1400 head speed, maybe Kalt should consider changing the engine/main rotor gear ratio to 10:1. Then the engine will sing happily at 14,000 instead of being lugged at 12,600. Better yet, I might later install a four-stroke R/C engine in the Cyclone, as four-stroke engines like to operate at low rpm.

Therefore, if you are a hot-dog flier, or an expert flier, you might be disappointed by the Cyclone II. It does not have that quickness and agility for hot-dogging. On the other hand, it is very docile and mellow, which makes it a nice beginner ship. In this respect, the inexpensive and simple JR MAX 5H radio may be ideally suited for this model. We will conclude our review by offering you some tricks we learned to bring out the full potential of the Cyclone as a smooth and docile helicopter.

First, make sure the tail rotor blades have the same pitch. Move the tail rotor control stick until the tail rotor blades are both at zero degree pitch. I found that on mine while one tail blade is at zero degree, the other is at 2 to 3 degrees. This imbalance caused tail vibrations. This problem was cured by shaving off about 1/32 inch from one of the tail rotor blade pitch links. This procedure should be checked on all new models.

The Cyclone tail rotor drive belt should be fairly tight. A loose tail rotor drive belt causes the tail to twitch from side-to-side. The instruction manual says set the belt at 5 kilograms tension. Probably it should say set the belt tight enough that the belt could only be depressed inward by about a 1/4 inch.

Due to the low head speed and large tail rotor diameter, Cyclone can be flown without a rate gyro. It is quite stable in yaw. The double ball bearings inside the tail blade grip also improves tail blade feathering action. (Feather means pitch change.) Just reduce the tail rotor control throw if you are not using a rate gyro. However, we recommend that everyone use a gyro, it saves some brain cells and lowers your blood pressure!

We suggest you use weighted main rotor blades. Try 180 gram blades. They reduce rotor blade flutter tendency, improve the vehicle stability and autorotation capability. Especially, at a low head speed of 1400 rpm, unless you use weighted blades, if the engine quits you would have very little inertia for safe autorotation. This brings up the topic of rotor rpm again. Usually in an autorotation, the main rotor rpm will fluctuate; especially at the end of an auto, the rpm will drop. In one auto, at the end, the rpm dropped below 1350, and the model went from a nice, smooth descent into a fore/aft oscillation. So, use weighted blades. Yale even makes pre-built and pre-weighted wood blades for Excalibur and Cyclone. (You can use the same for both.) While all American, Japanese, and European manufacturers use 14mm main rotor blade grip, Kalt uses 18mm. Come on Kalt, let's all standardize on 14mm. To use your existing 14mm thick wood blades on the K-5 head, just add some metal washers to shim them up to 18mm thick.

The main rotor blade pitch on my Cyclone II was set at 4° for hover (throttle half open), 9° at the top (full throttle), -3° at the bottom (idle) for doing autorotations. Beginners should set the low end at 0°O° because beginners tend to chop the power when they panic. Negative pitch would suck the model to the ground too fast and cause damage. For experienced pilots who like to get more cyclic controls, the middle ball joint on the K-5 seesaw mixing arm can be moved to the other pre-drilled hole. This increases the Bell control action, which causes the main rotor blades to feather more when the swashplate tilts. But, this also decreases the stabilizing Bell feedback effect.

The canopy may seem flimsy, but it is very strong after assembling. Four 3mm bolts were used to attach the canopy to the frames. It may not be as convenient as some of the click-on designs, but it works. We do suggest you take a 3mm tap and tap the plastic frame where the 3mm bolts are suppose to go in. Otherwise, the four 3mm bolts fit too tightly.

