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Weight: 0.57 oz. • Torque: 29 oz./in. Speed: 0.23 Seconds for 60° Rotation Dimensions: L: 1.07" x W: 0.50" x H: 1.07"

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94407 Micro Ball Bearing Servo.
Weight: 0.96 oz. • Torque: 29 oz./in. • Speed: 0.25 Seconds for 60° Rotation • Dimensions: L: 1.23" x W: 0.60" x H: 1.23"

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BUILT FOR GIANT SCALE!

92745 Micro Receiver, 72 MHz FM.
Weight: 1 oz. • Dimensions: L: 2.25" x W: 0.96 " x H: 0.82"

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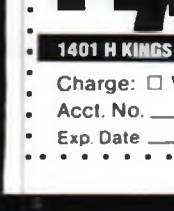

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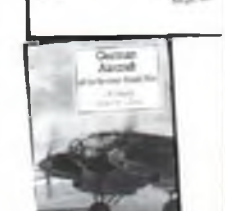

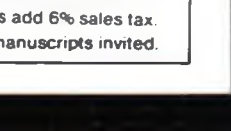

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CONTENTS

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COLUMNS

FEATURES

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PRODUCTS IN USE

ON THE COVER

Hobbico photographer Chris Brown captured Tim Lampe's Concept 30 SR during a switchless inverted hover at the Champaign (Illinois) County Radio Control Club's field. James Wang uses the 30 SR as an example for programming the JR PCM-10S heli system in part 2 of his radio review, see page 30.

CONSTRUCTION

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Model builder Jack Neal sends along this photo of his Monocoupe 90A, built from an Ikon N'Wst kit. It's covered with Sig Koverall and finished with Sig dope. Jack, who has been building for 57 years, powers his Monocoupe with a Saito 1.20 four-stroke and controls it with a Futaba radio. "With seven servos and all the paint, it weighs about 15 pounds," says Neal, one of five builders in Lyons who got this flying site—including the lake in the background—free from the town! "The Monocoupe flies well and the flaps make it all the more enjoyable. I've had about 20 flights and no problems. Using a Perry pump, I've had no trouble with the Saito running inverted." *Jack B. Neal, 915 S. Douglas, Lyons, KS 67554.*

The latest project from the workbench of Emmett Powers is this nearly completed large scale Starduster, built from a Bob Campbell kit. "The plane is covered with MonoKote, is equipped with a Futaba radio and will have a Zenoah 62 engine installed when completed," notes Emmett, who photographed his son, Jack, behind the plane. *Emmett Powers, 2216 Bilbrey Lane, Anderson, IL 46011.*

"My Travelaire 6000 is a 1"=1' model scratch-built from Cleveland drawings—but it was never intended to fly," writes Roy Didriksen of South Ozone Park, New York. "This airplane, covered with silkspan and dope, was built for the Bayport Aerodrome Museum on Long Island, where it hangs now from the rafters." Didriksen, who's been modeling since the 1930s, used Williams Bros. cylinders and wheels. "The cowling just behind the engine is made from Pepsi-Cola cans—an excellent source for high-grade aluminum. I used aluminum so I could duplicate all those #$@$% louvers!" A *Model Builder* custom T-shirt is on its way! *Roy Didriksen, 123-48 135th St., South Ozone Park, NY 11420-3017.*

Bruce J. Kunkel's woodworking ability is shown in his original design, "The Phantom Flyer Deluxe." He offers plans for four variants: rubber-powered, .020 free flight gas, Imp 30 electric free flight and Cox Failsafe single-channel RC electric that he says flies for more than two minutes on a stock Cox FlyBoy battery. *Bruce J. Kunkel, 1606 N. Tennessee Blvd., F-83, Murfreesboro, TN 37130.*

James J. Lindeman of Lattimore, North Carolina made only one change from the plans on his red, seven-foot Quaker RC Old Timer: the landing gear—"better to get it into the station wagon!" The 73-year-old builder got into RC Old Timers after 63 years with free flight. He powers his Quaker with a Saito FA-45, radio from Futaba, and the covering is MonoKote. "The small cabin job is a 58-inch wingspan Le Crate, designed for 05 electric," Lindeman adds. "I changed the power to a .074 Cox and the radio is from Airtronics. I covered the airplane with Solartex and clear dope, and it flies well." James *J. Lindeman, P.O. Box 162, Lattimore, NC 28089-0162.*

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PLANE TALK

These identical Super Decathlon 40s from Great Planes kits are so alike that even the wings are interchangeable, say Don and Jim Farris of Norman, Oklahoma. "Jim's plane weighs about 1-1/2 ounces more than mine, and both are powered by indentical Webra Speed .50s and controlled by JR Galaxy radios," says Don, who's in the white shirt. "The performance is unbelieveable, and talk about fun! In fact, we often stay at the field longer than we told our wives we would." Have they ever gotten the planes mixed up in the air? "Nope," replies Don. Both he and Jim fly with the Central Oklahoma Radio Control Society club, and now both will have identical custom *Model Builder* T-shirts—same size, of course! *Don Farris, 1601 Camelot, Norman, OK 73069.*

"My Electric Hots is built from the Midwest kit, powered by an Astro 05 cobalt and seven 1200-mAH cells," writes California modeler Gerry Markgraf, whose Leisure Playboy graced the cover of our December 1991 issue. "The covering of this plane is pink and metallic black MonoKote. The plane flies like it's on rails!" *Gerry Markgraf, 3120 Sunrise Ridge Lane, Hacienda Heights, CA 91745.*

The "Cordless Electric Iron" is what William I. Whitten calls his 36-inch long airplane(?). "It's made from 1-inch thick pink insulation foam with a bit of balsa and plywood to hold the radio, battery pack and motor," says the Birmingham, Alabama flier. "It's super easy to build and flies very well with a standard Astro cobalt 05 using a 3.5:1 gearbox and 15x12 prop. With eight 1400 SCR cells, weight is about 44 ounces. Guys here crack up when they see it floating overhead. I'm sure it would fly okay with a gas engine, but the noise would sort of spoil the illusion." *William I. Whitten, 1227 Littlebrook Lane, Birmingham, AL 35235.*

The Cloud Chaser pictured is the second that Joe Barkley has built from *Model Builder* plans—the first one literally wore out! "This newer model should be another real flier," reports the Hixson, Tennessee modeler. "The model can be flown in a very limited space by restricting motor size and winds, but it's large enough to be very forgiving of warps and other mistakes because it flies so slowly. I can't say this of many Peanuts, which have a higher wing loading and fly quite fast, and where a warp can be fatal." *Joe Barkley, 1732 Crabtree Road, Hixson, TN 37343.* **MB**

AIRMAIL

Have a question or comment? Send it to Air Mail, c/o Model Builder, 34249 Camino Capistrano, Capistrano Beach, CA 92624.

LIKES RUBBER

If the May '93 issue is the direction you're going, you're right on target and a lot farther down the road than I thought you'd be at this point in time. Two rubber plans/articles—unbelievable, but great!!

Bill Hannan's column is more prominently displayed and the article by John Pond is excellent. I believe these historical articles regarding the early manufacturers are enjoyed by all. Keep up the good work!

Claude Powell
Ridge, Maryland

MORE FREE FLIGHT

Enclosed is my renewal for another year. Hopefully you're still trying to improve *Model Builder*. As I review my issues back to Vol. 1, No. 1, I recall I've purchased it because it fills a special niche. It seemed to be heading toward another RC magazine; not to say it shouldn't have some, but let's even it out with more articles on smaller rubber scale, free flight, etc.

C.S. Johnson
Rapid City, South Dakota

In April I'll be 69, and I've been interested in airplanes large and small all of my life. I've built free flight models only, but recently have gotten a grandson started in RC. When I got the May issue, the article on free flight got me excited about building again. This past winter I built the Ford Trimotor 34-inch Sterling kit. It's the only one I've built that wasn't intended to fly. Maybe I'll build another and fly it!

You have a good magazine.
Joseph H. Wheelbarger
Anacortes, Washington

Please consider more free flight, rubber and indoor. Also those wonderful Bob Benjamin covers. They are fantastic!

Gordon M. Hastings
Grand Blanc, Michigan

THREE-VIEWS, PLEASE

I enjoy your *Model Builder* very much. I'm 68 and a solid-model builder of the old school. I employ white pine, usually for bodies, whether ships or planes. I use balsa for wings, stabilizers and rudders. My interest is in three-views and I hope *MB* continues to publish them.

Roy Booth
Salem, Ohio

JIRO SUGIMOTO'S RUBBER-POWERED MODEL

Enclosed is my subscription and a photo

of my latest model, a rubber-powered, 23-inch span Mr. Smoothie racer. I enjoy Hannan's Hangar every issue and hope you continue the Peanut Scale plans.

Jiro Sugimoto
Nagoya, Japan

As an avid free flighter, let me thank you for what I see as a gradual overall improvement. I like seeing the added free flight and Old Timer coverage, and especially the Peanut plans.

Jerald F. Zierdt
Colbert, Washington

FRANK KIESER REMEMBERED

Frank Kieser will be sorely missed by all free flight model builders. He will be particularly missed by that rare breed of men who build and fly ornithopters.

All of us who timed his flights at the contests knew how much he wanted to win—to be number one. This man was number one to us in every sense of the word! He used his engineer's mind to design and build his beloved ornithopters. He was a man who strove for perfection. After contests, he was back at the computer, adjusting formulas.

Yet, as much as he wanted to win, Frank was unique in his eagerness to share his designs, even if it meant we sometimes took the record from him. We could call him anytime and ask him to calculate our weights and specifications, or ask for some advice from his past experience. He was first to congratulate us on our wins, too.

Next to flying, he loved talking about flying. We stood in awe of him. He had such a great mind that I felt inferior, although he never treated me that way.

Lord, how we loved that man! But the Lord must have loved him more. He called him to that great flying field in heaven. All of us will feel his presence at future contests and he will look down on us and smile!

Roy White and Mary Reilly
Catawissa, Missouri ***MB***

over the counter

YET ANOTHER FROM ACE R/C

One of Ace R/C's new releases for 1993 is the "Grasshopper," a two-channel 1/2A funster conceived by Art Bigelow. The model has a pod-and-boom fuselage, employing a fiberglass arrowshaft for the boom, and is designed such that the wing, landing gear, tailfeathers and even the engine are held on with rubber bands, making a pop-apart ship that's darn near indestructible. The wing is one of Ace's molded foam pieces and spans 43-1/2 inches. One of the best parts is that there's enough room in the pod for two standard servos, a typical receiver and a 500-mAH battery pack—no miniature radio gear required. The airplane has already proven to be a hit with modelers; at Toledo, we saw more people walking around with Ace Grasshopper kits than anything else, and that's the honest truth.

You can get your own Grasshopper kit either from your local dealer or direct from Ace R/C, 116 W. 19 St., P.O. Box 472, Higginsville, MO 64037-0472. You can also place an order with Ace over the phone by calling (800) 322-7121.

SCALE PLANS

Scale scratch builders looking for unusual subjects should check out the latest issue (#5) of *AeroPlans*, compiled and published on an indefinite schedule once or twice a year by Andrew C. Anson. This is the first issue of *AeroPlans* we've ever seen, and were impressed enough that we've ordered a couple of back issues that sound especially interesting. Issue #5 comprises 36 pages and is made up mostly of scale drawings (most of them covering two or more sheets) and scale model plans. Emphasis is on the rare and unusual with some popular designs included as well. Issue #5 features scale drawings for the WWI Albatross C-V, Boeing F2B-1, Tucano A and H; Royal Aircraft Factory S.E.1, S.E.4 and S.E.4a; Polish RWD-4, Soviet UT-1 (AIR-14), and the Hickman Pack-Mag biplane on wheels and floats. Model plans include a 1"=1' RC replica of the 1913 Sopwith Bat-Boat, a Stinson Model "O" for rubber scale and full-size plans for a Peanut Scale "Toucan" homebuilt designed by publisher Anson in 1972 but never built.

AeroPlans #5, as well as back issues 1, 3 and 4, are available for $10.00 each plus $2.50 shipping and handling. Foreign rate per issue, sent air mail, is US$17.00. Order from AeroPlans, 8931 Kittyhawk Ave., Los Angeles, CA 90045.

REQUIRED READING

Of the many impressive models on static display at Toledo this year, one of our favorites was a beautifully built replica of the Northrop F-89D Scorpion, built by Tim Farrell of Lubbock, Texas. We don't know what Tim used in his research of the aircraft, but a good place to start would be the new Kalmbach book, *F-89 Scorpion*, authored by Bert Kinzey.

First flown in 1948, the F-89 was the first nuclear armed jet interceptor; the final variant, the F-89J, served with the Air National Guard until being retired in 1969. Everything you'd want to know about the aircraft is here, including five-view 1/72-scale drawings of the F-89D and side views of the C and H models. Of the 72 pages, eight are in color, and there is a modeler's section in the back with reviews of the various plastic display models that have been produced over the years.

F-89 Scorpion is Volume 41 of the Detail & Scale series and is published by Kalmbach Publishing Co., 21027 Crossroads Circle, Waukesha, WI 53187; or call toll-free 1-800-533-6644. The book is priced at $10.95 plus shipping and handling.

ONE BIG MIG

Still on the subject of jets, a company called Unique Aircraft has introduced a large 1/8-scale model of the MiG-29A Fulcrum, designed for two .91s and two 5-1/4 inch ducted fan units. Span is 74 inches, overall length is 96 inches and the flying weight is quoted at 20 to 22 pounds. The basic construction consists of a pre-joined, one-piece epoxy fiberglass fuselage and sheeted foam core wings and tail surfaces. The airplane is available in various forms—as a very complete kit, an ARF or even complete and ready to fly—and there are a number of optional items offered as well. Ambitious RC jet pilots are invited to write or call for full details: Unique Aircraft, 105 W. Remington St., Irvine, CA 92720; (714) 786-1488 or (714) 786-8469.

HOT CURRY

Coming soon in *Model Builder* will be a review of the new high-performance "Blue Curry" electric sailplane, produced in Germany by

a company called Blue Airlines and sold in the U.S. by Hobby Lobby. The Blue Curry is a two-meter T-tail ship designed for 10-cell power systems, and while not considered an ARF, it does sport a high degree of prefabrication, including a finished white fiberglass fuselage and foam core wings pre-sheeted with obechi. The wings have full-span ailerons and are supplied with the leading edges installed and shaped, the aileron hinge lines pre-routed and the aileron servo wires installed. Wing airfoil is the thin and very fast HQ 1.5/8. The review model we're building will be powered by one of the new Czechoslovakian-made Mega R4 motors also handled by Hobby Lobby.

Full particulars on the Blue Curry kit, the Mega motors and a host of other great electric power goodies are contained in Hobby Lobby's new catalog 22, which you can get free of charge by writing to Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027, or call them at (615) 373-1444.

ELECTRONIC GOODIES

Two new offerings from Model Aviation Technology (MAT) include an AC/DC charger for the big 6-volt, 1200-mAH MAT gel-cell that's been written up here and in Bruce Edwards' April '93 "Big Birds" column, and an ESV voltmeter for checking the condition of your radio batteries.

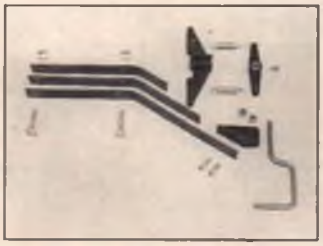
The battery charger ($49.00) is set up to charge at 400 mA and automatically goes into trickle charge when the battery is fully topped off; LEDs indicate the charge status. The charger operates both on 120 volts AC and can also be used at the field by connecting it to your car's 12-volt DC battery (a plug is provided for this).

The MAT ESV tests your transmitter and airborne radio system batteries under a 300 mA load; a row of 10 LEDs on the faceplate is used to indicate their charge condition. There are actually two separate airborne battery plugs, one for 6 volts and the other for the more common 4.8 volts; the latter thoughtfully provided for those who fly models in which MAT's big 10-ounce gel-cell either won't fit or would be an undue weight burden. The ESV sells for $25.00.

From Model Aviation Technology, 12848 Touchstone Pl., Palm Beach Gardens, FL 33418; (407) 626-6955.

BIG SCALE TAILGEAR

Sig Mfg. Co. now has two sizes of large leaf-spring tailwheel assemblies similar to those used on full-scale aircraft. The Large size ($12.95 retail) is for models weighing 8 to 16 pounds and will accept a 1-1/2 inch wheel; the X-Large unit ($17.95) is intended for models over 15 pounds and will take up to a 2-1/4 inch wheel. You can vary the "springiness" of the unit by using one, two or all three leaf springs. Both sizes feature a molded nylon tailwheel bearing, pre-bent wire and all hardware—everything but the wheel itself. Both of these tailwheel assemblies are now available in hobby shops or direct from Sig Mfg. Co., 401-7 S. Front St., Montezuma, IA 50171; (515) 623-5154.



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

FOR SEAPLANE LOVERS

Hangar Designs, located in Jacksonville, Arkansas, has released a new larger version of its Sea Cruiser seaplane, an attractive high-thrustline design with triple fins and sponsons in place of the more damage-prone tip floats. The new Sea Cruiser II, priced at $89.95, has a 59-inch span and is intended for .40-.50 power; the original Sea Cruiser ($69.95) is a 49-inch model for .20-.28 engines. Both are of all-wood construction and come with machine-cut balsa and plywood parts, hardware and a photo-illustrated instruction booklet. The kits are available factory direct only; shipping and handling adds $5.00 to the prices quoted above. To order or to get more information, write Hangar Designs, 2 Raccoon Court, Jacksonville, AR 72076, or call (501) 834-8177.

HOT ELECTRICS

We have to admit to being rather skeptical at first about the performance claims made by Model Electronics Corp. in its ads for its "War Emergency Power" electric motors and flight systems, however, having watched the video that company president Roland Peterson sent, we're convinced. The motors are the same physical size as a standard 05 "can" motor, but when equipped with a 6:1 gearbox, 13x7 prop and a nine-cell battery pack, the claimed thrust output is up to 52 ounces—enough to give the lightweight models in the video true unlimited vertical climb performance. The "War Plus" motor delivers even more power but, of course, sacrifices some run time.

Model Electronics sells the "War" motors, a custom gearbox, a *very* small and light electronic motor control unit and even some specially designed kits to complement the power systems. A complete catalog is available by sending $2.00 to Model Electronics Corp., 6500 6th Ave. N.W., Seattle, WA 98117; (206) 782-7458.

NOSTALGIA TIME

SAM 35, the British Old Timer group, has done its usual excellent job of preparing the latest edition of the delightful *SAM 35 Yearbook*, a copy of which was sent to *MB* headquarters for our perusal. This is book #7 and covers the full gamut of European modeling's early days, from the twin rubber powered pusher patented by Wilhelm Kress in 1880 to the early days of radio control. If you have any interest at all in vintage modeling, you'll find this book to be eminently enjoyable reading. Copies can be ordered from Ronald S. Knight, 14A, Enmore Gardens, East Sheen, London SW14 8RF United Kingdom. Personal checks or international money orders should be made out to SAM 35 and must be in sterling; the cost for each book is £4.50 plus £1.87 for postage. *continued on page 60*

DEAR JAKE

Advice For The Propworn

DEAR JAKE:

Hi. It's me, Tommy Smith.

Which do you think is better... to pluck out super-glued nostril hairs or to just breathe through your mouth until they grow out?

My Science Fair partner would really like to know.

We won, by the way. The judge didn't think that sparrow parts were re-attachable, but we proved him wrong.

Your Friend, Tommy Smith

Dear Tommy:

Congratulations on the Fair!

How is your sister? Has she been able to put together a wardrobe that hides or at least complements that lavatory seat? Or have the debonders finally freed her of her American Standard accessory?

Jake

DEAR JAKE:

With Defense Department spending being cut back by the Clinton administration, will our country still be able to do research on such exciting projects as the Stealth Bomber, the Space Shuttle, and Star Wars?

Starting with the Wright Brothers, the U. S. of A. has always been the leader in the aviation sciences. It would be a terrible mistake to sacrifice our aerospace preeminence to save a few lousy tax dollars. At least I think so.

Former Boeing Employee

Dear Former:

As an aviation buff, I have to agree with you, but as a realist, I think the public sees no foreign military threat out there and supports cutbacks. So defense spending will be slashed and research will take one of the hardest hits.

But fear not! My insiders tell me that the kinds of programs you mentioned will not be eliminated, just downsized and slightly redefined in the interest of cost savings and more emphasis on civil rather than defense research.

The Stealth Bomber Program Office, for instance, has been redirected by Congress to investigate the technical feasibility and long-term benefits of a Stealth Police Car. Estimated to cost only $7 million per unit versus the $10 billion each for the Bomber, the Stealth Police Car is expected to be very effective in catching speeders. Opponents, however, challenge its maintenance costs and the high likelihood of frequent dents from people trying to park in its apparently empty parking spot.

Space Shuttle funding is evidently going to be re-routed to help bail out the Trump Shuttle, and in a particularly ingenious initiative, Star Wars strategists and designers are going to focus their efforts on a new program called Price Wars. Star Wars, the anti-missile-missile system, would have stopped incoming warheads before they got here. Price Wars is apparently intended to start milk pricing wars before the dairy industry can conspire to prevent them. This top secret laser technology infects UPC price code readers and causes steadily declining prices to appear on the cash register across the street.

In all, these policy changes are expected to reduce the national deficit by at least a dollar fifty, with absolutely no sacrifice of defense readiness. Provided, of course, we can stop incoming weapons with the Trump Shuttle and use Stealth Police Cars to lob jugs of milk at whoever our next adversary turns out to be.

Jake

DEAR JAKE:

You wrote some time ago that a good way to reduce or enlarge a set of plans was to take a 35mm slide photo of them and project them on a wall. The idea was to move the projector backward or forward until the projected image was the size you wanted, and then just copy the plans by drawing over the projected lines with a pencil.

Well, I did all that with a set of plans for a 48-inch Citabria that I wanted to scale up to 80 inches for a four-stroke .90. It worked great and I started construction, but about halfway through, I lost interest and left it unfinished.

My problem is that I've been catching a lot of flack from my wife lately about the wing and fuselage halves still pinned to our living room wall. I keep telling her that I don't want to remove them from the plans because I'll probably get re-inspired and will want to finish the project. She doesn't seem to understand that a work in progress shouldn't be disturbed. Can you help?

Harried Husband in Vail, CO

Dear Husband

Sounds like a totally unreasonable woman. Granted, you could have taken the 3-digit-IQ approach and put some paper on the wall before you drew your plans and then built the model on your workbench. But hey, you took your best shot and she should get over it.

If she insists on squawking, put a fancy frame around it. Your work goes undisturbed and she can have the Ladies Auxiliary over to show off the new piece of abstract art.

Jake **MB**

LIGHT FLIES RIGHT!

Serious pattern competitors are fanatics about keeping unnecessary weight out of their models. Here are some tips for adding lightness to your next ship.

One of the oldest axioms in this model airplane business is to build them light, and this is especially true with pattern planes. "Light" is a very subjective term; what is light to one person is very often heavy to another. Indoor free flighters measure "light" in mere fractions of a gram, while giant scale modelers add and subtract pounds at a time and think little of it.

What is "light" when we talk about pattern planes? Why worry about how much your pattern ship weighs? How much can the weight really vary between aircraft constructed from identical kits? Finally, what are some of the common techniques that good pattern builders use to keep the dead weight out of their ships? Some of the answers to these questions might surprise the average builder.

BALSA WEIGHT CHART

(Weights expressed in grams)

Sheet Size	4 lb.	5 lb.	6 lb.	7 lb.	8 lb.	9 lb.
1/16x3x36	7.1	8.9	10.6	12.4	14.2	15.9
3/32x3x36	10.6	13.3	15.9	18.6	21.3	23.9
1/8x3x36	14.2	17.7	21.3	24.8	28.4	31.9
1/16x4x36	9.5	11.8	14.2	16.5	18.9	21.3
3/32x4x36	14.2	17.7	21.3	24.8	28.4	31.9
1/8x4x36	18.9	23.6	28.4	33.1	37.8	42.5
1/16x3x48	9.5	11.8	14.2	16.5	18.9	21.3
3/32x3x48	14.2	17.7	21.3	24.8	28.4	31.9
1/8x3x48	18.9	23.6	28.4	33.1	37.8	42.5
1/16x4x48	12.6	15.8	18.9	22.1	25.2	28.4
3/32x4x48	18.9	23.6	28.4	33.1	37.8	42.5
1/8x4x48	25.2	31.5	37.8	44.1	50.4	56.7

A typical, modern .60-sized pattern plane with a wing area of 800 square inches would be considered light at or below a weight of 7.5 pounds today. The average weight for a plane this size would be 8 pounds, and anything over 8.5 pounds would definitely be classed on the heavy side. These figures yield wing loadings somewhere between 21 and 25 ounces per square foot. By comparison, the wing loading of Hobby Lobby's Senior Telemaster at 10.5 pounds and 1330 squares is 18 ounces per square foot. Carl Goldberg's Eagle 2 comes in at about 17 ounces per square foot. These are figures derived from factory specs. A popular .60-sized ARF trainer that I just helped a novice friend put together came in by actual observation and measurement at almost 26 ounces per square foot, and it flew very well at that figure!

The point is that modern pattern planes are not heavily loaded aircraft; the wing loading of even a "heavy" ship compares well with that of an average trainer or sport plane. All modern pattern planes—even the overweight ones—have light enough wing loadings that they are easy to fly and land. This being the case, why worry about weight?

The answer isn't very closely related to wing loading. It has far more to do with power loading, thrust, and vertical performance. Power loading is usually expressed in terms of pounds per horsepower and can be figured by dividing the total weight of the airplane by the ponies available. We could easily figure this out for most of our planes, but the results wouldn't tell us much more than what we intuitively already know: given powerplant setups of equal thrust, the lower the power loading figure, the better the vertical performance.

The basic equation of flight holds lift equal to weight and thrust equal to drag in steady level flight. From this, it's easy to see that if you want to go up, you increase the lift component by increasing the wing angle of attack and generate some thrust in excess of that required to maintain straight and level. I could write out the formulae, but you already know this. It's one of the main reasons that you hooked up your elevator and throttle servos in the first place.

For pattern airplanes, the usual rate-of-climb and angle-of-climb equations go out the window. In general, pattern planes go up at just three angles—45, 60 and 90 degrees. The first two we don't worry about, because given adequate wing loading, any package that shows decent performance on a dead 90-degree vertical climb will easily handle lesser angles.

In a 90-degree climb, the wing is unloaded. All of the "lift" is coming from the prop. Thrust is in direct opposition to both weight and drag. When we unload the wing, the induced drag leaves along with the lift, but the parasite drag remains, as does every ounce of extra weight, hanging from the prop, causing your poor piston to grunt for every precious foot of that vertical line. We can't do much about the parasite drag, other than pay attention to proper streamlining, fillets, etc., but we definitely can do something about the weight.

This is one way to get the weight out of the nose. The servos in Bob Crump's Typhoon are beneath a hatch in the rear fuselage. Rick Allison photo.

Radio and powerplant weight is a relative constant with our craft. The average pattern .60 engine and radio setup with six servos weighs 3.5 to 4 pounds. The retracts and exhaust system are usually counted in this. This is just about half the weight of the total package. A little weight can be saved here, with attention to light wheels, carbon fiber tuned pipes, smaller servos, drilled spinner backplates and similar tricks. Lite Flite of Glendale, Arizona (602-842-0782) has a line of precision-made aluminum pattern trinkets like adjustable axles, fuel buttons, wing adjusters and control horn fairing nuts that are very light and high quality to boot. Using these and similar products is wise, but generally, it's tough to shave a lot of fat from the accessories. The other half of the total weight is the airframe. This is where you find most of the extra weight in a heavy bird.

With the difference between light and heavy being as much as a full pound or more, where is that extra weight? What do the smart builders take out or leave out that makes such a difference? Most fiberglass fuselages are created equal within a few ounces on similar airplanes, so we have to look elsewhere.

The major killers of climb are, in order: heavy wood, too much glue, and excess finishing materials.

Balsa weighs from about 4 pounds per cubic foot to more than 12 pounds per cubic foot. The term "contest balsa" is commonly applied to 4-6 pound wood, and this is the stuff you should seek out for your airplane. From the balsa weight chart, we find that a single 1/16x3x36 sheet of 5-pound density balsa weighs 8.9 grams. Most ordinary hobby shop wood in this size is 9-10 pound density, and weighs 16 to 18 grams! Extrapolating from this, a normal completed wing skin made of 4-6 pound wood might weigh about 30 grams. An identical skin constructed of 9-10 pound wood would weigh from 50 to 60 grams. At four skins per airplane, the difference just in wing skins can be over a quarter of a pound. When you add in the wing leading and trailing edges, the wood to sheet the stab and rudder, and all the control surface facings, using heavy balsa pulled from the bin without regard to weight can cost as much as half a pound on an average pattern airplane.

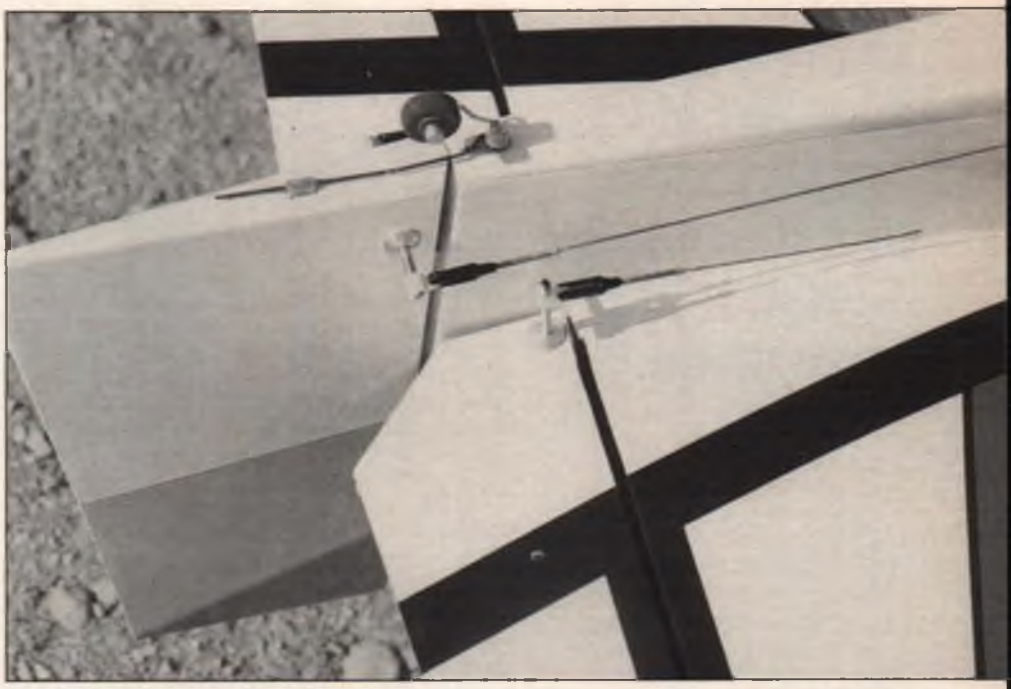
Aside from dealing with mail order suppliers of specialty balsa, the only answer to the wood problem is to buy a good scale that yields accurate weights at the gram level. I own a triple beam balance, and it is one of my most valued modeling tools. I have been known to carry it right into a hobby shop, set it up on the counter, and fall to weighing wood. In my present location, I no longer have to do this, as I have found a dealer, Webster's Hobby Shop in north Seattle, who not only carries many hard-to-get pattern supplies at excellent prices and keeps a good stock of light wood, but provides a scale for customer use as well. Everyone should be so lucky! Webster's can be reached at (206) 546-5159, and they will mail order on request.

Another heavy item is plywood. Aircraft birch plywood is wonderful stuff, but it is heavy and should be used with care. With modern soft mounts, the usual 1/4-inch birch plywood firewall can be replaced with light poplar plywood, which is 40 percent lighter. The retract plates and servo trays can be made from glass/end-grain balsa laminate or carbon fiber/end-grain balsa laminate rather than traditional birch ply. These changes can save as much as 2 ounces while actually adding strength.

Epoxy may be strong like steel, but on a scale it looks more like lead. It takes very little of the stuff to sheet wings if done properly, but it is amazingly easy to add as much as an extra ounce per wing panel. With honeycomb wings, I brush the epoxy on the foam directly, rather than use a squeegee to coat the skin. That way, glue is used only where it is needed. Another trick is to mix only as much as you really need—usually about 1/2 to1 ounce for an average wing panel—and make it stretch. Low-viscosity epoxy helps. Watch how much resin you use to glue in the firewall and especially the stab. The tail of a pattern plane is no place for extra weight. Big ugly globs of epoxy have no known structural, aesthetic or aerodynamic function.

Speaking of honeycomb wings, the usual weight savings here is less than 3 ounces, most of which is glue. The value of this feature lies chiefly in *where* the weight is removed: near the wingtips, where it lowers the rolling moment of inertia.

There exist on this planet individuals who can fiberglass and paint wings and stabs without adding much (if any) more weight than film covering would add. I have seen and held their work in my hands, and they are artists. Most people who attempt the glass/paint route routinely add an extra 1/3 to 1/2 pound to the finished product, most of which is put on behind the CG.



A pull-pull cable arrangement is lighter than pushrods and gives more positive control. The control horn fairing nuts are a Lite Flite product: see text. Rick Allison photo.

