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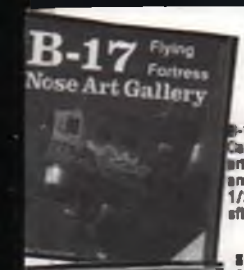

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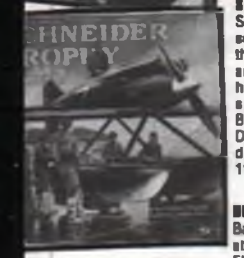

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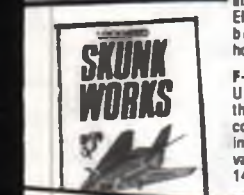

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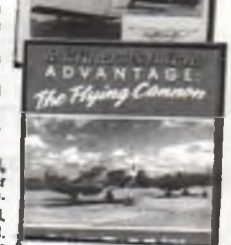

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PRODUCTS IN USE

ON THE COVER

Simple and quick construction, attractive lines, outstanding aerobatic performance—what more could a Big Bird modeler ask? And probably no single airplane embodies all three to better advantage than Lanier RC's "Stinger" series, the largest of which is pictured here being cradled in the loving arms of Vicki Edwards, daughter-in-law of *Model Builder* columnist Bruce Edwards. Bruce built the Saito 300 powered model for a Products In Use review—see page 36. Photo by Bruce Edwards.

CONSTRUCTION

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Hugh M. O'Connell, Jr., sends along this "slightly bashed" Senior Falcon, built from a Carl Goldberg kit. With a wingspan of 69 inches and fitted with an ASP .80 four-stroke turning an 11x9 APC prop, the Falcon weighs in at an even 7 pounds. Covering is white and yellow Aerospan from Balsa USA; the red trim is fluorescent Oracover. "The fuselage is covered with glass cloth and resin, painted with Rustoleum," says Hugh, who spent six weeks on the project. "I use an Airtronics six-channel Vanguard transmitter with RCD receiver and servos. Other modifications include omitting wing dihedral, raising the turtledeck, streamlining the cowl and making it a taildragger," he writes. "Flying characteristics are great and vertical performance is out of sight!" *Hugh M. O'Connell, Jr., 520 Ivywood Dr., Oxnard, CA 93030.*

After building a succession of models, Ben Bierman of Bayshore, New York, set to work on modifying a Klingberg Wing glider for electric power. He built a small fuselage and motor cowling to allow the use of standard six or seven-cell packs. The extended nose provided a dedicated hatch for battery access and allowed the batteries to be moved forward to balance the motor without adding ballast. It wound up weighing 36 ounces empty and 47 ounces with a seven-cell, 1100-mAH SR battery pack. He writes, "Performance was pretty marginal with a Mabuchi 550 motor and Sonic Fronies 8x4 folding prop, with flights lasting only a minute or so after a four-minute motor run due to the low rate of climb. With an Astro 05, it's a whole different ball game. The wing screams into the air and does great loops and rolls under power. It glides well but fast with the power off." *Ben Bierman, 335 Pennsylvania Ave., Bayshore, NY 11706.*

Edsel Ford didn't send any information on his light-as-a-feather indoor free flight creation, except that he's been building and flying such rubber-powered models for years. Clearly, he's a craftsman and will get his just reward—a custom *Model Builder* T-shirt. *Edsel Ford, 10613 W. Country Dr., Oklahoma City, OK 73170.*

With a name like Wright, a 55-year love affair with model airplane building is only natural. And Samuel C. Wright of Columbus, Ohio is determined that some of his 15 grandkids inherit his love for 1/4-scale craft. Shown are Samantha and Sammy, along with Wright's Spacewalker II—his third 1/4-scale model. It took five months of TLC to build the lovely plane, powered with a Super Tigre 2500 and covered with Goldberg UltraCote. "My 1/4-scale Cub has over 1,000 flights, but hauling them around is a hassle," notes Samuel, who's done FF, CL and RC over the years. We'll let the grandkids fight over his custom *Model Builder* T-shirt! *Samuel C. Wright, 6183 Stornoway Dr. N., Columbus, OH 43213.*

Ever seen an electric RC version of the 33-inch span Sterling DeHavilland Tiger Moth before? The kit was intended to be rubber or gas powered, but 71-year-old modeler Louis I. Hutton of Bellevue, Washington changed it to a Mini Olympus electric gear drive and RC and reports his Moth flies just fine for about four minutes. "The model weighs 21 ounces, including a Futaba MCR-4A radio and two S-133 servos, six AA NiCd batteries, and motor," says Hutton. "Rudder and elevator servos are mounted in the pilot's cockpit. Six exhaust holes were cut in each side of the cowling and pipes made from pieces of plastic soda straw were glued in. This provides additional cooling and the look of a 12-cylinder engine!" *Louis I. Hutton, 12235 S.E. 62nd St., Bellevue, WA 98006.*

NEWS RELEASE

BADGER AIR-BRUSH CO.

ACCU • FLEX

Dear Hobbyist,

With the positive impact of Accu-flex paint film on the hobby market, Badger Air-Brush Company has experienced some of the most positive press from the industry's publications in recent memory. As a result of the complimentary articles and rave reviews, Badger has experienced a tremendous demand for the new Accu-flex. We have worked very hard to keep up with the substantial influx of orders for this paint.

During the approximate time period of May 1, to July 1, 1993 we at the Badger Air-Brush Company, Franklin Park, IL, unknowingly and regretfully shipped to our distributors some defective colors of the new Accu-flex paint film. The Accu-flex was hardening in the bottles after being shipped. The problem was a result of a reaction between the water used in cleaning the filling pumps and the non-settling agent in Accu-flex paint. The cleaning water, left in the lines of the filling machine between color changes, changed the pH balance of the paint which caused the adverse reaction of the non-settling agent. This reaction resulted in the paint hardening in the bottles. Unfortunately this adverse affect was only noticeable weeks after the paint was bottled and sealed. Since becoming aware of the aforementioned circumstance we have recalled the affected colors from all of our Accu-flex distributors.

At this time we would like to publicly apologize for this unfortunate incident. We do not feel that there should be any further cause for alarm. Furthermore, we assure everyone concerned that the problem has been identified and that the necessary precautions have been taken to prevent any reoccurrence.

It has always been a policy of the Badger Air-Brush Company to proficiently manufacture and fully stand behind products of superior quality. We intend to put this mishap behind us and immediately get back to providing high quality Accu-flex paint to the modeling industry.

As we confidently support our product quality with a 100% guarantee, we hope that in our misfortune you will continue to stand behind and support our products as a vital part of your modeling experience.

Warmest Regards,

BADGER AIR-BRUSH CO.

PLANE TALK

"Gorgeous" is how we would describe Frank Pisano's latest effort, a Ben Buckle kit of Herb Greenberg's 1936 Red Zephyr. The covering is transparent MonoKote and power is provided by a PAW .35 diesel swinging a 13x5 prop. It's fitted with Airtronics radio equipment and weighs in at 3-1/2 pounds. Frank reports, "With a 4-ounce tank, it runs for 20 minutes and is a gentle flier." *Frank J. Pisano, 7 Eugene Pl., Staten Island, NY 10312.*

"Flies like a dream, cheap to build and easy to repair." That's how Franciszek Kokosza of Fayetteville, North Carolina describes the RC model he built without plans from 1/2-inch blue insulation foam. Wingspan is 64 inches, width is 13-1/2 inches, length is 51 inches and the weight without fuel is 5-1/2 pounds. The engine is K&B .45 Sportster. Design was patterned after the Sig Kadet Senior, which was Franciszek's first RC model. *Franciszek Kokosza, 5332 Silver Pine Drive, Fayetteville, NC 28303.*

Harold Kuschel took a trip down memory lane when he built a copy of Sal Taibi's Brooklyn Dodger from a 1942 plan. "It was the last FF model I built in 1945 (with an O&R .23 on ignition), before I joined the Army Air Corps." Harold's latest Dodger uses an O&R .23 glow engine and two-channel RC. It's on display at ABC Hobbies in his hometown of LaCrosse. *Harold W. Kuschel, 2803 S 31st St., LaCrosse, WI 54601.*

Small . . .

. . . *but Potent!*

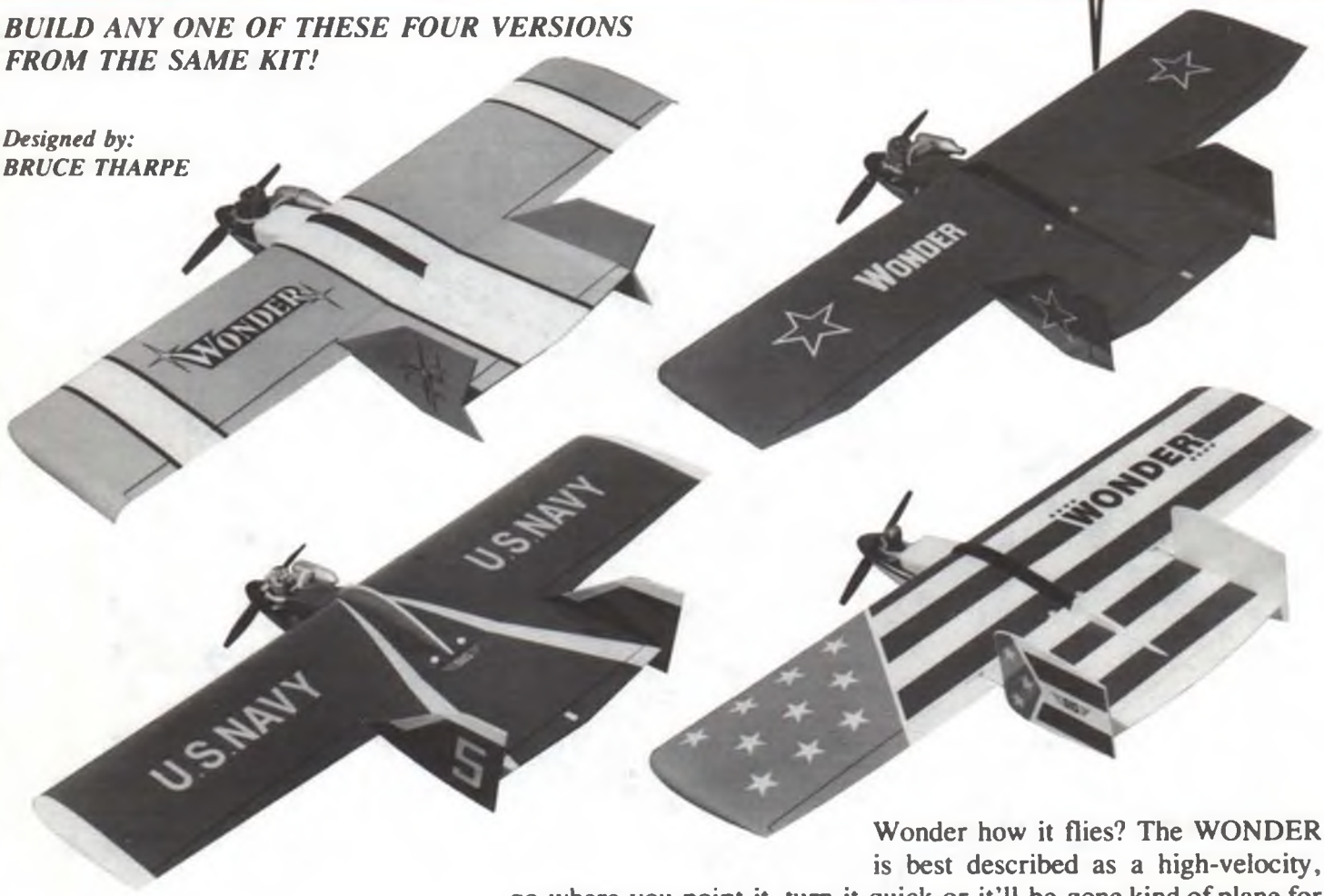
SIG

KIT RC-66

WONDER

BUILD ANY ONE OF THESE FOUR VERSIONS FROM THE SAME KIT!

Designed by:
BRUCE THARPE



Wonder how it flies? The WONDER is best described as a high-velocity, go-where-you-point-it, turn-it-quick-or-it'll-be-gone kind of plane for hot-thumbed R/C pilots. Hand launches and landings are no sweat thanks to the WONDER's thick airfoil and light wing loading. C'mon and take a walk on the wild side of sport flying -

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KIT FEATURES:

- Simple Balsa and Plywood Construction
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- Hardwood Landing Skid
- Photo-Illustrated Instruction Book
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- Complete Hardware Package

ENGINES:	.09 - .19
WINGSPAN:	37-1/2 in.
WING AREA:	338 sq. in.
WEIGHT:	26 - 38 oz.
RADIO:	2 - 3 Channel (Aileron, Elevator, Throttle)

CAUTION: The Wonder is not recommended for beginners or the faint of heart. It's fast!

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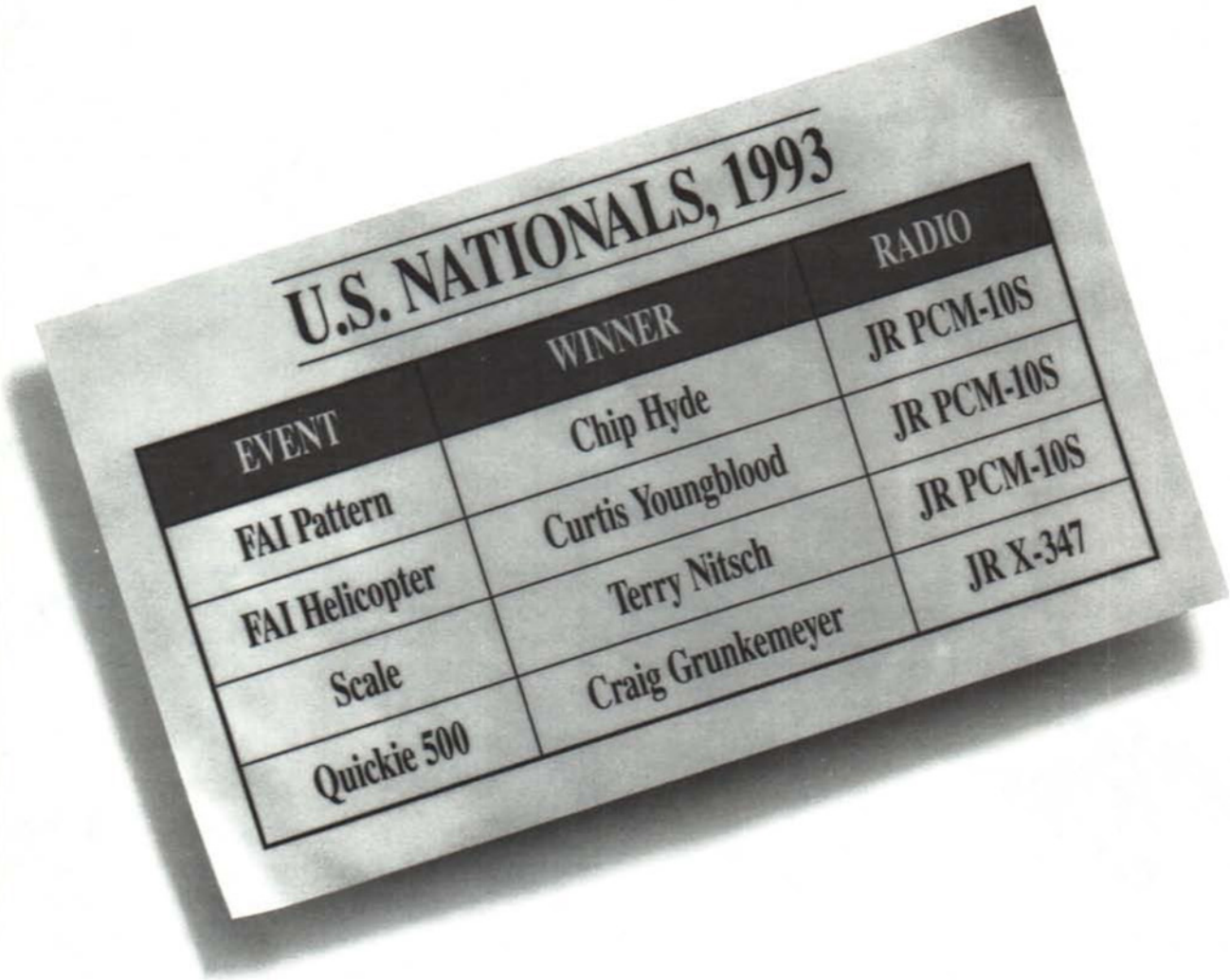
PH: 515-623-5154 FAX: 515-623-3922 Toll Free Orders: 1-800-247-5008 Sig Modeler's Hotline: 800-524-7805

Congratulations, Gentlemen.