Finally, the two factory assembled mixing arms on the sliding collective mixing base should be disassembled and reassembled. The idea is to add some grease and also tighten the nuts down more carefully, until the mixing arms have almost no play. The factory assembled unit has no lubricant and has some slop. Whenever you are assembling bellcranks or moving arms on any model, the nut and bolt that support the moving arm should be just tight enough to allow the arm's rotating motion, but not side-to-side play. I also drilled and tapped a 4-40 hole on the sliding plastic mixing base, then inserted a 1/4 inch long 4-40 bolt. The bolt protruded just enough into the groove in the main rotor shaft to make the sliding mixing base more solid. These last two things help minimize the play in the collective control. The bottom line is, the more patience you put into your models to remove the slops and make parts move smoothly, the better they will fly.

We think Cyclone II is an easy-to-fly beginner helicopter if set up properly. The very tall main rotor shaft gives good static stability and helps prevent the main rotor blades from hitting the tailboom in hard landings. It

is competitively priced (retails for $399). It is easy to assemble; even a thirteen-year-old should have no problem. But the expert fliers may find the higher priced Excalibur more gratifying. What are the best things we liked? The dependable centrifugal clutch and the super robust molded nylon landing struts; they are probably the toughest on the market! How tough? Most nylon struts would flex when the model sits on the ground. Not Kalt's! Ideal for beginner abuses. Stay tuned for our Excalibur and PCM 10 review in the next issue of *Model Builder*. **MB**

HANNAN'S *Continued from page 50*

Jerry Bockius shared an item from an old *Aircraft Year Book* about what was certainly a most elite flying organization during 1929. In addition to a clubhouse and four club-owned aircraft (a Travelair, an Avian, a Moth, and a Curtiss Fledgling) the group included the following members and privately-operated aircraft:

Alexander P. de Seversky, Stearman
Felix DuPont, Moth
Amelia Earhart, Lockheed
Harry F. Guggenheim, Vought Corsair biplane
Richard F. Hoyt, Loening Air Yacht
Charles A. Lindbergh, Lockheed Sirius
R. Barto Reed, Stearman and a Loening
Judge R.D. Silliman, Fokker
Croker Snow, Moth
John H. Whitney, Sikorsky
Chance Vought, Vought Corsair
Grover Loening, Curtiss Robin and a D.H. Moth

Jerry wonders why Loening was not flying one of his own designs?

QUESTIONS & ANSWERS

Every model magazine editor and columnist receives questions from readers, many of whom are perplexed by problems they assume are unusual. Often, solutions are fairly simple, and the information sought is readily available IF one knows where to find it. The big problem, however, is devising an efficient means of *supplying* such answers, given the busy schedules of most writers and the delay involved in published replies.

The British magazine *Radio Modeller*, besieged by reader questions, came up with a truly creative solution by establishing a telephone "hotline" service. And, within three years, more than two thousand calls had been received from modelers in at least six countries. Some of the more frequently-asked questions were also printed in the magazine itself. The next logical step was the publication of a book entitled *Questions & Answers*, compiled by Peter Smoothy, one of *Radio Modeller's* writers.

It doesn't take long to realize that most of the questions asked are practically universal. It would seem that balky engines and difficulties with model coverings are among the most common subjects. Not far behind are questions of the "where do I get it" or "how do I use it" variety with which most of us can identify. The questions are answered clearly, often with a frankness seldom seen in U.S. publications, and added bits of editorial flavor such as: "... models with insufficient dihedral may fly well, but they look horrible, just like flying coathangers!" Or: "If like me, you lack patience when tackling boring jobs, limit yourself to half an hour and do something more interesting in between!"

R/C Aircraft Questions & Answers is published by Argus Books, Argus House, Boundary Way, Hemel Hempstead HP2 7ST, England, and may be ordered through Zenith Aviation Books, P.O. Box 2, 729 Prospect Ave., Osceola, WI 54020.

WHERE THE HECK IS MAGALIA?

Following the transfer of Hannan's Hangar and Runway from Escondido to Magalia, we received several letters from readers who were unable to locate us on their maps. Klaus Jorg Hammerschmidt, of Germany, even noted that there is a place called Mangalia on the Black Sea. Well, we really didn't move that far. Magalia is in northern California, roughly 600 miles from Escondido, at an altitude of 4800 feet (it snows here!). The nearest fairly large city is Chico, known for their university and, believe it or not, pistachio nuts.