Fiberglass fuselages require painting, but careful attention to detail can save extra ounces. Many people leave far too much primer on the fuselage. Primer is the heaviest coat of all, and most of it should be sanded off, leaving only the imperfections in the surface filled. The idea is to have a smooth surface, not necessarily an opaque one. Shooting a light blocking coat of white or silver as a prep for a poor covering translucent color (such as yellow) is much lighter and will often allow one-coat coverage of the final base coat. Imperfections like dust motes, paint ridges, runs and dry edges should be wet sanded with 600-1000 grit and recoated only if necessary to get good color coverage. A final light clearcoat will bring the gloss back without adding weight in extra pigment. A good general rule is that layering on more paint will not fix an imperfection—it will only give you a heavy, thickly painted imperfection.

When you install the radio, keep the foam rubber to a minimum. Foam rubber is very heavy. I know you've been repeatedly told to isolate the tank and receiver from vibration, but with a soft-mounted engine, you can use much less. I use Velcro strapping to hold these components securely, with only a small patch of thin foam directly beneath them.

A final place to save a few ounces is at the balance stand. Adding lead to a completed airplane is something I have always regarded as an ugly admission of failure. Move Heaven and Earth (and especially the servos and battery pack) to get the balance point right before you add weights. Performance Specialties of Gardnerville, Nevada (702-265-7523) sells two-stroke aluminum piston and liner sets that will save 2 ounces of weight in the engine compartment and give you better engine performance at the same time. For tailheavy craft, I have moved battery packs to right behind the firewall, redone pushrods, moved servos forward, and (honestly!) installed lighter tailwheels. Lead should be an absolutely final resort. If you must use lead, make it do something. Put a 1200 mAH battery pack in the light end!

Get in the habit of weighing everything that goes into the plane while you are building. It won't take long before the tricks of the trade become second nature. In addition to super vertical performance and improved aerodynamic damping, one of the best rewards for your efforts will come when a new acquaintance lifts your plane for the first time and looks at you in amazement. When that happy day arrives, the pattern book of etiquette lists the correct response as a slightly wicked but modest grin accompanied by the merest touch of raised eyebrow. Enjoy! ***MB***

HANNAN'S HANGAR

BY BILL HANNAN

"It does not matter who made a thing (first). What is important is that it exists, that it has been made."

This month's quotation, by Romanian aviation pioneer Taian Vuia, who hopped his aircraft during 1906, seems an appropriate introduction to our first topic, since his flying machine featured CO_2 power! The quotation was found in the book *Romanian Aircraft Constructions 1905-1974.*

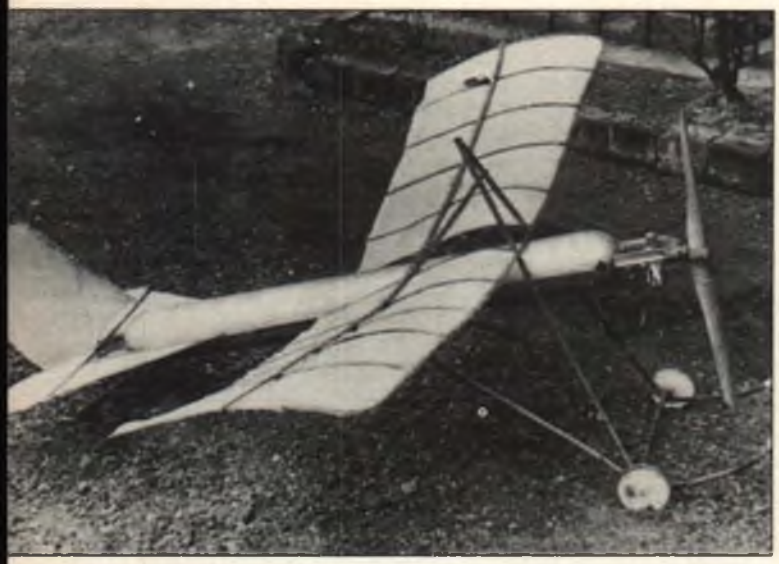
PRESSURE POWER

Compressed-air systems successfully flew model aircraft long in advance of full-size machines. Such models were demonstrated by such experimenters as Victor Tafin in France and Lawrence Hargrave in Australia during the 1800s.

CO_2 is also a vintage form of model propulsion, with surprisingly sophisticated powerplants being commercially marketed by 1912. And, judging by our mail, interest is again widespread enough to justify a review of these alternative power sources.

First of all, are they engines or motors? Semantics and deep theory aside, my personal feeling is that they more nearly resemble steam engines than electric motors. On the other hand, many of them are manufactured by Brown Junior *Motors.* But then, General *Motors* turns out zillions of internal combustion *engines,* so take your choice!

Daniel Baird's CO_2 engine collection gives some idea of the sizes and configurations produced over the years. How many can you identify?



Dating from 1915, this compressed-air powered model was constructed in Germany by Otto Reder, who later designed full-size aircraft. We bet John Pond doesn't have plans for this one! Photo via H.J. Meier.

Compressed-air engines were probably at their most popular during the 1920s and 1930s, but have been kept available for many years since by a few dedicated enthusiasts, augmented recently by the introduction of the Italian Zanin systems.

CO_2 engines are presently manufactured in at least five different countries in a variety of sizes and configurations, thus are more prevalent than the compressed air types. Sizes range from sub-miniature, suitable for powering Pistachio scale models, through units that can easily haul 36-inch span sport models aloft with vigor.

CHARACTERISTICS

Advantages of CO_2 engines include cleanliness, quiet operation, one-flip starting, ease of speed control, no batteries or wires or switches required, no danger of overheating, high power-to-weight ratio, and no need for fuelproofing. They are even suited to indoor flying, as recently recognized by the FAI. These engines can be made to run in either direction, depending on which way they are flip-started, and can efficiently handle small or large diameter propellers.

Shortcomings? Yes, as with any human-made products, there are some limitations. Efficiency can vary with temperature changes, CO_2 capsule quality, and inconsistencies in filling. Their fuel tubing is fairly delicate and must be handled carefully to avoid kinking or breakage. Also, just as with rubber, electric or internal combustion power sources, CO_2 systems can be frustrating at times, owing to such problems as leakage at check-valves and piston blow-by. Patience, persistence and experience seem the best solutions.

SAFETY CONSIDERATIONS

As with *any* form of power, these engines demand respect. CO_2 is stored under tremendous pressure and must be treated properly, such as protecting its containers from excessive heat which might, for example, be encountered under a car window or in a trunk on a hot day. And certainly, CO_2 systems should not be regarded as toys for young children. The manufacturer's cautionary warnings should be thoroughly understood and heeded for both safety and efficiency.

MODEL TYPES

CO_2 engines have successfully powered models as small as 1/72 scale and as large as

Jumbos. Although intended for free flight use originally, they have proven adaptable to control line and radio control use also. Standard stick-and-tissue construction, traditional for rubber-driven models, is usually adequate for CO_2 adaptation, requiring only the addition of a thin plywood firewall, fuel tank support and minor beefing up of the structure. Wijand de Joode of Holland came up with what may be the world's simplest powered model when he combined a small Gasparin CO_2 engine, mounted as a pusher, with a folded paper "dart" glider!

A CLOSER LOOK

Thanks to several suppliers, we have actual examples on hand for examination. And while we are not equipped (or qualified!) for scientific comparison tests, we offer the following commentary:

•**Brown Junior B-100:** One of three sizes available from Brown, the B-100 features a cast metal crankcase, steel piston and cylinder, aluminum head and fuel tank connected by a copper fuel line. Marvelous workmanship, instant starting, smooth running and easy adjustment of running speed. The engine comes equipped with a 5-1/2 inch Williams Brothers white nylon propeller.

•**GM-120:** Designed in Czechoslovakia by Stefan Gasparin and manufactured by Mikrotechna Holesovice, who have made aircraft instruments since 1936, this little gem is unusually attractive. All of its external components appear to be machined from aluminum bar stock, the cylinder head and speed adjusting lock-ring are anodized a contrasting blue, and the fuel line is apparently stainless steel. The engine is supplied with a 7-inch diameter red plastic propeller, spare parts and mounting screws. It runs smoothly, and the speed can be changed by loosening the lock-ring and rotating the cylinder slightly. SAMS of England, who furnished our sample, also offers 6-inch and 7-inch Knight & Pridham replaceable-blade propellers for this engine.

•**Russian Polus:** The lowest-priced of the three tested engines, the Polus is supplied complete with a charger (which is an extra-cost option on other makes), a 6-7/8 inch black plastic propeller, spare parts and mounting screws. The crankcase is molded plastic, the cylinder and tank are aluminum and the fuel line is brass. Our photo shows the motor mounted in a molded foam, almost-ready-to-fly free flight model, also manufactured by Polus. Since the engine/plane combination is only about $10 more than the engine alone, it represents an extremely good value.

This 15-inch span Brown CO_2 powered Avro G was built by Al Backstrom, of Texas, from the July 1972 *Model Builder* centerspread plans.

For prices and availability of these products, we suggest telephoning or sending a stamped pre-addressed return envelope to the suppliers ($1 in the case of SAMS):

•Compressed air engines: Bert Pond, 128 Warren Terrace, Longmeadow, MA 01106; (413) 567-5346.

•Brown Juniors: Brown Junior Motors, P.O. Box 77, Pine Grove Mills, PA 16868; (814) 238-9554.

•GM-120 and other Gasparin-designed engines: SAMS MODELS, The Chapel, Sandon, Buntingford, Herts SG9 0QJ, England; 076-388384.

•Polus engines and ARF models: D&B Import/Export, 4705 237th Place S.E., Bothell, WA 98021; (206) 481-5760.

•Swiss Heibi engines: Thomas Ogden, 27 Cortland St., Norwich, NY 13815-1317.

Hardly a handful, Frantisek Barta's Pistachio Piper Vagabond features a miniscule Stefan Gasparin CO_2 powerplant. This same model was also featured as an inset on the cover of the October 1992 *Model Builder*. Photo via Fritz Mueller.

BEGINNING BUILDERS

The Experimental Aircraft Association's new magazine, *Sport Aviation for Kids* for March/April, offered a big bonus in the form of pull-out plans for two simple all-balsa models—a canard glider called "E-Z Duck" and a canard rubber-

HANNAN'S HANGAR

The Russian Polus CO_2 powered almost-ready-to-fly FF model from D&B Import/Export. The engine and accessories are also available separately, as described in the text.

powered "Voyager"—both designed by Burt Rutan. Accompanied by H.G. Frautschy's detailed building and flying instructions, the plans seem bound to attract more young modelers to our ranks. Other featured articles include subjects such as skydiving, stealth aircraft, weather and much more—even aviation puzzles. Why not consider a subscription for a youngster of your acquaintance? Call 1-800-843-3612 or write EAA, Box 3086, Oshkosh, WI 54903-3086 for complete details.

Soon to be marketed, this Werner Heise-designed Heibi CO_2 engine from Switzerland runs about three minutes per filling on the 3cc tank. Photo via Thomas Ogden.

"SPARKY" CONTEST

A one-design event for Ed Lidgard's 1940 Comet Sparky rubber-powered free flight model will be held at the Marion, Ohio Municipal Airport on August 29, 1993. Sponsored by the Marion Airfoils and Explorer Post 7, the meet will coincide with the airport's 40th anniversary. Even if you are unable to attend, you can participate by flying your Sparky at home and sending in your flight times before August 22. The fee for a postal entry is $1 plus a stamped preaddressed return envelope, which will bring complete rules. Send to David Narance, 255 Chevy Chase Dr., Galion, OH 44833.

SIGN-OFF

From the *Domeduster* newsletter, edited by Stan Fink, we found this bit of sage advice for model builders: "Yes, it's time consuming. That's how quality things are made. There is no award for fast building. Slow down your projects and expect each one to take longer. Your deadlines are your own creation and you can alter them. If your plane isn't ready for this weekend's meet, you'll have it done for the next one. There's always another contest. Better one well-constructed, lightweight airplane that takes a month of evenings to build than three turkeys built in a couple of weekends." Amen! ***MB***

'FLOATING' ON LANDING

Seaplanes float. So do some airplanes when they are supposed to land. "Continue to fly" would be more accurate, but "float" is shorter and is commonly used. An airplane that wants to float instead of land is usually a good airplane. It is aerodynamically clean, has a good lift-to-drag ratio and/or a low wing loading (making for a broad speed range and low stalling speed). But floating is a nuisance, and also may be dangerous to the model when the field is short.

Until relatively recently, most of my RC flying was from the water on a big lake, and I didn't have to worry about floating on landing. Since my "field" was very large I didn't spend a lot of time adjusting the idle on my engines—I didn't need to. Also, seaplanes are heavier and more draggy than landplanes, which further reduced the need for a low idle in order to get down.

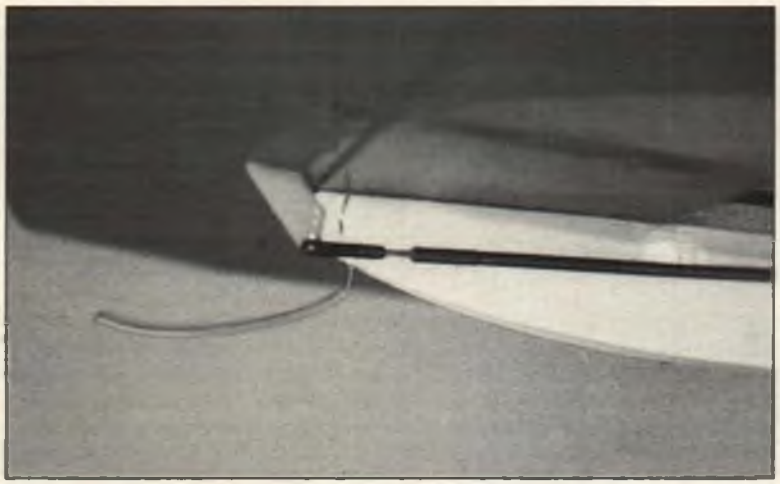
But these days I am flying from a field. There I have rediscovered that a low idle is a must if you have a good airplane; and I've observed a few other things about floating, relating to prop pitch and angle of attack. In the October 1992 issue of *Model Aviation*, John Tanzer wrote, "We have found that the plane can be slowed down for a landing much more easily with an 11x6 or an 11x5 propeller than with a high-pitch prop." I too have observed that, and it makes technical sense.

When we go to a higher-pitch prop, the static and low-speed takeoff thrust goes down, because even if we use a smaller diameter to permit the same rpm and engine power, the higher-pitched blades are then operating at a greater degree of blade stall. Full-scale airplanes use variable-pitch or "constant speed" propellers, with low pitch at takeoff for maximum thrust. "But," a few of you might ask, "landing is a low speed operation, so why won't the lower thrust of the higher-pitch prop at low speed permit a shorter landing?"

The thing those few of you forgot for the moment was rpm. During takeoff the rpm is high, and high-pitched props will be partly stalled; but in landing the rpm is low, and even at low idle speeds a high-pitch prop is still probably generating some thrust, and it is not stalled. With a low-pitch prop, on the other hand, at the same idle speed, the blades may be actually working at a *negative* angle of attack and generating negative thrust, which contributes to the airplane drag and causes it to land sooner.

"High pitch" and "low pitch" are of course relative terms, but I was surprised at the difference a small change in pitch can make in landing characteristics. I've been flying an original design, clean, light airplane with a 12x8 prop and was having trouble getting it down on our relatively short field. I broke that prop, and lacking another like it in my flight box, I put on a 12x6 of the same brand. The landing float problem went away!

Another vital aspect of the floating problem is speed range. Good airplanes can fly over a broad range of speeds; poor ones can't. There will never be a problem in getting a real dog of an airplane to land, since it is flying close to the stall at full bore in level flight. With a good airplane, especially if the elevator trim is set for optimum glide, the glide speed is going to be a lot higher than the landing speed. A lot of energy must be burned off before it will stall. That means a very long and gradual flaring period—a lot of floating. Flaps reduce float in landing, because they increase the drag and therefore use up more energy; but let's talk about models without flaps.



A steerable tailskid, such as that used by the author on his lightweight fun-fly design, can be simple, light and very effective. Design features are discussed in text.

On final, we can greatly reduce the float problem by flattening the glide. Get the idle down as low as you dare and then apply some up elevator early on the final leg of the landing approach, but first make sure the final leg is long enough and low enough; long enough to allow you to use up the model's excess energy, that is.

And why should we use more up elevator on final, some readers will shyly ask? Because it will reduce the lift-to-drag ratio (L/D), the writer boldly replies. To land, we have to get rid of energy. If we are having a float-on-landing problem, then we have more energy than we can get rid of in the field length available. The energy is in two forms: that due to altitude and that due to speed. A physics teacher would say that the altitude represents potential energy and the velocity represents kinetic energy. Both forms add to the float problem initially.

If we are too high, there is a natural (but unwise) tendency to steepen the glide to avoid overshooting. That increases the velocity, converting the potential energy of the excess altitude into additional kinetic energy, making the float even worse than usual. If we are a bit low we may (again unwisely) try to stretch the glide by flattening it. We aren't apt to have a float problem then, but we are more apt to stall and crash, and more apt to touch down short of the strip. If we are already coming in flatter to minimize float, we will have more chance of really stretching the glide if we put the nose down and increase the speed again, to get maximum glide ratio (minimum glide angle).

Modest up elevator on final will increase the angle of attack and decrease the velocity required to maintain lift equal to the weight. Since the plane will then have less energy to burn off, it will land in less field space than from a normal glide. Don't let the apparent angle of the airplane fool you; if the nose is down the airplane is coming down fast, but its resulting high velocity means lots of kinetic energy that is going to cause float when you flare for the landing. With a flatter glide the true glide slope will be steeper and the energy will be dissipated much better, since the drag is greater at the higher angle of attack.

An easy way to assure some up elevator on final while learning this technique is to crank in some up trim at the start of the final leg, but some experts advise against making it a habit of changing the trim on final. Some fliers also use a flatter glide on the downwind and base legs, as well as on final, but this is more risky, especially if the airplane is at all subject to surprise snap rolling. A snap roll is most apt to occur at the turns,

continued on page 85

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0% Nitromethane
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CF-028 Gallon $9.95

For 2-stroke model engines. Because nitromethane is scarce outside the U.S., most foreign modelers have been using FAI (no-nitro) fuel for years. It's an economical alternative for any sport engine over .19 cu. in. displacement. In our flight tests with an Enya .45 powered Sig Kougar, CHAMPION FAI FUEL turned a 10-6 prop at 11,500 rpm, a drop of only 500 rpm from the exact same combination using 10% nitro fuel. In the air, there was little change in performance of the model.

CHAMPION "5" FUEL

5% Nitromethane
20% Lubricating Oils

CF-012 Pint $3.25
CF-013 Quart $4.95
CF-014 Gallon $12.95

For 2-stroke model engines. An excellent fuel for sport fliers who want to economize slightly over the cost of the more commonly used 10% nitro fuel. Delivers longer engine runs, dependable low idle, and reasonable high speed. Typically only about 200-300 rpm less than 10% nitro fuel.

CHAMPION "10" FUEL

10% Nitromethane
20% Lubricating Oils

CF-021 Pint $3.95
CF-001 Quart $5.35
CF-002 Gallon $14.95

For 2-stroke model engines. This is the most popular fuel we have for sport, pattern, or scale fliers. A clean, cool burning blend that runs perfectly in any standard R/C or C/L engine from .19 to .90 cu. in. Smooth, dependable idle and excellent throttle response.

CHAMPION "15" FUEL

15% Nitromethane
20% Lubricating Oils

CF-022 Pint $3.95
CF-011 Quart $6.25
CF-010 Gallon $16.95

For 2-stroke model engines. A more powerful fuel for those times when you need just a little extra performance. Same terrific idle and throttle response as CHAMPION "10". Smaller engines in the .049 - .19 size range generally start and run better on higher nitro fuels like CHAMPION "15".

CHAMPION "25" FUEL

25% Nitromethane
20% Lubricating Oils

CF-015 Pint $4.95
CF-016 Quart $7.95
CF-017 Gallon $22.95

For high performance 2-stroke engines. The next step up from CHAMPION "15", this high performance fuel provides more horsepower for specialized contest use. Also excellent for use in very small .010-.049 glow engines, which require a hotter fuel to start and run properly.

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35% Nitromethane
20% Lubricating Oils

CF-006 Pint $5.95
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For 2-stroke racing engines. This ultra powerful blend delivers maximum performance from engines up to .60 cu. in. displacement. Developed primarily for racing, it contains the maximum amount of nitromethane suitable for a castor oil based fuel. CHAMPION "35" will give you the winning edge!

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For 4-stroke glow engines only. A clean, cool burning blend specially designed for peak performance in all 4-stroke model engines. You will get improved idling characteristics and throttle response compared to using regular glow fuel. Keep your 4-strokers well lubricated and corrosion free! Not recommended for use in any 2-stroke engines.

With the arrival of good quality synthetic lubricants, like KLOTZ OIL, most modelers now use fuel with a blend of castor and synthetic oils, like our regular line of SIG CHAMPION FUEL. This provides a compromise between castor oil's unquestioned high-heat protection and the cleaner burning characteristics of synthetic oil. Nonetheless, many modelers feel that there are still times when they can't compromise. They need the super protection of castor oil!

20% CASTOR OIL: Best choice for BALL BEARING engines with ABC, AAC, ABCR, and RINGED pistons. No other fuel blend can give you the same degree of engine life expectancy and consistent performance in these expensive engines.

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CONTROL LINE BY JOHN THOMPSON

CL STUNT COMPETITION, NORTHEAST STYLE

Control line model aviation goes on worldwide. It's done by individual fliers alone in their back pastures, by clubs large and small, and, in some cases, by fliers who are organized across an entire region.

One such hotbed of activity is the northeast United States, where a variety of CL types are popular. We've reported in the past about the year-round competitive schedule maintained by combat fliers, who keep in touch via the excellent *New England Combat News* newsletter.

The Northeast also is known for its contingent of top-notch precision aerobatics fliers and contests. The following is a report from PAMPA District II Director Tom Niebuhr, with highlights of the northeastern 1993 Precision Aerobatics season:

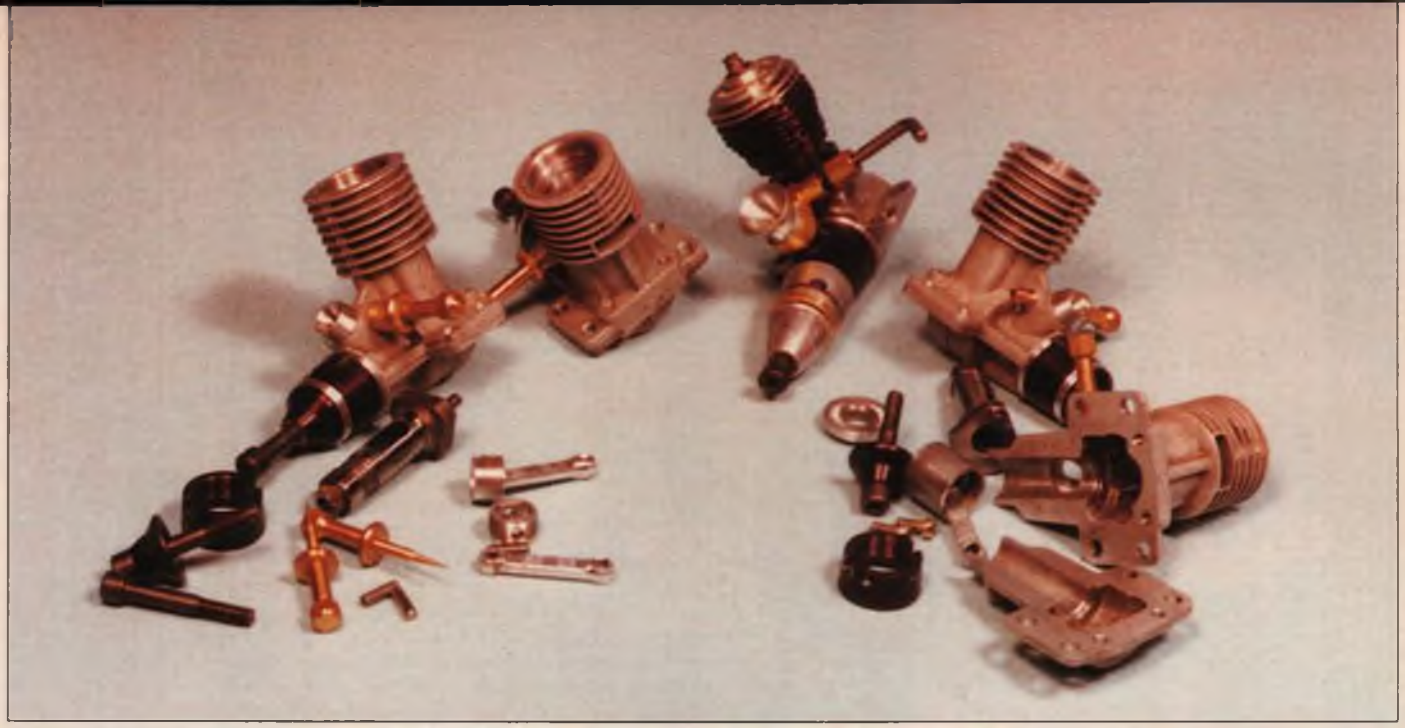
"The Northeast area is indeed fortunate to have an abundance of contests within a drivable distance of the New York metropolitan area," Niebuhr writes. "In fact, it is common for Northeast contestants to travel to meets that encompass AMA Districts I, II and III. The 1993 season might possibly have the most contests that we have ever had. A preliminary survey shows a possibility of 14 or 15 contests!"

In order to encourage participation and generate support among the fliers for as many events as possible, Northeast fliers have started the Northeast Stunt Championship Series. This series, which began in May, is similar in concept to the racing series that have taken place in the Northwest, Texas and southern California areas, and to the Old Time Stunt series announced this year in the Northwest.

Plans are to award four sets of three trophies—one set for each beginner, intermediate, advanced and expert skill class. In addition, Niebuhr reports, there will be a perpetual trophy for the overall points leader, who could come from any skill class.

The 1st place winners in each contest collect 10 points, 2nd seven points, 3rd five points, 4th four points and 5th three points, with all other competitors receiving two

Finishing 1st, 2nd and 3rd in Sport Scale at the 1992 Northwest Regional Control Line Championships were, from top: Fred Cronenwett's P-51D, powered by an O.S. .46 FP and using electronic throttle control; Ken Burton's colorful Christen Eagle, powered by an O.S. .50 FSR; and another P-51D, this one a .65-powered ship by Jim Fuller. Photo by Fred Cronenwett.



Dan Rutherford has lately been working with Russian racing engine expert Valentine Aljeshin to produce a full-on competition 1/2A motor, a few partially assembled prototypes of which are pictured here with a Cox Tee Dee .049 for size comparison. One on the right demonstrates the unusual split crankcase feature. Dan will be marketing the engines here in the U.S. when the design is finalized and production begins. More info in text.

points. There's also a one-time 10-point bonus for any flier who is bumped up to the next skill class. That flier also will keep his accumulated points from the lower class.

Enrollment in the series is automatic with contest entry; contest directors send results to Niebuhr, who tabulates series standings and arranges for them to be posted at each contest. Contests included for scoring include all of the District I and II contests and the eastern part of District III, excluding the National Championships. Awards are to be presented at the Garden State Circle Burners dinner dance during the winter of 1994.

The Northeast contest schedule provided by Niebuhr at press time for this article was subject to change, so fliers interested in finding out dates and events should contact Tom Niebuhr at P.O. Box 372, Highland Lakes, NJ 07422.

• • •

There *is* one contest date you can count on, however, though it's a little farther south. Just as this report was being prepared, news arrived from Tom Dixon that the second annual Eastern States Vintage CL Stunt Championships is set for September 18-19 in Tifton, Georgia. The site is Henry Tift Myers Airport. Old Time Stunt is scheduled for Saturday and Nostalgia Stunt for Sunday.

Dixon reports that this airport provides an excellent flying site and that the contest organizers are trying to generate a large turnout; also, the contest may be run as a benefit for a local charity.

Tifton is about 180 miles south of Atlanta on Interstate 75; the airport is about a mile off the interstate. Many major motels are available about three miles from the airport. There will be four paved circles and Dixon promises "smooth, unobstructed air." For a map to the site and motel information, send a stamped, self-addressed No. 19 envelope to Tom Dixon, 3390 Woodrun Trail, Marietta, GA 30062.

CL PRODUCT SOURCE DIRECTORY

"Would you please send me information on companies that make and sell control line kits and accessories?"

That inquiry from Ron Pechanek of Johnson City, New York was almost verbatim the most common question received by this column. As we all know, flying control line model airplanes is part detective work. We know that whatever we need to build and support our planes is out there somewhere, but where?

As often as possible, we list whatever product sources come to our attention; we also often refer readers to the excellent special interest group newsletters that carry listings of products for their particular activities.

Now we're able to give an answer that's even more comprehensive, thanks to Don Edberg of Irvine, California. Edberg has published the ultimate model airplane reference book, a document that may be as essential to the model shop as glue and sandpaper.

F.Y.I.—Model Flight, subtitled *The sourcebook for everything for flying models,* is not a catalog. It is a complete listing of all model aviation products, from adhesives to Z-benders. One of the key aspects is that it includes the small cottage industry manufacturers as well as the big companies. That's particularly important to us because that's where so many of the CL products are concentrated.

The book is divided into five parts. Part I is a product information directory by subject, listing names and phone numbers of companies selling the products—somewhat like the phone book's Yellow Pages. Part II is an alphabetical listing of companies, with names, addresses, phone numbers and a brief product listing. Part III includes model product data tables, which includes (for our purposes) a complete listing of available control line aircraft and engines. Part IV is a complete listing of U.S. model airplane clubs by city and state. Part V is a list of U.S. hobby shops by city and state.

The whole book is computerized and the author plans regular updates. In fact, he offers a gift certificate for 40 percent off to anyone who is first to mention a new product to him!

F.Y.I.—Model Flight can be obtained by sending $19.95 to Dynamic Modeling, FYIMF Order Dept., 4922 Rochelle Ave., Irvine, CA 92714. Clubs or groups of individuals can order four books for $79.80 and get a fifth one free.

One more publication of note (actually two publications): Gleason Enterprises has produced two directories of model aircraft plans. One is called *Published Nonscale Model Plan Sources* and the other is *The Gold Book of Model Plans from the Golden Age of Aero Modeling.* These are produced by Dick Gleason, a modeler since the 1930s and a retired general aviation mechanic.

Send $6 to Gleason Enterprises, 1106—10th Drive S.E., Austin, MN 55912.

SHUT 'EM OFF

Speaking of the Northwest Regionals, that contest was the first to require shutoffs for AMA fast combat planes. After the top-gun combat event had been suspended for one year because of concerns about flyaways at the airport site, the event returned in 1991 with a requirement that working shutoffs be on every plane. Since then, voluntary use of shutoffs has been

The late Paul Agerter, owner of Eugene Toy & Hobby, seen with his rolling hobby shop that was a fixture at Northwest CL meets.

PAUL AGERTER

One of the most familiar sights at the Northwest Regional Control Line Championships in Eugene, Oregon was missing this year—and was very much missed by the fliers. Paul Agerter, the genial host of the huge hobby shop truck that has been a long-term Regionals tradition, passed away on February 16.

As owner of Eugene Toy & Hobby, Agerter, 64, was one of the best friends of western control line fliers, supplying a wide range of CL supplies not only from his hobby shop truck but from his downtown store. He had been semi-retired in recent years from active management of the store, which now is managed by his two sons, Mark and Alan, who have carried on Paul's tradition of serving CL modelers' needs.

Paul Agerter began working in his father's hobby shop in Eugene in 1950 and was involved continuously since then. Under his management, ET&H was known as one of the top control line hobby shops in the west, and for a time it did an active mail order business through its advertising in the *Flying Lines* regional newsletter.

ET&H has been a major sponsor of the Regionals and several other northwest contests. Under Paul's direction, the store made contest and club activity prizes available, helped pay for commemorative T-shirts, offered Eugene Prop Spinners members in-store discounts and contributed in many other ways.

Paul was named Oregon Retailer of the Year in 1981-82 by the Oregon Retail Council, and was named Eugene Retailer of the Year in 1981 by the Eugene Chamber of Commerce. He was active in a number of local organizations.

In Paul's honor, the 1993 Northwest Regionals has been renamed The Paul Agerter Memorial Northwest Regional Control Line Championships.

spreading among the fliers, particularly in the west.

Support for the idea has grown over the past couple of years, and now it appears that some other contests are making the same move toward requiring these safety devices. Miniature Aircraft Combat Association interim president Chuck Cline reports that shutoffs will be required this year for AMA combat at all contests in Detroit, Cleveland, Cincinnati and Dayton, by agreement of the fliers.

I'm hoping that we receive some reports about how the contests go this year under this new rule.

THE RUTHERFORD REPORT

Dan Rutherford has been to Russia again, and for enthusiasts of control line exotica this means he has published another of his entertaining letters with reports of the situation of the common man in Russia. And every such travelogue contains a list of products that Dan has available for distribution. The list typically ranges from one-of-a-kind items to items produced in volume. Because it constantly changes, I won't mention specifics other than to say it includes a wide variety of engines, props and other accessories.

Of particular interest from this trip is the announcement of a new .049 engine being produced in Russia for Dan to distribute in the United States. He brought back a number of engines on this last trip that are still properly described as prototypes, but are available for sale at $50 each (the price is subject to change).

Design is still going on and details of production are being worked out. At this writing in February, Dan included this caveat: "I want to clearly make the point that [the engines currently on hand] truly are prototypes and while I expect most will run pretty strong, a few will no doubt be substandard. So the only real value here is a very limited-run piece for your collection."