U.S. NATIONALS, 1993

EVENT	WINNER	RADIO
FAI Pattern	Chip Hyde	JR PCM-10S
FAI Helicopter	Curtis Youngblood	JR PCM-10S
Scale	Terry Nitsch	JR PCM-10S
Quickie 500	Craig Grunkemeyer	JR X-347

Thanks for helping make JR's best year even better.

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Horizon Hobby Distributors, Champaign, IL U.S.A. (217) 355-9511

DEAR JAKE

Advice For The Propworn

DEAR JAKE:

I'm an RC flier, but I like to consider myself a well-rounded guy. So whenever I go to the Nats, I always visit several of the other venues in order to learn a little more about those parts of our hobby that I don't participate in. This year I visited Carrier U-Control, R.O.W. Free Flight, Outdoor Rubber Scale, and the Indoor Microfilm events.

I had a fun time and learned a lot. At the Carrier event, I saw the fine line between a good landing and a crash into the fantail. At the R.O.W. pond, I was amazed at how hot engines can crack if the pontoon digs in and the airplane noses over into the water. At the Rubber Scale event, I learned that ponderous early designs that didn't fly particularly well as real airplanes don't fly any better as models. I also saw what happens to balsa and tissue when a tightly wound rubber motor snaps.

I think I may have made an error in judgment at the Indoor arena, however. Just before going in, I scarfed down a quick lunch plate of Polish sausage, sauerkraut and hard-boiled eggs. In retrospect, I don't believe it was wise of the contest organizers to have these delicacies for sale anywhere near the arena, but I guess I wasn't thinking at the time. Shortly after I took my seat near the top of the bleachers, the gossamer-like microfilm models started to have problems with turbulence in the arena. Some were blown off course, some rose and fell in the thermal activity, a few were buffeted until the wings folded, and one that flew especially close to my location shuddered and exploded. The contestants got wise to the problem when someone lit a match and my section of the bleachers flashed off like a 19th century camera.

Is there such a civil offense as "gastronomic mayhem"? I think that's what I'm being sued for.

Carl in Sulphur Springs, FL

Dear Carl:

There most certainly is. My late Aunt Euphonia was sued for the very same thing after consuming tea, crumpets and a quart of baked beans at a silk flower arrangement show in Boca Raton. She lost and paid a handsome settlement. And then there was my Uncle Foster. He sat in the Olympic Track and Field Stadium in Montreal eating a three-bean salad, and was sued by a sprinter whose record was taken away because it was wind-aided.

I think you're in big trouble, lawsuit-wise. Given the new legal trend to blame everybody who was even remotely involved, I suggest you countersue whoever it was that served you that last hard-boiled egg.

Jake

DEAR JAKE:

Hillary and I think your column is great. Of course, we also think the words "education" and "Arkansas" can be used in the same sentence, and that a gas tax is a good idea.

Bill on Pennsylvania Avenue

Dear Bill:

Thanks. If I have a job and a car in 1996, I might drive to the polls and vote for you.

Jake

DEAR JAKE:

Hi, it's me, Tommy Smith.

I have a new friend. His name is Colin. That's pronounced Coll-In, not like that piece of your guts below your intestine. He moved here last month from a foreign land—some place called New Jersey.

Colin has an older sister named Daphne. We call her Daffy Daphne because she thinks a U2 is a bunch of guys who play rock music and not a spy plane.

Colin used to build model airplanes in New Jersey, but they're pretty backwards there and they only used regular glue. I've been showing Colin how to speed things up with super glue. It took a couple bottles' worth of practice, but he's really getting the hang of it now, except for that minor incident last week when he couldn't get his zipper unstuck.

Colin wants to build a big towline glider with lots of wing ribs, so I gave him a 4-ounce bottle of super glue for his birthday. We started working on the kit this weekend, but we had a little problem when we stomped on the glue bottle to clear a clog in the spout.

They have only one playroom in their house. Colin uses half of it as a workshop, but he has to share the room with his sister's doll collection.

We would like to fix this little problem before Daphne gets home from summer camp. We have an X-Acto saw, but my question is this: How many arms is a Ken doll supposed to have, and what color head goes on a Sunshine Barbie?

Your Friend, Tommy Smith

Dear Tommy:

All Kens have two arms, except Octopus Ken. That's the one Barbie refuses to date anymore. Sunshine Barbie has a blond head.

This is just a wild guess here, but you've got a solid mass of doll bodies, limbs, and heads, don't you?

Why don't you just leave it as is, wrap it up as a gift set for Colin's sister, and tell her she's the lucky owner of the limited edition, "Chernobyl Barbie and Friends."

Jake **MB**

over the counter

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

GP'S F-15 EAGLE

Following the lead set by its big F-14 Tomcat (see the review in the October '93 *MB*), the new Great Planes F-15 Eagle also has a nose-mounted engine with standard aircraft prop. The F-15 is smaller than the Tomcat—47-inch span and .40-.50 size two-stroke engine—but we're guessing that the construction is pretty much along the same lines. We saw the prototype at Toledo early this year, and it is indeed a striking model. The kit is now in production and carries a suggested list of $149.99. From Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021.

NSP'S NEW CATALOG

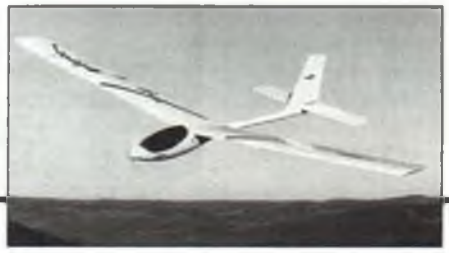
If you have any interest at all in RC soaring or electric flying, you owe it to yourself to get Northeast Sailplane Products' new *180-page* catalog of kits and related goodies. More than just a catalog, it's a volume loaded with valuable information that can help you become a better builder and flier—we learn something new every time we sit down with our copy. NSP offers an incredible selection of foreign and domestic sailplanes and now, electric systems and accessories as well. The catalog sells for $7, which includes first-class postage. Order your copy from Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 054952.

WE LIKE SURPRISES

To its extensive line of imported European electric motorglider kits, Hobby Lobby has added the Aeronaut version of reigning F3E (now officially known as F5B) World Champ Rudolf Freudenthaler's "Surprise 2" competition ship. The kit features a high degree of prefabrication—epoxyglass fuselage, presheeted foam core wings with glass cloth between the foam and balsa, preshaped tail surfaces, etc.—and will accommodate power systems from 10 cells on up. For experienced fliers only, this two-meter screamer is priced at $314, from Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444. Depending on your budget and the performance desired, HL can also set you up with a variety of power systems.

THE LATEST FROM ROBBE

In the current Robbe catalog are pictured two similar models, one a 63-inch span glider called the Impulse and the other, pictured here, the Balance, an electric version of the same airplane. Both are ARF kits that come with pre-built and covered wing panels and tail parts, blow-molded Plura plastic fuselage pod, anodized aluminum tailboom, etc. The Balance also includes a pre-wired motor, folding prop and motor switch activated by the elevator servo—everything but a six-cell NiCd pack and two-channel radio. For full particulars, contact Robbe Model Sport, 170 Township Line Rd., Building D, Belle Mead, NJ 08502; (908) 359-2115.



USE IT OR LOSE IT

The new System Analysis Meter from Hobby-tec is claimed to be able to take the guesswork out of

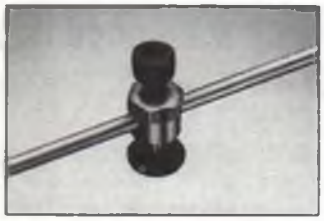
any radio installation; it "checks all radio components from batteries to servos, and tells you if your model is SAFE; before it's too late. . . makes any model perform better, and more importantly, it makes any model dramatically safer." Priced at $24.95 plus $2.95 S&H, from Hobby-tec, P.O. Box 220762, Santa Clarita, CA 91322. An info sheet is available by sending an SASE.

AND SUKHOI MAKES THREE

Joining the Goldberg Models kits for the Extra 300 and Ultimate biplane is another high-performance sport scale aerobat—the Sukhoi SU-26m. Goldberg VP Dave Patrick is responsible for all three; his 73-inch span Sukhoi is designed for .90-1.20 two-strokes or 1.20 four-strokes, and features all balsa and ply construction, a pre-formed aluminum landing gear, ABS cowl and clear canopy. The Sukhoi kits are slated to retail for $249.99 and should be available by the time this issue hits the stands. From Carl Goldberg Models, 4736 W. Chicago Ave., Chicago, IL 60651.

GET A GRIP

Du-Bro's new Kwik Grip E/Z Pushrod Connector features a hex-shaped brass body which, used with a special wrench (another Du-Bro product), allows you to firmly tighten the supplied socket-head screw without placing any strain on the pushrod wire itself. Check them out at your local hobby shop. From Du-Bro Products, Inc., P.O. Box



815, Wauconda, IL 60084; (708) 526-2136.

ACE'S RUBBER DUCKS

The so-called "rubber ducky" transmitter antennas are becoming quite popular these days, and now Ace R/C is offering them for its 72/75 mHz MicroPro, Olympic, Nautical Commander and Digital Commander systems. The flexible antenna is only 9 inches long and is much safer in the pits and around spinning propellers. Priced at $14.95, from Ace R/C, 116 W. 19th St., P.O. Box 472, Higginsville, MO 64037-0472.

EXTRA-HOT EXTRA

Ohio R/C Models has added a world-class aerobatic aircraft, the Extra 300S, to its Performer Series line of giant scale kits. The 84-inch span, balsa/plywood kit features

machine cut and sanded parts, glass cowl and wheel pants, canopy and preformed gear. The 300S is offered both as a kit for $359 and in built-up form (all major components framed and sheeted, ready for assembly) for $750. Ohio R/C Models, 4251 Lutheran Church Rd., Germantown, OH 45327; (513) 859-1660.

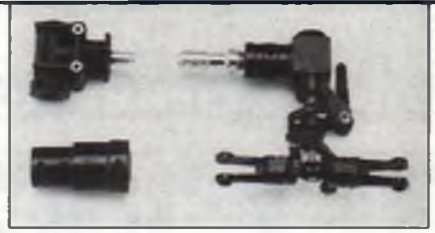
HITEC'S MONSTER SERVO

For its big HS-605BB Ultra Torque servo, Hitec RCD claims an output of 77 ounces and a transit time of .16 second on 4.8 volts; on 6 volts (a five-cell NiCd pack) the numbers jump to 91 ounces and .13 second. Mechanical features include dual ball bearings on the output shaft and extra-strong helical gears. Suggested retail is $59.95. From Hitec RCD, 10729 Wheatlands

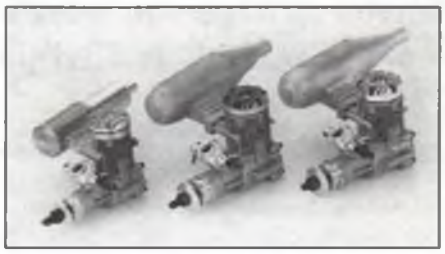
Ave., Suite C, Santee, CA 92071; (619) 258-4940.

HIROBO HELI UPGRADES

Altech Marketing, distributors of Hirobo RC helicopters, is offering tail rotor upgrade kits for owners of SST-Condors and SST-Eagles. Available are both shaft drive (shown in the photo) and belt drive setups, both of which are designed to fit Hirobo's exclusive octagonal tail boom. The shaft drive kit includes a counter gear set, tail mount, and a metal tail rotor gearbox; not included is the 2mm wire shaft. The belt drive kit consists of a counter gear set, a reinforced toothed belt and an open metal frame for ease of inspection and maintenance. Both come with thrust bearing equipped blade



holders and a linear pitch lever for precise control. Both of these kits are available now at your local Hirobo dealer, or write for further info: Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391.



THE WEBRA GT'S

Horizon is currently distributing the new economically priced Webra .32, .40 and .50 GT Series engines, which come with mufflers and an updated TN-II carb (features an aluminum throttle arm and an O-ring sealed high speed needle). The reviewers at Horizon say they put these engines through some pretty rigorous testing and they they pulled through with no problems whatsoever. To top it all off, Webra back these engines with a two-year warranty. You can get more details on the GT Series Webras from Horizon Hobby Distributors, 3102 Clark Rd., Champaign, IL 61821; (217) 355-0022.

HOTDOGGIN' FUN-FLIER

One of several new models from Global Quality Kits is the "Ricochet" fun-fly ship for four channels and .25-.36 two-stroke power (the Magnum PRO .36 SE ABC would be perfect). Span is 48 inches, wing area 780 square inches. The kit lists at $64.95 and includes machined and die-cut balsa and lite-ply parts, engine mount beams, fiberglass tailboom, preformed landing gear and basic

hardware. Ricochet kits are available at hobby shops throughout the U.S. and are distributed exclusively by Global Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728-8610.

BZZZZZZZZZ

Andy Clancy of Clancy Aviation is offering plans and kits for his unusual looking "Lazy Bee" RC sport model, designed for three channels and anything from an .049 to a .26 four-stroke or even electric power. With its ultra-low aspect ratio (526 squares in a 40-inch span!), short coupled stab and full-flying rudder, the airplane is claimed to have delightful low-speed performance and can be flown from very small fields.

Plans and a 36-page instruction booklet go for $19; the kit is $34. You can even get a video for $12 plus an $8 deposit. Catalogs are also available for $2 from Clancy Aviation, 219 W. Second Ave., Mesa, AZ 85210; (602) 649-1534.

BLAST OFF!

The new Strato Blaster is the second in Estes' line of rocket-powered RC gliders. It uses the same basic sheeted foam core wing as its predecessor, the Astro Blaster canard, but has twin booms and fins supporting a high-mounted stab. Forward fuselage pod is blow-molded plastic with a removable canopy/hatch for easy radio access. Rocket motor requirements call for an Estes D11-P or E15-P; or, using the adapter included in the kit, you can bolt on a Cox Black Widow .049. Or leave the motors off altogether and head for the slope. Priced at $69.99 retail, the kit is produced by Estes Industries, P.O. Box 227, Penrose, CO 81240. ***MB***

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

TEX JOHNSTON'S FAMOUS ROLL

Francis also delves into the subject of aileron differential; do we really need it, and if so, how much is enough? The answers will surprise you!

Many of you will remember part of this story. At the time it happened it was one of the most talked about news items of the jet age. After 38 years there has been a lot of fiction added to the facts, so I phoned Tex Johnston this spring in order to give you the straight scoop. Tex said his memory of some of the details is getting a little foggy (he is now 78), but the following contains no serious errors.

Tex Johnston (complete with cowboy boots and Stetson) is a famous test pilot who tested many Boeing airplanes, including the prototype 707 (known as the "Dash 80"). Prior to his career at Boeing, where I knew him slightly, Tex had been an aerobatic pilot and a test pilot for Larry Bell at Bell Aircraft, where he flew the X-1 rocket plane. He won the Thompson Trophy at the National Air Races while working at Bell. For details of his fascinating life, read his recent autobiography, *Tex Johnston: Jet-Age Test Pilot.*

What the heck are we looking at here? Answer in text.

But back to the story. The test program on the 707 was well along in 1955 and Bill Allen, then president of Boeing, asked Tex to make a fly-by over Lake Washington during the Gold Cup hydroplane race that year. Boeing was trying hard to get more orders for the 707, the first American jet airliner, and that kind of public exposure would be very valuable. Tex, of course, was pleased with the assignment, but he privately came up with a secret plan to increase the attention the fly-by would get.

I was there and saw it. The 707 made a pass over the crowd on schedule, right after the Blue Angels had put on their show; but in the middle of the pass the big four-engine jet did a barrel roll! The spectators were amazed and delighted—and Bill Allen was *furious.* For good measure Tex did another perfect roll during his return pass. Other Seattle newspaper headlines were pushed lower on the front page the next day.

On Monday morning Tex was called on the carpet in Bill Allen's office. Tex explained that the stunt was very carefully executed to hold a 1-G load throughout the roll, and there was absolutely no added stress on, or danger to, the airplane. It took Bill a while to believe that, but eventually everyone agreed that Tex was right, and he wasn't fired. Those rolls turned out to have tremendous publicity value.

The photo shows part of Seattle, some water at the top, and the left wingtip and outboard left engine of the 707 while *upside down.* The shot was taken by Bell Whitehead, a Boeing test engineer who was on board. Tex says it was the only photo taken from the plane during the rolls. I got a copy from Robert Nielson, an engineer friend in Marina Del Rey, California. He got it from his late father, who got it from a source unknown. I don't remember seeing the photo published before; this could be a *Model Builder* exclusive.

One story that circulated said Tex flew the ship out over the Pacific Ocean and practiced the roll before he did it in public. I asked Tex about that and he said, "Bull! I was a champion aerobatic pilot. I knew exactly what I was doing. I didn't need any practice."