Magalia itself boasts at least three model builders, which is what really counts, right? Just in case you missed our new address before, it is Box 860, Magalia, CA 95954. Many thanks for your continuing support. **MB**

trict (Burbank) has started a modeling curriculum and one class has used school funds to purchase seven Ringmasters and Fox .35s.

"Our club secretary is Joe Campbell, RO-3, Benton City, WA 99320. Telephone him at (509)588-4636. All requests for information should be sent to him.

"We are tentatively planning on a C/L contest in 1990. Class A, with possible events: Northwest Sport Race, Northwest Goodyear, Mouse I and maybe Carrier. We were given the old AMA carrier deck at the close of the Nats."

In a subsequent issue of the *Skywriter*, Joe adds:

"The new club with control line interest in the Tri-Cities is off and going. They have received their AMA charter... and are working up a schedule. Tentative for February 10 is a Flying Clown Race. A stock Flying Clown from a PDQ kit, any engine up to .19. Race for most laps within 15 minutes."

We'll be looking forward to getting more information from the Tri-Cities area as the schedule develops.

• • •

And now, back across the country to New Jersey for a tidbit from *Prop Wash*, the newsletter of the Garden State Circle Burners.

If you are a little depressed about the idea of being an "old-timer" who remembers when Old Time Stunt wasn't "old time" at all, here's something to make you feel even older. *Prop Wash* reports that the informal competition event known as Old Time Stunt is *itself* 20 years old in 1990!

To commemorate this momentous occasion, the Circle Burners, the originators of the event that now is popular nationwide, plan a 20th anniversary contest on October 7. It also will include the relatively new "Fox .35 Stunt" event and even newer "Nostalgia Stunt." For information, contact the GSCB. The president is John Miske, 415 Clifton Blvd., Clifton, NJ 07013.

• • •

Now, if you really are an old-timer, you remember an engine brand name known as "Forster."

Fred Bridgeman, writing in *Direct Connection*, the newsletter of the Knights of the Round Circle in Southern California, writes about a recent successful flying test of the Forster .35—a new engine made by RJL Industries that evidently is a replica of the original.

Curiosity got us looking into the RJL advertisements and we discovered that RJL offers a line of Forster C/L engines in both ignition and glow styles, along with various other engine-related products. We don't have any direct information from RJL but pass the information along for those "old-timers" who might be looking for such items. Write to RJL Industries, P.O. Box 5, Sierra Madre, CA 91025 and tell them you read about them in *Model Builder* control line column.

Bridgeman comments:

"The Forster .35 as presently produced by RJL is a high-quality, American-made product held to tight tolerances. Power output, though mild by today's standards, appears to meet published specs. Keep in mind that one should not expect this engine to be more than it really is, a 1930s vintage powerplant originally designed for ignition and converted to glow. In working with mine, I found that what this engine lacks in power it makes up in potential, real fun potential."

• • •

A follow-up to an item in the February issue of the control line column, in which some models called the "Python," designed by Richard Weprin, were pictured. Richard writes that he has come up with a new 24-inch span version of the Python and has produced plans for that one and the ones shown in the magazine column. For information, write him at P.O. Box 879, Clearlake, CA 95422.

The Python, an odd delta-wing design, is a reminder that C/L flying over the years has been an activity in which designers have been able to freely exercise their creativity. Coincidentally, in the same stack of mail with Richard's news about his new Python, is a package of information from another flier with an eye for the unusual, Vern Clements, of Caldwell, Idaho.

Vern operates a plans service for a variety of C/L and R/C airplane designs, including another delta-wing plane called the "Safire,"

designed in 1958. "Even though a 1958 much-flown design, 'Safire' still looks very modern today and into the future," Vern writes. "Safire received a Top Ten Plan Sales Rating in *Model Airplane News'* 1961 Annual." Vern includes a detailed instruction sheet with each plan.