Construction is unusual in that the engine is what Dan terms a "bottom loader," with the crankcase split horizontally and directly through the mounting lugs. Dan's letter goes on into some other interesting technical details. His ultimate performance goal is 26,500 rpm on a Grish 5x3 prop, with 40 percent nitro, from an engine nearly 1/2 ounce lighter than a Cox Tee Dee .049.

For more information about the engine, known as the VA .049, write for Dan's latest price list: Dan Rutherford, 4705 237th Place S.E., Bothell, WA 98021.

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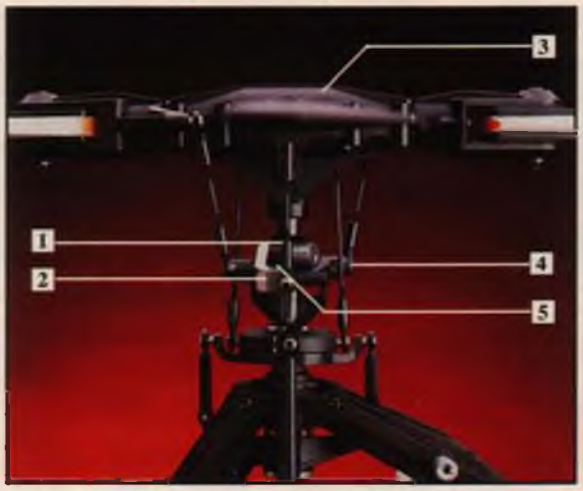
The *Model Builder* control line column always welcomes readers' contributions of photos, club and contest news, technical tips and questions. Write John Thompson, 295 W. 38th Ave., Eugene, OR 97405. **MB**

There's a change in the air

Introducing the new Concept 30 SR

When Kyosho introduced the Concept 30 three years ago, it was a breakthrough in .30 helicopters. With its simplicity, extreme durability and friendly, predictable flight characteristics, it set a new standard in the helicopter industry. Now, with the new Concept 30 SR, Kyosho has set the standard once again.

The SR starts with all the great performance features of the former SX and then goes even further. Its rotor diameter and tail boom have been "stretched" in order to produce a slightly larger Concept 30. The result is a helicopter that approaches the smooth flight characteristics and superior autorotations of a .60 heli, while maintaining the simplicity, lower cost and maneuverability of a .30.



Here are just a few of the features that give the SR its superiority:

1. Taller main mast
2. Metal inner mixing arms on washout set for less free play
3. New reinforced rotor head with one-piece blade grips
4. All-metal pivot balls for smooth, precise performance
5. New all-metal mixing base

Longer main blades; larger, stiffer landing gear; more rigid servo structure and tail rotor pitch plate; and a total useable pitch range of 24° also help make the Concept 30 SR Kyosho's most advanced .30 heli yet.

A complete lineup for all your heli needs

Although the SR can be flown by pilots of any skill level, its high-performance upgrades make it perfect for the challenging maneuvers of advanced and competition fliers. The more economical 30 DX is durable and easy-building, making it an excellent choice for beginners. If you're looking for the ideal in .60 helis, the Concept 60 offers smooth flight and stunning aerobatic capabilities for everyone from first-timers to top level competitors. The electric-powered EP Concept comes 85% preassembled and requires only minimal set-up—just charge the battery and you're ready to go.

Of course the SR and all Concept helis are backed by Kyosho's Total Support Program, which includes monthly newsletters, excellent parts availability and answers and advice from the Concept Hotline team.

See your hobby dealer today for the Concept heli that's right for you. For a free brochure and the location of the dealer nearest you, please call **1-800-682-8948, ext. 0368.**

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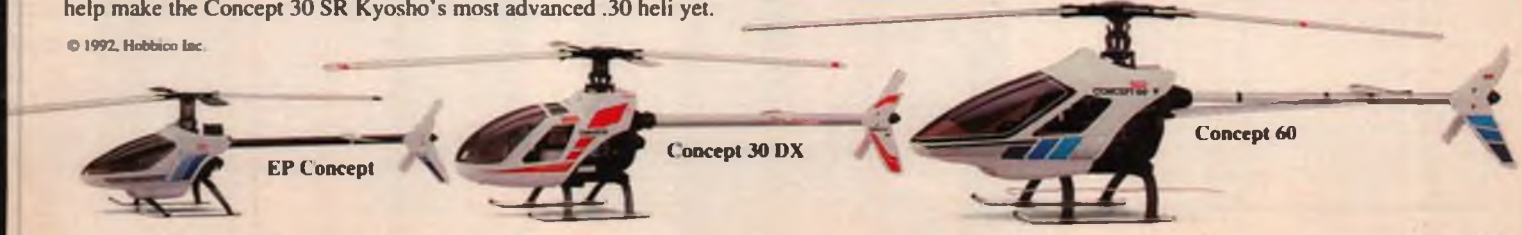
For answers to all your Concept heli questions, call the Concept Helicopter Hotline at (217) 398-2834.



HAVING EVEN MORE FUN WITH YOUR BIG BIRD

This month we will explore a couple of interesting ways to have fun with our Big Birds. Generally speaking, we don't do much more at our Big Bird fly-ins than bore holes in the sky, and although they are fairly interesting holes, we would probably die out eventually. Scale competition and the Unlimited races at Madera and Tucson have pumped new ideas and equipment into the Big Bird skies.

My friends Bennie Phillips and Bruce Lyons, as well as fellow flier Allan Poinsett of Renton, Washington, feeling that they don't have enough time during the day to fly as much as they would like to, have equipped their planes with lights and have taken on the challenge of night flying. Bennie and Bruce take a totally different approach to lighting their planes than Allan does.

Bennie and Bruce's applications are somewhat different but their ideas about illumination are generally the same. The planes they use are Bennie's own design, an 84-inch span high-wing model reminiscent of a Sig Senior Kadet.

Bennie illuminates each wing half with eight bulbs, one in each rib bay. Aluminum foil is glued onto the backside of the leading edge stick so that the light will reflect off of it. The wing is covered with clear MonoKote, which allows the lights to illuminate the plane's wing.

The fuselage is illuminated by a string of four lights down each side. Three lights are attached to the inside of the vertical fin, and each half of the horizontal stabilizer has two bulbs installed.

Bennie uses RAM 9.6-volt bulbs which are powered by two 4-volt, 2.5-amp lead-acid batteries. The bulbs are on a parallel circuit so that if one bulb should burn out, the rest will remain on. The 9.5-volt bulbs offer plenty of light from the 8-volt batteries.

One RAM 4-volt scale landing light is attached to each landing gear strut. The wiring is tapped into the main lighting system's battery pack. They are switched off by servo until he is ready to land.

Bruce Lyons uses 5-volt peanut bulbs on his night flying system, which is powered by a 4.8-volt, 1200-mAH battery pack. His model has nine bulbs in each wing half, five between the leading edge and front spar and four between the trailing edge and rear spar. Bruce's landing lights are made from small flashlights that have had the standard bulbs replaced with bright halogen bulbs.

Bennie and Bruce both have two 3-volt strobe lights on the bottom of their planes. They operate the strobes on 2-volt lead acid batteries and still get plenty of light.

All lit up and ready for takeoff, Bennie Phillips' 84-inch night flier looks like a holdover from Christmas. Another of our columnist's flying buddies, Bruce Lyons, has a similar ship with a slightly different lighting arrangement—described in text.

■ LEFT: Bennie Phillips lights up the wing of his night flier with a string of lights (one bulb per rib bay) running in a transparent plastic tube. Leading edge is a square balsa stick set on edge, and there is a piece of aluminum foil glued to the inside faces of the leading edge in each rib bay to act as a light reflector.
■ BELOW: Each rib in the fin of Bennie Phillips' model has its own bulb. Here you can see the aluminum foil reflector strips under each bulb. Entire ship is covered with clear MonoKote.

■ LEFT: Allan Poinsett flies this Megow Flying Quaker at night. It's equipped with running lights, two strobes and two wing-mounted landing lights. Molded ABS plastic floats are made by Stream Inc. Model was photographed at the 1993 Northwest Model Expo. ■ RIGHT: J.E. Boucher designed this simple aluminum shroud for some additional protection while bench running his engines. Keeps hands from inadvertently tangling with the prop while at the same time allowing easy access to all parts of the engine.

Allan Poinsett uses a two-strobe system to illuminate his plane. Both are on the bottom of the fuselage and are powered by 9-volt dry cells.

For landing lights, Allan used inexpensive pocket flashlight fixtures but replaced the regular bulbs with 9-volt bulbs he purchased from Robin's Hobby World, 1844 West Glen Oaks Blvd., Glendale, CA 91201. The landing lights are mounted in the wings and are switched on and off by a servo. The system also employs three running lights—red, green and white. They are standard 4.8-volt bulbs available from Radio Shack.

Allan's night flying plane is a 1936 Megow Flying Quaker which, as shown in the photo, does double duty as a floatplane when equipped with a set of 42-inch Stream ABS floats. The Quaker has an 84-inch wingspan and uses an O.S. .61 four-stroke for power.

Bennie and Bruce had a lot more lights on their planes than did Allan, but Allan's strobes seemed to do the job. Should you wish more detailed information, contact Bennie Phillips, 17336 40th Ave. S, Seattle, WA 98188, or Allan Poinsett, 408 Wells St. S. Apt. 1, Renton, WA 98055.

PAINT BALL BOMBING

Our next fun event takes place during daylight hours and involves piloting your specially equipped Big Bird on bombing runs through flak! Duane Sanders, owner of Model Aviation Products, along with members of the Clear Lake (California) Modelers Club, came up with the idea of dropping paint balls on two 4x8-foot sheets of plywood. Several methods of attack are explained in M.A.P.'s Official Rules for Paint Ball Bomb Competition. One method uses a pilot and bombardier; the pilot takes his best course to the target and the bombardier releases the bombs. Another method is to stand the plywood on edge and attach a vertical wall target.

No, I haven't forgotten the flak. The flak starts to fly when your fellow adventurers try to nail your plane with paint balls while it's on the bombing run. The flak teams are placed 30 yards away from the line of flight to the target. The original paint ball bombers used U.S. AirCore .40-sized planes, which could take direct paint ball hits with no damage. Big Birds would probably hold up just as well as these durable little planes do.

I noticed that the paint ball dropping device available from M.A.P. was mounted on the outside of the U.S. AirCore planes. It looks to me like they could easily fit inside some of our Big Birds and that more than one paint ball dropper could be employed, which is only fair since our bigger models offer easier targets for the flak teams.

For more information on Paint Ball Bombing, contact Duane Sanders, P.O. Box 1621, Middleton, CA 95461.

SAFETY REMINDER

I was recently enjoying the activities at a local flying field when we all were startled by a kind of burping sound. That sound was caused by a nylon coat being chewed up by a model aircraft propeller. Fortunately the propeller never became fully engaged with the fellow's coat, but it seemed like a good opportunity to remind everyone to watch loose clothing and tools around their planes.

A small screwdriver or pair of glasses that falls from your pocket can do a number on the finish of your plane. Should the object fall into the propeller of a running engine, a nice guided missile can be launched at some unsuspecting flier.

On this same subject, *Model Builder* reader J.E. Boucher sent pictures of a safety shroud he devised for use when bench running his big engines. Mr. Boucher says he can now safely test-run his engines without fear of getting too close to the propeller. I appreciate his sharing the idea with us and invite anyone else with a Big Bird safety tip to do likewise. You can write to me at 8304 53rd St. Ct. W., Tacoma, WA 98467. ***MB***

Duane Sanders' paint ball dropper is seen mounted on a U.S. AirCore plane. Several of these units could fit inside a typical Big Bird. They're produced by Model Aviation Products—see text.

BY ELOY MAREZ

Jomar Products' Ultimate Battery Backer and the McDaniel R/C Alarm Strobe

One of the most overlooked safety items in the radio control hobby is a relatively inexpensive device that can easily save you hundreds or even thousands of dollars and just as many irreplaceable hours. This is not a gimmick kind of thing; actually, similar devices are common in many of the electronic devices you own. In fact, there is a complete branch of electronic manufacturing devoted to what is called a UPS—Uninterruptible Power Supply.

In a humbler form, your computer or microprocessor-equipped transmitter probably has one. We are talking about a secondary power supply that automatically takes over and supplies electricity for whatever it is connected to, in the event of the failure of the primary supply source.

Despite the great advances in nickel-cadmium battery technology, there is little doubt that next to pilot error or some mechanical failure in the airplane, NiCd batteries and/or servo motors are the greatest causes of "I ain't got it!" It doesn't have to be a defective NiCd that does you in—it can also be something like the battery charger, switch harness, a plug, or a piece of wire that has a monetary value of next to nothing.

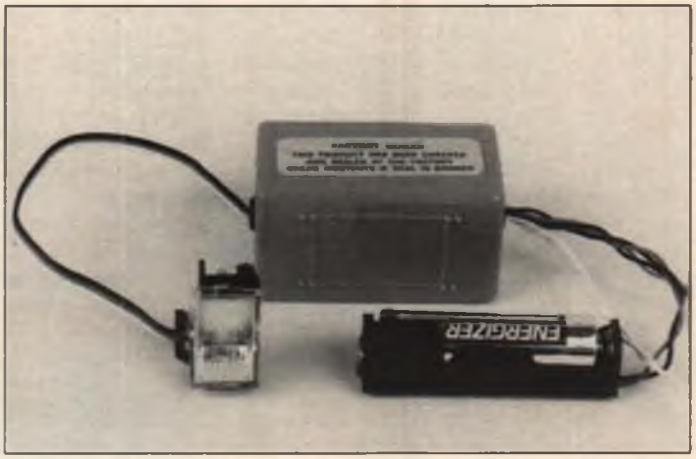
You can effectively remove all of these risks by adding a few ounces and a few bucks—49 of the latter in this case—to your airplane. I am referring to an RC system battery backer, an electronic device to which two separate batteries are connected, the main flight battery as normally used and a secondary one that is usually of lesser capacity. When the main battery is providing proper voltage, everything works normally. In the event that the main battery loses power, either through normal discharge over an extended period or through some defect, the battery backer senses the loss and switches over to the good secondary battery.

Such devices are not new. To my knowledge, the first one to appear was Ace R/C's 2x5 Redundant Power Source—at least 10 years ago!—but the new Jomar Ultimate Battery Backer is the most sophisticated of the lot, and uses the latest technology available. It is based on a specialized IC produced by Harris Semiconductors, designated ICL7673 and called an "Automatic Battery Backup Switch." The necessary sensing and switching could be done with a mixture of other ICs or even with a basketful of discreet components, but the 7673 puts it all together in one very small package.

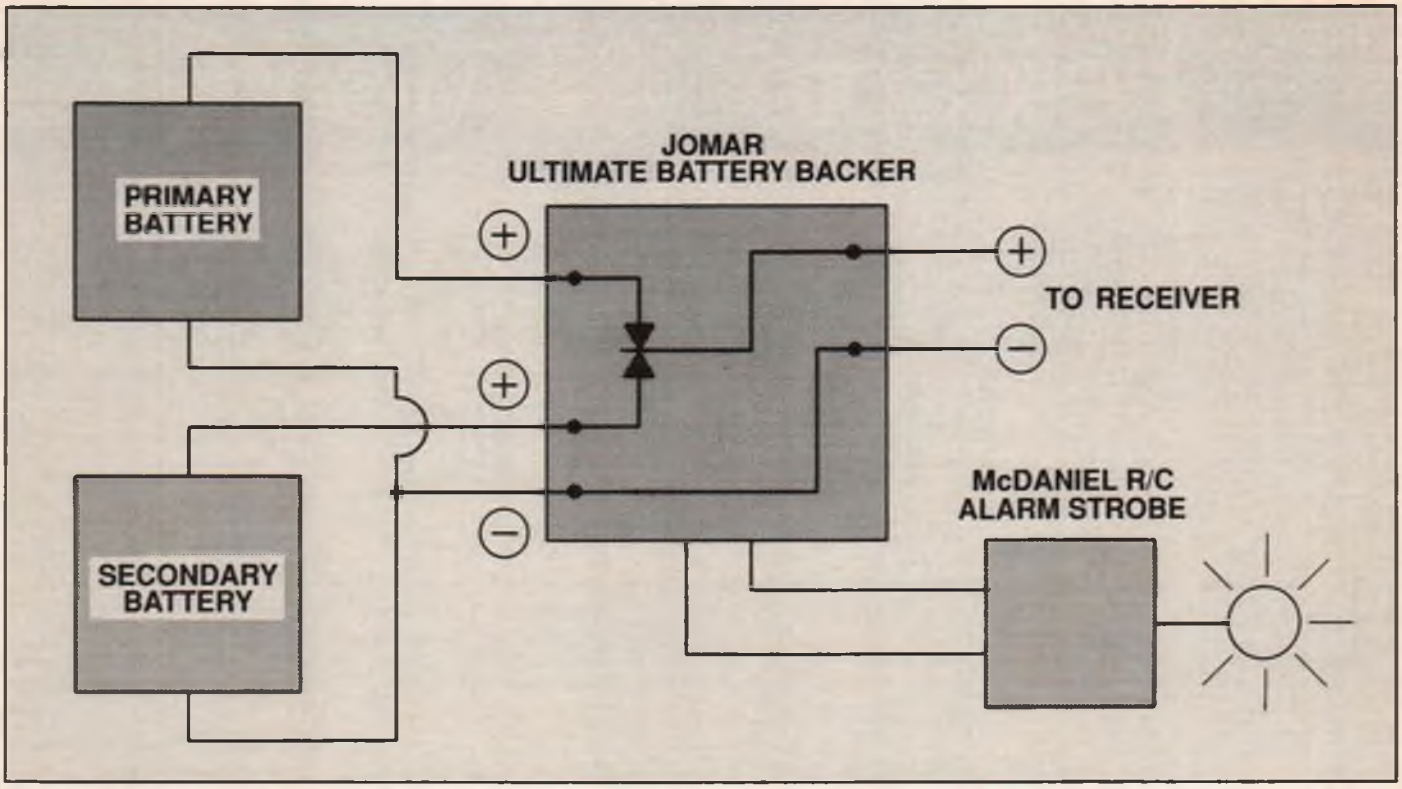
In the case of the Jomar Ultimate Battery Backer, the 7673 is matched to another specialized IC, designed specifically to provide the proper drive signal to MOSFETs (Metal Oxide Semiconductor, Field Effect Transistors). These latter components are what go into the super-efficient electronic speed controls so popular with electric power fliers. The desirable characteristic of the MOSFET, important also in the battery backer application, is that it can handle large amounts of current with very little loss within itself. The current-handling capacity of the Jomar unit is adequate even for 1/4-scale, multi-servo airplanes.

The Jomar Ultimate Battery Backer measures 1.5 by1.375 by .7 inches and weighs about .75-ounce. It comes with easy-to-follow installation instructions. Refer to the diagram for a simple explanation of the mechanics of the device, which is effectively a double-pole switch that selects one of the two batteries. The unit comes without connectors, as it must be matched to the RC system in use. It does require, in addition to the two batteries, one switch harness for

Though rather unimpressive in its physical appearance, the Jomar Ultimate Battery Backer provides a very important safety function which can positively save your airplane in the event of catastrophic flight battery failure.



An add-on to the basic Jomar Ultimate Battery Backer, the McDaniel Alarm Strobe provides an in-flight indication that the primary battery is defective or discharged, and that the flight is continuing on the generally smaller capacity backup battery.



A block diagram of the two-battery system makes it easy to understand what it consists of and how it works—keeping in mind that the voltage sensing and switchover circuitry is not shown in detail.

each battery. It can be wired directly to the switch harnesses with a single connector to the receiver, or it can be equipped with male/female connectors to which the switch harnesses can be plugged in. I prefer direct-soldered connections, as every socket and plug used in the RC system is another potential source of trouble.

There is no adjustment or tuning necessary; simply connect it and go. The unit is equipped with a single LED, which is normally "Off" to indicate a normal condition, i.e., the airborne system is being powered by the main battery. In the event of a problem and a switchover, the LED will be lit. Don't fly again until the problem with the main battery has been corrected! Though no special installation need be followed, the Backer should be protected as you would a receiver—with some foam rubber packing. To make it easier to view the LED, it can be removed from the PC board, attached with longer leads and mounted externally.

What kind of backup batteries should you use with the Jomar Ultimate Battery Backer? As with the main battery pack, your choice should be dictated by the size of the airplane, the number of servos in use and your routine checking of the LED before and after every flight. I would say that a battery of as little as 25 percent the capacity of the main one will be adequate. The idea is not to keep you flying the rest of the day, but to get your plane back down in one piece should the primary battery roll over and die while your plane is in the air—which is where it is going to happen if it ever does. Keep in mind that the secondary battery will require the same care as the primary. After all, the whole system will not help if you are flying around with an undependable backup battery.

The Jomar Ultimate Battery Backer is priced at $49 plus $2 shipping, and is available direct from Jomar Products, 8606 Susan View Lane, Cincinnati, OH 45244; (513) 474-0985. Like all Jomar products, it carries a 90-day warranty.

• • •

There is an interesting related product that you should consider: McDaniel R/C (1654 Crofton Blvd., Suite 4, Crofton, MD 21114; 301-721-6303) has an add-on strobe that can be mated to the Backer to provide a highly visible in-flight indication that a switchover has taken place and that you are flying on the backup battery.

McDaniel manufactures three similar strobes. Two of them, one for 4.8-volt (four-cell) and one for 6-volt (five-cell) battery systems, sense the voltage of the flight battery and start to flash when and if the voltage reaches a critical point. However, these units do not include a backup battery or switch over to any such alternate.

The third strobe is the one of interest to us at this point; it is model #757-JOM and is intended to replace the LED in the Jomar Backer for that in-flight indication mentioned. The strobe unit carries its own power source, a single AA cell, so it will not place an added load on a possibly already overtaxed flight battery.

The McDaniel strobe electronics measures 1.25 inches square by 2.25 inches long and weighs 3 ounces, including the AA cell. The strobe lamp is packed in a .5 by 1-inch lens-equipped holder and should be mounted so that it will be readily visible in flight. My tests with this unit have shown that unless it is lined up directly with the sun, where you shouldn't be flying anyway, it is visible up to all distances at which you will normally be flying. This version of the strobe unit is priced at $69.95 and carries a 90-day warranty.

Installation of the strobe unit is simply a matter of soldering two LED wires to the Jomar PC board. These are polarized connections with color-coded wires, and unless you completely ignore the clear instructions included, you can't go wrong. There are no adjustments and the procedure for testing for proper operation is also explained and simple to follow.

There is an important point of concern with the use of any of the McDaniel strobes, explained in the very first paragraph of the instructions, which read: "WARNING: this device may cause severe RFI (Radio Frequency Interference)." It explains the possible problem—servo jitter when the flash fires. It also details the cure, which requires only some separation of the strobe components from the receiver and its associated wiring and antenna.

The instructions also state that although the system has been extensively tested, you might run into a situation with a specific RC system in which it will not operate properly. In this case, you can return the strobe for a refund—with prior authorization and providing that you have not damaged it. I like that; there are few companies that will even consider such a thing, much less put it in writing! ***MB***

The JR PCM-10S Heli Radio

PART II • BY JAMES WANG

Last month we talked about the many features of the JR PCM-10S heli radio and used the Kalt Excalibur as an example of how to set it up. This month we will continue the discussion and will also talk about some setups for the Kyosho Concept 30 SR and Concept 60.

Often, just giving an example is better than a lengthy explanation. Merely reading this article will not help you improve your programming setup. The best way for me to show you how to program the PCM-10S is to first copy all of the parameters in my data sheet into your transmitter, then watch the display of the pitch and throttle curves on the screen and play with it; gradually you will understand why I programmed them this way. Give my data sheet a try. Once you are familiar with the settings, you can fine tune the values. Copies of the data sheets for the Excalibur and Concept helicopters are available by sending an SASE to Model Builder, 34249 Camino Capistrano, Capistrano Beach, CA 92624.

To protect his PCM-10S, James bought himself an aluminum carrying case. This one is made by JR specifically for this radio, so the foam has already been properly cut out. It holds a transmitter, charger, neck strap, and extra parts.

Let's start with the dual rate feature. I usually set the high-rate for all three controls (cyclics and tail rotor) at 100 percent, and low-rate at around 80 to 85 percent. On the PCM-10S, you can define the high-rate position to be with the switch arm either up or down. For the fore/aft and roll cyclic dual rate switches, I chose high-rate to be at the upward position (position 0). I connected the gyro dual sensitivity select to Aux 2. Flipping the Aux switch upward gives low gyro gain. I set up most of my transmitters this way so that in forward flight aerobatics, all three switches on the front panel will be at the up position, which gives high-rate cyclics and low-rate gyro. The photo shows the described positions. In hover, I flip all of them down, which gives low-rate cyclics and high-rate gyro. (Program mix 5 on the Concept data sheet shows how to use the idle-up switch to automatically trigger the gyro into low-rate.)

For the tail rotor dual rate switch, I chose high-rate to be at the "1" position, which means pulling the switch toward you. This is because I usually fly with the tail rotor at high-rate. This means the tail rotor switch will be pointed away from the throttle hold switch, which makes the throttle hold switch easier to flip. The photo shows the tail rotor dual rate switch at the low-rate "0" position.

On the PCM-10S there is an auto dual rate feature that automatically changes the cyclic and tail rotor control sensitivity when you flip the idle-up switch. I programmed mine to give high-rate cyclics and tail rotor controls when I am in idle-up 1 or 2, and low-rate cyclics and tail rotor when I am in normal pitch. Instead of taking space here describing the values for auto dual rate, just copy the values from the data sheet, and try them as a start.

Another useful feature on the PCM-10S is the "stunt trim." The stunt trim automatically gives you some cyclic and tail rotor trim change when the idle-up switch is turned on. On most helicopters, when you transition out of hover and into forward flight, you will notice that the model tends to bank to the left and yaw to the right and climb slightly. The purpose of the stunt trim is to automatically correct these drifts by flipping on the idle-up switch as you move into forward flight. I added 7 percent right cyclic trim (Aile), 2 percent forward cyclic trim (Elev) and 8 percent right tail rotor trim (Rudd). Note that I used *right* tail rotor and not left, because the P+ and P- in ATS Revo-Mix will give some left tail rotor when idle-up is turned on.

These three stunt trim settings make my Concept 30 and 60 fly straight and level in upright forward flight without me having to touch the control sticks. Program mixes 1 and 2 in the data sheet further help the model flies hands-off level in upright and switchless inverted flight. Mix 1 gives right cyclic for positive collective and left cyclic for negative collective. Mix 2 gives forward cyclic for positive collective and aft cyclic for negative pitch.

The amount of fore/aft stunt trim needed will vary with the type of main rotor blades used. For example, the Concept 60 with the stock wood blades needs 1 percent forward cyclic stunt trim; using the Zig-Saw GP-9II blades requires 1 percent back cyclic stick stunt trim.

Now let's talk about the programmable mix feature. The programmable mixes are used in a similar fashion to the stunt trim, their purpose being to make the model fly straighter and more level when you are upright or inverted and also for loops and rolls. For example, some people mix in some left/right cyclic

with fore/aft cyclic so that when they pull the stick back for a large loop, the model does not bank. I use the stunt trim to make the model fly straight and level in upright flight, and the programmable mixes to make the model fly straight and level in the switchless inverted position.

Program mix can automatically switch the gyro from high-rate in hover (normal pitch mode) to low-rate in forward flight (idle-up). Another example of program mix is to mix throttle with cyclic control, such that when cyclic control is given, the throttle is automatically bumped up slightly to keep the rotor speed up (program mix 3 and 4 on data sheet). Otherwise, when large cyclic inputs are given, such as in high-G turns or vicious hotdogging, the rotor speed could drop. More discussion on program mix can be found in the March and April 1991 issues of *Model Builder*.

The most important items to set up in any helicopter are the throttle and pitch curves. My settings for the Concept 30 are given in the data sheet. After you have programmed in these pitch settings, use a pitch gauge to check the main rotor blade pitch angle. The normal pitch curve is used for hover, and is also suitable for beginners. Idle-up 1 is for forward flight aerobatics; idle-up 2 is for 3-D hotdogging. For beginners, just program in the normal pitch and throttle settings, and keep idle-up 1 and 2 inhibited.

When using the pitch gauge to measure the blade angle, I suggest you start with idle-up 2. Move the throttle stick to full high and full low; you should get +10 and -10 degrees. If not, adjust the length of the collective pitch pushrod from the servo to the collective lever so you do get maximum positive and maximum negative pitch. Use the hole on the servo arm that gives the full throw capability of the collective lever without causing the servo to bind. This will depend on your particular servo arm—usually the second or third hole from the center of the servo arm. Once you can get +10 and -10 degrees at the idle-up 2 setting, then the recommended pitch settings given in the data sheet will guarantee that you get a reasonably good pitch curve for idle-up 2, idle-up 1 and even normal mode.

The pitch settings for the Concept 30 are for flying with the stock Kyosho foam blades or the wood Ninja blades from Century Helicopter Products. The stock symmetrical airfoil foam blades are actually excellent for aerobatics and switchless inverted flight. They give fast forward speed and excellent stability, but they are a bit light for autorotation. I recently designed a new set of fiberglass "Glass Ninja" blades for the 30 DX and Kalt Enforcer. They give good speed, lots of hover stability, and they float in autorotation. They give one to two seconds of hover at the bottom of an auto. If you are using this new Glass Ninja blade, then the hovering pitch must be increased by 1 to 1.5 degrees, otherwise the hovering rpm will be too high. To do this on your PCM-10S, simply increase the value of the pitch point at the center by 8 to 10 percent. Leave the top end and low end pitch settings unchanged, because although this blade may have less drag, it still has the same stall angle.

The pitch and throttle settings given in the data sheet can also be used for the Concept 60. However, due to mechanical limitations of the collective pitch swing arm, you can only get about +10 to -7 degrees of collective range. At full negative pitch, the pivoting elbow will bump into the top of the servo tray. I took a sharp X-Acto knife and shaved away about 1/32-inch off the bottom of the pivoting elbow, which gave an extra degree of collective travel.

The high-end pitch settings in my data sheet show a "out" value of 95. This is assuming that the high-end pitch trim lever, as well as the low-end pitch trim lever, are left in the center position. I have also chosen the "HOV SEL" feature for all of the points in the normal mode throttle curve and pitch curve. By pressing the SEL feature you are giving the two black knobs on the front of the transmitter the ability to fine tune the curves. Only the points that were selected will change as you turn the knobs. These two knobs, hovering pitch and hovering throttle, will affect only the normal mode, not the idle-up curves.

I use my PCM-10S for more than one model. For the Concept 30, I bought an inexpensive JR 327 seven-channel FM receiver and five of the least expensive JR servos (507s). For the Concept 30, these inexpensive servos work great. I think of my Concept 30 as my Kamikaze machine. I use it for pylon racing, doing snap rolls, hotdogging and dog fights with my friends. The JR 507 has good speed and has taken the abuse of crashes very well. For beginners and hotdogging, the inexpensive JR 327 receiver and JR 507 servos are more than adequate for the 30-size machines. Using the more expensive double ball bearing 4131s may be overkill.

Next month we will conclude this review by examining the tail rotor mix and other setup features of the PCM-10S. ***MB***

■ **LEFT: This month James discusses the PCM-10S's dual rate switch settings. The Elev, Alle and Aux 2 switches can be seen here. James programs the "0" position to be high-rate and the "1" position to be low-rate. The Aux 2 switch is used for dual rate gyro. The Elev and Alle are shown in the high-rate position. Aux 2 is shown at the low-rate gyro position.** ■ **ABOVE: The top-of-the-line PCM-10S comes with the NER-D940S ZPCM receiver and five NES-4131 servos. The 4131 is a double ball bearing servo with coreless motor. These are used in the author's Concept 60. The less expensive seven-channel FM receiver and JR-507 servos are used in his Concept 30.**

Chopper Chatter

The Hel-x Composite Side Frame Kit for the Shuttle 30

BY JAMES WANG

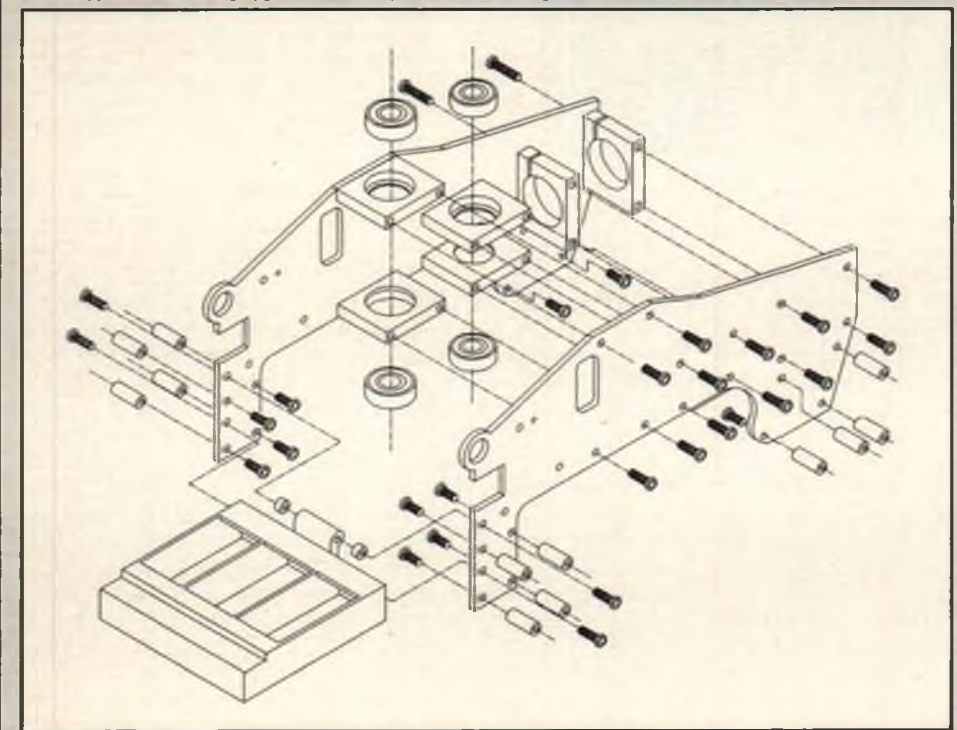
This month we will take a look at the new composite side frame kit from the Hel-x Corporation of Upper Montclair, New Jersey. The kit is designed expressly for the 30-size Hirobo Shuttle helicopter. It includes the four side frame boards themselves, all of the necessary screws and aluminum spacers, three metal bearing blocks, and two aluminum blocks for holding the tail boom. The suggested retail price is $129.