Tex gave me the formula for those rolls. Here it is, in case you have a four-engine, 600-mph jetliner you want to roll:

"Drop the nose and get adequate airspeed, then pull up to a 35 or 40 degree angle and crank in full aileron. As the airplane goes inverted you pull back on the wheel. That pulls the nose down because you are inverted. Keep the G-meter right on 1.0, the same as in level flight. The airplane never knows you did anything but go into a turn, because it is held at 1 G the whole time."

By the way, Tex Johnston was inducted into the National Aviation Hall of Fame, at Dayton, in 1993. I doubt if his unauthorized aerobatics in a 707 won him that spot, but they probably didn't hurt.

AILERON DIFFERENTIAL: FACTS AND FALLACIES

Experienced RC modelers know that we should set up our models so that when the ailerons are deflected, the one going up has a greater deflection angle than the one going down.

We also may "know" that the reason for this is that in a turn, the down aileron (obviously the one on the outside of the turn) will have more drag than the up aileron. Greater induced drag on the down-aileron side will result from the greater lift produced. This greater drag will cause a yaw opposite to the direction of the turn, "adverse yaw," which will increase the total drag and degrade the looks of the flight. Everyone agreed?

I was comfortable with the above until recently. Now I suspect we may have followed a modeler or two in the distant past who may not have thought things out thoroughly.

To study the matter in more depth, we need to go back to some basics. Simple RC

models without ailerons usually have considerable dihedral, which is required to make the model turn with rudder alone, for reasons we have discussed in the past.

Now consider an airplane with considerable dihedral *but with ailerons,* which are used in turns instead of the rudder. For a right turn, right aileron (the right aileron up) will be required to initiate the right roll for the turn. Because of the roll-stabilizing or bank angle neutralizing effect of the dihedral, right aileron must continue to be held to hold the desired bank angle in the turn. Aileron differential would be very appropriate here.

However, most models with ailerons have little or no dihedral. With aileron control we don't need roll stability. A plane with a lot of dihedral flies unrealistically, and its aerobatics are pathetic.

With little or no dihedral we still have to use right aileron to initiate a right roll for a right turn, but we don't have to hold aileron because we don't have a lot of roll stability to counteract. In fact, we have to apply *opposite* aileron to keep the plane from rolling too far. If the roll stability is neutral it will take as much left aileron to stop the roll as it took right aileron to start it in the first place.

And that isn't all. In a turn the inside wing is flying slower than the outside wing, therefore the lift coefficient on the inner wing must be greater in order for the lift on both wings to be equal. If the outside-wing lift remains greater, the bank angle will increase. So, in an airplane with little or no dihedral, not only must we apply opposite aileron to stop the roll, but in a turn we must hold opposite aileron to hold a constant bank angle!

From that hasty analysis, we come to the conclusion that in a turn, aileron differential is wrong! With differential we deflect the down aileron less because we assume it is on the outside of the turn, but it isn't. The down aileron is on the *inside* of the turn, and we need the extra drag there to maintain a little yaw in the roll direction for a balanced turn (if we don't also use rudder in our turns).

To avoid being guilty of oversimplification, however, again we must study further. In a balanced turn the airplane is banked. The tighter the turn, the steeper the bank angle and the more elevator we must use. This is true because we really turn with wing lift. The no-slip, no-skid bank angle is that which provides a lift vector which is the exact resultant required to react both the airplane weight and its centrifugal force in the turn. The tighter the turn, the greater the centrifugal force.

If we made tight turns with the wings flat, the inside wing would indeed be traveling considerably slower than the outside wing. But when we make a very tight turn the bank is nearly vertical, and the inside (lower) wing is therefore going almost as fast as the upper or outside wing. In a gentle turn the bank angle is low but the turning radius is great, and the inner wing is again going almost as fast as the outer wing. The argument is true that the inner wing in a turn is going slower, but considering bank angles and turn radii, the velocity difference is normally minor.

Turns are primarily executed with the elevator, and the aileron deflection required to initiate and hold the bank in a turn is small. We don't provide lots of aileron throw in our models for turns; we provide it to get a fast roll rate for aerobatics. And what effect does aileron differential, or the lack of it, have on axial rolls? It causes corkscrewing if it isn't right. The effects and the amount of differential required will be different for different airplane designs, however.

What we need is the theory that explains reality. The guys most observant of the fine points of flight reality are the expert pattern fliers, so I checked with my friend and FAI-level competition pattern flier, Kip Jackson.

Kip has a different theory on the need for aileron differential—he thinks it relates to the differences in the airflow above and below the wing—but we agreed on many aspects of the question. The more dihedral the plane has, the more differential aileron it needs. Also, the height of the wing on the fuselage affects the need for differential, as

continued on page 86

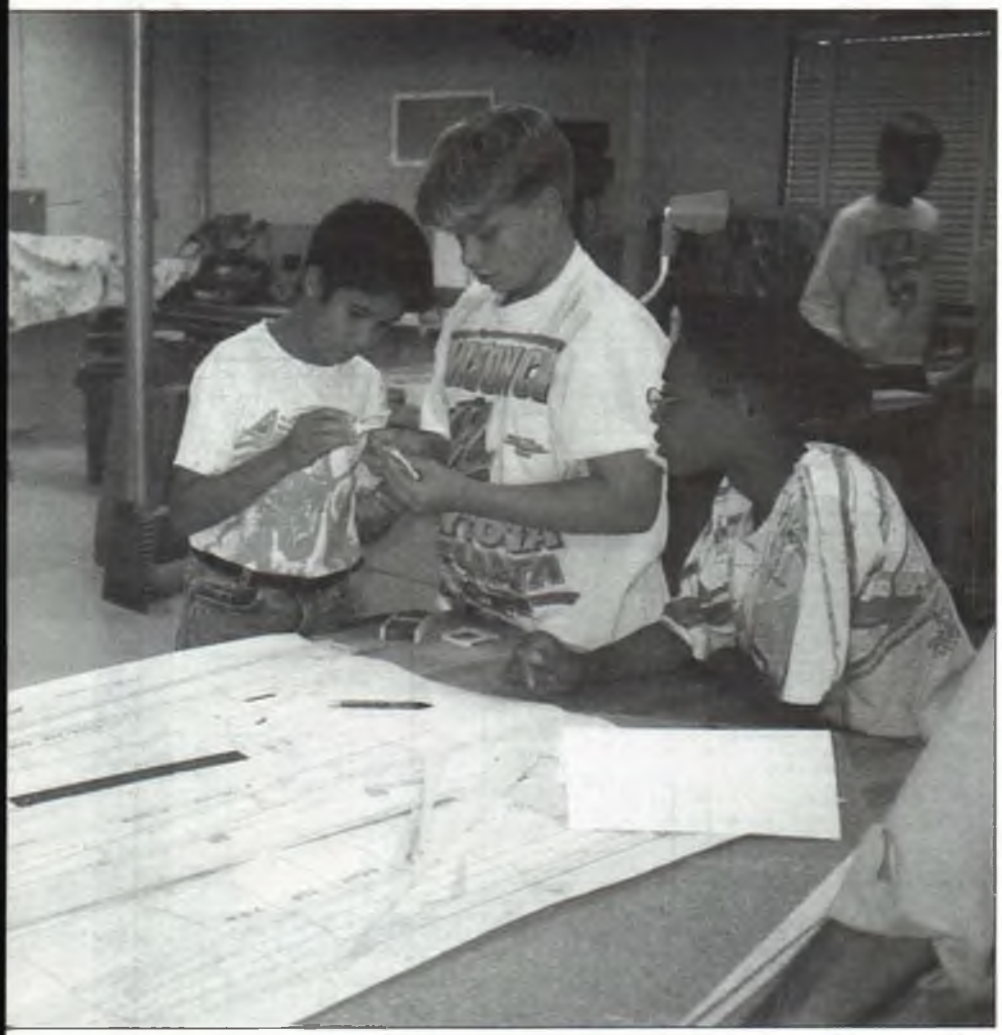
RC ELECTRICS AND KIDS

How our columnist used a simple electric trainer to introduce a group of junior high school students to the enjoyment of building and flying an RC model aircraft.

The following is the story of my involvement with Frank Forrester, a dedicated science teacher who started a Technology Club at Challenger Junior High School in San Diego, California last year. This club consists of about 20 hard-working students who have made a commitment to broaden their horizons beyond the typical ho-hum junior high school existence.

Mr. Forrester started the club by getting the students involved with amateur radio, constructing a ham radio station complete with equipment that would make your average ham operator drool. He has helped many of them get their ham radio license. In the last year, he has expanded his curriculum to include chemistry experiments, model rocketry, computer programming and analysis, and now RC modeling.

Early last summer, Mr. Forrester asked me to teach an after-school class in model building, beginning in the fall. The students would be the 7th and 8th grade Technology Club members who have an interest in modeling and aviation. The plan was to have the students construct their own RC aircraft from plans. The PTA would donate the balsa and other construction materials and I would donate the use of a couple of radios and battery packs. Bob Boucher of Astro Flight generously donated two cobalt 05 motors. Mark Potoki, the woodshop teacher, agreed to give us the run of his shop, and Pat Payne, the industrial arts teacher, offered to assist Mr. Forrester and me during construction.



Last fall, Roger assumed the role of model aviation instructor at a local junior high school, supervising a group of about a dozen students as they built two identical electric-powered trainers. For the project, Roger took Jim Bigley's "Tooter" design and made the necessary modifications for electric power, dubbing it the "Toot-E." Here the triangular balsa corner longerons have been glued to the sheet balsa fuselage sides and the students are building the individual bulkheads. Pictured from left: Philip Delaney, Travis Garrison and Edward Collins.

WHICH MODEL TO BUILD?

Quite a while ago I ordered building plans for the "Tooter," a powered glider designed for a .10 gas engine. It has a 66-inch wingspan, weighs about 36 ounces and is a good beginner's airplane. I've always liked this type of ship, so I constructed one and converted it to an 05 electric a couple of years ago. The plane was so nice that I still fly it regularly and have used it many times to teach others how to fly.

Remembering my experience with the Tooter, I chose it as the plane we would build. It has a sheet balsa fuselage, D-tube wing and a built-up tail section. An Astro 05 motor with a seven-cell 900 or 1200 mAH pack is used for power. I marked up the Tooter plans with my modifications, renamed it the "Toot-E," and made copies for the student teams.

LESSON PLAN

I wrote a detailed summary of the construction steps for the fuselage, the tail, the wing and finally the motor and radio installation, along with the approximate time required to complete each step. With this information, Mr. Forrester and I came up with a construction schedule that fit the available blocks of time.

Then we created a comprehensive syllabus listing the construction sequence, tools required, and procedures used to build the plane. For example, the activities for Meeting 1 are:

1. Aircraft definitions.
2. Familiarity with the model plans.
3. Materials and tools used in construction.
4. Templates for aircraft parts.
5. Plans preparation (pin down and cover with wax paper).

Once the bulkheads were constructed and square, they were applied to the fuselage. Emphasis was placed on giving them at exactly 90 degrees to the fuselage sides and getting tight glue joints. Pictured from left: Robert Martinelli, Randy Padrique, Pat Payne (industrial arts teacher) and Ryan McCollum.

Putting the finishing touches on the wing before sheeting begins. Pictured from left: Brian Weitkamp, Philip Delaney and Aaron Snead.

Two of the proud owners of this framed-up Tool-E: Rudy Guzman (left) and Ryan Phillips.

6. Fuselage construction:
   a. Cut out fuselage sides.
   b. 1/32 plywood doublers for hold-down holes.
   c. Drill holes for hold-downs.
   d. Mark location for bulkheads.
   e. Triangle stock on fuselage edges.

Each meeting's activities were detailed so the students could maintain direction and feel the natural course of events. For a 12-year-old, the tunnel to successful completion is long, but he or she can always see the light at the end of it.

We agreed to meet every Wednesday starting in late October (1992) for 1-1/2 to 2 hours each session. After I explained that this class wouldn't be a lesson in instant gratification—the project would continue well into March—we were left with about 12 students who were serious about the project and were eager to learn.

I purchased various sizes of sheet balsa, some spruce for the wing spars, some plywood for the wing joiners and hatch, and a dowel for the wing and hatch hold-downs. I also came away with some flexible pushrods, a couple of balsa strippers, a couple of covering irons and some covering material. The kids would have the use of the woodshop, so most of the tools they would need would already be available, but I did supply some razor blades and a few bottles of CA glue.

CONSTRUCTION

After explaining some modeling definitions, we unrolled the plans and described how the model is constructed. Many elementary construction techniques are used in this model. The fuselage is made with bulkheads and sheet balsa, giving the students practice cutting straight lines with the razor and securing stiffening stringers to the fuselage edges. The tailfeathers are constructed with 3/16 balsa sticks; this shows how simple sticks are glued together to form a strong tail structure and teaches the importance of slicing and fitting balsa accurately for tight glue joints. The wing is a traditional D-tube with spruce spars, shear webs, leading edge and center section sheeting, dihedral braces and capstrips.

After the parts were completed, we brought out the covering irons and covering material and let them go at it. I'll admit it wasn't the best covering job I've ever seen, but neither was mine on my first plane many years ago! The radio and pushrods were installed next. The students learned how the linkage between the servo and the control horn works and how control throws can be decreased and increased by moving the pushrod attachment points on the servo wheel and the control horn.

Finally, the concept of the center of gravity was explained. The planes were balanced by placing the motor and the battery packs in the appropriate spots.

FLYING

Our last meeting was in the schoolyard.

Using buddy cords (highly recommended), the planes were launched, quickly trimmed and handed to the students. Most of them were flying unassisted with five minutes or less of instruction. The look on their faces when their planes actually flew was priceless and worth all the time and effort. Future construction programs will no doubt be carried out next year.

This type of school activity is a very rewarding experience for the modeler teaching it and gives the kids a great introduction to our favorite hobby. The electric power systems also exposed the students to a technology in its infancy, much like radio control was 30 years ago and gas engines before that. The icing on the cake was that since we had no noise problems, we could fly in the schoolyard surrounded by houses!

MODEL ELECTRONICS' WEP POWER SYSTEM UPDATE

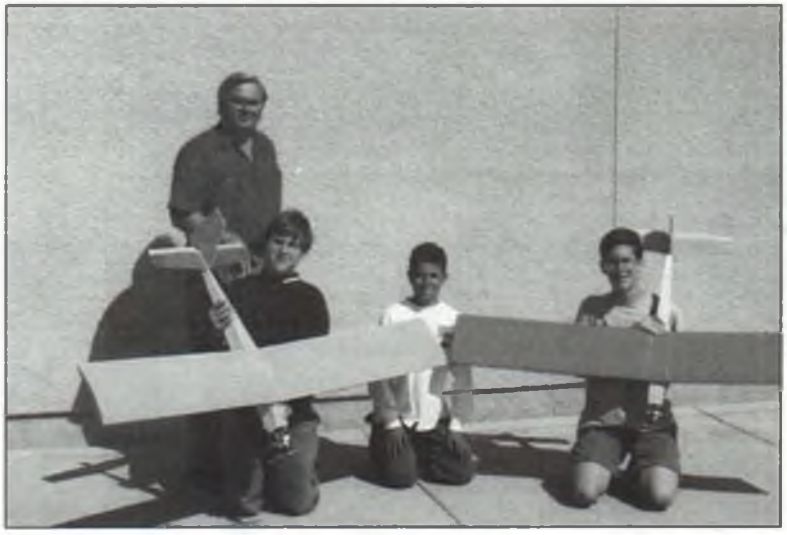
As I mentioned in my review of Model Electronics' War Emergency Power motor system (August '93 *MB*), I gave the motor and speed control to a fellow club member and modeler extraordinaire, Harold Reed, to test out in one of his Old Timers. According to Roland Peterson, president of Model Electronics, the WEP motor is at home in these slow-flying models. The following is Harold's report:

"I installed the WEP system in my 80-inch Playboy. The motor fit nicely inside a bored-out Astro Flight 035 motor mount. Using a seven-cell pack, takeoff was 120 to 150 percent longer than with a geared cobalt 05 and the climbout was also slower, but acceptable with an 11x7, 11x8 and 12x8 propeller. The 11x8 prop suited the motor and the big, high-lift, high-drag Playboy best.

"The speed control was adequate but seemed a bit rough at lower speeds. It consists of two components, making installation messy. The battery leads into the speed control were short enough to make battery changing difficult. On the plus side, I experienced no unwanted motor bursts or glitches common with some speed controls.

"The 6:1 gearbox was rather bulky and may be difficult to cowl in some models. It also made a shrill noise in flight. Maybe the smaller gear ratio units are quieter."

Many thanks to Harold for the report on the WEP system. Actually, the speed control being in two parts could be an advantage if you have a small plane with confined spaces. Also, Roland has told me that although the WEP motor performs well with seven cells, it was really designed to run on nine. Neither Harold nor I used a nine-cell pack, but I have future plans for an Old Timer that I will try with the larger pack.