The catalog, which shows interesting scale and sport designs of several types, also features a C/L scale version of the Gee Bee "Z." And Vern passed along a photo of a plane built from the plans by Bernard Sexton, of England, that is absolutely spectacular.

For copies of Vern's catalog, send $3 to Vern Clements, 308 Palo Alto Drive, Caldwell, Idaho 83605.

• • •

We've mentioned in this space often that the garages of modelers often produce some fine products for our use. The past month provides an example of how the system works for experienced modelers.

I realized that I was completely out of carbon fiber, a material that has become essential in the construction of fast combat planes. And, since the season is upon us, it was time to stock up. My local hobby shop didn't have any, so I began going through the drawer in the workshop that is full of mail-order catalogs, large and small, famous and obscure.

From the "obscure" category came a little blue, typewritten/photocopied catalog from Model Research Laboratories in Mission Viejo, California. I've never met proprietor Curt Stevens, but I have always enjoyed his little catalogs, which have elements of humor, modeling politics and just plain unusual and interesting.

The latest catalog I had was from 1985, so I didn't even know if the business still existed. But, being a trusting sort, I found the carbon fiber product I needed, wrote out a check and put it in the mail.

Sure enough, a couple of weeks later arrived the package and a new catalog with the headline: "Another arousing new catalog—1989—Number 7 in a continuously confusing series."

The catalog goes on to talk about what it's like to operate a garage business; MRL is in its ninth year. Curt says he is a modeler with more than 40 years experience in events as far-ranging as indoor microfilm free flight to control line jet speed. He was among the first to use fiberglass composites in the 1950s.

It's always reassuring to order products from someone who uses them himself. MRL's catalog has a long article explaining how to use some of the products he sells. The products include boron filaments, microfilm, mylar, kevlar, carbon fiber, fiberglass, aluminum, wire, plastic sheet, superlight wheels, and some engines and parts (Cox, Rossi, Picco), and props. For the complete catalog, write Model Research Laboratories, 25108 Marguerite No. 160, Mission Viejo, CA 92692.

• • •

Now a quick reference to some other reading material control line modelers will find useful:

The Miniature Aircraft Combat Association newsletter is always interesting reading, and continues to be so under new editor Larry Driskill. Of special interest is an article by Dan Rutherford, former *Model Builder* control line columnist, in the November/December MACA newsletter about the preparation, care and feeding of modern AMA fast combat engines. It's worth finding a copy and reading Dan's excellent advice.

To Join MACA and get the newsletter regularly, send $15 dues to Larry Driskill, 4916 Chagar Ct., Las Cruces, NM 88005.

As always, technical tips, questions, letters, photos, club news, contest information, and other material of interest to C/L fliers is welcomed. Write John Thompson, 1520 Anthony Ave., Cottage Grove, OR 97424. ***MB***

ENGINES *Continued from page 24*

cally compressed by an engine-driven belt. When we turn on the auto A/C we set a knob that determines the rate the compressed Freon is allowed to escape... to be released from its pressure. The Freon expands and absorbs heat... to us it gives the feeling of being cooled as the blower moves air around the car while the Freon comes out of the compressed state and cools.