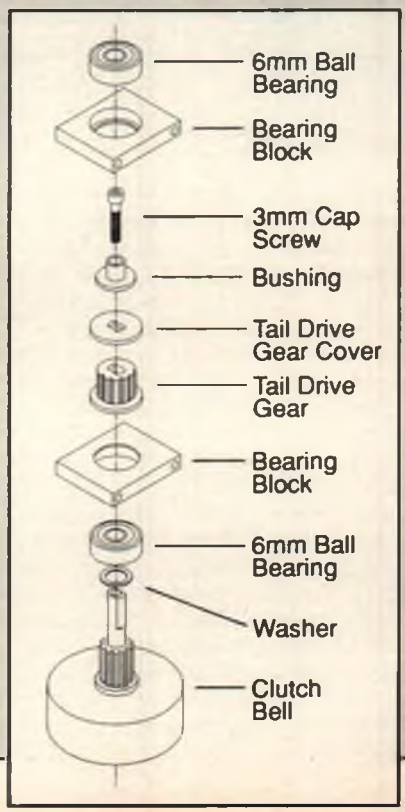
The composite side frame kit from Hel-x Inc. for the 30-size Hirobo Shuttle helicopter. There are four G-10 glass boards, 78 bolts, 16 spacers, three bearing blocks, and two boom holders. Hel-x's optional Upper Clutch Bearing Upgrade kit is shown at bottom right.

The Hel-x Shuttle composite frame kit comes in a small box with all of the parts neatly packaged in five separate plastic bags. A total of 74 machine screws and 16 aluminum spacers hold the frames together. Four additional screws are used to attach the landing gear struts. That sounds like a lot of individual parts, but it only took me an hour to assemble the entire structure. All of the holes in the frames are drilled accurately, and the frames and bearing blocks all

The whole assembly took James an hour to put together. The drawings in the manual are done on a computer and are extremely well illustrated. Notice the aluminum spacers connecting the upper and lower frames. Black anodized aluminum bearing blocks between the upper side frames don't show up here, but they're there.

■ LEFT: This drawing illustrates the upper side frame assembly. Three of the four bearing blocks are included in the side frame kit; the fourth bearing block, which supports the top of the tail rotor pulley, is included in Hel-x's Upper Clutch Bearing Upgrade kit. ■ RIGHT: Exploded view of the Shuttle clutch assembly; the top four parts are included in Hel-x's Upper Clutch Bearing Upgrade kit, which puts an extra bearing block on top of the tail rotor pulley.





aligned together perfectly—a very pleasant experience! (A hint for speeding up the assembly of this kit—or any other heli kit—is to cut off a 3mm Allen wrench and chuck it into a reversible cordless drill.)

These composite side frames are made of G-10 epoxy board—similar to the material used in high-quality printed circuit boards. The frames are about 2.2mm thick. They are extremely strong, and they do not flex very much. The frames are cut to shape and drilled on computer controlled CNC machines. There are no rough edges or frayed glass fibers exposed at the edges. The finished side frame assembly is stiffer and more rigid than the plastic side frames in the stock Shuttle. The frame assembly by itself came out at 11 ounces—slightly heavier than the plastic frames.

Of the three aluminum bearing blocks, two are for the main rotor shaft and one is for the engine clutch shaft. Hel-x also sells an optional Upper Clutch Bearing Upgrade kit for the Shuttle, a useful item that prevents belt tension from trying to tilt the clutch shaft. The upgrade kit retails for $33 and includes a metal bearing block that fits on top of the Shuttle's tail rotor pulley. It also includes a special bushing and a 3mm bolt for extending the clutch shaft. This excellent idea is best illustrated in the drawing.

The side frame kit includes two nicely machined aluminum brackets for holding the tail boom. These brackets and the bearing blocks are all anodized black, which gives them a very professional look. As recommended in the instructions, don't just hammer the ball bearings into the bearing blocks; instead, use a press or vise to carefully push the bearings in. Also, always push on the outer race of the bearing, never on the inner race.

A special clip is fitted onto the bottom of the side frames for attaching the landing gear struts. This clip is the same as used on the Hel-x fiberglass servo tray for X-Cell helicopters.

Whether the composite frames are more crashworthy than the plastic frames, I can't say, because (fortunately) I have not done a crash test yet. So far, after 20 flights, the side frames have held together very well. There is no sign of fatigue anywhere. I think it is going to take a pretty heavy impact to damage these frames. The G-10 material is the same stuff that Hel-x uses in their guaranteed unbreakable servo trays and fins. Hel-x has a free replacement policy on their trays and fins, but there is no such policy for the composite Shuttle side frames. Paul Schwartz at Hel-x says he might consider it, though.

We noticed that due to the different resonance and vibration characteristics of the composite frames, the Shuttle now sounds slightly different than it did with the plastic frames. Hel-x claims the G-10 material is inherently able to damp out some vibration. The stock plastic servo tray is still used, but due to the rigidity of the frame and the fact that the servo tray is solidly attached to the frame, any rolling moment from the main rotor can no longer flex the frames, and the cyclic controls seem to be more precise and responsive as a result. To get the most from the Shuttle, I suggest getting the optional Shuttle metal swashplate from Hirobo or Century. The metal swashplate can eliminate a large portion of the control paddle slop.

Finally, the Hel-x composite side frame kit is ideal for the Hirobo or the Century O.S. .46 engine conversion kit. I feel more comfortable fitting a .46 motor to this side frame assembly than onto the stock plastic frames. I mounted a .46 in mine, but I don't think the Shuttle really needs a .46 because mine went screaming all over the sky like a Kamikaze machine. It definitely moves! To increase the flight time, Hel-x sells a 2-ounce feeder tank system for $12, which includes the tank and all hardware.

The 15-page side frame assembly instruction booklet lists all the parts necessary for converting to a .46-size motor. The drawings are done on a computer and get an A for clarity. Hel-x has a special offer that lets you order the instruction manual and drawings alone for $5, which can be credited toward your purchase later on. If you have questions, give Paul Schwartz at Hel-x a call at (201)744-4962, or write to Hel-x at 558 Highland Ave., Upper Montclair, NJ 07043. **MB**

AERONCA: A PHOTO HISTORY

By Bob Hollenbaugh and John Houser

The Aeronautical Corporation of America was incorporated in Cincinnati, Ohio, on November 8, 1928. The acronym "Aeronca" was adopted and would become synonymous with light civil aircraft in the U.S.

The five prominent Cincinnati businessmen who founded the company hoped to ride the wave of interest in aviation created by Lindbergh's solo Atlantic flight. Strange as it may seem, the company was organized and capitalized, but in the beginning they had no airplane to produce. It was quite by chance that Jean Roche happened on the scene with his little single-seat homebuilt; a deal was struck, and his airplane became Aeronca's first production aircraft, the C-2.

Aeronca was the first American company to build and market a truly light airplane. Aeronca prospered at Lunken Airport in Cincinnati even during the dark days of the Depression. It was the disastrous flooding of the adjacent Ohio River that prompted the company move to Middletown, Ohio, in the spring of 1940.

Production of Aeronca aircraft continued in Middletown through the war years and into the post-war period, finally ending in 1951. In the short span of 23 years, Aeronca manufactured 17,408 airplanes in 55 different models.

Aeronca: A Photo History documents the story of Aeronca well. It is heavily illustrated with photographs of the many different models of Aeronca aircraft, together with related photos of general interest, all arranged chronologically. This book is not a repeat of what has already been published, but rather is a supplement to their history with a full pictorial account of Aeronca's lightplane years.

None of the photos used in this publication are of restored aircraft—all are original. All pertinent information is included in each caption. A few of the photographs are of prototypes. Much of the photos used have never been previously published in any publication.

No photo history of Aeronca would be complete without including a few photos of aircraft which didn't make it to production. These serve to illustrate the intense imagination of Aeronca's management at that time in attempting to deal with ever-increasing competition in the lightplane industry. Also included are several photos of various factory scenes that might be of special interest to Aeronca buffs.

Aeronca: A Photo History includes interesting historical tidbits with comprehensive photographic treatment of the C-2, C-3, Model L (low wing), Model K, pre-war Chief, Model T (trainer), TA (Defenders), Liaisons, TG-5 gliders, Aeronca-built Fairchild Primary Trainers, Model 7 Champion, Model 11 Chief, Model 15 Sedan, experimental types, and Aeronca engines.

The book is 8-1/2x11 inches and comprises 138 pages, 270 photos, chronological listings, a pre-war production chart, post-war production chart, Aeronca models with powerplants, ATC, years of manufacture, comparison specifications and appropriate remarks for each model. A classic collector's item for sure! Softbound, only $14.95 plus $3.50 shipping. Order from Aviation Heritage Books, P.O. Box 66-D, Destin, FL 32540. **MB**

RULES... RULES... RULES!

Our columnist's thoughts on the Quickie 500 event and why he feels it's in need of a major overhaul.

Rules. Sometimes they're a pain in the posterior, but a necessary evil. Wouldn't it be nice to race without them? *What am I saying?* Lost my mind for a minute because I've seen enough over the years to realize we don't have enough rules, as is.

Sounds goofy, because who needs more rules? The book is full of them, but we still have problems because of the language used. As laymen, we write our rules in layman's terms. We make them understandable to us and leave out the "party of the first part" and "the plaintiff prays" and all of that other legal gobbledegook that supposedly clarifies the law for lawyers. (However, I have my doubts on that too.)

We tend to write rules in simple terms and unfortunately, many loopholes result. Knowing this, some in our ranks overlook the true intent of the rules and purposely look for things that aren't written. If something is missing, they say, "Hey, the rules don't say you *can't* do that, so it must be legal!" The only way around this would be to write rules in strict lawyerese, but then, who would understand them? Only lawyers, I guess.

Anyway, the reason for this rambling is that we've had a pile of interpretations and misinterpretations lately that will require a major overhaul of some of the current rules; in particular, those written for Quickie 500.

When the current Quickie 500 rules were written for adoption as a national event, the NMPRA formed a committee to compile a set of rules for the Contest Board's approval. At the very beginning of the event, we were all racing Spickler Quickies with K&B .40s. Not much went wrong because the plane had to be built as the kit instructions specified. But somewhere along the way, we realized that specifying a certain kit or engine was not the way to go; someone said that what we really needed was a set of generic rules that would allow many different kits or home-brew designs and several different motors. WRONG!

The committee wrote rules that supposedly centered around a Spickler Quickie. Picturing it in their minds, they wrote, "Box fuselage, constant chord wing, fixed landing gear, etc., etc." They weren't thinking about swept wings because they didn't see swept wings, so there was no need to write, "No swept wings." However, we now have wings with sweep. They weren't thinking one aileron because they saw two, but we now have planes with one aileron.

Same with wing fillets/fairings. None on a Spickler, right? No need to write "no fillets" when they aren't in your mind's eye, but we sure have them now. There are other items but you probably see my point by now.

All of these fancy little features come along because the rules aren't specific, and anything missing is construed as being legal. Wrong again! The contest board on numerous occasions has been obligated to interpret the rules by their intent and have ruled accordingly. Just as a judge or appeals court, we must read between the lines and say "yea" or "nay."

Most times it's not a popular ruling because the person requesting the interpretation wishes to incorporate a certain feature and we say no. Or maybe he already has the feature and we reject it as illegal. Not popular decisions with some people—but necessary.

The reason for this rambling is that we've had a pile of interpretations and misinterpretations lately that will require an overhaul of some of the rules.

Now we're into another rules cycle. The '94 rulebook changes, if any, are being accepted up to September 1 of this year. In the last cycle, we only had three proposals that made it past the initial vote, so we had an easy cycle.

Not so this time around. I'm probably going to submit a fistful myself. We need to end the madness and inject some sanity or Quickie may suffer. Of course, I do realize that Quickie 500, as it was originally intended, has long left us for this new professional event we still call a beginner's event, but this is still good for racing, because Quickie has developed into the most popular racing event around—bar none. So we are fortunate to be involved.

We must not destroy the event. We are probably very close to opening the event to experts. But we must have a stable set of rules for the new guy, and to that end we must walk carefully and do the job right.

Let the go-fast guys go fast! This isn't hurting a soul and it's fun! Heck, a Quickie with a smokin' Nelson on it is a fun-to-race plane, but the new guy has to crawl before he can join in. We must take care of him. Newcomers are the future, as they say.

The funny thing about this is that the very same argument was heard when Quarter Midget was the stepping stone event. Now it's a different set of wheels, but the same old story. History repeats!

Should we require two classes? Maybe so. The last time this proposal came before us, we rejected it. Now is a different time and need. No doubt a vehicle is needed that spells out exactly what the novice must do before he can step up to the likes of a Nelson.

I would be very surprised if none of the proposed rules are approved, but I guess when it comes to racing, the desire to beat the pants off everyone is more important than straight arrow, so off they go with the little things to give them that edge.

It's a cruel world, my friends! Quarter Midget went through the same phase before it finally got down to allowing anything. Since then, there have been no more arguments in Quarter. Do what you want to a readily available engine and the event is hassle-free. Formula I is close, but there is occasionally a tiff about something or other. The Quarter rules are a little looser and there is less to hassle about. Quarter actually is closer to FAI, except they still do not allow a bar stock engine to compete.

Do you feel Quickie should go the same route for the experts? As stated earlier, September 1 is the deadline for rule proposals to the AMA. If you have an idea you feel has some merit, write up a proposal and send it to Bob Underwood at AMA headquarters. If you do not wish to submit a rule proposal but wish to be involved, read the proposals when they are printed and apprise your District Racing Contest Board member of your feelings.

Don't complain if rules are passed that are contrary to your thinking and desires. Stand up and speak out!

There are some old rules that have been ignored for years, yet there they sit. An example is in Form I: A rule states you can remove all the metal you wish, but woe to the person who adds any. Give me a break! Guys have been rechroming sleeves since Larry Leonard raced, and if that's not adding metal, what the heck is?

Another rule states an exhaust extension

continued on page 84

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11 X 9		2.49
12 X 6		2.89
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11 X 10	7	7.95
11 X 11	7	7.95
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11 X 12W	7	7.95
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22 X 12	13	31.00
22 X 14		31.00
22 X 16		31.00
22 X 18		31.00
22 X 20		31.00
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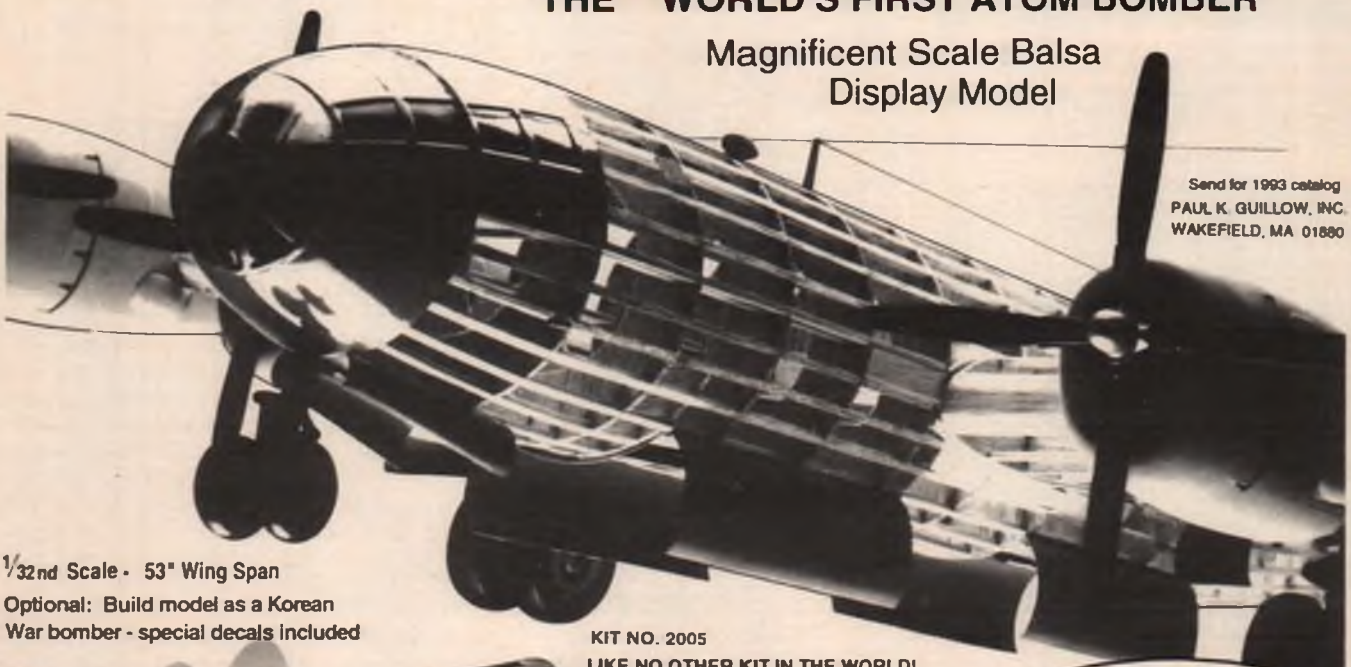

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MODEL BUILDING...just for the fun of it!

GAS-TO-ELECTRIC CONVERSIONS, PART 3

The third and final part of this series will look at two gas-powered designs that were successfully converted to electric and a 1/5-scale model that was built for electric power using a three-view of the full-size aircraft as a guide.

PIPER TOMAHAWK

The stand-off scale Piper Tomahawk was designed by Dave Peru and Dick Sarpolus for a .19-.30 cubic inch engine, and has a 48-inch wingspan and 408 square inches of wing area. The plane is easy to build, with a conventional built-up wing and a sheeted balsa fuselage. The T-tail makes the plane unique, but does not make the fuselage construction difficult.

The Tomahawk should be an ideal match with an Astro Flight 05 motor. Because the standard direct-drive 05 can only swing a 7 or 8-inch prop, a geared motor is a wise choice. Gearing a motor reduces the maximum rpm but increases the torque; the principle is similar to changing from a two-stroke engine to a four-stroke engine. Therefore, we can swing a larger propeller. For the Tomahawk, an 11- or 12-inch prop will be much more efficient and will look much better.

The author's semi-scale Piper Tomahawk is a good example of a successful gas-to-electric conversion. Model spans 48 inches and was originally designed for .19 to .30 glow engines; Roger powered his with an Astro geared 05.

The "Toot-E" is the author's electric conversion of Jim Bigley's "Tooter," a 66-inch span, .10-powered motorglider. Model has a direct-drive Astro 05 and except for the wing leading edge and the elimination of a plywood bulkhead, is built completely according to the original plan.

You'll probably ask how to estimate the model's finished weight before you actually build it, as it is necessary to have the ready-to-fly weight of the plane before you can perform the performance analysis. A good rule of thumb is to take the weight of the motor system and multiply it by 2.5 to estimate the finished, ready-to-fly weight of the model. The ratio of total weight to motor weight for most of the planes I have built ranges around 2.5, so using this ratio to estimate the weight should get us pretty close to the actual weight. Plugging in the parameters, including the weight estimate, gives the results shown in Table 4.

The wing loading of 15.88 ounces per square foot indicates that the plane will fly at a scale-like speed. It won't be able to slow to a crawl on landing, but it also won't be necessary to keep it hot and fast on approach. The power-to-weight ratio of 2.56 watts per ounce shows that the Astro 05 will be plenty of motor. Mathematically combining all of these parameters gives an aircraft performance ratio of 0.1609. Comparing this with the 0.1500 rule of thumb value shows that this plane should have enough power to fly at an adequate speed.

As a second check, I plugged the plane's parameters into another computer analysis program called Aero-Comp, which I reviewed in the February 1993 *Model Builder*. This program performs a much more comprehensive analysis of the aircraft than my program, but it will not automatically scale down full-scale aircraft to model size and it uses a completely different analytical method of evaluation. This package asks for the wingspan, aircraft type, motor type, propeller size, etc. Aero-Comp concurs that this plane should fly with a good climb rate.

THE TOOT-E

The "Tooter" is a gas-powered glider designed by Jim Bigley for .10 sized engines. (I renamed it the Toot-E after the electric conversion.) This aircraft is billed as a trainer with the characteristic flat-bottom airfoil, generous dihedral, D-tube wing and slab-sided fuselage construction. The only significant construction changes for electric power were the substitution of contest balsa for the dowel leading edge and the elimination of the plywood doubler forward of the wing saddle. Remember that electric motors do not vibrate, so the extra strength afforded by the plywood is not required.

Since this plane was originally designed for a .10 cubic inch engine, it would make an ideal candidate for an 05 electric motor. Using the method to estimate the finished weight in the previous example, the Toot-E should come out to about 40 ounces (remember that this plane will not have a gearbox). Plugging in the parameters, we get the results listed in Table 4.

The figures show that the added weight of the electric power system does not detract from the performance of the plane. The wing loading is excellent for a trainer, the power-to-weight ratio is adequate, ready-to-fly weight to motor system weight ratio is acceptable, and the aircraft performance ratio is excellent. This plane has more than adequate power, flies slowly and is very stable and forgiving—the desired characteristics of an electric trainer plane.

Aero-Comp's analysis shows that the Toot-E will have a very slow stall speed and a quick rate of climb.

1/5-SCALE LACEY M-10

Applying these concepts and formulas to gas-to-electric conversions is not the only application. A while back, I purchased a Lacey M-10 rubber-powered kit from Peck-Polymers. After building the plane it occurred to me that it would make a fine, if a little unusual, scale electric model.

When designing a scale electric model, you must properly match the size of the aircraft with the motor system. I decided to scale the model for an Astro Flight geared 15 motor. To make this task easier, I wrote a computer program to perform the scaling down and parameter calculations. Using the TLAR method (That Looks About Right), I tried a 1/5-scale model. As the motor system weighs 28 ounces, I guessed that the model will weigh in at 70 ounces. The computations are shown in Table 4. The wing loading will be good for a scale model and the aircraft performance ratio shows the power will be adequate. (Aero-Comp also determined that the Lacey will be a successful

electric model.)

The Lacey construction proceeds in a straightforward manner. The fuselage is built using 3/16-inch square balsa, much like an Old Timer model. The wing structure is a conventional D-tube—nothing fancy for an experiment! The ready-to-fly weight when completed was 73 ounces—very close to the target weight.

The first flight went well as the Lacey literally jumped off the ground during taxi tests. There was no holding it back! Unfortunately, after it broke ground it had a bad tendency to stay at a 45-degree nose-up attitude and hang on the prop. Obviously it was very tail heavy. After adjusting the center of gravity, the plane flew well. Curiously enough, the ailerons were not effective at all, and with no dihedral, the plane was not stable in its roll axis. Fortunately the rudder was very sensitive for turns. After flying it for a few minutes I became accustomed to the Lacey's flying characteristics and concluded that the experiment was successful.

As usual, the first plane of any type that I build becomes the guinea pig for future editions. When I build this plane again, the ailerons will be left out altogether, the CG will be farther forward, the rudder throw will be reduced and, while it won't be exactly scale, there will probably be a little dihedral for roll stability.

I hope this series has improved your understanding of electric power and electric conversions. Of course, some models are better suited to electric than others, but it's possible to convert just about any gas-powered plane to electric with strategic changes in wood selection and construction techniques. For those of you who have never built a plane from plans or designed your own, let me assure you that I had the same hesitation a few years ago. If you want to try your hand at it, obtain the plans for one of the simpler planes like the Tooter, the Electromaster or the Electri-Liter. After building the plane, you'll be that much prouder of your effort.

The computer program I wrote to do the aircraft analysis is available by sending $15.00 and your name and address to Roger Jaffe, 6462 Sunny Brae Dr., San Diego, CA 92119. Please specify the size diskette (5-1/4 or 3-1/2 inch) you need. The software package includes the program disk, some full-scale aircraft and motor data, and a brief instruction manual.

Aero-Comp is also available for $79 from USR&D Corporation, P.O. Box 561, Denville, NJ 07834-0561.

Roger's scratch-built 1/5-scale Lacey M-10 was inspired by the Peck-Polymers Peanut Scale kit. Model spans 48 inches and performs quite well with a geared Astro 15.

NO MUSS, NO FUSS

In a word, building and flying electric aircraft is fun. While your electric model is under construction you'll find it a pleasure to not have to use hardwood. You won't have any fuel lines and fuel tanks to install, and you'll have one less servo and pushrod to worry about. You can use any covering or finish, from Japanese tissue to acrylic paint. Any type of trim covering is acceptable, and it doesn't have to be fuelproof. In fact, *nothing* has to be fuelproof! Installing the electric motor is a snap because there are many mounting methods from which to choose.

You'll be guaranteed to draw a crowd when you bring out your new bird and no one can find the glow plug. You'll never have an engine fail to start or load up and quit. It will never flood, nor will it draw air bubbles because of a hole in the fuel line. Your motor will never die just after takeoff. You'll have the satisfaction of knowing that when the throttle stick is advanced, the motor will start—period.

Other pilots will "ooh" and "aah" when your plane flies just like the gas models but with no noise. Lastly, you'll be the envy of the crowd when you take the rubber bands off the wing, put them back in the box with all the unused rubber bands, and load everything into the car without so much as a squirt of glass cleaner. You won't even smell like glow fuel. When I started flying electric, I realized that this is the future, particularly in heavily populated urban areas. Electric power provides a definitive solution to ever-present noise problems. I can go to the schoolyard down the street and fly over the playground and none of the neighbors will know I'm there.

After six months of electric flying, I gathered up all of my gas equipment, including my fuel-soaked flight box, and sold it at a swap meet. I have to say, it's the best thing I've ever done. ***MB***

TABLE 4—ELECTRIC CONVERSION PARAMETERS

	Piper Tomahawk		Toot-E		1/5-Scale Lacey M-10	
Constants	**Estimated**	**Actual**	**Estimated**	**Actual**	**Estimated**	**Actual**
Wingspan	48	48	66	66	48	48
Wing Area (square inches)	408	408	561	561	665	665
Motor system weight (ounces)	18	18	16	16	28	28
Motor system power (watts)	115	115	125	125	185	185
Aircraft wt., ready to fly (oz.)	45	43.5	40	43.5	70	73.5
Computed Parameters						
Wing Loading (oz./sq. ft.)	15.88	15.35	10.27	11.17	15.16	15.92
Power-to-Weight ratio(W/oz.)	2.56	2.64	3.13	2.87	2.64	2.52
Total wt. to motor wt. ratio	2.50	2.42	2.50	2.72	2.50	2.63
Aircraft Performance Ratio (W-sq.ft./sq. oz.)	0.1609	0.1722	0.3044	0.2574	0.1744	0.1581
Wing Loading	Moderate	Moderate	Slow	Slow	Moderate	Moderate
Power-to-Weight ratio	Fair	Fair	Fair	Fair	Fair	Fair
Total wt. to motor wt. ratio	Good	Good	Good	Good	Good	Good
Aircraft Performance Ratio	Good	Good	Good	Good	Good	Fair

U.S. AIRCORE'S BARNSTORMER 40

ALL ABOUT ARFS
BY ART STEINBERG

Regular readers of *Model Builder* know that I seem to be infatuated with U.S. AirCore products. I must admit that I do find myself fascinated at the thought of a virtually indestructible RC airplane, and although I was rather skeptical at first, I am now a true believer. Five different airplanes from U.S. AirCore have passed through my hands over the last couple of years, and as far as I know, every one of them is still in excellent flying shape.

The latest kit from this company to come my way was their Barnstormer 40 bipe, a really nostalgic takeoff on the grand old Stearman bipe of yesteryear. Utilizing U.S. AirCore's "Fold & Fly" construction, the Barnstormer comes in the familiar blue and yellow color scheme of the 1930s military trainers. With its factory applied tri-color military insignia, the Barnstormer 40 makes an eye-catching and highly visible model.

Completely constructed of die-cut and scored AirCore material, construction time took only a couple of evenings. The Barnstormer 40 follows U.S. AirCore's practice of placing the engine and radio system on a sliding tray, called the "Power Cartridge." The idea is that you can own a whole fleet of airplanes, all of which can be flown with the same engine and radio merely by swapping the Power Cartridge from one plane to another.

The Barnstormer 40 has a wingspan of 50 inches, but for snappier performance, U.S. AirCore suggests clipping the wings to a

The dummy radial engine supplied in the kit, while only two-dimensional, does add to the Barnstormer's scale effect. Art added some paint and a few dowels to spruce it up still further. The O.S. .48 Surpass, a really fine engine, is at the bottom of the recommended four-stroke engine size range and proved to be marginal power for the 7-1/2 pound model.

■ LEFT: With its slow and gentle flying characteristics, the Barnstormer 40 is easy to fly, but not so easy to ground handle in its stock configuration—see text. ■ BELOW: Close-up of the dual cockpit arrangement and the rugged cabane system.

suggested 46 inches. I was pleased to see that both the upper and lower wings were equipped with ailerons and that they were of generous size, as were the elevator and rudder. Previous experience with U.S. AirCore models has shown them to be highly stable and not overly sensitive to control surface movement, so I usually end up setting up the control surfaces with plenty of throw. I figured the Barnstormer would have similar characteristics, so the four ailerons seemed especially desirable.

The upper wing is supported by a sturdy set of wire cabanes, which are backed up by a pair of N-struts connecting the two wings. All in all, the Barnstormer 40 is a rugged airplane that gives the impression of being able to easily cope with the rigors of rough handling. The two cockpits, complete with windshields, plus the dummy radial engine, help contribute to the illusion of a Stearman biplane.

BARNSTORMER 40

WINGSPAN ..... 50 inches top, 48 inches bottom.
TOTAL WING AREA ..... 882 square inches.
FLYING WEIGHT ..... 7.5 pounds.
WING LOADING ..... 19.6 ounces per square foot.
OVERALL LENGTH ..... 36 inches.
MFR. RECOMMENDED ENGINE SIZE ..... .40-.50 two-stroke, .48-.50 four-stroke.
SUGGESTED RETAIL ..... $169.95.
Manufactured by U.S. AirCore, 4576 Claire Chennault, Hangar 7, Dallas, TX 75248; (214) 250-1914.

With its 50-inch span and wing area of 882 square inches, the Barnstormer 40 is not what you would call a small airplane. The

manufacturer recommends using a .40 to .50 two-stroke, or a .48 to .60 four-stroke engine, but frankly, I feel these choices are very much on the conservative side. Biplanes produce a lot more drag than monoplanes and are prone to sink rapidly when the power is cut back, so it's important that you don't underpower these birds. We chose to install an O.S. .48 Surpass, a four-stroke engine which has always performed well for us, but this proved to be a rather poor choice, as the little O.S. just wasn't up to hauling the big 7-1/2 pound biplane around with much authority.

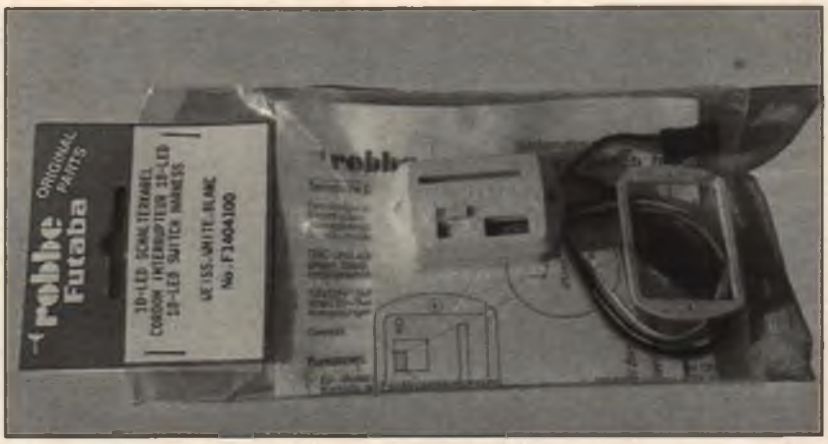
The day chosen for initial flight tests turned out to be one of those perfect California mornings, and upon arrival at our favorite paved airstrip, the Barnstormer 40 was readied for flight. Applying throttle gradually, I was surprised to see the Barnstormer respond with a vicious ground loop! After at least a half dozen more attempted takeoffs, applying throttle in every way imaginable, all I got for my efforts was a series of tight ground loops. We then went to work on the landing gear, spreading them apart, applying toe-in, then toe-out, and still no luck. Eventually, we reversed the entire landing gear so that the wheels were located about an inch farther back toward the tail, and this solved the problem nicely.