The completed Toot-Es. Note that there is no covering on the fuselage—time was short and what the heck, they didn't have to worry about fuelproofing anyway. Pictured from left: Frank Forrester (science instructor and Technology Club advisor), Ryan Phillips, Aaron Snead and Ryan McCollum.

ELECTRIC MODELER'S MAIL LIST

Don't forget about the Electric Modeler's Mail List. To request a listing of electric modelers in your area, send me a self-addressed, stamped envelope. To get yourself and/or your electric club on the list, send me your name, your club name, address, and phone number (optional), and I'll put you on pronto.

Questions, comments, or pictures pertaining to electric flight should be directed to me at 6462 Sunny Brae Dr., San Diego, CA 92119, and please enclose a self-addressed stamped envelope. You may also call me during working hours at (619) 463-4453. ***MB***

For those who feel the need for speed

Introducing the Great Planes F-14 Tomcat

The scene is high over foreign waters. The atmosphere is tense as you patrol your sector, ready to intercept incoming attackers. You receive a signal—inbound bogie approaching fast. You prepare for the dogfight to begin...

It's easy to imagine. Easy, that is, if you're behind the sticks of your own Great Planes F-14 Tomcat. Modeled after the full-scale U.S. Navy Tomcats used in the Persian Gulf War and at the "Top Gun" Naval Training School in Miramar, California, the Great Planes F-14 lets you experience the excitement of real jet-like power.

A front-mounted engine and prop provide familiar sport plane construction.

With a .60 engine, optional retracts and a sleek, 58.25" swept wing design, you've got the speed you need to turn and burn. Aileron rolls, high-speed passes and other jet-like maneuvers are all possible with this striking model.

Unlike standard jets, however, this plane doesn't require the expense or advanced building skills needed to construct a complex ducted fan model. A front-mounted engine and prop and Great Planes interlocking parts make the F-14 far easier to build. As for the price, well, the F-14 was made to burn holes in the sky, not in your bank account.

To get into the pilot's seat of your own F-14, though, you must complete your first mission: go to your local hobby shop and bring home the Great Planes F-14 Tomcat today. Where you go from there is up to you.

For a free brochure and the location of the dealer nearest you, please call **1-800-682-8948, ext. 0373.**

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BY KRIS ADAMS

Sig's Mid-Star 40

The folks in Montezuma have a real winner on their hands with this easy-building .40-size sport/trainer—a great choice for your second airplane.

With all the aerobatic trainers on the market today, one may have a problem finding a model that possesses both great flying characteristics and good looks. It's tough to find both qualities in a single model; to me, most good-flying semi-trainers look like shoeboxes with wings. Happily, the Mid-Star 40 from Sig Mfg. Co. is an exception, and is well worth taking a look at.

The kit is very complete. Sig really had the builder in mind when they packaged this model. In my kit I found some very nice stick and sheet balsa and a generous assortment of pre-shaped balsa parts, including a pre-cut rudder, fin, elevator, stabilizer, wing ribs, pre-tapered ailerons, and a number of very nicely die-cut plywood (lite-ply) parts, most of which make up the basic structure of the fuselage.

The hardware package is also very complete. It contains over 35 different items, including pre-bent aileron torque rods, clevises complete with pushrod assemblies, Sig's famous "Easy" hinges, blind nuts, wing bolts, pre-bent aluminum landing gear, molded clear canopy and a white molded plastic canopy base. Also included is a detailed photo-illustrated instruction manual and a copy of *The Basics of Radio Control*, an informational booklet written by the folks at Sig specifically for the novice flier.

To top off the kit, you also receive a set of full-size plans and two colorful decal sheets. The Mid-Star 40 can be built with tricycle gear or as a taildragger. Both the nose and tail gear are included in the hardware package.

Mistine Adams poses prettily with hubby Kris's Mid-Star. Model is covered entirely with Sig's Supercoat iron-on film; colorful graphics—two full sheets of 'em—are supplied in the kit.

BUILDING

I'm personally not a real fast builder, but this kit gave me hope. It does just as the box says: it builds fast. I found the highly detailed photos in the instruction manual to be quite helpful. The manual takes you step by step through the building and leaves nothing to the imagination. I built the majority of the model with Zap CA, using epoxy where called for.

The fuselage has a feature I especially liked: a removable hatch for easy access to the fuel tank. This will be handy should it be necessary to get to the tank in the future.

COVERING

I covered the entire model with white Sig Supercoat film. This covering really adheres well without much heat and goes around tight corners with ease. Electric fliers should love it, because at only 1.5 ounces per square yard, it is ideal for lightweight models. The supplied decals and some of my own black trim really added the finishing touches to the model.

RADIO INSTALLATION

I used a Futaba four-channel radio with S148 standard servos for all controls, and a 500-mAH battery pack. I changed the location of the throttle servo out of personal preference, but with all of the room inside the fuselage, you can use most any arrangement you wish. Sig's new pushrod connectors made the control hookup easy. They have a hex-shaped brass body so you can hold them with a wrench or pair of pliers while you tighten down the socket-head set screw that holds the pushrod in place. The combination works great.

ENGINE

Much has been written about the K&B .45 Sportster in the model press, so I will only add to it by saying I feel it's a perfect match for the Mid-Star 40, both for its inexpensive price ($99 suggested retail) and overall performance. Because of its sleeveless, chrome-plated aluminum cyl-

Ace photographer and frequent *Model Builder* contributor Skip Ruff captured the Mid-Star 40 making a *very* close pass while flying at the famous free flight field at Taft, California. Kris has nothing but good things to say about the model's flying characteristics.

inder construction, it's as light as any comparably sized engine available. The engine comes with a surprisingly effective muffler as well as a separate backplate radial "spider" mount that allows the engine to be bolted directly to your model's firewall, no additional engine mount required. The engine ran great and was ready for flight after 15 to 20 minutes of break-in.

FLYING

I was more than impressed with the way the Mid-Star 40 flew. I set up the controls with the suggested throws given in the instruction manual and found them to be sufficient for any kind of flying. In flight, the model was very smooth and stable—so stable that I couldn't even get it to stall. With the throttle pulled all the way back to idle and with full up elevator, the model would just hang there, almost floating as it flew. Loops, spins, and rolls all went without a hitch.

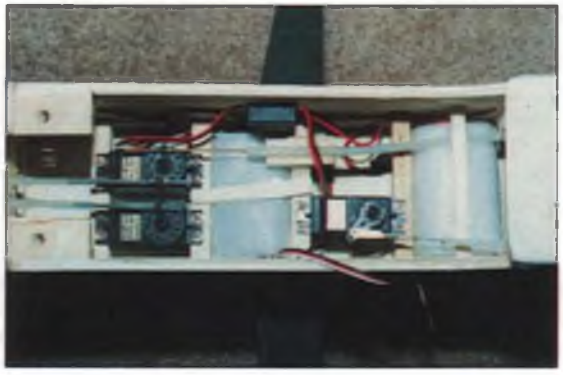
With flight characteristics like these, this airplane would seem to be the perfect choice for an RC trainer or as a hotdogger for the sport flier. The Mid-Star is a testimony to Sig's ongoing commitment to excellence, and is sure to bring many hours of flying pleasure. ***MB***

SIG'S MID-STAR 40

WINGSPAN	64-1/2 in.
WING AREA	630 sq. in.
FLYING WEIGHT	5 lbs.
WING LOADING	18+ oz./sq. ft.
OVERALL LENGTH	47-1/2 in.
POWER	.30-.40 two-stroke; .40-.50 four-stroke
RADIO	Four channels required
SUGGESTED RETAIL	$84.95

Produced by Sig Mfg. Co., Inc., 401-7 S. Front St., Montezuma, IA 50171; (515) 623-5154.

■ **ABOVE: All framed up and ready for covering. Basic fuselage structure is made of die-cut lite-ply; note the lightening holes in the tail section. Wing features a fairly thick semi-symmetrical airfoil with beefy spars top and bottom and shear webs over the full span. Hatch just in front of the wing is for access to the fuel tank. Plans detail the installation of both trike and taildragger landing gear installations.■ BELOW RIGHT: Spacious fuselage is big enough to accommodate virtually any modern radio. Author used a Futaba four-channel rig with four S148 standard servos; receiver is wrapped in foam at far right. ■ BELOW LEFT: The Mid-Star 40 and the K&B .45 Sportster make a terrific combination. Engine is surprisingly quiet, puts out plenty of power and fits perfectly into the nose. Prop is a 10x6 Master Airscrew.**



ELECTRONICS CORNER

BY ELOY MAREZ

•Adding LEDs to Electronic Circuits •Measuring Battery Voltage Under Load

The Electro Dynamics DM100 Digital Multimeter, a small toolbox-size instrument useful for measuring all common circuit values. Looks good, too! A deep rich yellow! More in text.

The first subject this month results from my correspondence with Andy Woitowicz, in Timmins, Ontario, who wrote regarding the popular subject of charging batteries on the field. Andy's favorite method involves a circuit that appeared in *MAN* back in September 1983; it charges the normal four-cell pack at a starting rate of 280 milliamperes, tapering down as the battery voltage rises. According to Andy, the method does the job well, and he recommends it.

Andy is interested in using an LED in series with the charger output to indicate that charging is indeed taking place—a common battery charger practice. The first thing to remember is that anything, be it a meter, incandescent bulb or meter inserted in series with the charger's output, is going to change the apparent resistance as seen by the charger. Two things will happen: 1) The charging current will be reduced, and 2) If the same parameters are to be maintained, such as automatic changeover to a trickle rate, the unit will have to be recalibrated.

I've often used a series LED as a current indicator; a seemingly simple task that brings with it a not-so-simple catch. It has to do with the relatively low current carrying capacity of the common LED, a parallel resistor being required to carry the additional current. I've always arrived at the proper resistor value through the "cut and try" method, effectively reinventing the wheel every time, but this time I decided it was time to look up and hit you with the formula on how to calculate these shunt resistor values. As it turned out, I couldn't locate the first trace of what appears to be really useful information. So some of what you are about to read can be called "LEDs *a la* Eloy"

Although higher current LEDs are now available, run-of-the-mill ones are capable of handling only 25 mils or so. Like all light-producing devices, the intensity of the light is determined by the current. And like everything else electronic, per Ohm's Law, the current is determined by the applied voltage, LEDs being rated at 1.6 to 2.5 volts. Current flow, and thus light intensity, will also have a bearing on the life of the LED, and must be considered in that respect.

In order to evolve my formula, I needed to know the in-circuit resistance of the LED under various conditions, and came up with the following data:

INTENSITY	VOLTAGE	CURRENT	RESISTANCE	CLOSEST STD. VALUE
Visible	2.01	5 mA	402 Ohms	390 Ohms
Average	2.09	10 mA	209 Ohms	200 Ohms
Bright	2.25	15 mA	150 Ohms	150 Ohms
Very Bright	2.36	20 mA	118 Ohms	120 Ohms

To review, the resistance noted is that which the LED will introduce into the circuit when the voltage is adjusted to produce the stated current and thus the light intensity given. Because the calculated resistances differ from those commonly available, the closest values given can be used should you want to simulate any circuit conditions. The slight difference will not affect things to any great degree. Another thing to remember is that since there are literally hundreds of LEDs available, and colors other than the red ones used for these calculations will have other resistances, these figures cannot be taken as 100 percent accurate for all LEDs. However, they all are rated pretty much the same for voltage and current, and using the above will definitely put you in the ballpark.

Now for that formula I promised you! Also as promised, it is a simple one:

$R_S = R_{led}/N-1$

where:

R_S = the resistance of the required shunt resistor;

R_{led} = the in-circuit resistance of the LED as determined for the desired intensity.

N = the factor that the LED current is to be increased by, i.e., if the desired current is twice that intended for the LED, N is 2. If that current is to be multiplied 10 times, N is 10.

Want an example? Let's take Andy's case; his charger is running at 280 mA, and let's pick a "bright" LED intensity at 15 mA. In all cases, for all electronic formulas, we have to use basic units: 280 mA converts to .280 amperes, and 15 mA to .015A. First, to figure out the factor, we divide .280A by .015 to get 18.67. This means then that when the LED is carrying 15 mA of current, the shunt will be carrying 17.67 times that (18.67 minus 1). Working that out mathematically, you'll get 265 mils for the shunt plus the 15 through the LED for the 280 total desired.

We now have to divide 150 by 17.67, getting 8.49 ohms as the required resistance for the shunt. The nearest available standard resistor value is 8.2 ohms. The slight deviation will not make that much difference, bu I recommend you try to find a 1 or 2 percent tolerance resistor, as the more common 5 or 10 percent units will introduce an even greater error.

The other resistor parameter, wattage, can be obtained with another simple formula: I^2R. In the above example, we calculated the current through the resistor to be .265A, which squared is .07; multiplying this by 150 (R) gives us 10.5 watts. It's generally recommended to double the calculated wattage figure for resistors in circuits that involve heavy currents and will be on for long periods; in this case we are probably better off using two 16-ohm, 10-watt units in parallel. The total value then is 8 ohms at 20 watts. The extra few mils that will flow are still well within the capability of the extra wattage.

Formulas are kind of fun, don't you think? While I am all warmed up to them, let me give you another to play with, this one to use when you want to use an LED not as a current indicator but merely to show that something is turned on. As

stated, LEDs are rated for voltages much lower than we normally use, therefore a resistor has to be inserted in series with it and the power source to bring things in line.

In this case, the opto-electronics textbooks do provide a formula:

$R_s = V_{in} - V_{led}/I_{led}$

where the series resistance (Rs) is obtained by dividing the difference between the applied voltage (Vin) and the LED voltage (Vled) by the desired LED current (Iled).

Still using 15 mils (.015A) as an example, and assuming we would like an "ON" indicator on a transmitter operating from an eight-cell NiCd battery at 9.6 volts, the necessary series resistor would be: 9.6 minus 2.25 equals 7.35 divided by .015A equals 490 ohms. In this case you have a choice of a little brighter LED with a 470, or a little dimmer with a 510 ohm, standard value, resistor. The wattage is calculated in the same manner as in the first example.

When plugged into the DM100, the Electro Dynamics EDR-2 NiCd Tester module provides a constant 220 milliampere load to a cell or battery for true operational voltage readings.

There are a couple more types of LEDs that can come in useful from time to time. First, there is the blinking or flasher LEDs. These are ordinary appearing units, but have built-in circuitry that causes them to flash on and off approximately once per second. These are higher voltage units, most being rated at from 3 to 7 volts, and like the non-blinker, the higher the voltage, the greater the light output.

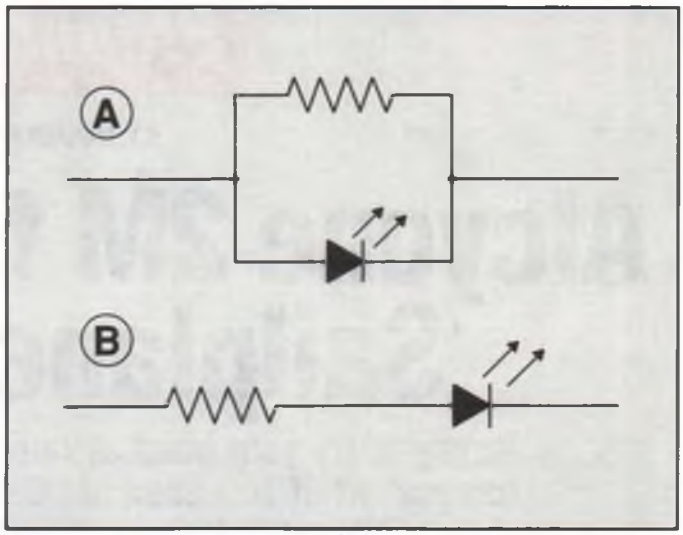
Series resistors are not used for yet higher voltages. I find the easiest way to power them is with a 100-mil, 5-volt regulator (78L05). If the applied voltage is just slightly higher, it can be dropped with one or more series diodes—1N4148s will suffice. Each diode will drop the voltage about .75 volt, and is independent of the current drawn. An interesting feature of blinker LEDs is that they can be used in series with non-blinkers, to cause them to blink. To keep the same intensity, it is necessary to increase the supply voltage 1 to 1.5 volts for each series LED added.

Multiple color LEDs are available in two-lead and three-lead versions. The two-lead units are a red and green LED in the same package, milky white in color. The choice of color is determined by the polarity applied to the leads, i.e., connecting negative and positive in one manner will result in, say, a red glow. Reversing the wires will cause it to glow green.

The three-lead version, again in the same opaque white package, is actually one red and one green LED with a common cathode (negative) connection in the center. Applying positive voltage to the outside leads, one at a time, will cause the LED to glow red or green. If voltage is applied to both outside leads at once, an orange glow is created. The resistors required for using multi-color LEDs in various ways are calculated as described for the simpler red units.