The opposite of this occurs when we pump

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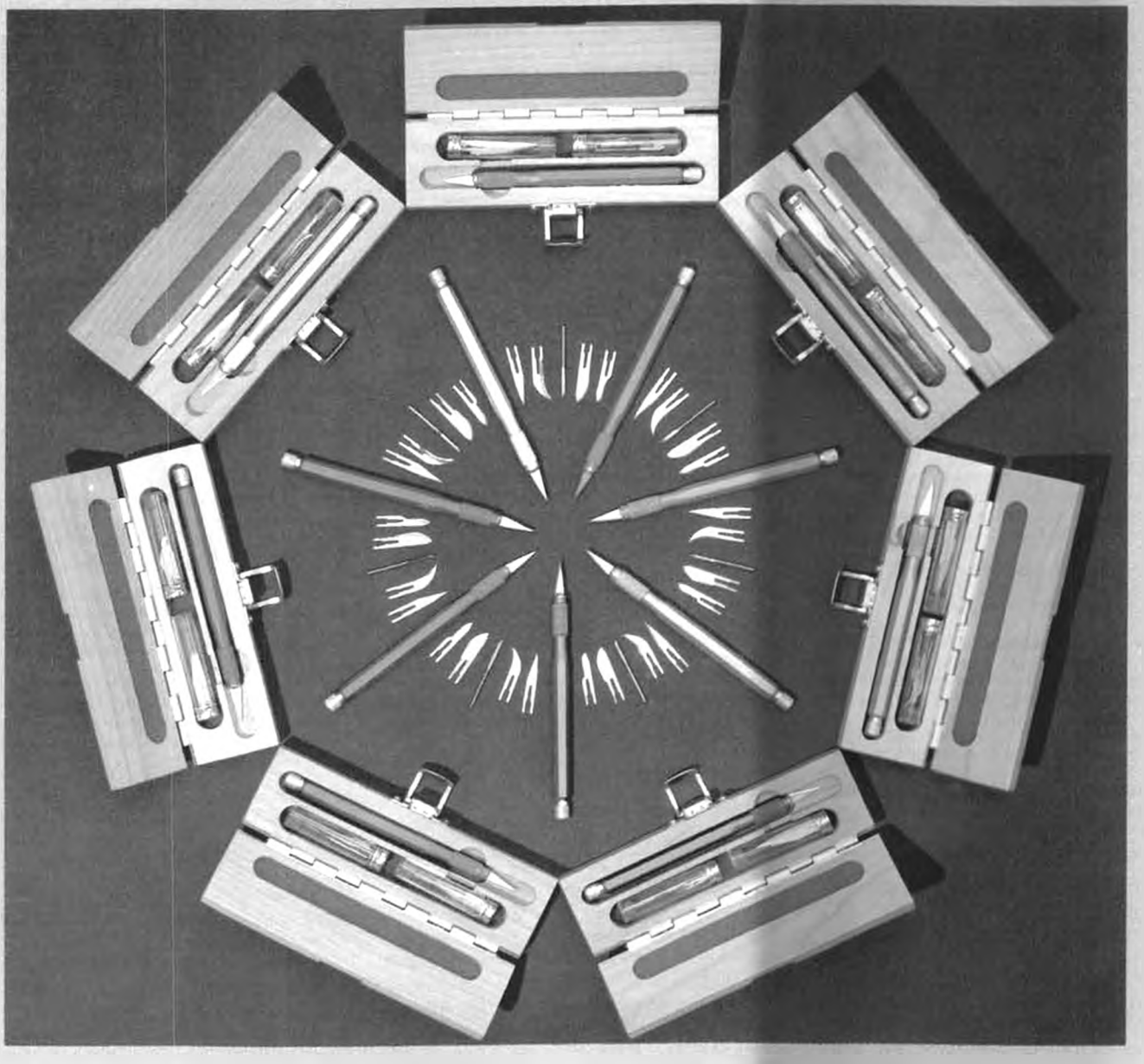

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up a bicycle tire. The gas in this case is simply air. As we put our back to the handle of the pump we force air into the tire and it inflates, or has its internal pressure increase in a relatively fixed volume (the tire does expand slightly). As we pump harder and harder and the tire nears wanted firmness, the air in the tire is warmed. We feel the warming most at the bottom of the pump's round base... or the bottom of the pump's cylinder. Our strength pushes a piston repeatedly down into the round cylinder to compress air and pump it into the tire. That warming at the bottom of the tire pump is what makes a model diesel engine run!

We call such model engines *diesels* to honor Rudolf Diesel, who developed the engine that runs without sparkplugs. The French call them "AUTO ALLUMAGE" which translates to "self-detonating," which is really a better description. Maybe we should also call them "self-detonating" or "compression ignition"... but the term "diesel" is accepted.