Our next takeoff was routine, straight ahead with no problems, with a slow, gentle climb. It quickly became obvious that the O.S. .48 Surpass was simply not powerful enough to fly the model the way I like to fly. Aileron response was slow even on high rate, and I made a mental note to increase the throws at the end of the flight. On the other hand, elevator response was rapid and jumpy, as though the model was a bit tail heavy. I set up for a landing and was surprised to find that the power-off glide was somewhat flatter than one would expect from a biplane, so that no more than an idling engine was needed for landing.

On the ground again, the CG was checked and found to conform with the building instructions; still, two ounces of nose weight was added, and the elevator throw was decreased to reduce the sensitivity experienced in flight, and aileron throw was maximized. The next flight was smooth with no surprises, with gentle but adequate response to control inputs.

Using the .48 Surpass or its equivalent, you can forget about vertical maneuvers, crisp rolls and snaps, and knife-edge flight. With that kind of power you will be limited to slow and gentle trainer-type maneuvers. To realize the full potential of the Barnstormer 40, I believe a .60 two-stroke or a .65 to .80 four-stroke engine would do wonders.

If you would like an easy-to-fly bipe in your future and don't wish to devote the next few months of your life to building one, consider the Barnstormer 40. For further information, contact the manufacturer: U.S. AirCore, 4576 Claire Chennault, Hangar 7, Dallas, TX 75248



The new Futaba RC system switch harness from Robbe features a built-in external charge jack and an LED battery charge indicator. Details in text.

ROBBE TO THE RESCUE

When I transport a large airplane it is usually dismantled and stored that way in my workshop. If I want to plug in my charger, all I do is fish the female charging jack out of the fuselage and plug in my charger. However, I also fly smaller planes which do not require dismantling for transport, and with these, charging can be a problem if you don't want to have to remove the wing each time.

Now that venerable firm, Robbe Model Sport, Inc., 170 Township Line Road, Belle Mead, NJ 08502, has solved the problem in a big way, at least for owners of Futaba radios. Robbe has come out with a switch harness which combines a charging jack with the on/off switch, similar to the "ChargeSwitch" recently introduced by JR. A little sliding door closes the charging jack when the switch is turned on, preventing exhaust residue from contaminating the jack. However, the Robbe unit also includes 10 tiny LEDs to give you an idea of the charge status of the on-board radio battery.

If you feel (as I do) that you just have to have one of these switch harnesses, be prepared to spend around $50 for a 10-LED unit, or around $35 for a simpler 2-LED model. Each is available in black or white, and I think you'll get a real "charge" out of this highly convenient and ingenious accessory.

Art Steinberg, 2267 Alta Vista Drive, Vista, CA 92084; (619) 726-6636. **MB**

MILES M-5 SPARROWHAWK

BY WALT MOONEY

Reprinted from the May 1974 *Model Builder*

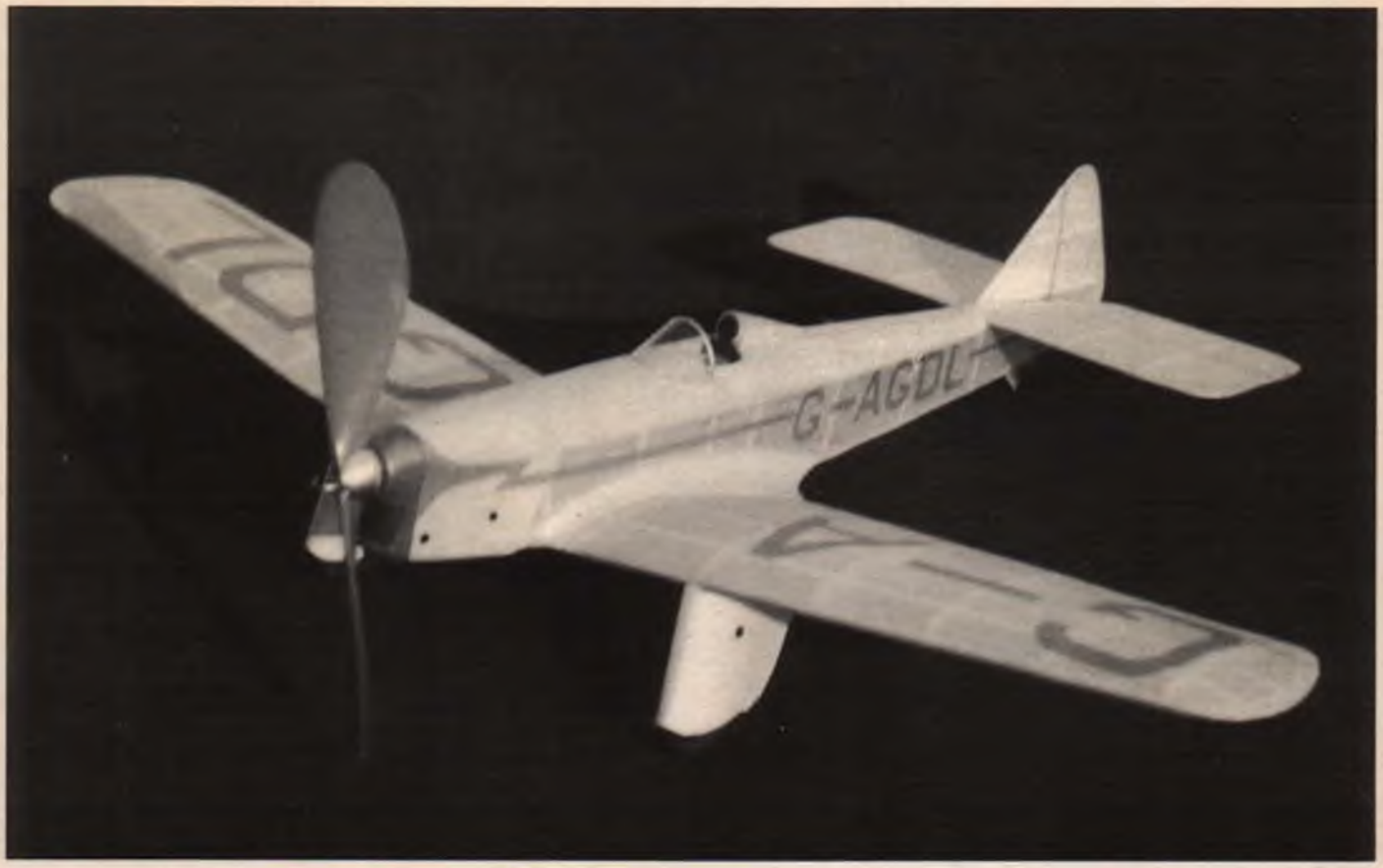
The M-5 Sparrowhawk was a special racing machine designed in the 1930s by the Miles aircraft firm in England. Several were built, and they were fairly successful. In shape, they are classic for their period in aviation history. I found the model to be particularly pleasing, both for its looks and for its flying ability. It flew "right off the board," and the best flight to date is 53 seconds in a contest at the Santa Ana (California) Blimp Hangars.

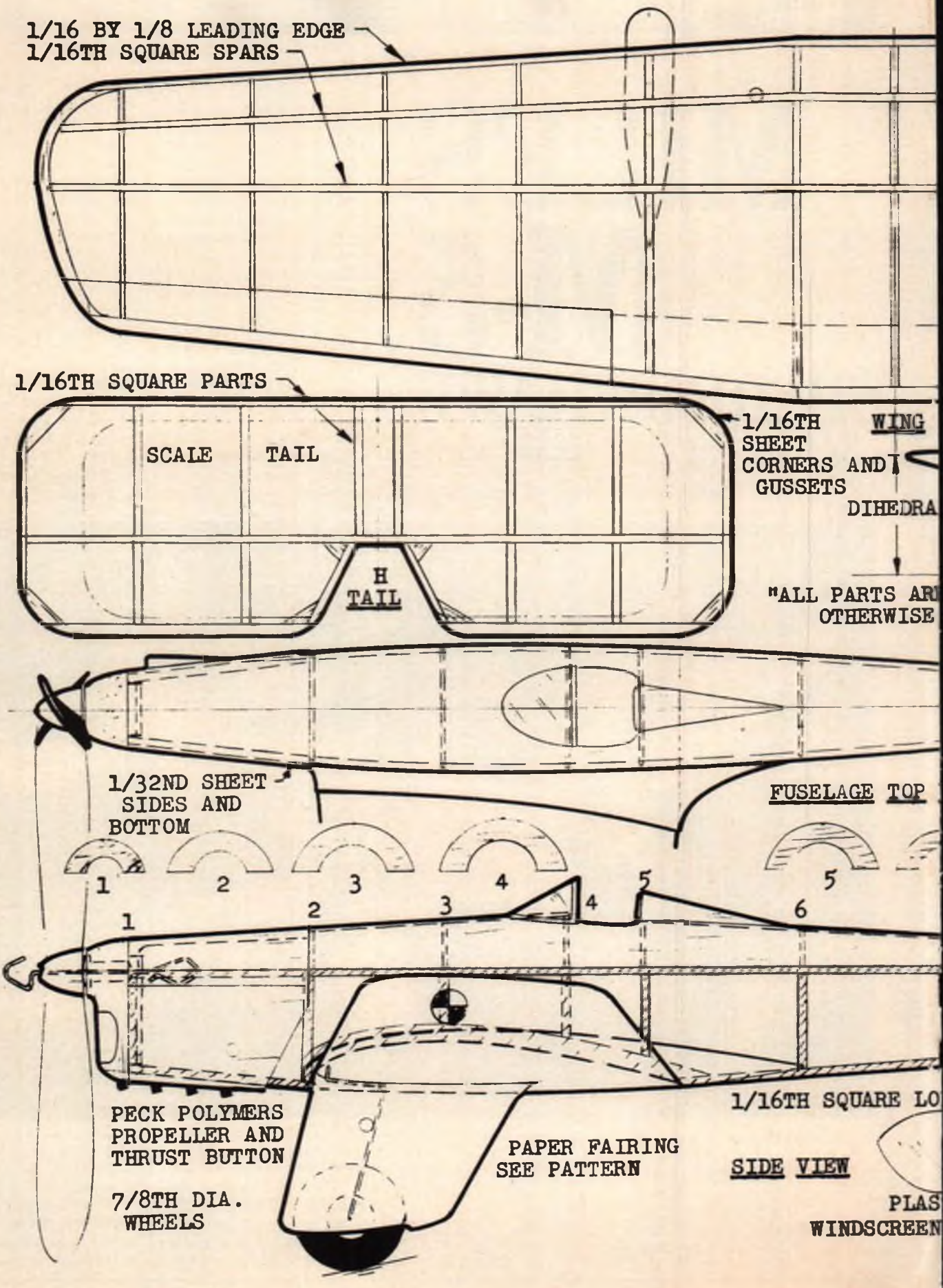
Before going into the construction of the model, a more detailed description of the flying configuration is in order.

The model was designed and built with care to make it light; it weighs 1/2-ounce without the rubber motor. It could be lighter if superfine tissue were used for covering, but because the full-size "G-AGDL" was red and cream, we used Marlow Engineering tissue, which has a pale yellow as one of its available colors. The top decking is 1/64 balsa from formers 2 to 8. If that is unavailable to you, use bond paper, or sand down some 1/32 sheet. With the exception of the fuselage, which has two coats, the model has a single coat of thin, clear dope.

The wings were built flat over the plans (using the flat bottomed ribs) and after covering and doping, they self-warped to give 1/8-inch of washout. That is, the tip rib is twisted nose-down relative to the center section ribs. For good flying, this twist is essential, so if your wings don't warp automatically, make sure you do it to them.

The best motor found so far is a single 17-inch loop of 1/8-inch brown Sig contest rubber. It was lubed with Sig rubber lube, rather sparingly to keep from slopping up the inside of the fuselage. A Peck-Polymers 4-3/4 inch plastic propeller was used. The model balanced at the CG indicated and flew with no adjustments required.

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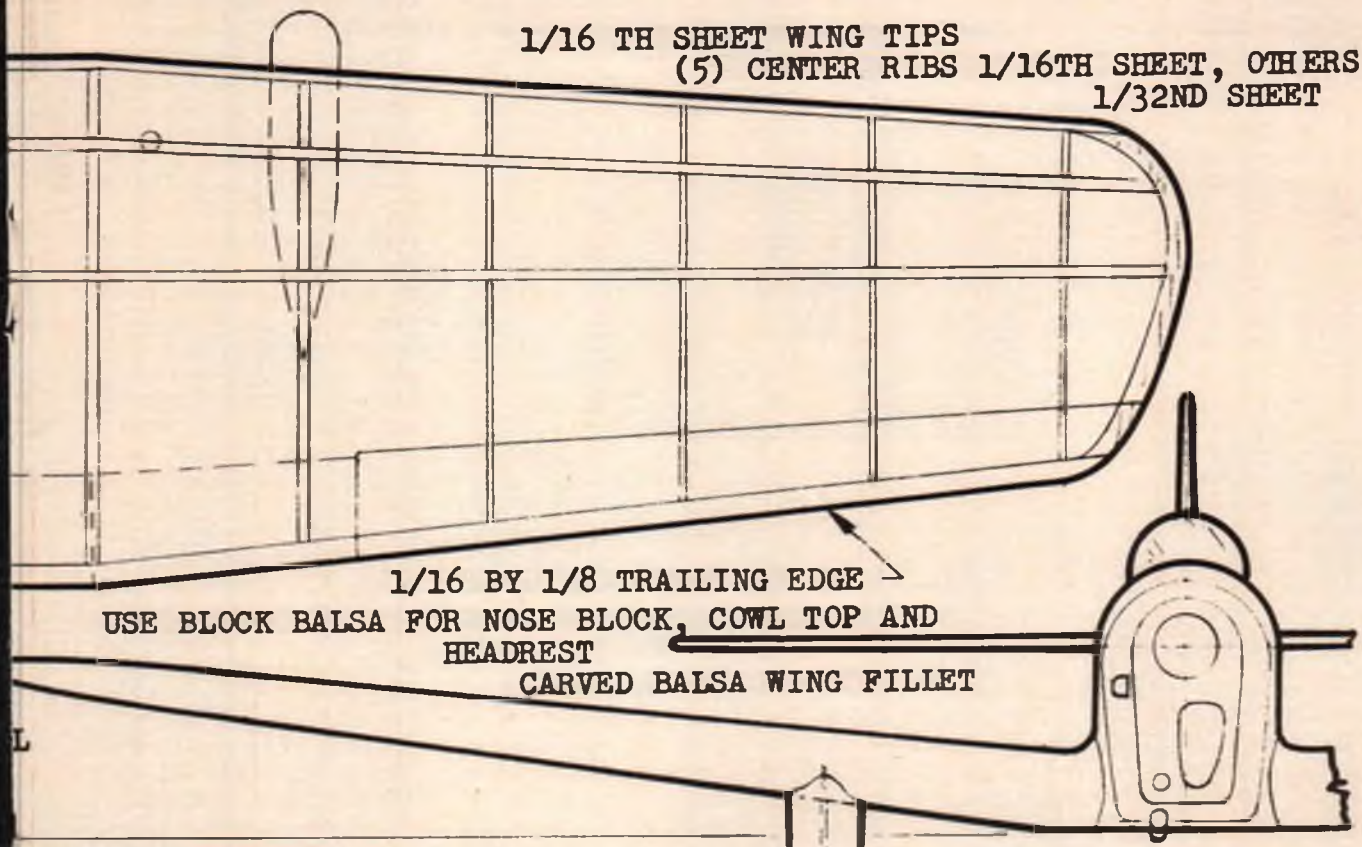

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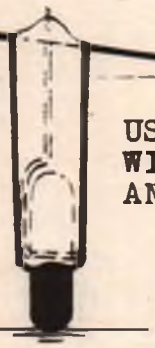
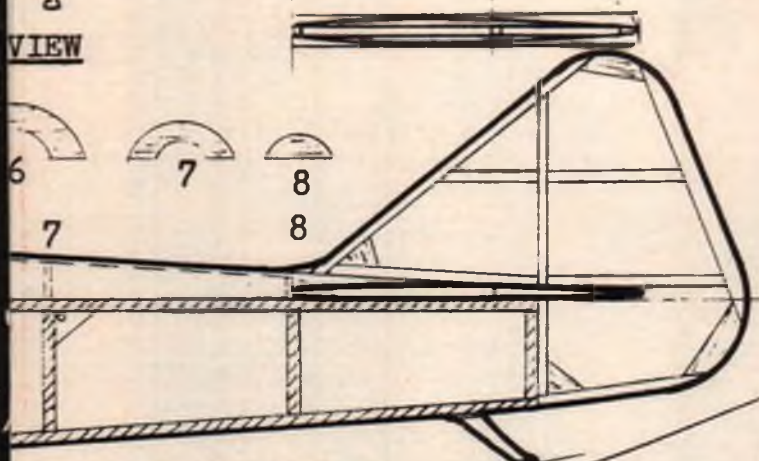
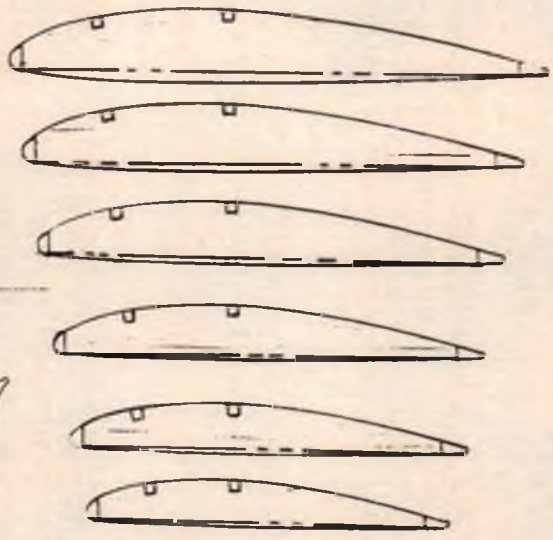


USE 1/32ND DIA. PIANO WIRE FOR LANDING GEAR AND PROPELLER HOOK

FRONT VIEW

VIEW





NGERONS AND UPRIGHTS

WHEEL FAIRING PATTERN

WING RIBS

TIC PATTERN

PEANUT SCALE
"MILES M-5 SPARROWHAWK"
BY WALT MOONEY

The 53-second flight was the third ever, and was from a hand launch. Various other minor adjustments were tried after that, but none of them improved the flight time. The model will consistently exceed 45 seconds from an R.O.G. No thrustline adjustments were required, and the model automatically flew in right-hand circles.

The construction of the Sparrowhawk follows the standard, time-proven format. The fuselage is a stick balsa box with semicircular formers added to the top, which are then covered with thin sheet balsa. Because of the high thrustline, there are cutouts in the formers and no permanent cross sticks between the upper longerons. You may find a few temporary cross sticks an aid during assembly.

The top part of the engine cowl between Stations 1 and 2 is carved from a balsa block and hollowed to provide motor clearance. The nose block is carved from a block also. A piece of 1/8 balsa, cut to fit snugly in the front of the fuselage, is cemented to the back face of the nose block so that the front end can be removed. This allows easy installation of the motor and stretching of the motor for winding. The wing saddle part of the lower longerons is cut from 1/16 sheet to match the shape of the top of the center section ribs.

The wing structure is conventional. The ribs over the landing gear should be cut from rather firm balsa sheet, because the landing gear wire is simply poked into the front end and cemented to the bottom of the rib after the wing is covered. The wing ribs can have the scale sections shown or the flat-bottomed sections indicated by the phantom lines.

The M-5 Sparrowhawk was a special racing machine designed in the 1930s by the Miles aircraft firm in England.

The tail surfaces can be simply flat structures or, if you desire, they can be streamlined as indicated.

The wing fillets are probably the toughest thing to make on the model. Usually I use bond paper fillets, but several attempts left me unsatisfied, so I finally carved them from soft balsa blocks. Cut the blocks carefully to the shape shown in the side and top views and then carve in the concave upper surface of the fillet. Patience is the most important ingredient here, with sandpaper coming next. The final fitting of the fillets is done after the model is covered and the wings are in place on the fuselage.

The landing gear fairings are of a type not seen on too many airplanes. They have been called "spats" and "trousers" at different times, for obvious reasons. In the interest of lightness and simplicity on the model, they are made of bond paper, which was covered with tissue before cutting the pattern in order to have them the right color when they are completed.

Note that the fairings are not 90 degrees to the wing lower surface, but are vertical. This means there is a right and a left fairing. The pattern will work for both, but must be turned over between cutting the right and left fairings. Fold the fairing by wrapping the middle around a small dowel or tube so as to get a smooth leading edge without creases. Use the thinnest line of cement to bond the trailing edges together. When attaching them to the wing, only the front and rear need be cemented to the wing. Then, in case of damage, they can be easily replaced.

The little circles shown several places on the plan appear to have been inspection holes on the real airplane and show up as black dots on photographs. The side inlet and exhaust pipes were made from short lengths of dowel. The tailskid is balsa. The air inlets are painted on the noseblock with flat black paint.

The spinner was added to the propeller by epoxying a thin sheet disk to the aft face of the prop after cutting off the hub extension on the back of the propeller. Then the spinner was built up of several applications of Sig five-minute epoxy, holding the propeller while it hardened into the proper shape. **MB**

How to hit Mach 1 without ever leaving the ground

F-15 EAGLE

Wingspan: 47 in (1194 mm)
Wing Area: 615 sq in (39.67 sq. dm)
Weight: 6-6.5 lb (2.72-2.95 kg)
Length: 52.5 in (1334 mm)
Requires: 2-cycle .40-.50 cu in (6.5-8.0 cc) engine and 4-channel radio with 4 servos

Shown with optional Armament Package. Propeller and landing gear removed from photo for dramatic effect.

Get behind the controls of a Great Planes F-15 Eagle

Within 23 seconds of brake release, the USAF F-15 Strike Eagle can accelerate through the speed of sound, known as Mach 1. This is just one of the many capabilities that helped F-15s bring home the majority of air-to-air victories during DESERT STORM and has made them the most sophisticated air superiority fighters in the world.

Now Great Planes brings all the excitement and adventure of flying an F-15 Eagle to pilots who prefer to keep their feet on the ground. Its authentic sport-scale design captures the dogfighting spirit of the real F-15 in beautiful detail. An extensive decal sheet lets you copy the look right down to the afterburners.

If you've mastered a trainer, you can build the F-15

With Great Planes' new Auto-Lock™ construction, no advanced skills are necessary to build this jet-like plane. This new interlocking construction lets you simply twist formers inside the fuselage, locking them into place for the most simplified assembly process offered by any R/C kit manufacturer.

A double jig-tab wing builds on any flat work surface and a front-mounted engine and propeller make it far easier to build and fly than any ducted fan jet.

Add Great Planes traditional easy-to-follow, photo-illustrated instructions and you're ready for your first thrilling taste of jet-like excitement...without ever leaving the ground.

"At Great Planes, our goal has always been to make planes that are easy and fun for the modeler to build. With the F-15, we've taken our interlocking construction even further, creating Auto-Lock parts which automatically align while you build. Anyone who is ready to move on from a trainer can have fun with this amazing jet-like model."

Don Anderson

Founder and President
Great Planes Model Manufacturing

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ELECTRIFYING MINIMAX 1000

With very few modifications, this big, super-lightweight, two-channel polyhedral sailplane from Minimax Enterprise makes a terrific electric floater when equipped with a geared Astro 05. Author's first powered flight lasted over an hour!

The graceful 3-meter Minimax 1000 is very lightly built, but has enough inherent strength to handle the weight of an electric power system. Even with a complete electric system aboard, the wing loading is still only 7.5 ounces per square foot—lighter than many comparable "pure" sailplanes.

What pilot of either a full-size or model sailplane hasn't pondered the problem of getting his craft to altitude? He searches through the alternatives again and again, turning them over in his mind. . . but the "clean" solution always seems to just barely elude his grasp. Most pilots of either discipline settle for aero-tow, winch, or bungee assist. Not because they particularly want to; it's more of a lesser-evil sort of thing.

Increasingly, full-scale sailplane pilots are opting for the powered glider approach. For most of us, though, the addition of an infernal combustion engine, even if only used for self-launching, diminishes the appeal of the glider more than the small decrease in soaring performance should logically indicate.

For the model sailplane flier, the glow engine is usually not even considered. With its attendant noise, glop, and starting paraphernalia, it's often a good part of the reason he's flying

The Minimax 1000 is a big model, as demonstrated here by the author's lovely daughter, Mrs. Amber Way.

MINIMAX 1000 ELECTRIC CONVERSION

SPAN	118 inches.
WING AREA	1095 square inches.
TOTAL FLYING WEIGHT	57 ounces.
WING LOADING	7.5 ounces per square foot.
CLIMB RATE	570 feet per minute (measured).
DEAD AIR TIME	30 minutes.

KIT & EQUIPMENT SOURCES

KIT:

- Minimax Enterprise, P.O. Box 2374, Chelan, WA, 98816; (509) 683-1288.
- Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 05495; (802) 658-9482.

MOTOR:

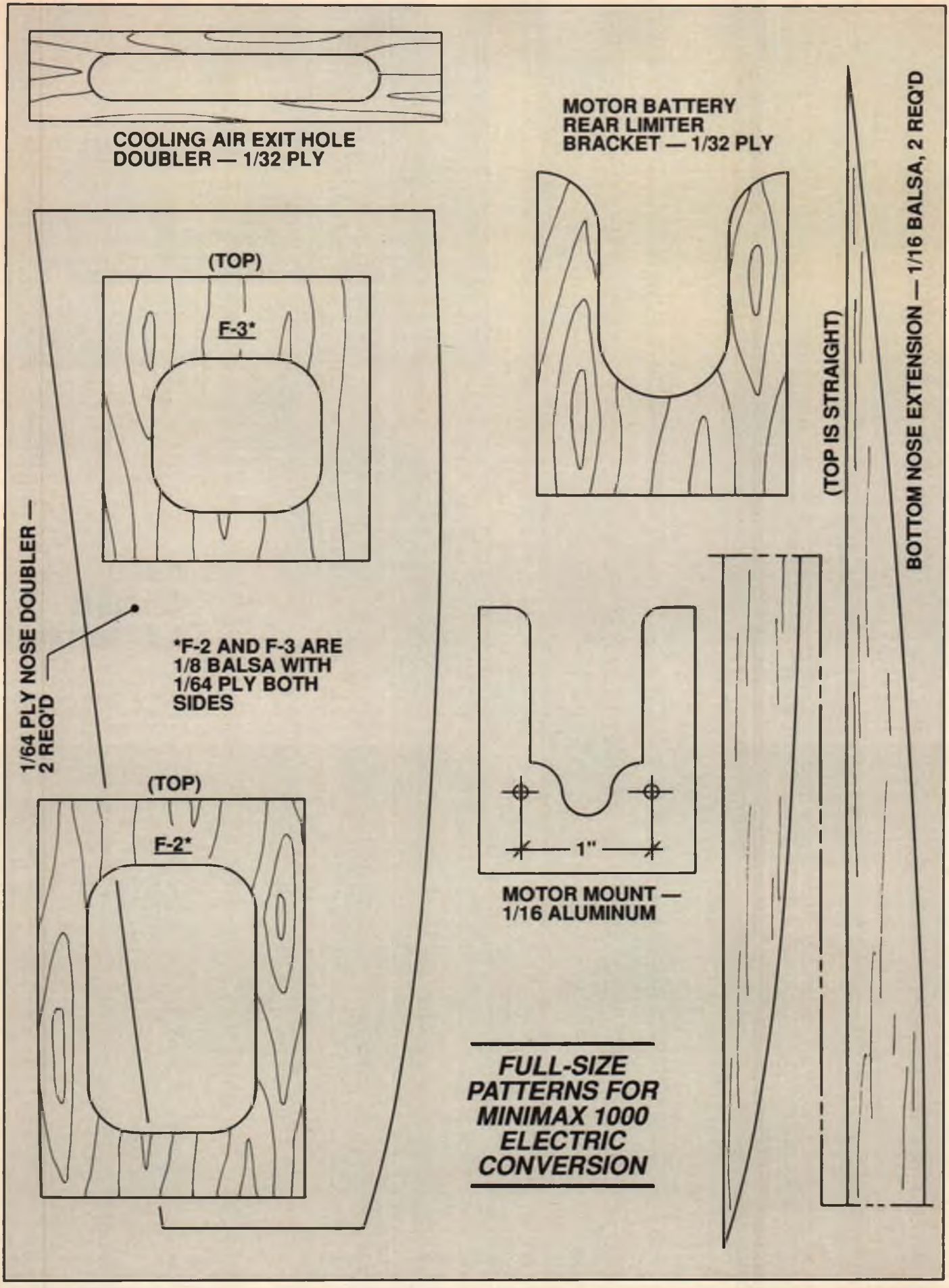
- Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242.

BATTERIES:

- Cermark Electronics and Model Supplies Co., 107 Edward Ave., Fullerton, CA 92633; (714) 680-5888.

BY CRAIG LACHANCE

The author's featherweight electric floats in after another long flight. Dead-air time typically averages 30 minutes, with five climbs to high-start altitude on a single charge.


COOLING AIR EXIT HOLE DOUBLER — 1/32 PLY
MOTOR BATTERY REAR LIMITER BRACKET — 1/32 PLY
(TOP)
F-3*
1/64 PLY NOSE DOUBLER — 2 REQ'D
*F-2 AND F-3 ARE 1/8 BALSA WITH 1/64 PLY BOTH SIDES
(TOP)
F-2*
1"
MOTOR MOUNT — 1/16 ALUMINUM
(TOP IS STRAIGHT)
BOTTOM NOSE EXTENSION — 1/16 BALSA, 2 REQ'D
FULL-SIZE PATTERNS FOR MINIMAX 1000 ELECTRIC CONVERSION

gliders to begin with.

Hand-launching a model into a current of wind flowing up a slope is a neat way to go. . . if the slope and wind are available. Hand launching from a field into a thermal is possible and is real sport, but is too great a challenge for most.

Rocket power is an interesting proposition, but can be quite expensive and is pretty much limited to small, high-speed gliders—not the best choice for thermal flying.

THE SOLUTION

Which leaves electric. Clean, quiet, low drag; but what makes it unique among all methods is that it allows multiple climbs from a single launch.

"Heresy!" someone shouts from the back. "The Purist would never stoop to launching his sailplane with an electric motor!" (As we all turn to view this guy, we see he's got one foot resting on a pair of car batteries that are hooked to—you guessed it—a big automotive starter motor, complete with line-loaded drum. Smiles all around.)

So what are the drawbacks? Not cost; a decent motor, on-off control, charger and a couple of battery packs will cost more than a good high-start, but certainly less than a winch. Complexity? If you can install the radio in the glider, figuring out the motor mounting and hook-ups shouldn't overwhelm you. The weight? Ah ha! However, with the batteries and motors getting more efficient all the time, you may be surprised. What wing loading would you settle for if your sailplane could launch itself? Nine ounces per square foot? Eight? What if you didn't have to give away anything at all?

THE PLANE

Upon first reading the specs for the Minimax glider kits (two 2-meter ships and a 3-meter offering, all at 3.8 ounces per square foot), I was incredulous. What could this designer know that had escaped everyone else? Being fully convinced that the laws of physics apply to liars, fools and realists alike, I concluded that a 29-ounce, 10-foot sailplane was either misleading advertising or would be impractically fragile, and/or would have to be controlled by expensive flyweight radio gear with a 20-minute half-life. Case dismissed.

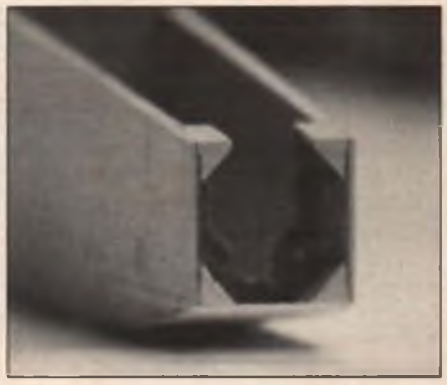
Until I saw one at a trade show. Pretty airplane; the kit was also of impressive quality. I had other projects going at the time, but later called the designer. "Yes, 29 ounces with regular radio gear. Yes, they are normally ballasted with up to two pounds of lead in their belly, but be cautious with the aerobatics at that weight." I ordered a Minimax 1000 kit.

Using standard radio gear (regular servos and a 500-mAH receiver pack) and equipped with a geared Astro 05, this almost stock model flies at 7.5 ounces per square foot. It gets five climbs to high-start height per charge. The first flight (after a few hand tosses) was an hour and 14 minutes in light mid-morning lift. With lighter radio equipment you could be under 7 ounces; utilizing a BEC and a 600-mAH motor battery (two climbs), you'd be in the 5 ounce range.

To accommodate the Astro 05 and its gear drive, the Minimax's nose gets deepened by adding an extension to the bottom of the sheet balsa fuselage sides; the 1/8 square corner longeron follows the curve. What looks like a pushrod exit opening at the tail end is actually the cooling air exit—don't omit it!

New fuselage formers F-2 and F-3 are made of 1/8 balsa with 1/64 plywood faces on both sides. Forward of F-2, the fuselage sides are doubled on the inside with 1/64 ply; between F-2 and F-3, doublers are vertical grain 1/16 sheet balsa.

Motor mount or "firewall" is made of 1/16-inch thick aluminum, which gets glassed in place. The mount's exact location will depend on the spinner used—see text. Make sure your installation includes the proper amount of down and right thrust.



After the motor mount is permanently installed, the forward corners are filled in with triangular balsa blocks and will be carved to conform to the spinner.

Construction is straightforward—nothing exotic here, just solid engineering utilizing the minimum structure to get the job done. Unlike converting other glider kits to electric, there's no need for lightening holes or for substituting thinner material. In fact, I added some 1/64 ply to reinforce the forward fuselage area because I normally fly out of a plowed field. If you have a smoother surface available, that reinforcement would be unnecessary. I also laminated .007-inch carbon fiber onto each of the inboard panel spar caps, although this too may very well be unnecessary. Omitting these two modifications would only save about an ounce, though.