MORE ON BATTERIES

Actually, this is a continuation of a subject last discussed in March—that of properly loading NiCd batteries while taking voltage measurements. At that time I presented a number of load circuits, any of which are a definite improvement over a resistor, which introduces its own variables into already varying conditions. If you didn't like any of those methods, there is now another option for you: the Electro Dynamics EDR-2 NiCd Tester.



The two circuits to be used when using LEDs to indicate current (A) or voltage (B). The simple formulas for calculating the appropriate shunt resistor values are included in the text.

The EDR-2 presents an unvarying load to the the battery under test—in this case, 220 milliamperes. Actually, it is a two-part device, which starts with a 1/2-inch, 3-1/2 digit digital multimeter, a self-contained instrument on its own. Designated DM100, its complete specs are:

- DC Voltage: To 1000V in five ranges.
- AC Voltage: To 750V in two ranges.
- DC Current: To 10A in five ranges.
- Resistance: To 2000K in five ranges.
- Diode Test: Forward resistance in K-Ohms.

In addition, the DM100 includes an audio continuity function, used when all you need to know is that a path exists between two points. This saves a lot of time looking back and forth at the display when troubleshooting.

Contrary to common practice for small, relatively inexpensive instruments of this sort, the DM100 instructions include the tolerances that might be expected during different tests and in various ranges. Some fast comparisons were made with my Fluke 8840, and the DM-100 readings fell well within the claimed tolerances in all cases.

For strictly NiCd cell (or battery) testing, a plug-in module, described as a "constant current, voltage and polarity independent, short circuit proof load," is attached to the DM100 and the selector switch placed on the 20VDC range. An adapter to match JR and Futaba equipment is included; ones for all other RC systems are available from Electro Dynamics or can be wired from readily available parts.

The instructions furnished with the EDR-2 explain all the capabilities of the system, and include graphs and charts with which you can keep accurate track of the condition of your all-important NiCds. I was glad to see that nowhere do they tell you that you can use voltage readings to measure the remaining charge in any pack. I accept that you can do that with one particular battery if indeed you gauge its parameters closely and constantly, but to believe that all similar batteries are going to act exactly the same—and to gamble your airplane on them—is not something that I can recommend.

The condition of your NiCds and how they work in your model should be important to you. Check with Electro Dynamics Inc., 9567 Crosley, Redford, MI 48239 for more info on how the EDR-2 can help you, and the other related products they have to offer.

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

BY DOUGLAS E. BUCHANAN

Alcyone 2M from Northeast Sailplane Products

Ready to try your hand at two-meter competition soaring? NSP has just what you need in this high-performance 2M version of the well-known Alcyone open-class sailplane.

Simplify construction, reduce weight, provide structural integrity and you have the new Alcyone 2M two-meter competition sailplane. As expected, the 2M is a downsized version of the open class three-meter Alcyone, both of which are produced by Mel Culpepper and available exclusively through Northeast Sailplane Products in Williston, Vermont.

The pride Mel Culpepper takes in his product is evident even in his packaging. Full-size plans, instructions, foam wing and stab cores, wood and hardware is included, packaged and bundled appropriately. Because of the high quality 4-6 pound contest grade balsa supplied, the kit doesn't contain a lot of excess material, and in some cases none.

Construction is fairly easy with the instructions and full-size plans provided. One thing you'll notice is that the instructions refer to fractional dimensions, while the plans contain both decimal equivalents and some fractions. I found this a bit disorienting at times, but not really detrimental to proper assembly.

The building process begins with the rudder, where just enough wood is provided. When building the fin, the stab pivot wire is useful to help align the bellcrank tube and supports. This alignment is important because it squares the elevator to the fin, and the pivot wire's length allows any error to be easily seen. Install only one side of the 1/64 plywood fin so the previously installed bellcrank can be used to mark the arc and cut the front elevator wire slot on the inside before installing the other side of the fin.

The fuselage construction on kits produced after January 1993 is accomplished per the instructions. On previous kits, installing the nose block when instructed will cause the lower fuselage sheeting to project below the nose block. The fuselage side view on the plans shows the correct orientation for the nose block and lower sheeting on all kits. Take your time when fitting the truss pieces of the tail boom and the results will provide a very durable assembly.

The stab halves were done per the instructions using 3M transfer tape to bond the 1/32-inch balsa skins to the foam cores. I find this method quick, clean and a reliable way of keeping the tail weight down.

The wing is designed as a one-piece unit. Like the original Alcyone, the 2M version is designed with coupled ailerons and rudder, all driven by a single fuselage-mounted servo. Flexible cable pushrods imbedded in the wing are used to actuate the ailerons. Another servo in the fuselage operates the flaps.

For ease of transportation, I deviated from the design and made a two-piece wing. Keep in mind that transportability adds weight—a definite concern on a two-meter sailplane. The wing modification includes replacement of the aileron cables with two wing-mounted micro servos. The fuselage-mounted flap servo was likewise replaced with two wing-mounted servos.

The two-piece wing was constructed using two 4-inch pieces of 1/4-inch I.D. brass tube, 8 inches of 1/4-inch music wire, two plywood root ribs, and some Kevlar tow to wrap around the plywood shear webs at the spar root. A steel U-clamp is used to hold the wing halves together, and the joined wing is then bolted to the fuselage as shown on the plans.

Aileron horns and flap linkage were replaced with prototype 6061-T6 aluminum horns manufactured and provided by Mark Gaskievicz of Soarcraft (509-926-4803). These horns mount nicely and effectively distribute the load to the control surface.

I chose to cover my Alcyone 2M with Black Baron film because of its low temperature adhesion and light weight. Easy hinges were used for the rudder and Graupner hinge tape (available from NSP) used for the flaps and ailerons.

First flights consisted of hand tosses. Gentle stick movements indicated that adjustments were needed to decrease rudder and elevator authority. I've never felt that any of my sailplanes had too much elevator or rudder before, but the Alcyone 2M does. The long tail moment makes the rudder and elevator much more effective than I had expected. With the Airtronics Infinity 600 radio, making the needed adjustments was not a problem. Rudder travel was reduced by 25 percent of the recommended travel, and its coupling to the ailerons was reduced by about 20 percent. This is something to keep in mind when doing the stock mechanically coupled version, as changing the coupling would be more difficult. The elevator travel was reduced to plus or minus 3/4 inch. This roughly coincides with the bellcrank slot shown on the plans. No other adjustments were made at this time.

Subsequent flights from a hi-start revealed what a pussycat this sailplane is. Turns were easily initiated and held with minimum control input. Direction changes could be made with rudder and elevator alone, but using the ailerons made for crisp turns without overcontrolling. Initiate the direction, release the stick and the Alcyone 2M maintains that flight path. In the dive test it proved very stable, but when the stick was released the model pulled up severely, indicating that the CG needed to be moved back. The CG and towhook were moved back a little more than 1/4 inch. This may seem drastic, but the recommended settings are ultra-conservative, as proven during the test flights.

Living in the Pacific Northwest, the next chance I had to fly was a couple weeks in coming—even a trip to sunny California proved wet. Finally, a dry, cloudy, windy day arrived and I was off to the slope to endure an 8-degree wind chill factor for some stick time.

The wind was shearing and the seagulls needed to flap at times, but I decided to give it a try and launched. To my surprise the model started climbing and, with gentle turns to keep it in the lift, I was able to obtain some altitude. During this session the only bird that floated by without flapping was a mature bald eagle, but I was able to stay up in the light lift.

While playing with the 90-degree flaps I found I didn't have enough elevator compensation dialed in. The model would balloon up as if to stall and would start sinking as if a pair of spoilers had been raised, but never did drop its nose. After landing and adjusting the elevator compensation, I proceeded to explore the flap performance and this unusual stall characteristic. Repeated landings with a little elevator input to override the compensation confirmed this soft stall. Like so many new generation sailplanes, the flaps on this ship do drag the ground when landing, so the usual cautions apply.

Another time out, the Alcyone 2M really had a chance to show off when flown by two experienced pilots and a novice. The day provided marginal lift with temperatures in the mid-30s, the ground frozen, and no wind or clouds. Standard hi-start launches were stable and produced reasonable height. The Alcyone 2M's ability to work light lift was demonstrated when it left a floater and a hand launch descending as it slowly circled its way up or maintained altitude in the hands of each pilot. Its reaction to lift is quite obvious, and it exhibits almost hands-off spiral stability in a thermal turn, once the turn is established. The responsiveness of the ailerons at stock travel (3/4 inch up and 3/8 inch down) provides quick centering of thermals and accurate landings.

To duplicate the tested characteristics, my CG is at 5-7/8 inches forward of the

■ ABOVE: Author demonstrates the Alcyone 2M's soft stall characteristics. With the flaps deployed to a full 90 degrees, the ship sinks as though it had spoilers and will not drop its nose.
■ LEFT: Here's what you get for your $99.95. The Alcyone 2M kit is produced exclusively for NSP by Mel Culpepper, whose kits are renowned for their exceptionally high quality.

ALCYONE 2M

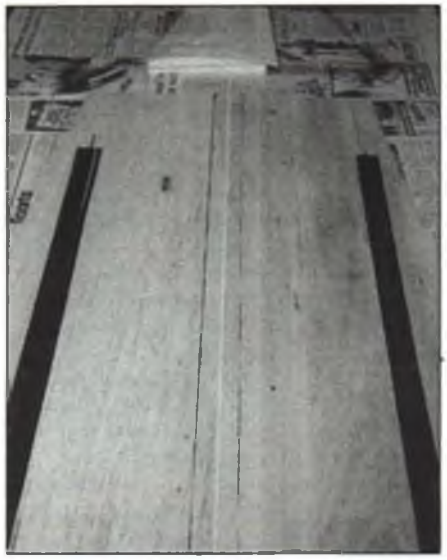
SPAN	78.75 in.
LENGTH	50.5 in.
WING AREA	609 sq. in.
ASPECT RATIO	Approx. 10.5.
FLYING WEIGHT	33-40 oz.
WING LOADING	7.8-9.5 oz./sq. ft.
AIRFOIL	SD7032 at root, transitioning to SD7037 at tip.
RADIO	Three channels required (elevator, flaps, and coupled ailerons and rudder).

Sold exclusively by Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 05495; (802) 658-9482. Kit priced at $99.95.

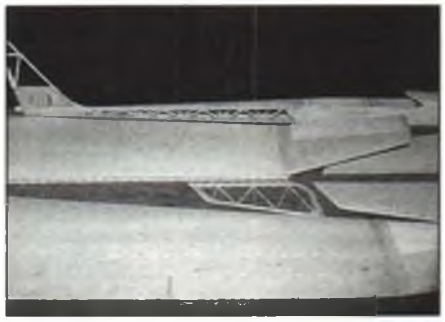
The Alcyone 2M has a full-flying stab, actuated by a pull-pull cable system, using Sullivan 1/32-inch stranded cables. Base of the fin is sheeted with 1/64 plywood.

For strength and light weight, the aft fuselage on this sailplane is a built-up open truss, with 1/8x3/16 spruce longerons and 1/8 square balsa diagonals. Top and bottom are fully sheeted with balsa. Sides are built one over the other, with a waxed paper glue barrier in between.

The Alcyone 2M uses pull-pull cables for the elevator and rudder; cables are swaged onto small cotter pins, which attach to the servo via standard pushrod connectors. The control system detailed on the plans also has the rudder servo driving the ailerons by means of cable pushrods built into the wing panels, but Doug chose to go with the more versatile (and more expensive) six-servo configuration. Rudder and elevator servos are Futaba S148s with ball bearing conversions; flap servos are Hitec HS-80MG metal-geared micros; aileron servos are Kyosho KS10 micros, all operated by an Airtronics Infinity 600 system.



Here the wing skins have been given a *very* thin coat of epoxy and are ready for the foam core and the vacuum bag (or weights if you don't have access to a vacuum bagging setup). Skins are prepared by taping the trailing edges together with a small gap in between and folding them over the foam core. You can't see it, but there's also a 2-inch wide strip of 2-ounce glass cloth along the taped seam to strengthen the trailing edge.



Finished components, ready for covering. Doug used Coverite's Black Baron film throughout because of its light weight and low heat requirements.

trailing edge, and the towhook is 1/8 inch in front of that point. This is conservative; for better launches I know they both need to go back, but the model flies so well that I've been hesitant to make changes.

The Alcyone 2M has proven to be more than I expected in several respects—its design, construction, and most of all its flying qualities. Its ability to fly slow, combined with a soft stall even in turns, enable one to work light lift, and the ship has enough speed to cover a reasonable amount of territory when desired. Building the wood fuselage was a nice change from the glass ships I usually build, and flying it an easily derived pleasure. ***MB***

Soaring in light lift over Washington's Puget Sound, Mount Baker in the distance. Considering the model's excellent handling and its ability to stay up when most everything else is coming down, the author recommends the Alcyone 2M as an excellent choice for two-meter competition.

FLYING THE ALCYONE 2M —AN UPDATE

Several months of flying the Alcyone 2M have passed since the original writing of this review, and some additional experiences and information seem appropriate.

Hi-start launches with the towhook and CG at the stated locations proved reasonable, but for good launches on a winch, I knew some changes were in order. The CG was changed in 1/8-inch increments until the sailplane would no longer fly hands-off. With the CG 5 inches forward of the trailing edge at the root, the model required constant attention. Moving the CG forward to 5-1/8 inches settled it down and provided the smoothness that I had become accustomed to.

During this process of moving the CG back, all of the nose weight was removed and the 500-mAH battery was replaced with a 270-mAH pack. The desire to have the 500-mAH battery back on board meant that some other means of nose weight reduction was necessary. Replacing the Futaba S148 rudder servo with a lighter servo proved to be the answer. The rudder does not require much torque for proper operation and centering anyway.

The towhook was placed 1/8 inch in front of the CG, and with 15-20 degrees of flap on launch, the launch height on a winch is respectable.

With the changes made to the CG the Alcyone 2M now weighs 34 ounces, giving it a wing loading of 8 ounces per square foot.

In the past few months, my model has been flown by many individuals, from novice to expert, and they all seem to feel the Alcyone 2M is mild-mannered and a pleasure to fly. Once, I was letting a few people fly it and before I knew it, there were several individuals waiting to take their turn. As it turned out, each one would take the radio at about treetop height (100 to 150 feet), fly around until they reached 500 to 600 feet, dive down to comfortable altitude and hand the radio to the next person waiting. These dives were with and without using the flaps, depending on how comfortable the pilot felt.

If you're looking for a sailplane to compete with at modest cost or to transition to ailerons and flaps, the Alcyone 2M is definitely one to consider. ***MB***

A HELPFUL TIP FOR INSTRUCTORS

For students who have a hard time with right and left when the model is coming toward them, here's a tip that may prove useful. Also discussed: the 1994 Rally of Giants fly-in.

Teaching a newcomer to fly RC is always exciting and rewarding. Some of the fledglings catch on right away; others, for whatever reason, never make the cut.

If you plan to volunteer to be an instructor, make sure you have the necessary time to do the job properly, otherwise you will discourage your student and he will either find a new instructor or quit the hobby. Worse, he could destroy his plane and maybe hurt someone trying to fly it himself.

Ray Gareau, who lives in Laval, Quebec, Canada, wrote and said that some of his students just did not understand that you move the aileron stick toward the low wing to make it go up or level when the plane is flying directly toward you. The key words that seemed to confuse Ray's students were "raise" and "up." Instead of rolling the airplane level, some of the students were pulling back on the stick.

Ray said that by rephrasing his command to "don't go there" (i.e., do not move the aileron stick to the high wing), he was able to help several fellows get it right. Additionally, the students were taught how to trim their planes and to check the trim levers before taking off. The fledgling pilot should *always* be taught to check all flight controls after engine start-up, to insure that they are working and move in the correct direction.

Thanks for the suggestion, Ray. The reminder to check the controls is something I encourage everyone to do regardless of how long they have been flying or how small or large their plane is.

It's easy to lose the perspective of your model when flying, no matter how wild the paint job. If your plane gets far enough away with the wings level, it becomes difficult to tell if it's coming toward you or turning away from you. In order to regain the perspective of the plane you need to reflect light off some part of it. I find that by tilting a wing, the light reflected from the surface will indicate which direction the plane is turning.

The best plan, of course, is to not fly your model so far away that you lose the color and perspective of its flying altitude. A number of older pilots fly Big Birds simply because they are able to see them better than the smaller planes. Slower reactions sometimes prevent them from turning soon enough to take advantage of the size of the plane and it gets too far away to tell its attitude. Once they take steps to get caught up with their plane's flight path the problem usually dissipates.

These four Lanier Stingers were seen at IMAA Chapter 163's July fly-in. Three are stock and belong to our columnist, Chuck Willcox and Jerry Cohen; the "Fang" is Dick Glad's highly modified and lightened ship—details in text.