If we turn our bicycle pump upside down we parallel it to the piston and cylinder of the model diesel engine. If we flip the prop really fast, the piston rises up in the cylinder quickly and compresses the trapped fuel/air mixture... and along with compressing comes the rise in temperature. If the air/fuel mix is just right... if the heat rise from compressing is just right... the fuel/air mixture will self-detonate or explode and we get a diesel engine power stroke right after the explosion! The needle valve controls the fuel/air mixture and the compression lever on top of the cylinder controls the closed volume into which the mixture is compressed to control the heat rise. EACH POWER STROKE BEGINS WITH AN EXPLOSION WITH THE PISTON NEAR *top dead center*. Like the bicycle pump that has a long skinny cylinder that requires a long pumping stroke, the early model diesel engines didn't have today's CNC-generated precision fits between the piston and cylinder to form a leak-proof seal for compressing... the action that gives the needed heat rise for combustion. They were designed for long stroking... just like the cheap $7.95 bicycle pump of today that also lacks a precision seal. It is the long stroke feature that yields the LARGER PROP TURNING AT SLOWER SPEEDS... like today's pattern fliers are using to lessen sound levels!

Most any of today's modern model engines, with the advent of electric starters, will run on model diesel fuel. West German model magazines are advertising ducted fan engines that turn faster with lower sound levels when equipped with Davis Diesel conversions... howzat!

The exhaust sound levels are lower from diesels because the power stroke begins with an EXPLOSION of the fuel/air mixture. The glow engine has the heat of the plug's coiled wire ignite the mixture and the burning is often still taking place as the piston travels down and opens the exhaust port which lets out the harsh sound of combustion for us to hear. But the diesel fuel mix explodes or virtually burns all at once long before the piston comes down and opens the exhaust port... so we don't hear the harsh

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sound of combustion with diesel fuel. The addition of nitromethane to glow fuel tends to slow the burn rate of glow fuels a bit... and it adds a cracking level to the sounds of glow fuel exhaust, as it adds oxygen to the burning process which harshens the burn to increase power.

In auto traffic we can always tell when the car next to us has a diesel engine... it sounds like it's rattling at idle. The rattle sound is like a fast frequency of loud "pings" which we often call "pre-ignition"... and that's exactly what is happening. The internal explosions are reverberating through the mass of the engine's body and they tend to dissipate at higher rpm as the engine performs work. The explosions require a stronger engine to withstand greater internal pressures. That's why the Davis 1/2A conversion includes a stronger crankshaft and that's why his conversions for some K&B engines include a forged connecting rod.

Glow model engines have compression ratios from about 7-1/2 to 1 up to about 10 to 1. Diesel model engines have compression ratios from about 9 to 1 up to about 12 to 1. So you can see that many glow engines will run nicely on model diesel fuels. Commercial diesel fuel is available on the West Coast from Allan Heinreich, 398 West Wilson, Apt. F-214, Costa Mesa, CA 92627. RED MAX makes two diesel blends... P.O. Box 9, Clover, SC 29710. Davis Diesel has four blends... P.O. Box 141, Milford, CT 06460.

Diesel fuel for models is largely kerosene (half again more energy per pound than methanol) and castor oil for lubrication and low grade ether as an igniter to promote detonation at lower temperatures. Our model diesel engines do not have compression ratios approaching 21 to 1 like Mercedes Benz cars... and they will run about 50% longer on diesel mix over glow mix... and they are VERY USER FRIENDLY, sound levels are lower, glow plugs aren't needed and plain ol' nitrate dope isn't affected by the model fuel mixes. Eric Clutton, 913 Cedar Lane, Tullahoma, TN 37388 sells the rugged British P.A.W. diesels... $1.00 per catalog. I often have the very fine high performance Soviet MK-17 .09 diesels here for sale or trade for items wanted behind the Iron Curtain by modelers who send them out... you can reach me through *MB* address. Unless you use a Davis Diesel head that allows you to vary the size of the combustion chamber on a standard glow engine, you'll have to vary the castor oil content up and down by trial and error (the old Drone diesel used this method) and it's not reliable. I've used Davis fuels in regular glow engines and added/subtracted head shims with excellent results... use the glow plug to aid cold starting. Sound levels are muchly reduced.