The motor used is an Astro 05 FAI turning a Master Airscrew 12x8 folding prop. Battery is a seven-cell 1700 SCR, which provides five 40-second climbs—enough for honest 30-minute dead-air times. Although the smaller capacity cells (600-900 mAH) are tempting for their lighter weight, they don't make much sense in a sport model. As the motor battery is only a portion of the weight of the propulsion system, increasing the battery capacity (and run time) from 600 mAH to 1700 mAH (2.8 times) increases the weight of the whole propulsion system by only one-third. Of course, the total climb achieved will be somewhat less

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#207 Kwik Switch & Charging Jack
#208 Charging Jack for **#203** Kwik Switch Mount

A protective cover snaps securely into place to prevent dirt and fuel from plugging up the Charging Jack.

Models already equipped with DU-Bro's #203 Kwik Switch Mount, can simply add the #208 Charging Jack.

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#608 Kwik Grip E/Z Connector

#609 Kwik Grip E/Z Connector Wrench

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#601 4-40 Spring Steel Kwik-Links (For .093 Wire) ..... 12/PKG.
#602 Nylon Kwik-Links ..... 12/PKG.
#603 2-56 Solder Kwik-Links (For .072 Wire) ..... 12/PKG.
#604 4-40 Solder Kwik-Links (For .093 Wire) ..... 12/PKG.
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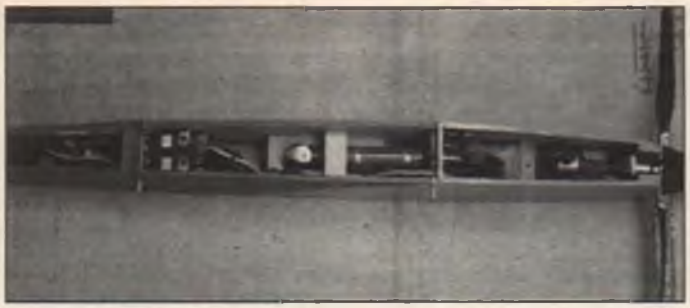
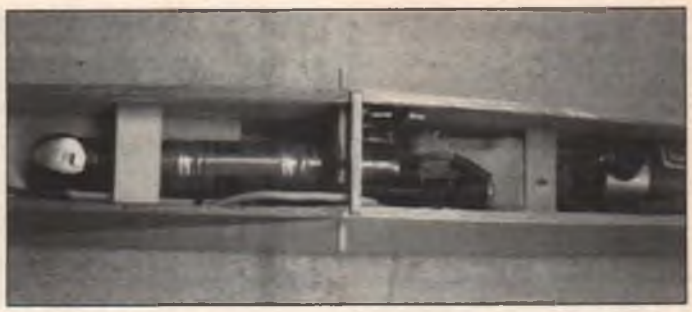




The radio and Astro 05 power system installation in the author's model. The seven-cell motor battery can be removed and installed through the forward hatch without removing the wing. Rudder and elevator servos are mounted under the wing trailing edge, the receiver and radio battery are placed aft of them and are accessible through the rear hatch, if needed. ■ RIGHT: Close-up of the motor battery installation. A chunk of polyurethane foam holds it securely in place, yet allows easy removal for charging.

than 2.8 times as high; the climb *rate* will be reduced slightly due to the increase in weight, but not by much.

If you're looking for a minimum weight ship with the least conversion hassle and maximum hang time, I can heartily recommend this plane. In fact, given those parameters, there's no other kit on the market that comes close. No, you won't be making 1000-foot dives into vertical eights (at least not twice), but the structure is sufficiently strong for normal flight loads. Also a nice touch: you won't find a more precisely cut kit at any price.

THE DETAILS

In this conversion the needed modifications to the airframe were minimal. As mentioned earlier, no lightening was necessary, and what strengthening of the wing and forward fuselage occurred was accomplished more for insurance than out of definite need.

Doublers of 1/64 plywood were glued to the inner fuselage sides from former F-2 forward; the fuselage bottom was also covered with 1/64 ply over the kit's 1/16 balsa flooring forward of the wing bay area. It is necessary to deepen the forward fuselage to accommodate the Astro geared motor; formers F-2 and F-3 must be made slightly wider and longer to allow everything to fit. Face each side of a piece of 1/8 balsa sheet with 1/64 ply to make these formers. Cutting out their center sections allows for another necessity in the conversion—a cooling airflow over the motor and batteries. Make the air exit hole the same size as shown on the doubler template; the location is not critical (I like to hide it under the stab), but the size is—at least more so than the inlet size. If the air exit is large enough, it will draw sufficient flow from the opening behind the spinner that air scoops will probably be unnecessary. If the air exit is non-existent or too small, increasing the inlet size will have little or no effect on cooling.

Access to the receiver and its battery was accomplished by a simple hatch cover behind former F-3 in the aft fuselage. As access is only occasionally needed here, a wood screw into a hardwood support holds one end of the hatch while a plywood lip secures the other end. On the forward fuselage a pull-off cover is used to expose the motor and allow access to the motor battery. The battery can be changed after first removing a piece of foam wedged between it and the hatch hold-down bracket. The battery is unable to move forward and thus slide out until that foam is removed. In flight it is also unable to move side-to-side or up and down or rearward because it is captured by former F2 in the front and by the limiting brackets and fuselage bottom in the rear. This method is absolutely secure but still allows the batteries to be changed in 15 seconds.

If you're looking for a minimum weight ship with the least conversion hassle, I can heartily recommend this plane.

The hatch hold-down itself is simply a piece of music wire glassed to the underside of the hatch and bent to engage a hole in the 1/16 ply cross brace in the fuselage. Depending on how the engagement prong is bent and the size of the hole in the plywood, the hold-down tension is easily adjusted. Balsa tabs on the sides of the hatch contact the fuselage sides as it comes down into place to maintain alignment.

The motor is most easily mounted onto a 1/16-inch thick aluminum plate firewall using 4-40 socket-head screws that are slightly longer than the stock ones that hold the gearbox to the motor. They must be longer by only the thickness of the motor mount; if they protrude into the motor any farther than the original screws, the armature may hit the screws and be ruined. I purchased 3/4-inch long 4-40s and ground them to the proper length.

To find the correct position for the motor mount, first trim the front edge of the right fuselage side 1/16-inch shorter than the left—this will give the needed right thrust. Using a line drawn parallel to the horizontal stabilizer as a reference for a 0-degree thrustline, trim the front of each fuselage side to be perpendicular to this line. Next trim the front of each side to a line drawn from the corner of the top to a point 1/8-inch back from the bottom corner; this will provide the down thrust.

Screw the firewall to the motor and gearbox, then add the prop and spinner. Position this assembly in the fuselage and maintain a 1/8-inch gap between the fuselage ends and the back of the spinner as you tack the firewall in place with thick CA. When dry, remove the motor (leaving the firewall in place) and reinforce the fuselage-to-mount joints with 1/2-inch wide strips of light fiberglass. Lightly spray them on one side with 3M "77" spray adhesive, stick them in place and then saturate them with thin CA.

Fill in the inside corners of the cowl area with triangular balsa before sanding the nose area to the spinner's contour. Then glass the first two inches of the nose area with lightweight glass and CA. Later, when you're ready for final installation of the motor, mount the gearbox to the motor with the original (shorter) 4-40 screws. Cover the two gearbox openings with electrical tape, then remove the screws. The tape will hold the motor and gearbox aligned as you position them behind the motor mount (as well as later keeping the lubricant in and any grit out); then install the longer set of screws through the firewall and into the gearbox and motor.

A note on antenna routing: I always put a Deans pin connector in the antenna wire a few inches from the receiver so that I can change receivers between planes without fishing antennas in and out. (Leave the antenna the original length; the connector causes no degradation in range.) I dislike dangling antenna wires, so mine exits the fuselage and is hidden along the underside of the elevator hinge line. Be sure to range check the model before the first flight with and without the motor running. You can remove the prop to do this if there's no one available to hold the plane.

THE END. . . OR BEGINNING?

That's it! As you can see, a very simple and straightforward conversion with many possibilities for performance improvements over what has been presented here. Although electric propulsion will never be everyone's solution for sailplane launching, the performance and convenience of the converted Minimax 1000 may give some holdouts reason to re-think their position. ***MB***

FREE FLIGHT

BY BOB STALICK

Get Ready for October!

This is a great time of year if you are a free flighter, but the absolute, most crushing, awesome and unbelievable free flighter's pork-out of all time is yet to come. Take a look at the contest schedule for the month of October. The World FAI Free Flight Championships will be held at Lost Hills, California, during the week of October 4-9. After that you can head a few miles south and enjoy the week of October 11-15 at Taft, where the SAM Old Timer Champs will be underway. On October 2-3, the Juan Livotto FAI meet will take place, and the Sierra Cup follows the whole shebang on October 16-17 up north in Sacramento.

You will never find such a juxtaposition of planets as will occur in October. If you can make it at all, do what you can to get there. If you want to help with the events at the World Champs, you can become an official helper, timer or other contributor. Contact Bob White, 1030 Normunbega Dr., Monrovia, CA 91016. Do it now; the deadline for getting your name in Bob's hands is immediate.

Lyman Armstrong and his Veco .31 powered B/C Zeek, photographed at the Yuba County (California) Airport venue in 1951. A little bit of Nostalgia and lots of open space in the background. Photo supplied by Lyman Armstrong.

Vic Cunnyngham Jr. tries to hide behind his very successful Diablo Class C model. The scene is Taft, California, at the 1989 U.S. FF Champs. Vic is a master of trimming models with tissue paper, and is presently in the process of preparing an article for *Model Builder* on that very subject. Photo by Bruce Augustus.

JULY THREE-VIEW: BEWITCHED F1J

by John Carbone

John Carbone is a member of the Skyscrapers of New York, from whose newsletter this month's three-view comes. What is significant about this is that it was the Skyscrapers who originally provided the inspiration for the F1J event, which has now become one of the most popular power events on the schedule. So it comes as no surprise that John would give this event a try. Bewitched is the model that won the F1J event at the 1991 Nationals and placed 3rd in 1992. The engine of choice on this ship is the Cox Tee Dee .049. John has also flown the model with a Shuriken, and according to him, the model flies the same, just faster.

Compared to the Pegasus and the Northern Light F1J models featured recently in *Model Builder*, the Bewitched is smaller and lighter... more like a typical 1/2A gas model. For a 300 square inch model, it is very light, with an all-up weight of just 7 ounces. It has no gadgets, in contrast with the Pegasus, and uses no high-tech materials such as carbon fiber and the like.

Bewitched would be a good performer for either 1/2A or F1J. If you like its looks, you can get full-size plans directly from John Carbone, 394 Oakwood Rd., Huntington Station, NY 11746; $8.00 postpaid.

JULY MYSTERY MODEL

Well, gang, I've got a stumper for you this time. This is a design that will throw everyone a great big curve. I doubt that anyone will guess the name of this ship. How's that for a challenge?

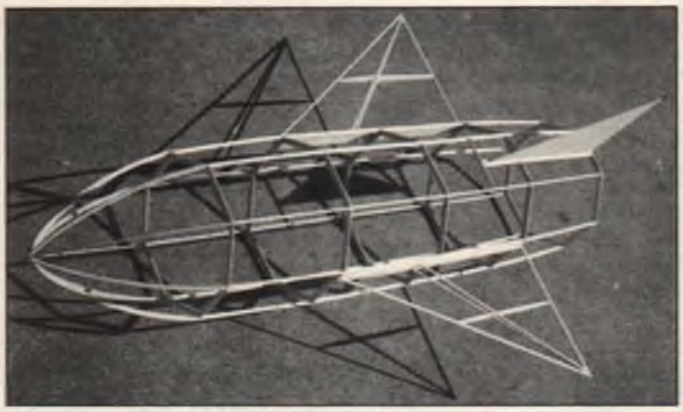
This model will make some of you think of Shulman's Wedgy, but it isn't. According to the designer, it was designed after reading a series of articles by C.H. Grant on the theory of Center of Lateral Area. The designer, being outside the U.S., was not aware of the Wedgy, and conceived this model on his own. Because it has dramatically similar form and outline, especially in the fuselage, it shows that great minds run in the same channels.

So, smart guy, you think you know the name of this month's Mystery Model? If so, write it on a postcard or in a letter and send off to *Model Builder* magazine. The person with the correct answer, who has his name drawn from among the correct entries, will win a one-year subscription to my favorite magazine. Do it soon.

APRIL MYSTERY MODEL WINNER

"Forget those fuel cans, CO_2 capsules, jet pellets, and rubber strands—just blow, brother, blow!" Thus began the article for Paul DelGatto's "Flying Ballooney," featured in the June 1955 issue of *Flying Models*. The model was basically a streamlined octagonal tube of very light construction, open at the back, equipped with built-up wings and a sheet balsa fin, and powered by the thrust provided from a blown-up balloon inserted through the open aft end! Power was low and didn't last long, but, as a couple of readers who had built one wrote, it was still a lot of fun to mess with.

Of the seven correct entries received, the one that surfaced



Coincidentally, when we featured Paul DelGatto's "Flying Balloney" as the April Mystery Model, Steve Staples, of Little Rock, Arkansas, had just finished framing one up and sent this photo along with his entry. An inflated balloon is installed through the open rear end and provides the thrust for flight.

as the winner of the complimentary *MB* subscription was James W. Patten of Urbana, Ohio.

1/2A NOSTALGIA ENGINE TESTS

Some time ago, during the big flap about the relative merits of various 1/2A Nostalgia engines, I decided to run a test on the engines that I had on hand. The argument, if you recall, contended that most people could not find suitable and powerful 1/2A engines at a reasonable price, so the NFFS Nostalgia Committee should allow such contemporary engines as Cox Medallions or Tee Dees to participate. The NFFS has since ruled that these are not legal, and most areas of the country are following these rules.

During the course of the arguments, however, the NFFS committee voted to allow Tee Dee racing heads in Nostalgia competition, so the performance of the reed-valve engines can be improved slightly with this change.

I gathered five engines to test. All of these were from my own collection and represented the best examples of those available to me. I didn't have a Cox Medallion .049, so I went to the local hobby shop and forked over $45 for a new one. All tests were conducted one afternoon in Oregon—the temperature at the time of the tests was 73 degrees and the humidity was 58 percent. All engines used the same APC 5.7x3 propeller and the same fuels (Sig 35 percent and Magnum 50 percent). All engines were tached by an Ace digital tachometer.

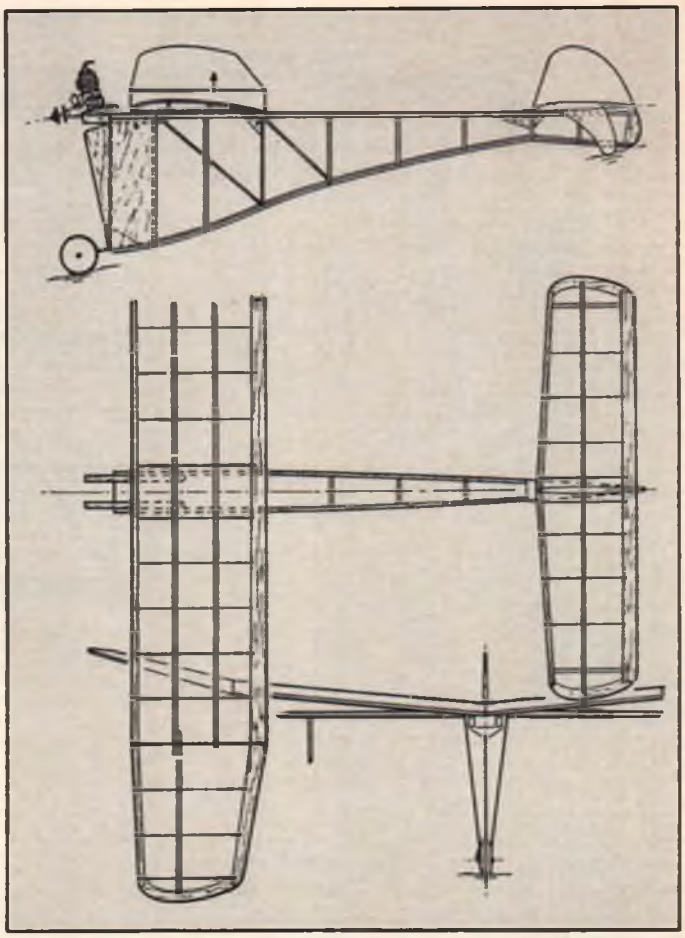
Engine Test Results

	35% fuel	50% fuel
Cox 290 (46 grams)		
Cox sport head	15,800	—
Cox racing head	16,700	16,900
Cox Space Hopper (38 grams)		
Cox sport head	17,300	17,800
Cox racing head	17,400	18,400
Cox Medallion (47 grams)		
Cox sport head	17,000	—
Cox racing head	17,000*	—
Holland Hornet (47 grams)		
	16,900	18,100
Cox Tee Dee .049 (48 grams)		
Cox racing head	19,200	20,100

*Indicates inability to maintain a steady engine run.

The engines used were a Cox 290 with a two-port cylinder and open exhaust ports (not slits); a Cox Medallion with the slitted exhaust ports; a Cox Space Hopper; a Holland Hornet Mk.II, and a Cox Tee Dee .049 used as a comparison engine. The Hornet, the Medallion and the Tee Dee were fitted with pacifier pressure systems for the test.

The tests leave little doubt that the Holland Hornet and the Cox Space Hopper are the best engines to use for 1/2A Nostalgia. But don't overlook the possibility of the Cox 290 engines, as they can be picked up at swap meets for a couple of bucks, and parts can be mixed and matched to give good performance.



MYSTERY MODEL

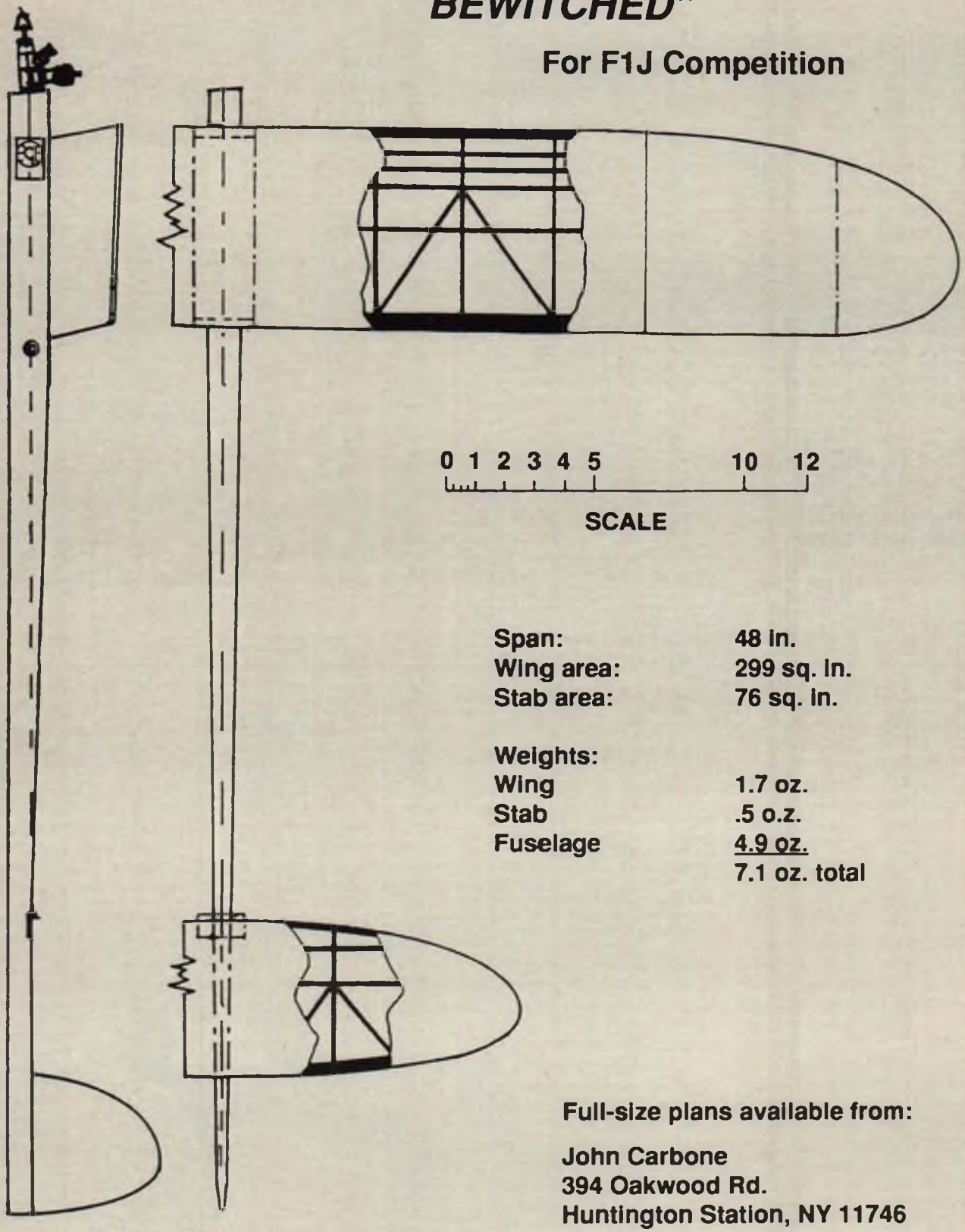
Although the Medallion I tested wasn't given adequate break-in time to be truly loose, it didn't seem to have much of a future as a powerful Nostalgia engine. One of the problems with the Medallion is that it can be made to run like a Tee Dee by switching engine parts, since the only exterior difference between it and a Tee Dee is the carburetor assembly. Because the Tee Dee has been outlawed for Nostalgia competition for a number of years, the use of the Medallion crankcase with Tee Dee parts becomes a real possibility for overzealous competitors. I think the NFFS Nostalgia Committee is to be commended for its stand in removing both the Medallion and the Tee Dee from the list of Nostal-

A Pacific Ace with its tongue hanging out. Capt. Doug Hannay of Vancouver, B.C., Canada has been flying this little ship for many years. Here the forlorn-looking beast appears to be resting in its winding stooge just waiting to be tossed into the air for another exhausting flight. Photo by Bob Stalick.

John Carbone's

"BEWITCHED"

For F1J Competition



0 1 2 3 4 5 10 12

SCALE

Span:	48 in.
Wing area:	299 sq. in.
Stab area:	76 sq. in.
Weights:	
Wing	1.7 oz.
Stab	.5 o.z.
Fuselage	4.9 oz.
	7.1 oz. total

Full-size plans available from:

John Carbone
394 Oakwood Rd.
Huntington Station, NY 11746

Cost: $8.00 postpaid

gia-legal engines.

PEGASUS PARTS

Bill Lynch, designer of the Pegasus F1J record holder and importer of AD engines, writes to say that he has developed a source of parts for anyone interested in building a Pegasus or similar ship. What Bill has is an aluminum firewall insert to fit the AD engine and a carbon fiber fuselage tube. This unit sells for $10. He also has a fuel cutoff and skid system that goes for $14, and an AD engine backplate with mounting ring for $10. If you want the whole assembly, it sells for $32.50. If you are interested in these items, contact Bill Lynch, 11137 Creekhaven Ct., Auburn, CA 95603.

Bill also has made arrangements for Ken Oliver to make the carbon fiber and aluminum fuselages with stab mounts to fit either the Pegasus or Hurry Up designs. Ken will make these units to order. The cost is $45 per unit. Contact Ken at 2213 El Cejo Circle, Rancho Cordova, CA 95670.

CORRECTIONS TIME

In the April 1993 issue I wrote about the wonderful service that Dick Gleason of Gleason Enterprises was providing to modelers. I waxed eloquently about this and that, and gave what turned out to be all kinds of erroneous information. As you might expect, Dick contacted me and asked for some corrections to be made, as follows:

"The plan catalog number 5-8N is the most recent update. It lists all plans available along with duplicate magazines. It is currently in the process of a complete overhaul and update to add over 1500 more plans of all types and to revise the layout for the use of an ACCO two-prong fastener to make it easier to utilize quarterly revisions. It will be basically the same except that each model type listing will be in its own page numbered section to simplify handling the revisions. Cost of the current catalog is $2.75.

"The Non-Scale Published Sources is a printout of my computer file containing 3050 models. The master list goes for $5 postpaid in the U.S. and Canada. These published plan sources have been cataloged only through February 1984. For those modelers with specific interests, i.e., CL, FF, Gliders, RC and Rubber, this computer file is available sorted accordingly for $2.50 each postpaid.

"In addition to the above, I can offer good results enlarging plans from magazines that are not available anywhere. Also, existing plans can be enlarged or reduced to a limited extent. Since I have a nearly complete model magazine collection, I can provide article copies of just about anything."

I hope all readers who were contacting Dick Gleason based upon the April issue will make corrections in their references. If in doubt, call Dick at (507) 437-3781, or write to Gleason Enterprises, 1106 10th Dr., Austin, MN 55912.

THE .010 SCENE

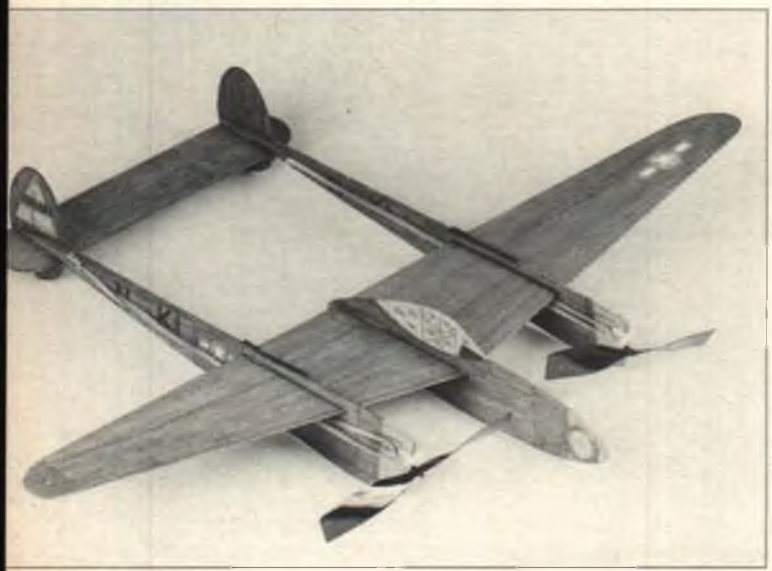
A reminder for all of you who are planning to build and fly .010 ships this summer. If you want to enter the *Model Builder* Mini-Power contest and get in on some nice prizes, such as Cox Tee Dee .010 engines, *MB* subscriptions and the like, drop a note for the entry details to Bob Stalick, 5066 N.W. Picadilly Circle, Albany, OR 97321. And keep building and trimming those little beasts. It should be a blast this summer! ***MB***

THE LOCKHEED P-38 FOR PROFILE RUBBER

Keep the kids busy for an afternoon or two with this simple, all-balsa, twin-engine warbird. Step-by-step building instructions are included right on the plans.

BY THOMAS HERR

The author has built P-38s both with and without landing gear; the gear-up version is of course the longer and higher flying of the two, but sacrifices the enjoyment of ROG takeoffs. The solution? Build one of each! Note the three-blade props on the wheeled model; they're each made from three red North Pacific props with one blade cut off and the hub trimmed such that one blade has the forward third of the hub, another blade the middle third and the last blade the rear third. Then they're put together on a wire shaft, the blades spaced 120 degrees apart and the hub sections epoxied together, forming a one-piece unit. Tom credits Bill Hannan with this idea and reports that while you can't beat the three-bladers for appearance, the model actually flies best with the stock two-blade props.



The Lockheed P-38 was one of the most graceful aircraft to fly for the Allied powers during WWII. During early 1937, a time when biplanes were still commonplace and airplanes like the DC-3 were still cutting their teeth, the Army Air Corps laid down specifications for a new aircraft that would be used for "the tactical mission of interception and attack of hostile aircraft at high altitude."

Lockheed Aircraft, under the direction of Clarence L. "Kelly" Johnson, developed the P-38 to meet these requirements. First flown in January 1939, the P-38 evolved into one of the great aircraft of the war, and of all time. Today, the P-38 survives in museums and in the hands of a few collectors. A very small number still are flown occasionally at airshows.

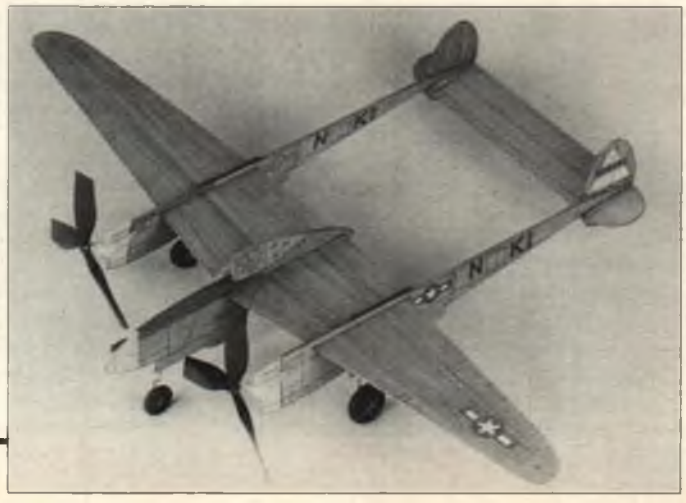
The P-38 is a good candidate for a rubber model. Its twin booms and rudders allow for long motors and good stability. The model has a wingspan of 24 inches. The illustrations on the plan pretty much explain the building of the model. Select your wood carefully. Keep the tail as light as possible to minimize the need to add nose weight. Make sure that all of your wood is free of warps. Warps can be removed by holding the wood in front of a hair dryer while twisting the warp out. Hold the wood straight while allowing it to cool.

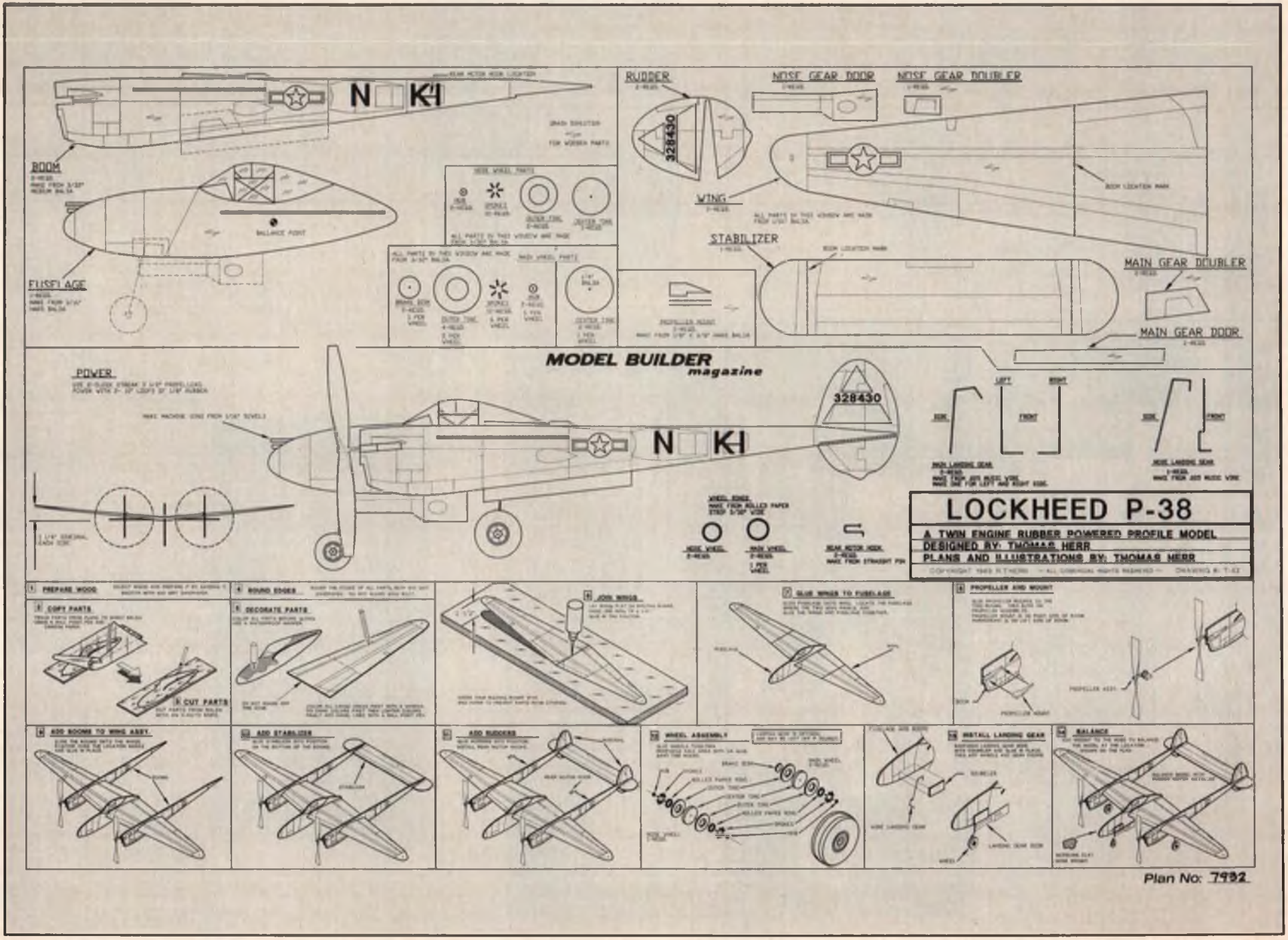
Take your time to decorate your model carefully and I am sure you will be pleased with the results. A quick and easy way to decorate the model is to use waterproof felt-tip markers. When using the markers on balsa, you must be careful not to let the colors bleed together or into an area you wish to leave uncolored, so practice on some scrap pieces until you have developed the proper technique.