■ TOP: Dick Glad's geodetic Stinger/Fang wing came out a full pound lighter than the kit's standard (solid foam core) wing. Ribs are cut from foam board, punched full of lightening holes and capped with balsa. Ailerons have likewise been given the Swiss cheese treatment. In his quest for lightness, Dick went so far as to use *titanium* aileron servo mounts! ■ BOTTOM: The empennage on Dick's Fang also makes use of geodetic construction. Finished assembly is light and yet strong enough to do away with the stock Stinger's tail bracing.

THE LANIER STINGER— ONE MAN'S MODS

Nearly everyone who flies a Stinger appreciates the plane's fine flying characteristics and simplicity of design. You would imagine that it would be difficult to improve on the airplane, however, my friend Dick Glad took a standard set of Stinger plans and went to work.

Dick designed a geodetic wing that uses foam board ribs. Dick's wing came out a full pound lighter than my standard foam

core Stinger wing. Dick also designed a tail section that requires no tail braces. His plane, dubbed "Fang," weighs 18 pounds 4 ounces with a 4.2 cubic inch Walker/Sachs for power. That's a pretty fair weight reduction. My Stinger weighs 21 pounds 4 ounces, and I tried to keep it as light as possible.

Just to put his plane to the test, Dick entered the Novice category at a recent Boeing Hawks open pattern contest and took 1st place. So the Stinger-turned-Fang retained the Stinger's excellent flying qualities.

Dick related an unusual experience during the early check flights of his Fang. During one flight he saw something drop off his plane; later examination revealed that his ballast had fallen off and had apparently struck the propeller, as about a quarter of one blade was missing. All was not what it seemed, though; it turned out that the spinner's mounting screw had not allowed the spinner cone to be fully tightened against the backplate; the spinner had loosened and contacted the propeller enough to cause part of one blade to fly off. The resulting imbalance in turn caused enough vibration to dislodge the ballast weight.

This probably explains why the instructions for mounting spinners always warn against letting the spinner contact the propeller. It's also a good idea to make absolutely sure your spinner retaining screw has sufficient thread length to secure the spinner cone to its backplate.

ACE R/C'S ABACUS

Until just recently, I had been using automobile lightbulbs to run my battery packs down before recharging them and had been using various formulae to determine their capacity—quite a tedious, painstaking routine that I probably did not do as often as I should have.

Several weeks ago, one of the new Ace "Abacus" battery capacity analyzers arrived at the Big Bird hangar, and I quickly put it to work. Eloy Marez reviewed the Abacus in depth and explained its electronic workings in last month's *Model Builder*, and I cannot improve on his explanations. I have to concur, though, that it is an excellent piece of equipment for determining the capacity of nickel-cadmium battery packs. The instructions are clear and easy to understand. I like the fact that the Abacus visually displays the capacity of your battery in milliamps, so that you can easily tell at a glance whether the pack is losing its ability to deliver its rated capacity. The Abacus is capable of analyzing nickel-cadmium packs up to 4000 mAH, which should cover most any modeling application.

The Abacus carries a suggested list price of $69.95 which, as Eloy points out, is cheap insurance. You can pick one up at any hobby shop that stocks Ace products, or order direct from Ace R/C, 116 W. 19th St., Higginsville, MO 64037-0472. *Continued*

Dave Halley poses with his custom glider tug, dubbed "Andante." The 25-pound plane features homemade retracts, flaps and a full-flying horizontal stabilizer. It's powered by an Enya 1.20 four-stroke and does a good job of aerotowing large scale RC model sailplanes.

Marlow Anderson (left) assists Larry Wheat with his Sig Clipped Wing Cub. Larry is the overall Contest Director for next year's Rally of Giants, hosted by the Boeing Hawks club in Seattle. More info in text.

IMAA RALLY OF GIANTS

The Boeing Hawks RC Fliers have many members involved in preparing for the IMAA Rally of Giants in 1994. Larry Wheat and his associates at the Boeing Airplane Company in Seattle have prepared three-ring binders with 36 pages of organizational charts and all other aspects of putting together a great Rally of Giants for the coming year.

The 1994 Rally will be the first time the event has been hosted in the northwest, and everyone involved from the modeling end wants to have a meet that will be remembered as one of the best ever.

The 1994 Rally of Giants will be held July 15, 16 and 17 at Arlington Airport in Arlington, Washington. The meet will be held one week after the Northwest Experimental Aircraft Association Fly-In, which is an annual event at Arlington. If you are planning to attend the Rally, you should seriously consider coming early and taking in the EAA fly-in the week before. Then you'll have time to visit some places of real beauty here in the area between events. There's Hurricane Ridge on the Olympic Peninsula, or the rugged beauty of the North Cascade Highway across the Cascade Range. Then you'll be prepared to have a great time flying with the northwestern Big Bird pilots.

Larry Wheat asked me to be the Aircraft Inspection Director. I agreed on the condition that my friend Chuck Willcox assist me as Co-Director. This was agreeable to everyone, so we are off and running

The Rally is the IMAA's biggest annual event, therefore we will be using the latest version of the IMAA Safety Inspection form. Using the inspection form will allow a high degree of safety and standardization so that you'll know what to expect and how to prepare your plane for the inspection. I would hope that you make the IMAA's safety inspection standards the minimum safety requirements for flying your Big Birds at all times.

Chuck and I intend to have a sizeable inspection crew available so that the models can be inspected as quickly as possible. We will have had meetings with all of the inspectors involved, to insure that they understand and interpret the Safety Form in a uniform manner. If for some unforeseen reason your model does not pass the inspection, rest assured that every effort will be made to assist you in making your plane meet the standards set down on the IMAA Safety Form.

You may pre-register by sending $30 to Larry Wheat, 26214 42nd Ave. S., Kent, WA 98032. For your money you will receive a hat and be entered in the pilots-only raffle that will feature many fine Big Bird products. An information package is also included, giving local motel accommodations and other facilities in the area. The $30 fee also includes your landing fee for the three-day event.

Come and fly with us and enjoy the IMAA's Rally of Giants as it visits the northwestern region of the United States! ***MB***

CONTROL LINE BY JOHN THOMPSON

NOW FOR SOMETHING COMPLETELY DIFFERENT!

Getting bored with the same old CL stunt pattern? World Champ Paul Walker tried something at Suntathon '93 that makes CL stunt more fun for fliers and spectators alike.

The first task for anyone who wants to fly control line precision aerobatics is to learn the stunt pattern—not just what the maneuvers look like, but the sequence in which they're flown. After all, "pattern points" are part of the scoring. All stunt fliers know the pattern backwards and forwards.

Or do they?

Fliers at the Jim Parsons Memorial Stuntathon '93 in Kent, Washington in June had a chance to find out just how well they know the pattern. And at the same, time, they got a chance to find out just how good they are as "stunt" fliers—when the security of the familiar pattern is taken away.

This twist was dreamed up by World Champion Paul Walker, who vowed after the hard work of winning that championship that it was time to have some fun with stunt.

His first "fun" project was to build a four-engine B-17 scale stunter that not only flew up to expert standards but immediately won the Northwest Regional Control Line Championships, its first contest! As far as anyone around here knows, it's the first attempt by anyone ever to campaign a four-engine stunter. More on that project later.

In the interest of lightening up his fellow and sometimes overserious stunt fliers, Paul decided to turn things topsy-turvy for the Stuntathon.

Some fliers needed help in remembering the special stunt pattern they had to fly at Stuntathon '93—a pattern which they didn't know in advance. Here Jim Cameron calls out maneuvers for Jack Pitcher, winner of the expert class. See text for details.

The second day of the annual two-day contest is devoted to precision aerobatics in three classes—beginner, advanced and expert. (Old Time Stunt and Nostalgia Stunt take up the Saturday schedule.) Instead of the traditional two official flights with the best counting as the total score, Walker offered three flights, with the total score counting. Beginners flew their regular novice pattern, but the advanced and expert fliers (which included those qualifying for the intermediate class) got some special treatment.

The first flight was nothing unusual—just the regular AMA precision aerobatics pattern. Then came the second pilots' meeting of the day, in which Paul offered the fliers the chance to fly his special rules or to continue with the standard pattern for their next few flights. All but five of the 13 advanced and expert fliers—with varying degrees of trepidation—chose the special approach. They were told in advance what the second flight pattern would be, but the third flight would remain a mystery until the round was to begin.

Under Paul's special rules, the second official flight would be a *reverse pattern*. That's right, on the flyer advertising the contest, it was stated that the pattern would start with the landing and continue backwards through the pattern, ending with the takeoff. However, not even the world champion could figure out how to start a flight with the landing, so one concession was made to tradition: the takeoff and level flight would come first, followed by the cloverleaf, and regressing toward the reverse wingover. Everything else was the same.

There was a flurry of conversation at and after the pilots' meeting as fliers figured out how they would enter maneuvers, such as outside loops, which traditionally are entered inverted—following the inverted pull-out from the inside loops. Most fliers eventually decided to enter the outside loops from the top, pulling out inverted and continuing into the traditional six inverted laps, pulling out into the top of the inside loops.

Sweaty palms notwithstanding, not a single flier had much trouble with the reverse pattern, though some took the option of having a "caller" in the center with them to remind them of the order of maneuvers.

In fact, taking into account the 10 percent bonus for the reverse pattern, most fliers turned in excellent scores.

Then the pilots met for the third time, at which Walker handed out his special pattern, including maneuver diagrams and degree data for the more difficult maneuvers. Fliers who had committed to the experiment at the second pilots' meeting—and who could not back out once the second round started—received a 20 percent bonus for the third flight (a 1.2 K factor).

In this flight the potential for confusion and an unrecognizable maneuver (or worse) was present, but nobody flinched. Everyone who chose the special pattern got through it without mishap, and once again turned in reasonable scores. Judges were understandably lenient in the scoring of these unfamiliar maneuvers, but virtually every pilot made them recognizable.

The special pattern included (in addition to the standard appearance, starting and pattern points):

- Takeoff, immediate climb to 45 degrees, level, dive, level.
- Squared return wingover: a wingover with inverted pullout into a half outside square loop, followed by a half inside square loop, pulling out vertical into a second wingover, finishing at the starting point.
- Three inside enlarging loops: three loops that get progressively larger.
- Three outside enlarging loops.
- Three inside enlarging square loops.
- Three outside enlarging square loops.
- Two inside triangles, point down.
- Two outside triangles, point down.
- Two horizontal square eights.
- Two horizontal triangular eights.
- Two square vertical eights.
- Two hourglass figures.
- Square four-leaf clover.

CL precision aerobatics World Champion Paul Walker starts the engines—all four of 'em—on his 1993 masterpiece, a B-17 scale stunter. More in text.

There's little likelihood—and no intent—that the Special Walker Rules will revolutionize stunt flying. But for a one-day contest to toss a little variety into the neat, orderly lives of precision aerobatics enthusiasts, it was a smashing success. (And, both the advanced and expert class winners flew the special pattern; those who wimped out and flew the regular pattern finished in the pack.)

The winners of the two-day Stuntathon '93 contest were:

- Old,Time Stunt: Don McClave, Portland, Oregon; All American, 298.5 points.
- Nostalgia Stunt: Don McClave; All American, 500.
- Beginner Precision Aerobatics: Jim Holmack, Vancouver, Washington; Twister, 593 (total of three flights).
- Advanced Precision Aerobatics: Chris Cox, Delta, B.C.; Stiletto, 1,399, special pattern (total of three flights).
- Expert Precision Aerobatics: Jack Pitcher, Gresham, Oregon; Smoothie, special pattern (total flight score

■ LEFT: Mouse race pilots work hard too! In a Northwest Regionals mouse heat, Roy Andrassy faces the camera, Bob Boling has his handle high for a pass. Third pilot is unidentified. One plane is visible in upper left. ■ RIGHT: A line of sport and profile scale models is always a spectator favorite. These are just some of the '93 Regionals entries. Photo by Tom Moore.

unavailable).

I mentioned above that Paul Walker has spent this year having fun with some unusual projects, and none was more unusual or impressive than the four-engine B-17.

"Most twins are just an attention-getter, but this is a *real* stunt plane," marveled one northwest flier upon having seen some of the early flights of the B-17.

"He should enter it in scale—he'd have a good chance of winning," remarked one of the scale judges at the Northwest Regional Control Line Championships.

The huge aircraft was decorated in realistic flat camouflage paint and its dimensions were not far off true scale, yet the 90-ounce behemoth flew a solid, true stunt pattern. Naturally, with Paul at the controls, it was near perfection with those 5-foot bottoms, perfect squares and "on rails" level flight.

Pulled by four muffled O.S. .15 engines spinning APC props, the plane was nearly silent in flight. Silent or not, the plane instantly drew a large crowd on every flight. Casual spectators lined up alongside the circle and expert competitors at every circle dropped what they were doing to watch.

Despite the fact that the Regionals was the first contest in which anybody had ever tried to fly a four-engine stunt plane, Walker breezed to a 1st-place finish among heavy competition.

One of the most impressive aspects of the B-17 operation was the professional style with which Paul started the engines. Each engine was fueled, then started for an instant to burn out the prime. Then each was topped off, and Paul went down the line securing a "bump" that assured the engine was ready to start. Then he connected the four battery clips from two separate batteries and went down the line, flipping each engine once to start it.

The B-17 flew well enough to loop on two of the four engines and cruised comfortably in level flight on one.

Sadly, we're speaking of the B-17 in past tense, because it was reported that in early July the big bird suffered multiple engine flameout in an overhead maneuver and crashed—a total loss. Paul was uncertain at press time as to whether the plane would be rebuilt.

• • •

Looking for a way to draw a few more competitors to your next contest? The Pacific Aeromodellers of Vancouver, B.C., Canada have hit upon an idea designed to do just that.

The PAC fliers schedule one of their major summer contests during a July community festival in Burnaby, thinking that the entertainment and activities will give the fliers' non-flying family members something to do during the contest. The opportunity to take the family along could make it possible for more fliers to attend.

Nearly every town has some kind of annual festival. Would a CL contest in conjunction with the festival in your town be feasible?

One more Northwest note: Salem, Oregon area fliers are continuing to work toward formation of a club for the mid-Willamette Valley area. For information, contact Mark Wahlster at (503) 873-3775 or Mike Hazel at (503) 365-8593. Any other new clubs forming out there? Let us know and we'll pass the word along.

Club news, contest reports, technical tips, questions and photos are welcomed. What's going on in your region? Send a report to John Thompson, 295 W. 38th Ave., Eugene, OR 97405. ***MB***

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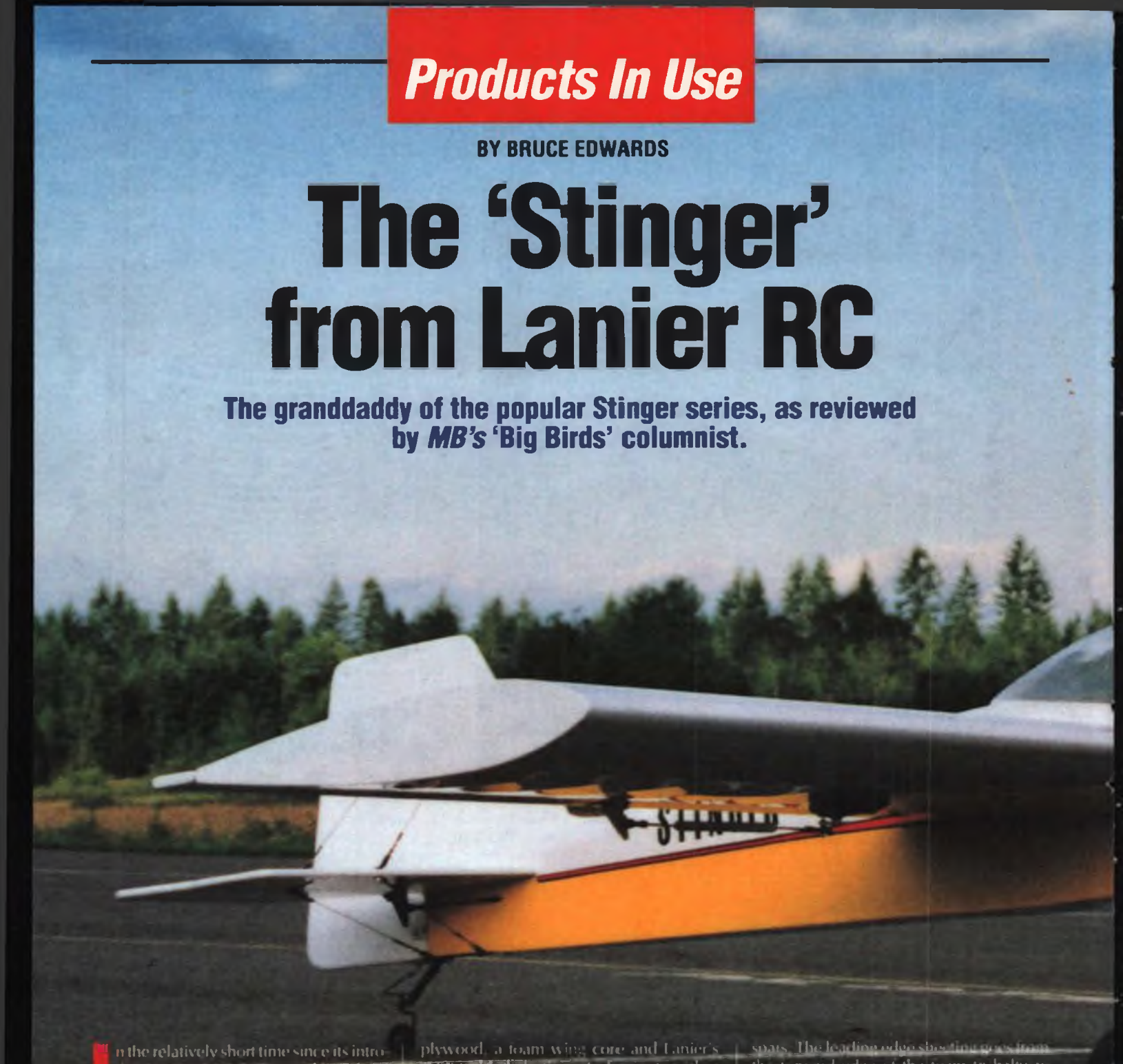
BY BRUCE EDWARDS

The 'Stinger' from Lanier RC

The granddaddy of the popular Stinger series, as reviewed by *MB's* 'Big Birds' columnist.