But if you really want to go first class in the true style of the old long stroke model diesel engine, send two dollars in cash (no checks due to clearing costs) to Gordon Burford so he can mail you ordering details for his repro DEEZIL that I've enjoyed so much. My old-timer SIMPLEX *MB* August '89 construction article) has had many happy air/hours with the Burford DEEZIL repro... write Gordon at 86 Tierney Drive, Currumbin, Queensland 4223, Australia. Tell him you read about his top quality DEEZIL here in *MB!* **MB**

FREE FLIGHT *Continued from page 61*

cam"77" spray cement works very well with these films and the very small amount required results in very low weight gain.

• • •

So there you have it... A few hints for our folks interested in indoor. Now, you may think that the indoor season is just about over for the year, but think again. The biggest indoor meet of the year in the U.S.A. is being held in June. Since the summer months bring forth warm weather outside, just think of the effect this warmth has on an indoor

site. Models fly better in warm weather either inside or outside. Try indoor year round.

CARBON FIBER FREE FLIGHT PARTS AND OTHER GOODIES

Fellow club member and free flighter, Chuck Gode, has opened shop with another cottage industry especially for free flighters. Chuck is an engineer who works as a consultant with the aerospace industry, and he has been experimenting the past couple of years with carbon fiber F1C parts and the like. He has field tested a really beautiful 1/2A sized carbon fiber fuselage, which is a straight taper with a circular cross section front to back. Front diameter at the firewall is 1.5 inches and the diameter at the tail is .5 inch. Overall length is 35 inches and overall weight after sanding is 28 grams. The unit is lightweight and very strong. They are for sale for $25.00 postage paid. Chuck also makes and sells a timer mount unit that can be Hot Stuffed directly to the above tube, as well as a cast carbon fiber raised stab mount. These units sell for $5.00 each post paid. Ron McBurnett, another fellow club member, has used all of these components to build one of the 1/2A Vee models featured in *Model Builder* last year. Chuck has found that carbon fiber components can be cut very easily by using solid carbide burrs mounted in his Dremel tool. These are available from him at $2.00 each or three for $5.00. If you are interested in any of these items, or some of the other items that Chuck is making, drop him a line at CRG Enter-

prises, 855 Brink Ave. S.E., Salem, OR 97301. You won't be sorry you asked.

NOTHING NEW UNDER THE SUN

Real free flighters would never consider a plastic or synthetic covering material, right? After all, it is a recent development, and most of us adhere stubbornly to the good old days. I know I do. I get really puckered when I see a good looking Antique or Old Timer covered in MonoKote or some other plastic film. Ugly is the word that comes to mind. Well, bunkies, I recently ran across an ad in the December, 1938 issue of *Model Airplane News* that blew that "good old days" theory into the dumpster. Right there on page 57 was an advertisement for "Planefilm." To quote, in part, from the ad: "No glue or dope necessary, patches easily, quickly and invisibly... tough, elastic, attractive, at least 50% lighter in weight... Planefilm is attached to a backing sheet... Planefilm comes in many colors. The speed of application is hardly believable... a 7-foot wing spread was covered in 20 minutes... Available in either transparent or opaque... "

So, what's new under the sun? Not much, so it seems. I guess I will need to rethink my ideas about MonoKote and the good old days... .

INFORMATION FOR NEW OR RETURNING FREE FLIGHTERS

As promised at the start of this month's column, I received two letters last month that pretty much asked the same kinds of questions. These were questions that inspired me to begin a periodic set of definitions and explanations about my favorite hobby—free flight modeling. So, let's start.