Use the following sequence to decorate the model. First, using a black ballpoint pen, draw the panel lines and markings that separate areas of different colors. Then, using permanent markers (not water-based), color the model using any colors you chose. Last, using the ballpoint pen again, add the rest of the panel lines and any other details you like.

To fly your model, first test glide it with no power. This should be done in a field of tall grass, free of obstructions and spectators. Trim the model so it has a shallow flat glide. When you get the glide close to where you want it, you can start winding the rubber motors. Slowly increase the number of winds while continuing the trimming process, until you are flying with full power.

The North Pacific nylon prop mounts can be bent with your fingers to adjust the thrustlines. Count the turns as you wind the rubber motors, so that you're sure the model has equal power in both motors. Both of my P-38s climb in a right-hand circle and glide in a left-hand circle. The P-38 is very solid and stable, and provides a very satisfying sight in the air. ***MB***

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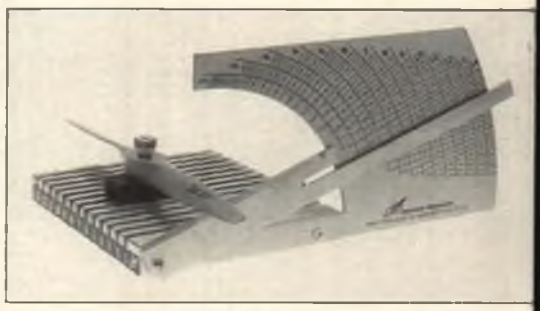
LOCKHEED P-38
A TWIN ENGINE RUBBER POWERED PROFILE MODEL
DESIGNED BY: THOMAS HERR
PLANS AND ILLUSTRATIONS BY: THOMAS HERR
1 PREPARE WOOD
2 COPY PARTS
3 CUT PARTS
4 ROUND EDGES
5 DECORATE PARTS
6 JOIN WINGS
7 GLUE WINGS TO FUSELAGE
8 PROPELLER AND MOUNT
9 ADD BOOMS TO WING ASSY.
10 ADD STABILIZER
11 ADD RUDDERS
12 WHEEL ASSEMBLY
13 INSTALL LANDING GEAR
14 BALANCE
Plan No: 7992

COUNTER *continued from page 11*

FIND YOUR PITCH

Terry Prather wrote to say that his company's precision-made prop pitch gauge, which has been unavailable for the past couple of years, is back in production. Priced at $59.95, the tool can detect variations in pitch from one blade to another and can also be used to alter a prop's pitch. It will



work on props up to 12 inches in diameter and at pitches from 3 to 15 inches. Complete instructions are included, along with tips from Terry Prather himself on how to optimize your prop/engine combination for maximum performance.

From Prather Products, 1660 Ravenna Ave., Wilmington, CA 90744; (310) 835-4764.

PRECISION AERO'S SUKHOI

The Russian Sukhoi SU-26M, currently the hot ticket in the world of full-size competition aerobatics, is now available to modelers in the form of a new kit from Precision Aero. There are actually two kits offered for the same model: the budget kit ($69.95 plus $6.50 S&H) includes plastic parts, foam cores, hardware, and plywood parts, but no balsa; the deluxe kit goes for $99.95 plus $7.50 S&H and includes all of the above plus all balsa, and many of the balsa parts are pre-cut for you. The finished model spans 54 inches, weighs 4-1/2 to 5 pounds ready to fly and is designed for a hot .35 to .45 two-stroke.

An information pack on this and the other models in Precision Aero's kit line can be had by sending an SASE to Precision Aero, 1561 River Highlands Dr., Oconomowoc, WI 53066; (414) 567-5341. ***MB***

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Comprehensive histories of these classic and antique airplanes - and their builders - are detailed and illustrated. Hundreds of photos, in each book, including original factory photos. Includes the planes, the men, the families. The complete story. Internationally Acclaimed - Our authors are the leaders in Aviation Heritage. Our goal is to continue to give you the best in Aviation Heritage.

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The definitive and revealing biography of aviation pioneer, promoter and entrepreneur Donald A. Luscombe, his airplanes, and the men who shared these ambitions. This comprehensive work draws upon factual sources, family records and former company employee interviews to detail the development, flight testing, production, financing and marketing of the Monocoupe, Monocoach, Monoprep, Phantom, Ghost, Model 4 and Model 8 airplanes. Highly illustrated with over 400 never before published black and white and color photographs. Great line drawings and color profiles. Includes MONOCOUPE History, 6 color pages. 8 1/2" x 11" 335 pgs., 475 photos line drawings & color profiles.
Softbound, #109, $26.95; Hardbound, #109-A, $36.95.

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The complete story of the Taylorcraft Company and its airplanes are detailed in the new book, the Taylorcraft Story. The incredibly detailed history of C.G. Taylor and 65 years of Taylor and Taylorcraft airplanes. Hundreds of photos of famous people, planes under construction, original ads, articles, letters, and all the models from the first Taylor Chummy to the first Taylor E-2 Cub to the first Taylorcraft to the new F-22s, to include the production of the 13,000 Taylorcraft aircraft, including the British Auster model. 3-views of each model, plus a wealth of information from primary sources portrays the technical, financial, and marketing through the latest rebirth of Taylorcraft which still produces airplanes in 1992. Foreword by C.G.'s son, Bob Taylor. Specs, performance data, factory shots, early testing and construction, profiles of every model, engine specs, simply the most complete history available. The first and only Taylorcraft book! 8 1/2" x 11", 256 pgs., 423 photos.
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WACO - SYMBOL OF COURAGE & EXCELLENCE — By Fred Kobernuss

Deals with the evolvement of the largest producer of commercial aircraft during the 1920s and '30s. For example, in 1927 this company built 460 airplanes while Boeing rolled out 25. Detailed history of the early personalities, early airplanes, up to Waco Model 9, and early airplane companies which existed before the formation of the Waco Aircraft Company. Airplanes include: 15 hp biplanes, DBJ biplane "Scout", Cootie #1, #2 & #3, and Waco Models - Waco 4, Waco 5, Waco 6, Waco 7 and Waco 8. Includes the inside story of the developmental stages of the Ohio Aviation School, the DBJ Aeroplane Co., the Weaver Aircraft Co., and the Advance Aircraft Co. Comprehensive "Waco" history from 1910 to 1925. 8 1/2" x 11", 190 pgs., 150+ photos.
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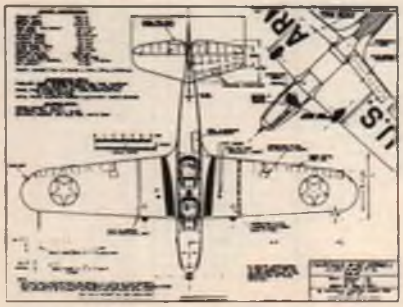
AERONCA - A PHOTO HISTORY — By John Houser & Bob Hollenbaugh

Includes interesting historical tidbits with comprehensive photographic treatment of Aeronca C-2, C-3, Model L (Low Wing), Model K, Pre War Chief, Model T (Trainer), TA (Defenders), Liaisons, TG-5 Gliders, Aeronca-built Fairchild Primary Trainers, Model 7 Champion, Model 11 Chief, Model 15 Sedan, Experimental Types, and Aeronca Engines. Includes All Variants. Illustrated with photographs the many different models of Aeronca aircraft, together with related photos of general interest, all arranged chronologically. 8 1/2" x 11", 138 pages, 250 photos, Chronological Listings, Pre War Production Chart, Post War Production Chart, Aeronca models with Power Plants, ATC Years of Manufacture, Comparison Specifications, & Appropriate Remarks per Model. Softbound, #701, Only $14.95.

PIPER CUBS — By Peter Bowers

A classic presentation of the most famous airplane in the world. The "Cub" is many airplanes as Model production stretched over more than a half-century. Model-by-model, Bowers traces the evolution of the Cub including more than 200 illustrations detailing the differences in models and the myriad ways the Cub has and does perform aviation activities. The book describes each of the designated Cub models in sufficient detail to enable you to distinguish visually between such J-3 Cubs as the J-3C-40 and the J-3C-65, the prewar and postwar J-3C-65s, and the PA-18-125 and PA-18-135. Separate chapters describe some of the unique activities of the Cubs and the modifications that ingenious owners and operators have made to the basic tandem two-seater Cub to make it the world's most versatile airplane. 7 1/2" x 9 1/2", 240 pages, 227 photos & illustrations, 8 pages of full-color 3-view drawings, Specifications, Index. Softbound, #248, Only $17.95.



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BY LOUIS GARWOOD

The Super Cheetah from Cheetah Models

The Super Cheetah is the perfect glider for the slope flier who likes to build fast and fly fast. And not just fly fast, but smoothly penetrate into high winds. It is also a durable model for hotdoggers who like to fly close to the hill (which causes many accidental landings). If you fit this description, this is the plane for you!

My name is Louis Garwood, and I'm 14 years old. I have been flying RC for three years. The Super Cheetah is my seventh RC model, most of which have been gliders of one kind or another. In a plane I enjoy speed and maneuverability. I also like to do aerobatics. I fly both thermal and slope, but I like slope much better. I like it because there is more excitement and the flying is done close to the ground. Also, on the slope you never have to search for lift.

When I opened the box of my newly received Cheetah Models Super Cheetah I was surprised and pleased to see how much work was already completed. The kit contains the polyethylene plastic molded fuselage, the foam wing and tail cores, spars, leading edge, sub-trailing edge and aileron stock, Kromekoat wing skinning material, and hardware for the control system. It also contains a five-page instruction manual with 11 diagrams. The fuselage is guaranteed against breakage, and the other parts are available as replacements if needed.

The cost of building this model is well under $100, with $52.95 for the kit, $11.50 for Cheetah Models Wing Skin Mounting Tape, and $25.98 for two rolls of covering.

CONSTRUCTION

The Super Cheetah is great for people

SUPER CHEETAH SLOPE GLIDER

WINGSPAN	64 inches.
WING AREA	496 square inches.
FLYING WEIGHT	34-36 ounces.
WING LOADING	10.45 ounces per square foot.
OVERALL LENGTH	35.5 inches.
RADIO	Two channels (ailerons and elevator).
SUGGESTED RETAIL	$52.95.

REVIEW MODEL

FLYING WEIGHT	47.6 ounces.
WING LOADING	13.82 ounces per square foot.
RADIO	Futaba mini four-channel receiver, two S148 standard servos, 500 mAH battery pack.

Kit produced by Cheetah Models, 14725 Bessemer St. Unit B, Van Nuys, CA 91411; (818) 781-4544.

Completed Super Cheetah weighed in at just over 47 ounces with standard Futaba S148 servos and a 500-mAH battery pack aboard. Wing and tail surfaces were covered and trimmed with Coverite Black Baron film; shark mouth and eye markings on the fuselage were made with Sig Super Trim stick-on film. Photo by Dave Garwood.

■ LEFT: The Super Cheetah cruises in slope lift over the Atlantic Ocean off Cape Cod, Massachusetts. Photo by Dave Garwood. ■ ABOVE: Lou launches the Super Cheetah into a 15 mph wind over Cape Cod Bay. Dave Garwood photo.

who are on a budget and don't want to spend a lot of time building. The kit goes together quickly, since most of it is already done. On the tail feathers, you merely put a balsa "frame" around each foam core, then cover them with the supplied Kromekoat skin material and tape. This is done by cutting the Kromekoat to size, sticking the tape to it, peeling off the backing, and sticking it to the foam core. I found this to be a very easy and effective covering method.

The wing comes next. This was also simple and quick. After gluing on the spars, leading edges and the sub-trailing edges, it too gets covered with the Kromekoat wing skin. After joining the halves with epoxy, the wing can be used as is or finished with paint or heat-shrink film.

While this was my second foam core aircraft, it was the first time I had used the double-sided wing skin mounting tape. This is a good method for skinning foam wings, because it applies the right amount of glue, spreads the adhesive evenly, and it prevents getting glue on your hands. It does take a little longer to do than spray contact

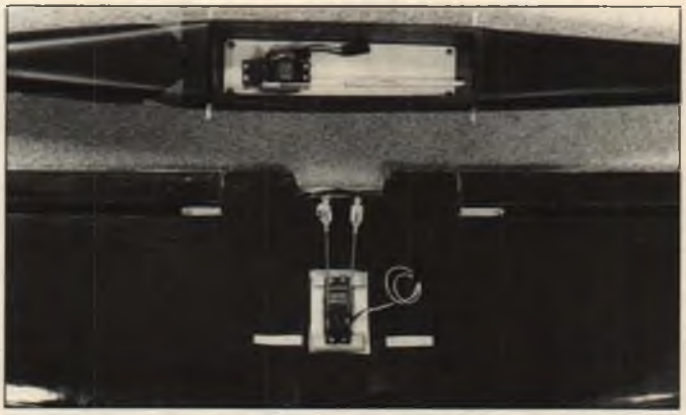
The Super Cheetah kit consists of foam cores for the wings, fin and stab; spruce spars, balsa leading and sub-trailing edge stock, aileron stock, rotationally molded cross-linked polyethylene fuselage (available in six different colors), "Kromekoat" wing sheeting material, and instructions.

Lou spreads slow-curing epoxy into the spar notches in the wing cores before installing the spruce spars. Wings are then put back in their beds and weighted and left to cure overnight.

Leading edge and sub-trailing edge balsa stock are attached to the wing cores with Titebond aliphatic resin carpenter's glue. When dry, they are sanded down, blending them smoothly into the airfoil shape. A long sanding block with fresh sandpaper makes this a quick job.

The recommended adhesive for attaching the KromeKoat wing skins to the foam cores is thin double-sided tape (available separately from Cheetah Models). It's plenty strong and easy to use for less-experienced foam wing builders. "Kromekoat" is .010-inch thick—.008 on the tail surfaces—white card stock with a shiny surface, and makes for an extremely durable model.

Lou covers the skinned wings with Coverite Black Baron Film to seal the structure and provide a base for colorful markings.



The elevator servo mounts on a plywood tray cut to fit the molded fuselage. The aileron servo mounts in the wing and is hooked to the ailerons via torque rods. Radio receiver and battery slide up into the nose when the servo tray is removed.

cement or epoxy. The tape is plenty strong and won't peel off.

The Super Cheetah's control system is like a lot of other slope soarers, with the elevator servo mounted in the fuselage and connected to the elevator with a pushrod, and the aileron servo mounted in the wing and connected to the ailerons by torque rods. The receiver and battery pack slide up into the nose area when the elevator servo tray is removed. I had to add a lot of nose weight to get my model to balance properly, the result being a flying weight of 47-1/2 ounces. Total building time was only 18 hours over 11 days.

FLYING

The Super Cheetah flies very smoothly because it is so heavy. I first test-glided it in the soccer field at a local high school. It stayed up surprisingly long despite its weight. The first real slope flights were made during a three-day flying session at Cape Cod Bay. The first two days were flown in 15-20 mph winds. I made many passes, low and high, far and close, to get the feel of the plane. I liked the Super Cheetah's flight performance right from the start. It rolls smoothly but slowly. It does very well inverted. At a flying weight of 47 ounces, loops have to be entered with the model moving quite fast, otherwise it tends to lose speed and flop over. This airplane will withstand any conditions on the slope with winds higher than 15 mph. On the third day of flying I flew it in 40 mph winds gusting to 55 mph and it did just fine.

SUMMARY

If you're on a tight schedule and a limited budget, this is a superb aircraft. It flies solidly like a bomber and builds quickly, almost like an ARF. This is how I like my models, and I thoroughly enjoyed this one. ***MB***

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What's more, it packs this extraordinary selectivity plus six channel capacity into a wafer-thin, single-deck package weighing only one ounce—the same weight as many special-order-only, "micro" size *four* channel receivers.

All by itself, the 226X is reason enough to choose a Max. But there's more.

JR QUALITY THROUGH AND THROUGH.

Pick up a Max transmitter and you'll notice something special right away. You'll notice that it cradles in your hands perfectly.

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feel the difference!

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The entire model and paraglider/hang glider launch and flying areas at Torrey Pines are visible in this shot, taken by our columnist from the front seat of a Schweitzer 2-33. While building just off the wingtip is the restaurant/pilot shop. Bill got to talking with instructor John Duprey of the Associated Glider Clubs of Southern California and wound up going aloft for the first launch of the day. . . the lucky bum! In Bill's words: "E-ticket all the way!"

TORREY PINES GLIDERPORT

—SAN DIEGO HISTORICAL SITE NO. 315

Southern California's premiere slope soaring venue was recently declared a historical site by the city of San Diego, thus foiling any future plans to develop the area. In celebration, scale sailplane modelers and full-scale pilots converged on Torrey for a great weekend of flying fun.

RC SOARING BY BILL FORREY

Soaring enthusiasts the world over—whether they favor full-size sailplanes, model sailplanes, hang gliders or paragliders—can mark March 21, 1993 on their calendars as the day that California's Torrey Pines Gliderport was officially declared a San Diego City historical site. What this means is that the city-owned portion of Torrey Pines City Park (known as the Gliderport) has been saved from any form of land development, which would preclude the use of this famous cliff by any kind of motorless flight.

Responsible for this official action was a large group of very noteworthy and influential people organized, inspired and motivated by former *Model Builder* Soaring columnist Dr. Larry Fogel, his wife Eva and son Gary.

Declared "Torrey Pines Gliderport Day" by San Diego City Councilwoman Abbe Wolfsheimer, the day and declaration were also recognized and applauded by many high-ranking officials at state and local levels. These officials included California Governor Pete Wilson, Senator Diane Feinstein, Congresswoman Lynn Schenk, State Assemblywoman Dede Alpert, and San Diego Mayor Susan Golding.

Instrumental in the process of historical site designation were San Diego Historical Site Board Chairwoman Vonn-Marie May, San Diego Historical Society Executive Director Jim Vaughan, and La Jolla Historical Society Director Ms. Pat Schoeflin.

Lending their support to the effort to preserve Torrey Pines Gliderport were Ed Slater, President of the Associated Glider Clubs of Southern California; Chris Moore, Contest Director for AGCSC's 34th Pacific Coast Soaring Championships; Brad Hall, Director of the Torrey Pines Soaring Council; the Torrey Pines Scale Soaring Society (Dr. Larry Fogel, Secretary); and Geoff Styles, Director

■ ABOVE: Victor Lanz of Carlsbad, California and his 1/4-scale Roebers Pilatus B4. Model spans 3.75 meters, or just over 12 feet. This is Victor's *third* exact same model B4—he really likes 'em! Weighs 12 pounds, has a modified Ritz #3 airfoil (semi-symmetrical) and is fully aerobatic. ■ RIGHT: Talk about the crowded sky! This was a typical scene during the weekend's activities. Full-scale sailplanes, paragliders, hang gliders and RC models shared the sky both days with no conflicts. City of La Jolla in the background.

■ LEFT: Probably no one had more fun over the weekend than Wayne Spani, of nearby Mission Viejo, seen here in the cockpit of his Bowlus Baby Albatross, said to be the only example currently flying. The ship carries serial #11 and has a colorful history, including having been owned by Charles Lindbergh at one point in the late 1930s. The fellow with the model Bowlus is Gary Fogel, son of former *MB* Soaring columnist Dr. Larry Fogel. The Fogels were the ones who spearheaded the successful effort to get Torrey Pines Gliderport recognized as an official San Diego Historical Site, thus saving it from any future development. ■ ABOVE: Wayne Spani waves hello from the cockpit of his Baby Bowlus, which he flew several times over the weekend. On almost every pass, Wayne whooped, hollered, waved and otherwise made sure we knew he was having a heck of a lot more fun than those of us watching from the ground!

■ ABOVE: Don Troxell of Laguna Hills, California hefts his 5.5-meter span (18 feet) ASK-18 sailplane. Don brought the kit in from Germany by private arrangement. It's not available in the U.S. normally.■ ABOVE RIGHT: This contraption is the ASCGC's glider winch, converted from a WWII-vintage barrage balloon winch. Power is a 350 cubic inch Chevy V-8. Line speed and tension are done by sight and sound, and rely heavily on the experience of the winchmaster. Pilots use rudder signals for more or less speed. The winchmaster is well protected from this giant weed-eater by a full cage. ■ BELOW: Gary Fogel's entry in the model competition was a 2-3/4"=1' scale, 122-inch span Bowlus Baby Albatross built from *Model Builder* plans (#9751, $24.00). Model was designed by Col. Robert E. Thacker and won 1st place in Scale at the 1975 Soaring Nationals.■ BELOW RIGHT: Larry Haig's famous "Minibat" flying wing was on display from the San Diego Flight Museum. This composite structure sailplane had a span of only 25 feet! Ship had an L/D of 23:1 (30:1 with tip extensions) and a minimum sink of 180 fpm. Gap between the fuselage and rudder was for the prop on a small "sustainer" engine.

The full-size "glass slippers" have almost nothing in the way of surface detail, so scale details are pretty much limited to pilot detail and retracts. Model is Don Scharl's 3.25-meter Graupner Discus, a *very* fast sailplane.

The father-and-son team of Fogel and Fogel launch their Schweitzer TG-3, built from *Model Aviation* plans. Model features very simple rudder/elevator control but would really benefit from ailerons, according to Dr. Fogel.

of Marketing for the Academy of Model Aeronautics.

Keynote speakers at the noontime ceremony included Bud Pearl, a gentleman who taught Charles and Anne Lindbergh to fly sailplanes at nearby Point Loma. Bud set cross-country distance records in full-size sailplanes in the area in 1930, and worked for Hawley Bowlus, who founded the first sailplane factory in the U.S.

Bud was followed by Maralys Wills, mother of America's second and third hang glider Nationals Champions, one of whom, Bob Wills, was the first person to fly a true hang glider from Torrey Pines. Maralys was followed by Sealed Representative Trish De La Rosa, from Senator Diane Feinstein's San Diego branch office, who read a speech prepared by the Senator. Likewise, Sealed Representative Tim Ryan read a speech from Congresswoman Lynn Schenk. Dr. Larry Fogel read speeches from Governor Pete Wilson and San Diego Mayor Susan Golding. And finally, Torrey Pines Hang Glider Safety Officer and Flight Director Bill Bennett gave a historical account of the early hang gliding days at Torrey in the '70s. Bennett, an Australian, is credited with introducing modern hang gliding to the United States.

As you can see, the preparations which led up to this day, and all the ceremony which filled it, were major undertakings of literally monumental and historical signifi-

One section of the model pit area where the "glass slippers" seemed to congregate. Some truly beautiful models here.

cance. They paid off with resounding success.

Chalk one up for OUR side!

THE UNIQUENESS OF TORREY PINES

To say that Torrey Pines is a unique soaring site is a little like saying Chicago's Sears Tower is a tall building. Torrey Pines is one of the few places on earth where you will find virtually every form of motorless flight known to man. . . sometimes flying simultaneously!

Torrey Pines is located along the California coastline south of Corona Del Mar and immediately north of the city of La Jolla. La Jolla is surrounded by the city of San Diego, and in fact, portions of the site are owned by the city of San Diego and the University of California, San Diego campus.

Overlooking Black's Beach (a designated "clothing optional" area), the Torrey Pines cliff rises 400 feet almost straight up.

Official launching and landing areas are set aside for RC sailplanes, while the hang gliders and paragliders share a separate site at the cliff. Rules are posted describing how the airspace in front of the cliff is divided between these two types of flight operations. Hang glider and paraglider pilots carry police whistles around their necks to signal unintentional model airspace violation, to avoid mid-airs, or to clear the landing area. Full-size conventional sailplanes may fly anywhere along the cliff within common courtesy and common sense safety limitations. Generally, the sailplanes fly so much higher or farther out that sharing airspace is not a problem.

Torrey Pines Gliderport has an impressive safety record, and the weekend of March 20-21 kept up the reputation with "No accidents or problems at all," according to Carl Guartney, the TPSSS Safety Officer. Carl is a very interesting guy who flew full-size gliders at Torrey before WWII. In 1942 he trained in Schweitzer TG-2 gliders at Twenty-Nine Palms in California's Mojave Desert. During the invasion of Europe, he flew combat missions in Waco CG-4a troop and cargo carrying gliders. Man, what stories he could tell!

I'm sure that the TPSSS Scale Judge, Johnny Robinson, could also tell some stories. Johnny first flew sailplanes from the beaches below Torrey Pines in the late '20s and early '30s. Then he went on to become an instructor of military glider pilots at Twenty-Nine Palms during the war. In the mid to late '40s, Johnny won three National Soaring Championships, set the first altitude record, broke other records, and was the first pilot to earn soaring's highest award, the Diamond C.

FIRST ANNUAL TPSSS CONTEST & FUN FLY

This low-key RC "fun contest" was hosted by the Torrey Pines Scale Soaring Society, and featured scoring based on the model's beauty and fidelity to scale. Also factored in was the pilot's ability to launch, stay aloft, hike to the landing zone, and land at exactly

continued on page 82

ELECTRIC POWERED RC SCALE: THE KITFOX

An attractive, easily built, all-wood model of the popular two-place homebuilt, designed for the Astro 15.

BY LADDIE MIKULASKO

The full-size Kitfox came on the market as a kit in the mid-1980s and has since become a leader in the kitplane business. The demand for it just keeps growing. With its good looks, simple assembly and good flying characteristics, the appeal of this aircraft is not surprising.

When I first saw a picture of the Kitfox I knew I wanted to build a scale model of it, but it was several years before I came across a three-view in the Czechoslovakian model magazine *Modelar*. Looking at the three-view, I formed a clear picture of how I was going to build it. The only decision I had to make was how large to make the model for an Astro 15 geared electric power system.

For the last several years I have been designing and building models for electric power, and the knowledge I have gained has helped me in determining what will work and what won't. The full-size Kitfox is a cross between an ultralight and a more typical homebuilt, and was designed to be a relatively slow, easy-to-fly, relaxing plane. I wanted to keep these features in the model, so I went with a wingspan of 70 inches—close to the limit for the power available from the Astro 15 geared motor.

The plan was drawn up in short order. I kept an accurate outline on the whole model and tried to design it to be as simple as possible. For this reason the cabin area is sheeted with 1/16 balsa and the cowl is not removable. Access to the motor is through the front opening of the cowl. Again, for the sake of simplicity, access to the motor batteries is from the top, which requires removing the wing. I find this to be no big deal. Undoing the two wing screws and the two wheel collars holding the struts to the fuselage takes less than a minute.

The model went together quickly and easily and was soon ready to be test flown. I did not expect any major problems and

got none. The model took off beautifully and climbed nicely. In the air, the model is stable with all control surfaces being just right.

The rudder is very powerful on takeoff and in the air. The stabilizer and elevator surfaces are relatively small in comparison with the wing, but are more than enough to make the model stable in pitch. The model does very nice loops. The ailerons are sluggish, but are capable of rolling the model.

Because I like to fly in a scale-like manner, I don't like to roll the Kitfox; the full-size aircraft wasn't designed for rolling or flying inverted anyway. As expected, the glide ratio is good and the model can be flown for a considerable period of time at a low power setting because of its large wing.

Before you start construction, study the plan. Use the lightest balsa you can find, cut out as many parts as possible beforehand, and drill and cut out lightening holes in the plywood parts as shown. Be sure to use lite-ply and not regular birch aircraft plywood, it's much heavier!

Author copied the colors and sunburst trim scheme of the original full-size aircraft. The only real deviation from scale was done for simplicity; the ailerons, instead of being the full-flying type suspended below the trailing edge of the wing as on the full-size ship, are instead hinged directly to the wing.

WING

Begin by cutting out all of the wing ribs. Note that the W1 ribs are shallower than the W2s to allow for the center section sheeting.

The wing is built in two halves, which will be joined later. To build the first half, mark the locations of the ribs on each of the spars. Slide all of the main ribs onto the upper spar. Pin the bottom main spar, rear spar and bottom trailing edge strip to the building board over the plan. Position all of the ribs and glue them in place. Glue on the top trailing edge strip. Glue in all of the false ribs and the leading edge. Glue on the wingtip and its support gussets. Where shown on the plan, glue in the 1/8 plywood plates that hold the eyes for the wing struts. Punch holes in the ribs and install the aileron Nyrod tube as shown. Sand the wing panel and put it aside.

Build the other half of the wing to the same stage. Before you join the two halves together, pin the center section bottom sheeting to the building board. Pin the W1 root ribs to the sheeting and the building board. Place the proper size blocks under the wingtips to get the specified dihedral. Glue the plywood and balsa dihedral braces in place. Glue in the two hardwood blocks for the wing bolts. Glue the top sheeting to the center of the wing. Mark the location of the wing strut eyes onto the plywood plates and drill the 1/16-inch holes.

The eyes are made from 1/16-inch cotter pins or soft steel wire. The hole in the eyes should be 1/16-inch diameter. Insert the eyes into the holes in the plywood plates and bend the ends out so the eyes will not come out under load. Use epoxy or thick CA glue to cement them in place.

TAIL SURFACES

Cut the parts from medium-hard balsa and sand them to your satisfaction. Bend a piece of 1/16 piano wire as shown to join the elevator halves together later.

ELECTRIC KITFOX

SCALE	1:5.33 (2-1/4"=1').
SPAN	70 inches.
WING AREA	598 square inches.
FLYING WEIGHT	72 ounces.
WING LOADING	17.31 ounces per square foot.
OVERALL LENGTH	38-1/4 inches.
POWER	Astro 15 geared on 12 cells.
RADIO	Four channels (ailerons, elevator, rudder, throttle).

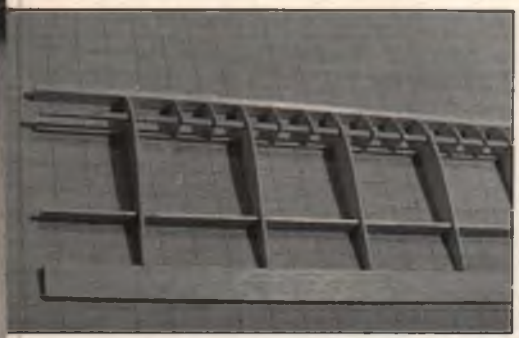
FUSELAGE

The fuselage is built in two sections; a front half up to former F4 and a tapered rear section. Begin the forward section by gluing the 3/16 square longerons to the 1/16 balsa fuselage sides. Stand the sides upright and glue in formers F1 through F4. Make sure everything is square. Glue on the side window sheeting, the top nose sheeting between formers F1 and F3 and the bottom sheeting between formers F1 and F2.

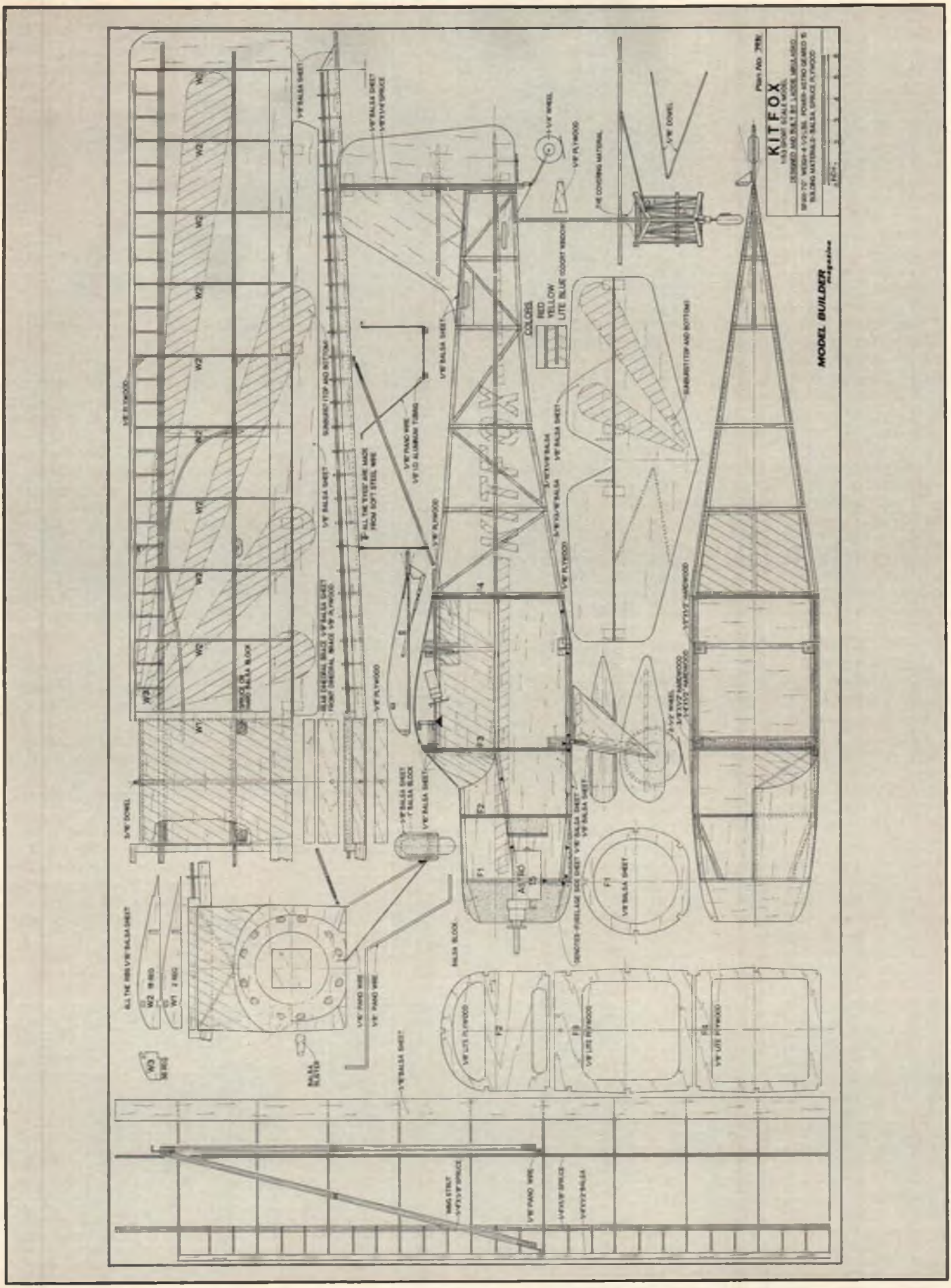
Make the balsa/plywood motor mounting block to fit your particular motor mount; I used a SonicTronics adjustable mount with the motor secured by tie wraps. This is fastened to the wood mount with four self-tapping screws, then this whole assembly is glued to former F2, making sure the prop shaft is centered on the thrustline indicated.