In the relatively short time since its introduction [illegible] Stinger has proven to be one of the most popular non-scale aerobatic Big Birds ever designed. There are actually three sizes of Stingers in the series: the original Stinger, which is the largest of the three and the subject of this article; the Stinger 120, a slightly smaller version for 1.20 size engines; and the little Stinger 10, which fellow *Model Builder* columnist Art Steinberg reviewed last month. The Stinger has received much good press and has been extensively reviewed by other writers in other model publications, but I thought perhaps I could shed some additional light on this proven and well-received design.

The Stinger kit is a combination of balsa, plywood, a foam wing core and Lanier's own molded plastic parts. Lanier furnishes a 10-page building instruction booklet that includes a list of available replacement parts and a list of items needed to finish the plane. The Stinger comes with no hardware, but there is a Du-Bro hardware catalog in the kit along with suggestions for various adhesives. Several people have commented on the lack of hardware, but they don't seem to realize that including a full hardware package would make the kit quite a bit more expensive. Besides, as Lanier's Bubba Spivey said, everyone has their own favorite brands of hardware they like to use.

The Stinger's foam core wing is strengthened by the addition of four beefy main spars. The leading edge sheeting goes from the forward edge of the foam to halfway over the spar. (I appreciated the fact that the leading edge sheeting provided was wide enough to be trimmed to the required width.) The leading edge piece is added after the sheeting has been cemented in place. The trailing edge is a similar arrangement—sheeting top and bottom and a balsa stick along the aileron hinge line. I used 3M "77" spray adhesive for the sheeting and gap-filling U.F.O. CA for the sticks, which worked well.

Top and bottom capstrip "ribs" bridge the space between the fore and aft sheeting. The two wing panels are joined by a 1/4-inch plywood brace, then the center section is sheeted and fiberglassed. I used the

Rear view emphasizes the Stinger's large tail surfaces—no shortage of control authority back here! Tail braces ensure that the stab stays with the rest of the model during violent aerobatic maneuvers. The author's model is finished entirely with Coverite's 21st Century materials—paint on the turtledeck, cowl and landing gear, and film everywhere else. Wing decals are from Dumas Products.

LANIER STINGER

WINGSPAN	84 in.
OVERALL LENGTH	71 in.
WING AREA	1596 sq. in.
FLYING WEIGHT	14 to 22 lbs.
WING LOADING	20 to 32 oz./sq. ft.
ENGINE	1.83 to 4.2 cu. in. two-stroke; 2.70 to 3.20 cu. in. four-stroke
RADIO	Four channels required.
CONSTRUCTION	Balsa and plywood with foam wing core and molded plastic turtledeck, cowl and wheel pants
SUGGESTED RETAIL	$299.95

Produced by Lanier RC, P.O. Box 458, Oakwood, GA 30566; (404) 532-6401, FAX: (404) 532-2163

Properly powered, the Stinger is a sparkling aerobatic performer. Bruce found his Stinger/Saito 300 combo to be the fastest thing he's flown since his pylon racing days. These big models have been successfully flown with everything from 1.20 four-strokes to 4.2 cubic inch gas burners . . . although, if you're going to stick to the smaller end of that size range, you should seriously consider the Stinger 120, a slightly smaller model designed specifically for those size engines.

foam beds that were left from the foam wing core cutting as a jig to line up both wing halves while the glue set.

The wing is attached to the fuselage with two large dowels in the front and two 1/4-inch bolts in the rear. Two tapered washers must be made to provide a proper seat for the bolt heads. I used the wood plugs from a 1-inch hole saw to make mine.

There are no wingtips on the model, just 1/8-inch balsa glued to the end of the wing and cut and sanded to shape. Several Stinger builders in my area have added wingtips, which do enhance the plane's appearance. I'm surprised that Lanier chose not to go with rounded plastic tips, as they have all the necessary facilities to make them. On

The tail surfaces are built up almost entirely of 3/8-inch square balsa stock. Note the short pieces added at the hinge points to provide more gluing surface for the 3/16-inch diameter Robart hinges.

The entire top of the fuselage is made up of three molded plastic pieces which have to be carefully trimmed to fit. Bruce found the plastic a bit tough to work with and recommends taking your time to assure good fits between the mating parts.

the other hand, the flat end plates do keep the building time down.

The horizontal stab, vertical fin, elevators and rudder are all framed up from 3/8-inch square balsa. Hard points for the tail bracing are made from sections of hardwood dowel.

The fuselage is fairly conventional except for the three-piece plastic turtledeck. One piece covers the aft fuselage from the vertical fin to the bulkhead in back of the wing, another covers the wing, and the third goes from the wing leading edge to the firewall.

The fuselage sides are three-ply mahogany doorskin plywood. I recommend that you treat the edges right away with CA glue to prevent splitting. The firewall and wing attachment former are aircraft-grade birch plywood, as is the aft wing attachment plate.

The plastic fuselage parts require very careful cutting and trimming to make them fit properly. Extra instruction on how to work with the material would be welcome. One of the most tedious jobs on the whole project was to fit the wing cover over the wing and make it fair in with the other two pieces. I finally put a piece of Fourmost cockpit combing on the edges that touch the wing, then sanded it down to a nice fit. This also keeps the sharp edge of the cover from digging into the wing.

A few Stinger builders I've talked with have had problems with cracks forming in the plastic fuel tank cover. According to Bubba Spivey, the problem is caused by builders using screws to hold the cover in place (for easier access to the tank) instead of gluing it down as specified in the instructions; engine vibration causes cracks to form around the screw holes. My friend Chuck Willcox also experienced a crack at the rear of his Stinger's wing cover and talked to Bubba about it; Bubba recommended that Chuck take the rear bulkhead out of his wing cover so that the plastic is not "loaded" and under stress. Follow the instructions about gluing and make sure the installed plastic parts are not being forced to bend, and you should be OK.

The canopy that comes with the kit is nicely formed clear plastic and not too difficult to make fit. It looks very nice, especially if you take the time to paint the frame.

The instructions say to glue fiberglass cloth on the inside of the cowl and plastic wing cover. I put an inch of glass cloth around the edges and then CA'd plastic packing straps in three or four places on each piece to save weight.

The cowl consists of upper and lower halves, which are supposed to be glued together. I elected to leave mine in two pieces, joined by screws. Hardwood was added around the inside edge of the lower cowl half, then 2-56 blind nuts were added to match the holes in the edge of the upper cowl. I made a small brace to support the lower cowl when the upper half is removed.

I used Kevlar cable from Aerospace Composite Products and rigging pins and clevises from Du-Bro to brace the tail. The attachment straps are pieces of 1/4-inch wide nylon tie-wraps, rather than metal. This works very well and is lighter than the standard solid wire and soldered-on clevises.

With all major components built, it was time to think about covering and painting. I had seen the ads for Coverite's Century 21 products and decided to give them a try. In the end, I was quite impressed with the Century 21 film—especially when the Stinger rolled off the end of a table at the flying site. It landed upside down on the wing, leaving no holes but some rather nasty gouges in the covering. Two days later, when I sat down to do what I thought would be some major patching, I could barely find the gouges. A light touch of the covering iron and all the damage disappeared!

The cowl was painted with Century 21 paint—one coat of primer on both cowl halves, one coat of white on the upper half and one of yellow on the lower half. The paint is holding up well against glow fuel—no evidence of softening or wrinkling. The paint was not real shiny at first, but some wet sanding with 1200-grit wet sandpaper and some polishing brought out a nice shine.

The radio used for this project was a Hitec Focus 4 FM system. The Focus 4 comes with 650-mAH NiCds for both the transmitter and receiver. The transmitter features a buddy cord receptacle and switch, as well as servo reversing and adjustable travel volume for all four channels. The sticks are nice and smooth, with no slop. I

Author recommends Hitec RCD's Apollo 15s as good, strong servos that can take all the aerobatic loads the Stinger is capable of delivering. Pushrods are Sullivan's High-Stress Gold-n-Rods—Bruce's favorites ever since they were introduced several years ago.

These few small gussets are not on the plans, but were added to help locate and stabilize the aft fuselage turtledeck.

The Stinger's fuselage sides are made from mahogany doorskin plywood, which has a rather coarse grain. Goldberg's Model Magic filler filled the grain nicely prior to covering with Coverite's 21st Century film.

liked the stick length and pressure just as delivered, but both are easily adjustable.

I'm using a Hitec RCD Apollo 15 servo on the rudder, two on the elevators, and one Tower TS-72 on each aileron. The throttle servo is a Hitec RCD Apollo 10. In the servo reviews in the May and September '93 *MB*, these servos received high marks.

I equipped my Stinger with a Saito 300 twin four-stroke on a custom mount using eight Davis soft mounts. A McDaniel Model #472 on-board glow plug driver was installed to keep the Saito running smoothly at idle. This unit switches the current to the plugs on and off 188 times a second; this saves battery power and the glow plug thinks it's getting straight DC. I adjusted my unit so that the glow plugs come on from idle to about one-third throttle.

The fuel system is a 24-ounce Du-Bro tank and single point filler. I have been using the Du-Bro single point fuelers for some time and have found them to be a very dependable, neat way to fill fuel tanks.

Jack Huisman of R/C America sent one of his "Super Gear" landing gears for the Stinger project. The Super Gear features a special monofilament plastic that is wound in a form and then injected with resin. It's not cheap, but it's extremely durable and features built-in caster and camber to give good, straight takeoffs and landings. To this gear I mounted a pair of Sullivan 4-inch Sky Lite wheels, which seem to have no problem handling the Stinger's 20-3/4 pounds.

Kevin DeShazer, a local pilot who normally flies a 1/4-scale Diablo, flew my friend Dick Glad's Stinger. Kevin remarked that the airplane's performance was somewhere between fabulous and fantastic.

I found this to be true also. The Stinger is a very capable aerobatic performer that will do any aerobatic maneuver known to man, with the right pilot and powerplant.

It's necessary to plan carefully to achieve the correct center of gravity. If you use a big 4.2 cubic inch gas burner, you may have to put your servos in the tail section as shown on the plans. The Saito 300 twin is not a light engine, but I was able to install all of the fuselage servos in the compartment under the wing and just made the aft center of gravity as shown on the plans with no ballast. The center of gravity is not real critical, but Bubba Spivey recommends that you don't go farther back than 6-1/4 inches from the leading edge until you become thoroughly familiar with the way the model handles.

The Stinger's aerobatic capabilities are equal to that of the more expensive Lasers and Extras, so you can do most of your contest practice with the Stinger and save the $2,000 plane for competition. Should interference, a careless modeler or just dumb thumbs destroy your Stinger, you would not be out such big bucks. The Stinger could also be easily modified to resemble many popular scale aerobatic planes and used in competition.

The Stinger flies fast and tight. I would recommend this airplane to any experienced Big Bird pilot who wants a fun plane that's also easy to disassemble and transport. It will rip up the sky with hot aerobatics, but it also slows down well for landing.

To summarize, I've never heard anyone say anything really negative about the Stinger. One fellow said he didn't like it because it was too predictable, but I know pilots who would *love* to have such a good, predictable plane! ***MB***

■ TOP: F3A World Champ and new Nats Champ Chip Hyde, with his Dr. Jekyll 1.20. Dr. Jekyll and Mr. Hyde operate well together. JR PCM-18S radio, O.S. 1.20SP. ■ ABOVE: Canadian Dave Patrick shows off his new Finesse 1.20, now a Goldberg kit. The large plane flew very well, and so did Dave—fifth in FAI. ■ RIGHT: Masters Champ Bob Richards and his Y.S. 1.20 powered Hanson Runaround. Light, straight, small, and simple at around 9 pounds; no air chamber engine, no fancy exhaust setup. Good piloting is what gets the job done, not the fancy stuff.

RC PRECISION AEROBATICS

BY RICK ALLISON

■ LEFT: FAI competitor and new Team USA member Bill Cunningham. Bill flew the Malibu to third place. ■ RIGHT: Craig Buckles of Indianapolis was second in Advanced with his nice GyModels Elan. Y.S. 1.20, Futaba radio.

Pattern at the Nats

Small crowds, plenty of time to fly, less noise, little confusion, decent weather, not much in the way of controversy... No wonder it didn't feel much like a Nats!

The AMA Nationals has always been a little different kettle of flying fish. At the Nats, one comes to expect things a little larger and a lot more diverse, with more bustle, noise, and always more confusion. Everything seems a little larger than life, with all the flitting, buzzing, roaring, whistling, droning and blatting going on. The wind is likely to be stronger, the rain wetter, the clouds more ominous, and the sun always hotter than wherever home is.

Nats problems pass into legend and become a source of pride. Grizzled vets tell stories about the wind in Lincoln, the heat in Lake Charles, the blowing grit in Reno, or the radio interference in Tri-Cities like they were casually recounting their parts in the bloody heroics of previous campaigns to green replacements. It's all part of the Nats tradition and mystique; something for all of us to pass on and share.

Another Hanson Runaround done up in pre-WWII training colors, this one a much-modified version by Advanced competitor Ron Lockhart of Absecon, New Jersey. An O.S. .91 Surpass makes it go.

This year the Nats was held for the third time since 1990 at the Mid-America Air Center just outside the twin cities (Villages? Towns?) of Lawrenceville, Illinois and Vincennes, Indiana. The dates were traditional late July (17-25). The schedule was much the same. Thunderstorms, heat, and high humidity were predicted for Nats week, as usual. It was, as Yogi Berra once said, pretty much *deja vu* all over again. Except that it wasn't.

This Nats didn't really feel like a Nats. Not that it was a bad contest; far from it. In pattern, the consensus was that the flying and judging were as good or better than most years. There was ample time for everyone, including FAI F3A, to fly six full rounds, and FAI had their usual three-round finals on top of that. There were no midairs, and only one aircraft was destroyed on an official flight. Forecasts aside, the weather cooperated beautifully, with sun and fairly light winds (crosswinds, as usual). Only three hours of flight time were lost to rain—on Thursday, with the contest nearly over. No major protests surfaced, and few controversies. It was a good contest, well run, and a lot of fun; just not much like your usual Nats.

The '93 Nats was small, which may have had something to do with the missing atmosphere. Only around 400 entrants showed up to do battle, so there was noticeably less flitting, buzzing, and blatting than usual. As to why this was so, speculation ranged from the poor economy to the HQ move to Muncie and the resulting confusion with lost entries, etc., to the massive flooding in the midwest. No matter; it was small. Some years are like that.

The confusion factor was way down. After two previous visits to the area in the past three years, most folks knew where all the event sites, practice sites, stores and restaurants were. The setup crews knew about where everything went. Most things ran pretty much by the numbers.

In Sportsman class, 19-year-old Sean McMurtry, of Oklahoma City, Oklahoma, had most of the fun, winning three of the six rounds to edge out another teenager, Michael Caglia of Albuquerque, New Mexico. Rick Helmke of Auburn, Alabama picked up the third spot. The number of pilots may have been low, down from the "normal" 60 or so in this class, but the competition was good, and the flying much improved. People seem to be getting the (partial) turnaround format figured out, and the patterns generally looked more "together" this year.