Bill Friedlander, from Hudson, Wisconsin, gets the Rip Van Winkle award for this month. Bill wrote that he was a model builder during the early '40s, building Pacers, Zombies, and Comet Interceptors. He notes that the competition classes were fairly straightforward back then: A, B, and C Gas. He recalls Wakefield and Moffat. However, he is having difficulty understanding such classes as P-30, Coupe d'Hiver, Peanut, Walnut, Mulvihill, 1/2A Texaco, and all the other versions and classes. He admits to being confused about the size-weight-dimension requirements and the power limitations of these and other classes, and the contest requirements for participation. He inquires as to a possible reference source or requests a series in *Model Builder* to explain the categories.

When Bill Northrop forwarded this letter to me, his pencilled-in note asked, "Is this like trying to answer 'How high is up?' The more basic the answer, the bigger the job."

Well, I have tried to put myself in Bill Friedlander's place. If, for example, his point of reference is the power and weight restrictions in place during the 1940s, he expects that such is the case today. And, in many classes, such is not the case.

First off, the best source for specifications for all of the modeling classes and the requirements for flying can be found in the Academy of Model Aeronautics rules book. You can get one of these books if you are an AMA member, or you can order one from AMA at 1810 Samuel Morse Dr., Reston, VA 22090. The cost to nonmembers is $5.00. Regarding SAM events such as 1/2A Texaco, the best source is direct from The Society of Antique Modelers, c/o Bob Dodds, 209 Summerside Lane, Encinitas, CA 92024. Membership cost is $10.00 per year and you get a SAM rules book in the deal. The rules book may be available without membership, but you'd best inquire about the cost.

Second, a couple of thoughts about the issue of size-weight-dimensi and power limitation question. If the AMA or SAM rules don't specify any size-weight-dimension or power limitations, there aren't any. Example: a typical 1/2A gas model must only be powered by an engine of no greater than .049 cu. in. displacement. No other restrictions on the model exist. Half-A models typically range in size from about 225 square inches of wing area to around 350 square inches. Any kit of any free flight that you purchase will indicate which engines or power supply will be allowable.

If a design or class, such as P-30, has some kind of restriction, these are spelled out in the rules book as well. The reason that we have classes beyond the simple Class A, B, and C that Bill remembers is that we have adapted and adopted new events without dropping many of the old ones. FAI events are new to the scene since the 1940s (although Wakefield is certainly no new event), are international in scope, and are rigidly specified. Coupe d'Hiver is another such event.

Other events are regional or local in scope and quite often the rules are those flown by one or two clubs in one part of the country. For example, our club and a couple of others fly an indoor event called P-24. It's intended to be a simple event: plastic propeller (thus the P in P-24), no dimension is to exceed 24 inches (thus the 24 in P-24), rubber power, with the best flight out of six attempts determining the winner. It's a good event for beginners who don't want to mess with fancy prop jigs. You won't find P-24 in your AMA rules book, and the chances are that if you go to an indoor contest within 500 miles of Wisconsin, you won't find anyone flying this event there either.

Third, as far as finding out just what models are doing the winning, or what the design parameters are that the guys seem to be flying, the best advice I can give to any Rip Van Winkle or newcomer to the entire F/F scene is to read the contest calendar section of *Model Aviation,* find a free flight meet somewhere in your general vicinity, and contact the Contest Director, whose name and address appear in the contest notice. He will help you find the site and send you an entry form. Go to the meet, talk to the free flighters who are flying there, take some pictures, make some notes, volunteer to assist with the meet (take your stopwatch with you), and generally act interested. I don't know of very many free flighters who won't take some time to talk about their models or their hobby. However, I suggest you use some common sense as to when to interrupt them. I suggest further that you don't bother them when they are flying, preparing to fly, or otherwise occupied in concentration. Some of us can get downright surly at these times!

Next month, I will give the second letter some attention as I attempt to answer questions about free flight for the newcomer. Stay tuned for Part II.

THAT'S IT DEPARTMENT

That about wraps and ties it for another month. For those of you who have written, enclosing article ideas or pictures, keep the faith. I have your stuff, and I will use it as I can in the column. In the meantime, enjoy the sunshine and catch a thermal for me. ***MB***

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