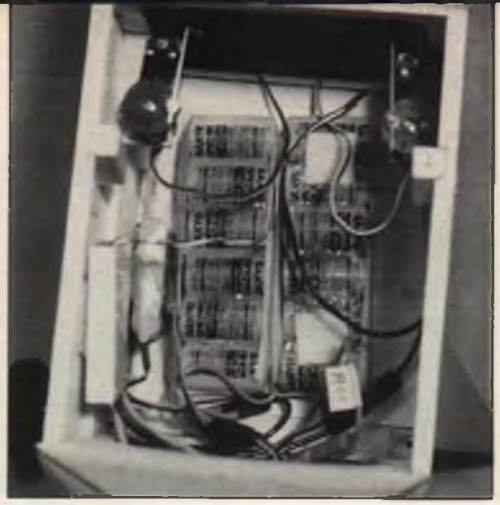
Drill the hole in the wing leading edge for the hold-down dowel. Place the wing on top of the fuselage so that the wing center section is right up against former F3. Drill a 3/16-inch hole through F3 into the two plywood dihedral braces in the wing.

The windshield is made from 1/16 balsa sheet with the grain

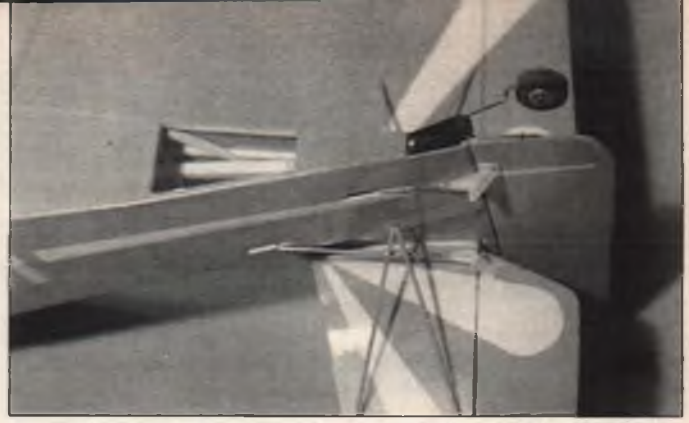


■ LEFT: Wing construction is pretty basic. Note that the upper main spar is positioned below the surface and runs through a rectangular hole in each full rib. Spars are spruce and the wing struts are functional, but you still might want to add shear webs between the spars for extra strength. ■ CENTER: Fuselage is built in two sections, front and back, then spliced together. ■ RIGHT: Rather than mess with clear plastic windows, the author quite sensibly chose to go with painted windows (light blue MonoKote, actually) and a stronger, easier all-balsa cabin. Seen here is the 1/16 balsa "windshield" after being glued in place.


KITFOX
MODEL BUILDER



Looking down into the interior, we see the twin six-cell 1400-mAH SCR NiCd packs that power the geared Astro 15. The excellent Sermos connectors are used throughout the system for best performance. Note that the rudder and elevator servos are mounted on the fuselage sides to give easy access to the batteries.



Underside view of the tail end reveals the cooling air outlet opening and clearly shows the stab support struts. These struts are functional—don't omit 'em! Note also how the tailwheel wire is cleverly connected to the rudder with a common cotter pin. Author used similar cotter pins for the wing strut connections as well.

running vertically. Make a paper pattern to fit your model, then transfer the pattern to the balsa sheet and cut it out. To prevent the balsa from splitting while bending, stick masking tape on the outside. Glue the canopy in place and remove the tape when dry.

Finish the forward fuselage section by gluing the landing gear blocks to former F3, gluing the bottom fuselage sheeting in place, and gluing the balsa cowl ring to former F1.

The rear section comes next. Pin the longerons to the building board over the plan and glue in all of the uprights. Once both sides are made, stand them up and glue in the cross braces. Use squares to keep everything aligned.

Glue the front and rear fuselage sections together, then sand the fuselage to your satisfaction. Glue the center stringer to each side of the fuselage and also glue on the plywood plate that holds the tailwheel bracket.

Inside the fuselage, glue in the plywood plates and tapped hardwood blocks for the wing bolts. At the bottom, glue in the plywood plates that hold the eyes for the wing struts. Drill the holes and insert the eyes, then bend the ends outward so they cannot be pulled out under load. Place a drop of glue over the ends.

The landing gear is made by bending 1/8-inch music wire as shown on the plan. Solder short 1/16-inch music wire braces to the landing gear to support the balsa landing gear fairings. Glue these to the legs with CA glue. Wrap the legs and balsa with thin fiberglass cloth and saturate with thin CA glue.

The tail wheel is mounted on a 1/16-inch music wire strut. The upper end of the wire fits inside an eye at the bottom of the rudder.

The wing struts are functional and are made from straight grain 1/8x1/4 spruce. Round the corners. Glue them together at one end as shown on the plan. Make the grooves for the 1/16 music wire ends. Insert the wires into the grooves and wrap tightly with thread, but do not put any glue on the thread yet.

Bolt the wing to the fuselage. Feed the wire strut ends into the eyes on the fuselage and the wing. Carefully check the alignment to make sure there are no

continued on page 83

PLUG SPARKS

BY JOHN POND

Alternatives to the Lanzo Bomber for RC Texaco and Antique

Like the old saying goes, "If I had a dollar for every time I've had to repeat myself, I would be a rich man today." In this case, I am referring to the staggering number of telephone calls asking me what is the best model for any particular RC O.T. competition event. For this reason, the first part of this month's column is dedicated to those would-be competitors and those new to the game (Old Timers, that is).

The most popular events are still the old Texaco and Antique events, as in many cases, one model may be used in both. Naturally, based on its stunning success and the fact that it qualifies for both the Antique and Old Timer classes, the beginner is immediately attracted to the Lanzo Bomber.

Here is a model that appeals to those modelers who want to become competitive immediately. In this respect, the writer is reminded of 1940, when the Comet Zipper designed by Carl Goldberg dominated the competition, including the Chicago Nationals. Here was a model which, if built properly to the kit instructions, would reward the beginner with startling good flights.

Such is the case of the Bomber. When Chet Lanzo unearthed his original drawings and had them authenticated and approved by SAM, there was an immediate demand for plans. For a look at the culprit who started the Bomber craze, Photo No. 1 shows Chet with his model at the 1988 SAM Champs, staged at Lawrenceville.

Photo No. 1. The late Chet Lanzo with his 96-inch span Bomber, currently the most popular design in all of the basic SAM RC events. Light, easy to build and a superb soarer, even a novice flier can be competitive with one of these.

The design was in such heavy demand that Roland Boucher of Leisure Electronics produced a kit for a 630 square inch version adapted to his Leisure 05 electric motor systems. This size Bomber proved quite successful and several were even built with gas engines, up to and including a Super Cyclone!

Photo No. 2 shows what we are talking about. Seen is Jack Albrecht with two Bombers; on the left is a Class B version, while on the right is an electric powered Leisure Bomber. Both are excellent flying models.

What causes this phenomenon? It is simply a case of "Monkey see, Monkey do." We have all been guilty of this in one form or another. It's only natural to copy something that works well for others. This is what happened to this writer when he first brought out his Dallaire Sportster, powered by an Ohlsson .60, at the First East Coast SAM Champs at Lakehurst NAS, ultimately winding up in 3rd place.

It was not until the second

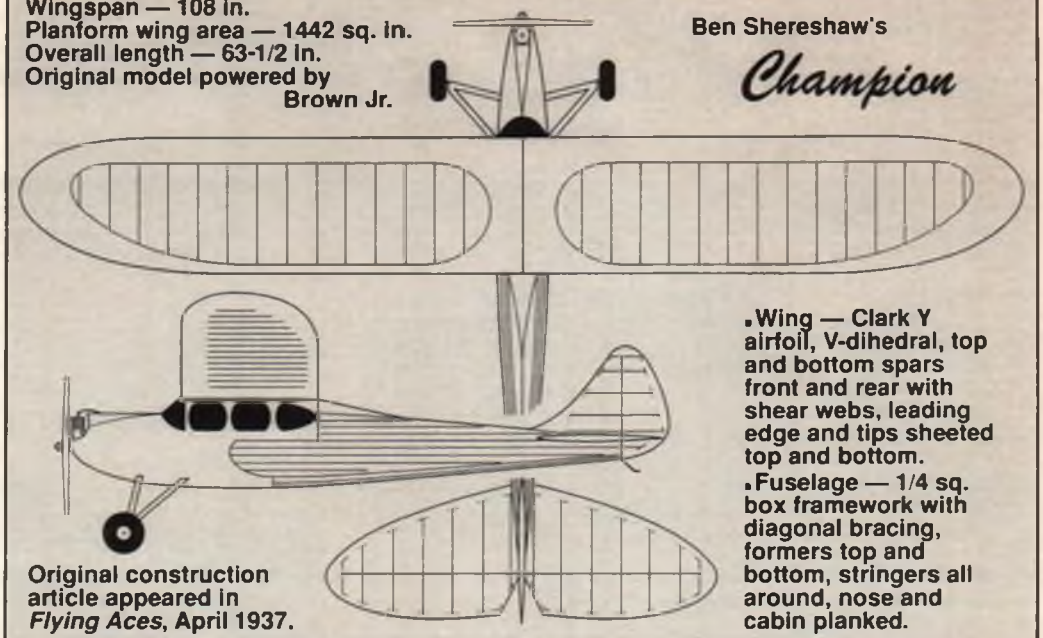
Photo No. 2. Bombers have been scaled to virtually all sizes. Jack Albrecht is pictured here with his Torp .29 powered Class B model (left) and electric powered Leisure kit version, both of which have won their share of trophies.

Photo No. 3. Mike Bernhardt (Pond's helper) poses with our columnist's original RC Dallaire Sportster. Photo was taken many years ago at one of the first Pond Commemorative meets at Santa Maria, California.

Wingspan — 108 in.
Planform wing area — 1442 sq. in.
Overall length — 63-1/2 in.
Original model powered by Brown Jr.

Ben Shereshaw's

Champion



- Wing — Clark Y airfoil, V-dihedral, top and bottom spars front and rear with shear webs, leading edge and tips sheeted top and bottom.
- Fuselage — 1/4 sq. box framework with diagonal bracing, formers top and bottom, stringers all around, nose and cabin planked.

Original construction article appeared in *Flying Aces*, April 1937.

MODEL OF THE MONTH

time around that the Dallaire made its mark at the Coyle Air Drop, New Jersey, with a convincing win using the then-new and little-known O.S. .60 four-stroke. This was followed by a win at the Denver SAM Champs. The rush was on! It got to the point that the only thing that could beat an O.S. .60 four-stroke powered Dallaire was another Dallaire with the same powerplant. The model is illustrated in Photo No. 3.

There are also pockets of activity in the U.S. in which local designs have proven very successful. Photo No. 4 is an example of the MG-II, designed by Mike Graneiri, which has dominated the eastern U.S. Texaco events for a long time. This 9-1/2 foot model first made its appearance in 1935 with a cabane strut arrangement and later with a cabin fuselage. This design also does double duty as an Antique, handling hot glow engines.

The big Anderson Pylon is an Antique design that is arguably the next best thing to a Bomber, and some fliers think it is actually the better ship. Up in Northern California, the SAM 30 boys, most notably Jim Kyncy and Stan Lane, have made 10 percent enlargements over the original 90-inch wingspan with eye-popping results. Even today, they still dominate the Antique and Texaco events held in the northern Sacramento Valley. Scaled to around 300 square inches, these models have proven to be excellent subjects for 1/2A Texaco. One example is seen in Photo No. 5. The popularity of this design has spread over the entire SAM chapter membership, including Australia and New Zealand. Of the models to be built in preference to the Lanzo Bomber, this Alva Anderson design is one of the best.

Most of the Texaco models lend themselves very well to the Antique event. Again, the easy-to-build Lanzo Bomber reigns. However, in the interests of creating interest in other model designs, we present the following.

Photo No. 6 shows Charlie Critch with an excellent flying Frank Ehling design called the "Contest Gas Model." Charlie's model has been variously powered with Anderson Spitfire, K&B 6.5 and several other combos. This model flies very well and can be flown in extremely tight circles due to the short tail moment and the 30 degrees of dihedral in the outer wing panels. This design may not be the prettiest, but it is an extremely stable model in all sorts of air. Well worth considering over a Lanzo Bomber.

Another Antique model we unhesitatingly recommend is the old standby, the Berkeley Buccaneer as seen in Photo No. 7. This model not only qualifies for and does well in the Texaco and Antique classes, it also performs well in the Class C event and the new Brown Jr. event. The Buccaneer was first presented in 1935 by Bill Effinger of Berkeley Models and has won more than its share of awards over the years.

The following list as compiled by this writer is based on observations over the years and what wins at contests:

1) Lanzo Bomber: 96-inch span, pylon mounted wing, very popular, easy to build, outstanding soarer.

2) Dallaire Sportster: 108-inch span, cabin model, easy to build, good climb and float-

Photo No. 4. This good-looking MG-II was built by Don Parmenter of Pleasanton, California. A beautiful flier for Texaco, this design is much more popular on the East Coast than the West.

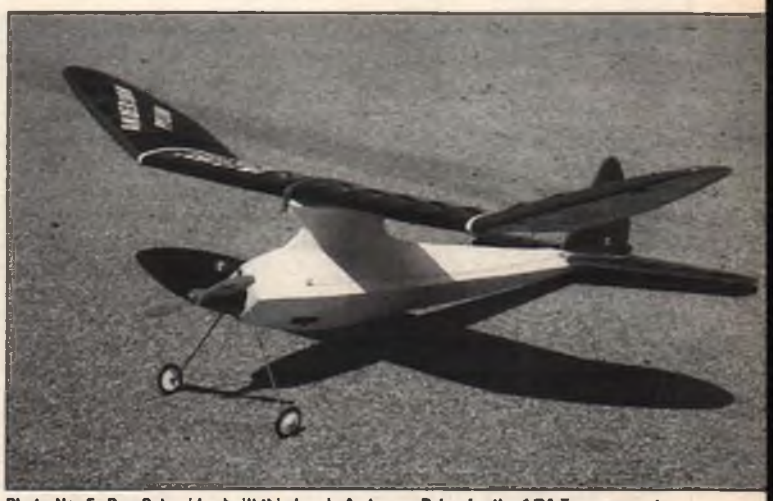


Photo No. 5. Dan Schneider built this lovely Anderson Pylon for the 1/2A Texaco event. This is another design that's been scaled to every imaginable size.

Photo No. 6. Very nicely built Ebling Contest Gas Model by Charlie Critch. This pot-bellied airplane has a lot of character and is an excellent flier to boot.

Photo No. 7. Old reliable! The ever faithful Berkeley Buccaneer as beautifully re-created by master craftsman Bob Munn of San Diego, California.

ing glide.

3) MG-II: 114-inch span, cabane mounted wing, construction is a bit more complex than the other models listed here.

4) Anderson Pylon: 90-inch span, a little more effort than a Lanzo Bomber, has an excellent floating glide.

5) Contest Gas Model: 96-inch span, short coupled, deep-bellied fuselage.

6) Buccaneer: 84-inch span, one of the most popular cabin models over the last 50 years.

7) Powerhouse: 84-inch span, cabin fuselage, simple structure.

8) Westerner: 96-inch span, cabin fuselage, strong construction, good soarer.

9) Flying Quaker: 84 or 96-inch span, cabin fuselage, longer span wing improves soaring performance.

10) Miss America: 84-inch span, cabin fuselage, the best-selling Scientific kit of all.

There are many other favorites, some built in limited numbers and others that have faded from the scene; examples include the KG-1, PB-2, Lanzo's Record Breaker and RC-1, and some of the Shereshaw designs such as the Cumulus, Nimbus, etc.

If this stuff is of interest to you, let me know, and I will do a piece on the popular Limited Engine Run designs used in SAM RC competition.

Photo No. 8. Nathan Sturman of Japan sent in this photo of his pretty 1/2A-powered "Megowcoupe" as built from a Flyline kit.

MODEL OF THE MONTH

When this writer built his Shereshaw Champion many years ago in conjunction with flying buddy Red Barrows of San Diego (we built two of them simultaneously), the text in the April 1937 *Flying Aces* stated the model could be built with either a six-foot or nine-foot wingspan. Of course, being involved in Texaco, "big"

is the way to go, so the nine-footer was built.

The writer, when he submitted the "Thor" for the April '93 Model of the Month, was struck by the similarity of Ben Shereshaw's Champion to this Magnus Anderson design. This is not to detract from the Thor, but there is no question of Ben Shereshaw's influence on early gas model designs, with graceful lines in all flying surfaces plus the generous use of sheet balsa in the flying surfaces and many stringers in the fuselage.

Most Shereshaw designs incorporate these features. Even when he was commissioned by Scientific Models to produce a line of competition models, Shereshaw's unmistakable touch was easy to spot. Take a look at the Scientific Commodore, Flagship, Ensign, Eaglet, Coronet, Mercury and Starling, to mention a few. No question about it, Shereshaw was a prolific designer of excellent models.

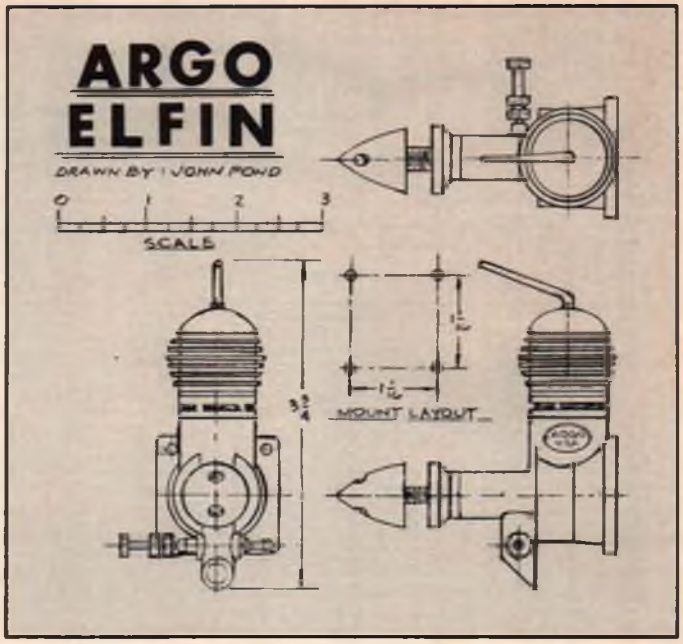
ENGINE OF THE MONTH

When the original Elfin 2.49cc diesel was revived as a replica by the Dunham Engineering Co. of England, this writer wasted no time securing one through the original U.S. distributor, Bert Striegler.

When Dunham ceased production of the Elfin replicas a few years ago, John Targos of Argo USA decided to try and produce them himself. With the help of old-time modeler Lew Mahieu (who owns his own machine shop) and Larry Jenno, the first of the production Argo Elfins finally emerged.

It didn't take long for the boys to discover that this "new" Elfin was a real performer. Between Bob Munn and Larry Davidson, reports on the Elfin diesel are outstanding when classified as an antique ignition engine. Although all the figures are not in, this .15 size engine turns a 9x4 prop at 11,100 to 11,500 rpm.

The Elfin diesels are presently being produced by Argo USA, 3229 Dianora Dr., Palos Verdes, CA 90274 under the proprietorship of John Targos. Availability is very limited, as John and his wife Millie take orders in strict rotation. The waiting period can exceed six months. If you are interested, you can call him at (213) 377-6186.



ENGINE OF THE MONTH

THE WRAP-UP

What better way to close this column than to receive a letter from Nathan Sturman of Gunma Machi, Japan 370. Several years have passed since this columnist last heard from Nate, who is quite active in Old Timers. He sent in Photo No. 8 showing his latest, a Herb Clukey "Megowcoupe" as kitted by Flyline Models prior to Herb's death.

This photo is proof that the popularity of 1/2A Scale is reaching unprecedented interest in the O.T. fraternity. Sturman, in talks with Clukey, reveals that the Megowcoupe was actually a double-size Megow Mono-coupe, extensively re-engineered for RC.

Sturman, who formed a warm friendship with Clukey via all those long-distance calls, built this kit as a tribute to Herb. He states the model is powered by a P.A.W. .049 RC diesel and has a three-channel radio. The engine has a collector manifold which makes the engine, at low throttle, sound like a WWI rotary engine, burping at intervals to clear the spark plugs of castor oil. A very realistic sound when coming in for a landing! ***MB***

MODEL MARKETPLACE

SCALE 3-VIEW DRAWINGS

PB2Y-5 CORONADO .....58"
PB4Y-2 PRIVATEER .....74"
CULVER CADET .....54"
KNIGHT TWISTER .....51"
FAIRCHILD AMPHIBIAN .....74"
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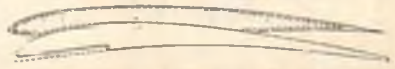

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TORREY PINES *continued from page 69*

6 minutes (360 seconds) on the carpeted runway some distance behind the cliff. During the flight, an on-board Casio Alti-Depth Meter wristwatch acts as an altimeter, recording maximum altitude gained during the flight. A score was given for the altitude you gained.

Sixteen pilots entered models in this event. Contestants and observers alike enjoyed the laid-back competition. Before and after the event, fun flying was allowed for the many attendees who were not a part of the competition.

Next year, the TPSSS will hold the 2nd Annual Scale Fly-In on or near the same weekend in March. Only model sailplanes designed prior to the end of WWII (i.e. vintage sailplanes) will be allowed to enter the competition.

34TH PACIFIC COAST WINTER NATIONAL SOARING CHAMPIONSHIPS

First started in 1947, this Torrey Pines contest is the longest running full-size soaring event in the United States. It was an annual event until 1979, when it was decided that a couple thousand spectators and a sky full of sailplanes might not be the safest thing to have along a cliff. This was the year that the PCWNSC event was halted. However, non-organized soaring has continued at Torrey every year thereafter to the present time. This is the first year since 1979 that an organized contest was held at TPG.

The event consisted of a flour sack bomb drop and a spot landing. (Gee, these guys have fun events just like we modelers do!) Anyway, it is the AGCSC's hope that more pilots will become interested in flying sailplanes at TPG. The club welcomes people to come and take glider rides (about $30 per flight), join the club, or come take lessons. They fly at TPG about six weeks out of the year, usually in late March to early April. Contact the AGCSC at (619) 449-5888 for more information.

PART OF TORREY STILL AT RISK

The cliff section of the Torrey Pines Gliderport is now San Diego City Historical Site No. 315, and this part of the TPG is safe from development. However, the city's declaration does not affect the University of California's portion of the gliderport. UCSD owns about 18 acres of the TPG runway and the land beyond it to the east. What remains to be done is to secure national (and state) recognition of TPG as a historical landmark. When this happens, even the full-size sailplane operations will be forever secure. By May of this year, we should know if this recognition has been achieved.

By the way, Gary Fogel, AGCSC's Historian, is looking for photographs and historical memorabilia from Torrey Pines' early years. If you know of someone with such historical material, or you have some, please contact Gary at (310) 559-5696. ***MB***

KITFOX *continued from page 73*

warps in either wing half. If there are, just reposition the appropriate wire on the struts. Once satisfied, place just a drop of CA glue over the thread at each end of the strut.

Next add the jury struts to the main struts. Slide two short pieces of 1/16-inch I.D. aluminum tubing onto a piece of 1/16 music wire and bend it to the shape shown on the plan. Feed the ends into the eyes in the wing. The aluminum tubes should be resting on the strut. Wrap thread around the tubes and the strut and saturate all of the wrapped thread joints with CA glue.

Complete construction by gluing the fin to the fuselage. The stab will be glued in place after covering.

COVERING

I used MonoKote in the colors of the prototype—bright red overall and yellow for trim and lettering. The windshield and side windows are done in light blue.

Start with the fuselage. To get a nice fillet between the fin and the fuselage, first cut a strip of MonoKote and tack it inside the slot in the fin, then tack it to the front edge of the fin and to the fuselage sides. By carefully pulling and tacking the material, you will get a naturally curved fillet. Don't worry about small wrinkles, they will come out when the covering is shrunk. Do both sides. Before you proceed with covering the rest of the fuselage, shrink the MonoKote in the fillet area to make sure the fillet is wrinkle-free. If you're not satisfied, remove it and try again. This part done, go ahead and cover the rest of the model.

Trim pieces were cut from yellow MonoKote and applied to the base covering with the sealing iron set at a lower temperature than when shrinking the covering material.

Insert and glue the stabilizer into the slot in the fin. The struts supporting the stabilizer are functional and *must not be left off.*

Install the main landing gear and the tailwheel. On my model the wheel pants were fastened to the strut legs with clear silicone. After many flights, they are still in place.

Hinge and install the ailerons to the wing. Notice that the aileron servo is mounted at an angle so that the pushrod connector on the servo arm lines up with the Nyrod. Glue in the elevator and rudder servo rails and mount the servos. Hook up all of the flight controls and check their operation.

Install the motor batteries and check the balance. If necessary, reposition them to get the model to balance at point shown on the plan (1-5/8 inches back from the leading edge). With everything installed and tested, install the wing and struts. The struts are held to the wing and fuselage with wheel collars. *The wing struts are functional—do not fly this model without them!*

Good luck and may you have many hours of enjoyment flying your Kitfox. ***MB***

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RC PYLON *continued from page 36*

can be used "... if its sole purpose is to carry exhaust fumes and residue out of the cowling." You mean to tell me that when I see all those guys trying out different lengths and diameter pipes, the entire exercise is just to do a better job of removing residue?

I use these for examples, but there are more. This writer plans a major overhaul of the rulebook this cycle and I may propose several unpopular items. If so, write and tell me why I'm wrong or why you disagree. Don't get on my case with the argument of, "That's the way we've always done it," because that won't hold water. Give me something legitimate.

I'm not planning on submitting proposals to make wholesale changes, however, there are some deadwood, redundant rules that need altering or removing. I plan on doing whatever it takes to streamline the rulebook. Good, sound ideas are needed from you folks out there. So take pencil in hand and write some proposals, or write me with an idea for a proposal and we'll go from there.

I'm certain there will be much to say about the rules at the Nats. This is the one place where the rulebook is king. Sometimes we get a little sticky on certain subjects—not by choice, but because the AMA wants their contest run by the book. We get into some pretty good discussions while trying to interpret the rulebook after seeing the latest thing in Quickies. Believe me, there are some wild-looking models out there. How about one with a box fuselage that ends right at the trailing edge of the wing and extending to the rear is a boom which holds the rudder and elevator? Yup!

• • •

Recently I committed a monumental goof and must confess my sins. After completion of racing, I impounded all planes in trophy positions and asked Henry Nelson and Dave Shadel to check engines and mufflers for any possible rework/modifying. When they finished, they called me aside and indicated they found no rework, however, two of the engines had rechromed liners in them. My first thought was, "What the heck do I do now?" I really didn't want to throw a trophy winner out of the contest. The problem, for those of you not familiar with the rules, is that Quickie is a stock engine event, and a rechromed liner is not considered "stock."

So I'm standing there racking my brain on what to do and at this point, Shadel offered some advice. He said in effect, "The people with their chromed liners had no gain in performance. All they really did was

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save the cost of buying a new liner when they possibly wore out their old one, therefore, I would let them know you are aware of what they have done, but I wouldn't make an issue of it."

As I was grasping for an out, I wimped out and quickly jumped on his suggestion and agreed. I talked to the individuals involved, told them what we had found and that we were aware of what they had done. I advised them to get straight in the future. We passed out the trophies and I went home confident of settling a delicate issue in a reasonable manner. WRONG!

Two weeks after returning home it dawned on me. YOU DUMMY! I had opened the door to the future! If I inspect for rechromed liners at the next Nats and find any, I must let them go just as I did before! It would be very unjust for me to disqualify a flier when I wimped out so badly and did nothing.

Now I'm in trouble and looking for an out. After careful thought and soul searching, I have concluded the following. I must admit my error to everyone and take full responsibility for my actions. I was wrong! I admit it to the world! However, I will not propagate it by continuing any further. Two wrongs do not make a right, therefore, the upcoming Nats will be a test. We will not accept rechromed liners, and any found will result in immediate disqualification of the owner. ***MB***

MODEL DESIGN *cont. from page 21*

where aileron (and perhaps rudder) is being used, and where centrifugal force is increasing the load on the wings and requiring a higher angle of attack.

The name of the game, then, is to "flair" a bit all during the long descent for landing, to burn off much of the energy gradually so it won't all have to be gotten rid of on the short pass across the field itself. With a good airplane you can increase the angle of attack significantly during the glide and still be safely above the stall point. You will still flair some more at landing, but the amount of rotation will be less because you will start the final flair from the higher pitch-angle of the flatter glide.

This essay has assumed stalled or "three-point" landings. Of course, if you come in hot, well above stall speed, for a "wheel landing," you can get the model down without floating. (If it is a taildragger you may have to apply some down elevator to hold it on the ground.) In such cases you won't float, but if the field is short and smooth you will probably still have a problem. The model is going to roll and roll, instead of float and float. Again, a flatter glide or a lower-pitch prop (or brakes) will help. An intentional ground loop will also safely stop a rolling plane approaching the end of the field, if the velocity is low enough when the turn is started.

These suggestions, and flaps, are easy ways to solve the float-on-landing problem. If you want a more interesting but more difficult way, try side slipping. Old time full-scale pilots, flying ships without flaps, often "slipped her in" if the field was short or their approach was too high. I tried slipping RC models years ago with little success, but I'm going to try again. If you missed it, read Stu Richmond's instructions on how to slip a model, in his "Sunday Fun" column in the March 1993 issue of *RCM*. Stu says it isn't easy to learn, but it is a lot of fun, and well worth the effort.

TAILSKIDS AND WHEELS

If we are designing, building or modifying a taildragger, we have a choice between using a tailskid or a tailwheel, and we can choose between having them fixed, free wheeling, or steerable. In the past I have usually used steerable tailwheels, but I've found something better.

A steerable tailwheel gives us yaw control on the ground—too much control, the way I have usually built them. Yes, I know that the smoothest control is obtained if the tailwheel steering angle is only about half as great as the rudder control angle, but attaching the tailwheel directly to the bottom of a beefed-up lower section of the

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rudder is easy to do, and I can usually keep my rudder thumb in check enough for smooth takeoffs and landings with that setup. Also, with the tailwheel on the rudder, with its big throw, I can show off and do tighter turns on the ground than anyone else.

A free wheeling (castering) tailwheel will reduce overcontrolling tendencies, but also reduces ground steerability. A plane with a fixed tailwheel steers poorly, if at all, at low speeds, even with throttle-induced blasts of propwash on the rudder. . . most unsatisfactory, unless one is trying to simulate the handling of certain early airplanes.

I recently designed and built a very light taildragger. I wanted to be able to steer it on the ground, but didn't want the weight and complexity of a tailwheel. I built a steerable tailskid on it, and I love it. Light, simple, rugged, low airborne drag, high tail-down braking, and it steers fine.

I guesstimated the design features. Since they all worked well, I'll pass them on. Use relatively light music wire for the skid. The size will depend on the weight of the model, but choose it so that the weight of the tail and aft fuselage will slightly flex the skid. It will then provide a little shock absorption while landing or taxiing.

I slipped a piece of flexible plastic tubing over the extending part of the skid to give it more area on the ground, reducing the depth it will cut into the surface and therefore reducing the drag.

Make sure the lower part of the rudder is structurally up to the added loads from the tailskid, and that the lower hinge or hinges are strong enough.

Shape the skid where it bears on the ground so that the leading and trailing edges sweep up a bit, but have an inch or so of the wire formed so that it is essentially flat on the ground when the tail is down. This skid contact length will cause it to track in the soil or grass like a sled runner, providing positive steering. If the skid were to contact the ground at only one point, it would not only tend to dig in, it would also not steer the plane.

The plane on which I have been using the steerable tailskid is a "fun-fly" type with only one central wheel. One wheel has less weight and drag than two or three wheels, and it works fine. I've had no problems.

Some of the single-wheel fun-fly specials are getting by with no wing skids, but I use wingtip skids in addition to the steerable tailskid. The tip skids were made of 1/2-inch wide springy aluminum alloy sheet, and are adjusted to just touch the ground when the plane is resting on the main wheel and tailskid.

PARTING WORDS

The woman on the line asked the small boy answering the phone, "Is your mother free?" "No, but I'm free. She is firty-free." Bil Keane.

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