In Advanced, Michael Caglia's older brother, Robert Caglia, was the top man with a very solid performance. Craig Buckles of Indianapolis, Indiana flew well enroute to a strong second, and Raiko Potter, last year's N-PAC Sportsman champ from Gulf Shores, Alabama, finished third. The average skill level in all the classes was improved this year, but it was most evident in Advanced. This is now a very competitive class, with good flying and solid "box sense" evident deep into the finish order. Next year's more difficult and longer schedule shouldn't be an undue burden on these people.

Bob Richards of Wake Forest, North Carolina, won Masters class, flying cleanly, precisely and very consistently. Close behind was Bob Smyth of Cincinnati, Ohio, who flew very consistently as well. Eugene Goldstein of San Antonio, Texas, was third, narrowly edging out (less than 1/2 point!) Joe Walker of Maitland, Florida. Masters class is well on the way to becoming a solid, challenging alternative to FAI for those who don't aspire to the heights of international competition, as well as a splendid preparatory class for those who do. This was the role originally envisioned for Masters when the classes were realigned several years back.

In FAI, there were no real surprises. Defending World Champion Chip Hyde blew past the field, winning five of six preliminary rounds, mostly by comfortable margins. Chip flew much as he did during his Master's Team Selection Tournament demo flights—small, low, solid, and very smoothly. His improved Dr. Jekyll 1.20 looks to be just that: improved.

Canada's Ivan Kristensen finished the prelims in second place, flying a four-stroke design (SL-1) for the first time. Ivan looked a bit as if he were still in the process of making friends with the larger bird. Bill Cunningham was third, with Dave von Linsowe in fourth spot, heading into the finals. Mike McConville finished the preliminaries in fifth, with Tony Frackowiak, Mike Klein, Dave Patrick, Chris Lakin, and Geoff Combs rounding out the top 10.

By decision of Tony Stillman, the Pattern Event Director, 21 went into the finals on Friday to fly the B pattern, leading to one of the few pattern "controversies" at this Nats. Since this controversy also surfaced at the '92 Nats and N-PAC, it might be worth a few words of explanation.

Three sites were used, each staffed with a set of five judges, and the pilots rotated through the sites. So far as the judges were concerned, each set saw an unbroken (except for breaks) line of 21 pilots fly a single round. So far as the pilots were concerned, three rounds were flown, each one in front of a different set of judges at a different site. This was roughly the same type of finals arrangement used at the '92 Nats and N-PAC contests. I believe this expanded format works well, although a few of the top pilots don't like it.

The argument against it hinges on the FAI Sporting Code provision that the three-round finals be flown from a single flight line, using all the judges, and only the top 20 percent (but no more than 20) from the preliminaries be qualified. Those who don't like the expanded format are convinced that the finals should be kept small and

continued on page 80

THE T.E.A.M. HI-MAX

A little model of what is in effect little more than a big model—one of a series of simple all-wood homebuilts kitted by Tennessee Engineering and Manufacturing.

BY GEORGE BENSON

The Hi-Max homebuilt aircraft developed by T.E.A.M. of Tennessee lends itself beautifully to Peanut scale, having simple lines, a wide range of scale color schemes and detailing, various types of engines and exhausts, and last but not least, lots of wing area. This model follows M.I.A.M.A. club rules, which permit an overall length from the rear of the propeller of 9 inches; in this case resulting in a wingspan of 14-3/4 inches.

The full-size Hi-Max which I modeled was built by Robert Macy of Cherryvale, Kansas. The attractive blue and white color scheme smartens up a simple rectangular design.

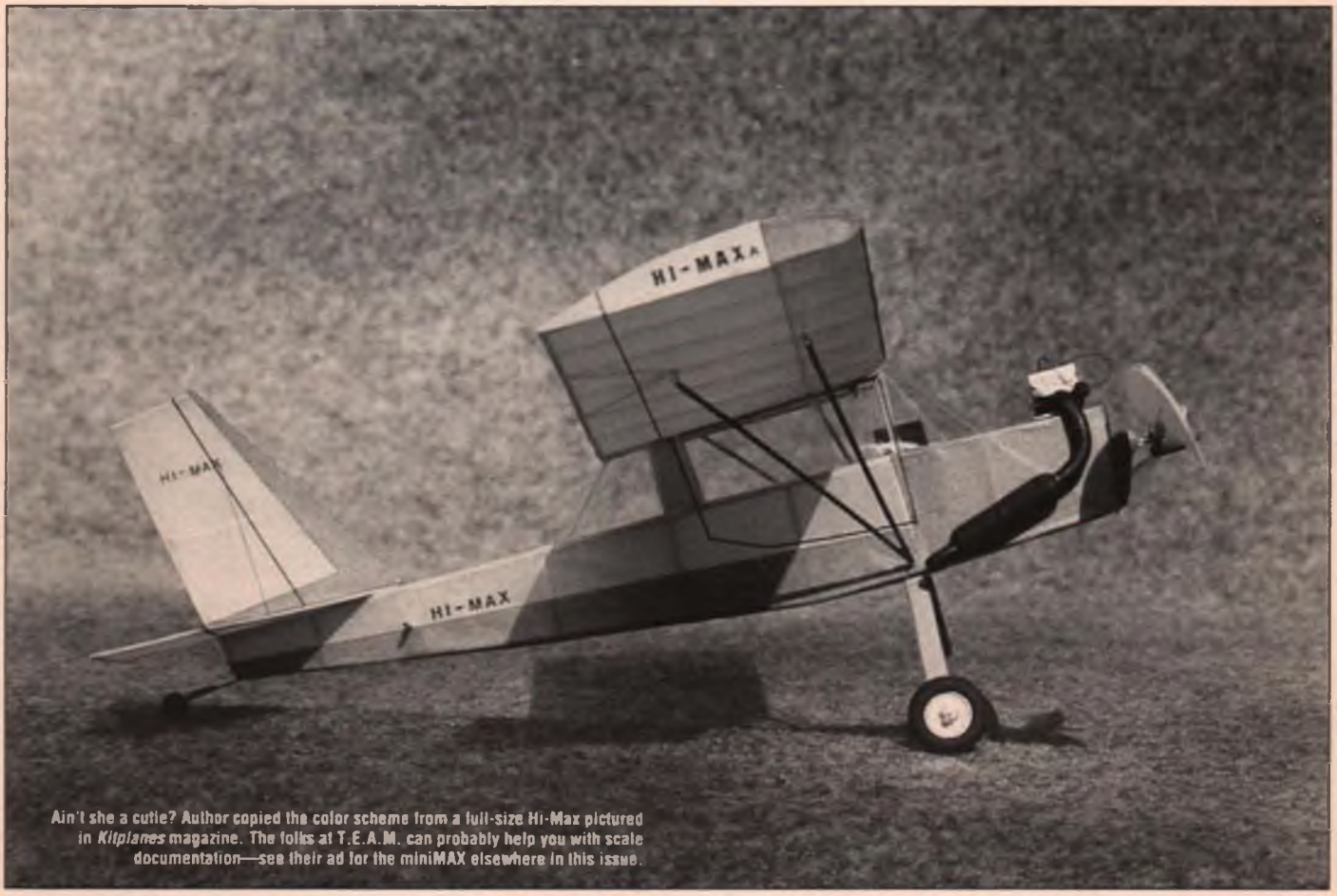
CONSTRUCTION

Standard stick-and-tissue construction is followed, so rather than give a detailed description I will elaborate only where variations from the norm are encountered.

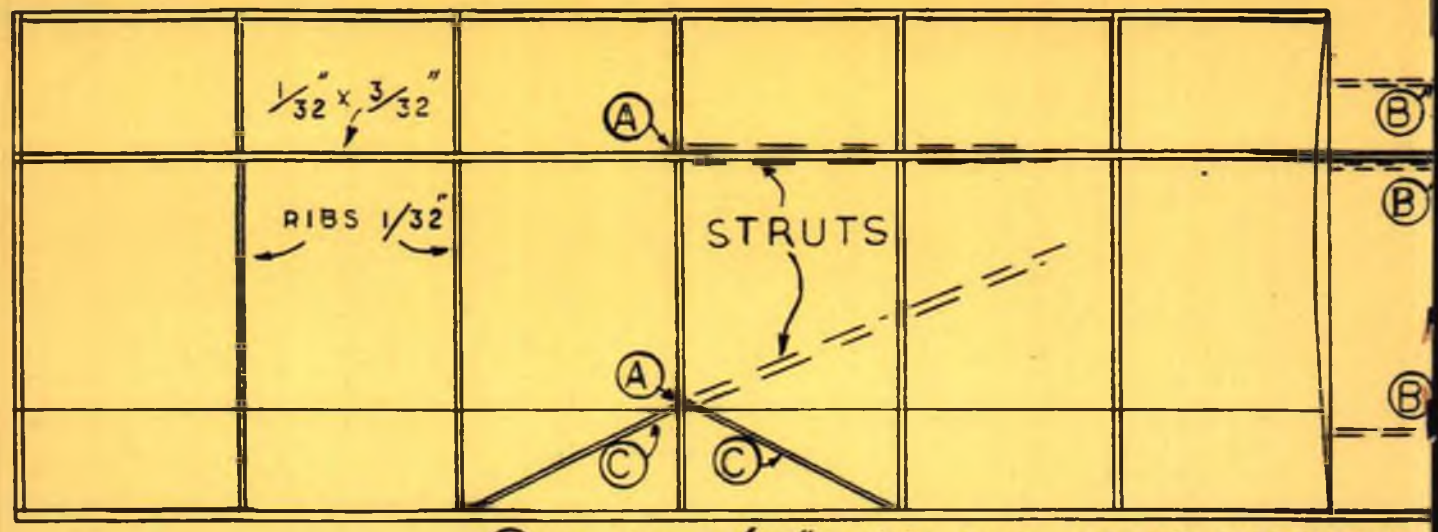
Build the wing in one 14-3/4 inch long structure, flat on the plan with the center two ribs tilted slightly to conform to the dihedral added later. The leading edge is omitted between the two center ribs. The three B pieces of 1/32 balsa are put in later when the dihedral is added.

At C, insert shaped 1/32 balsa to stiffen the ribs where the soft wire is glued to attach the wing struts. The soft, thin copper wire is made into an eye and the two tails are glued to the ribs at two points A on each panel.

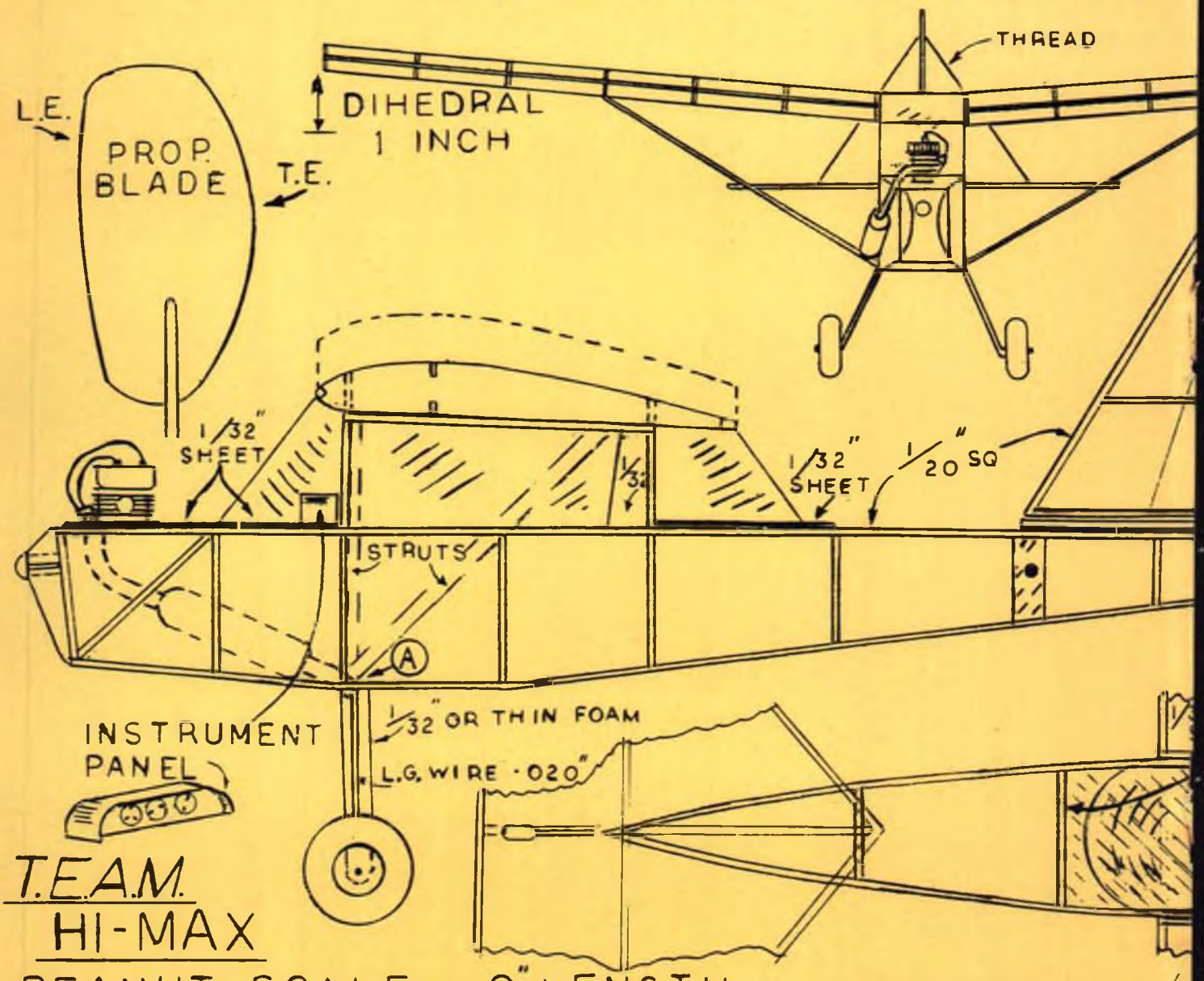
When building the fuselage, note that a second piece of 1/20 square balsa is glued inside the uprights at each end of the side window. They extend from the bottom longeron to the top horizontal 1/20 square that supports the wing. Glue thin, light, sanded 1/32 sheet on the fuselage top in front of the side window and also cover



Ain't she a cutie? Author copied the color scheme from a full-size Hi-Max pictured in *Kitplanes* magazine. The folks at T.E.A.M. can probably help you with scale documentation—see their ad for the miniMAX elsewhere in this issue.

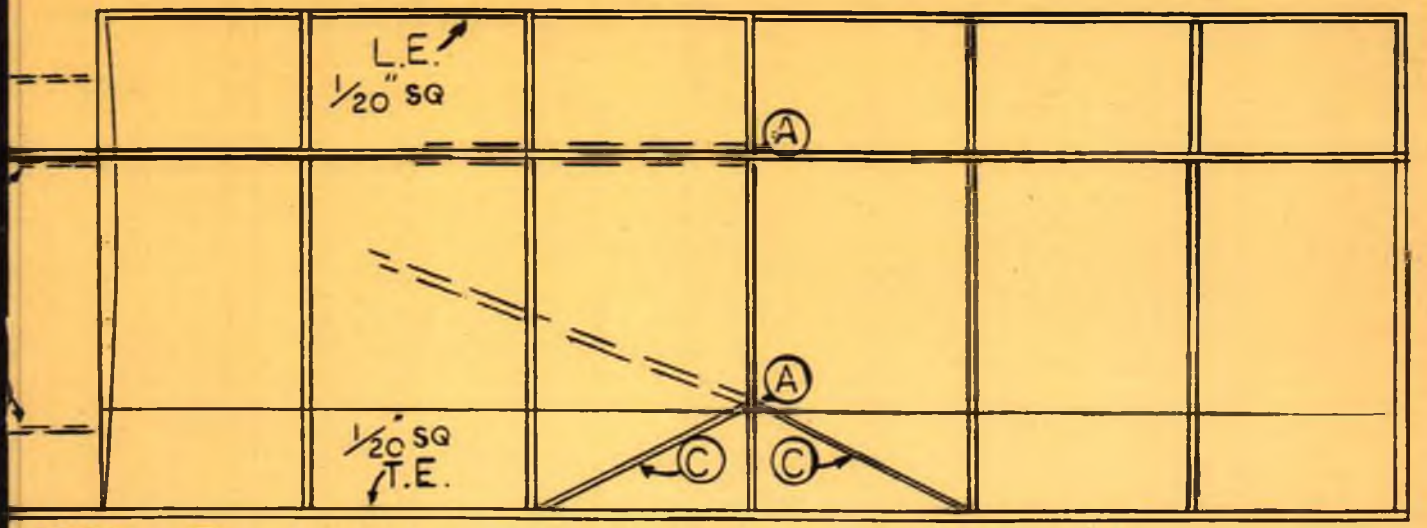


Ⓑ GLUE 1/32" IN PLACE AFTER ADDING DI

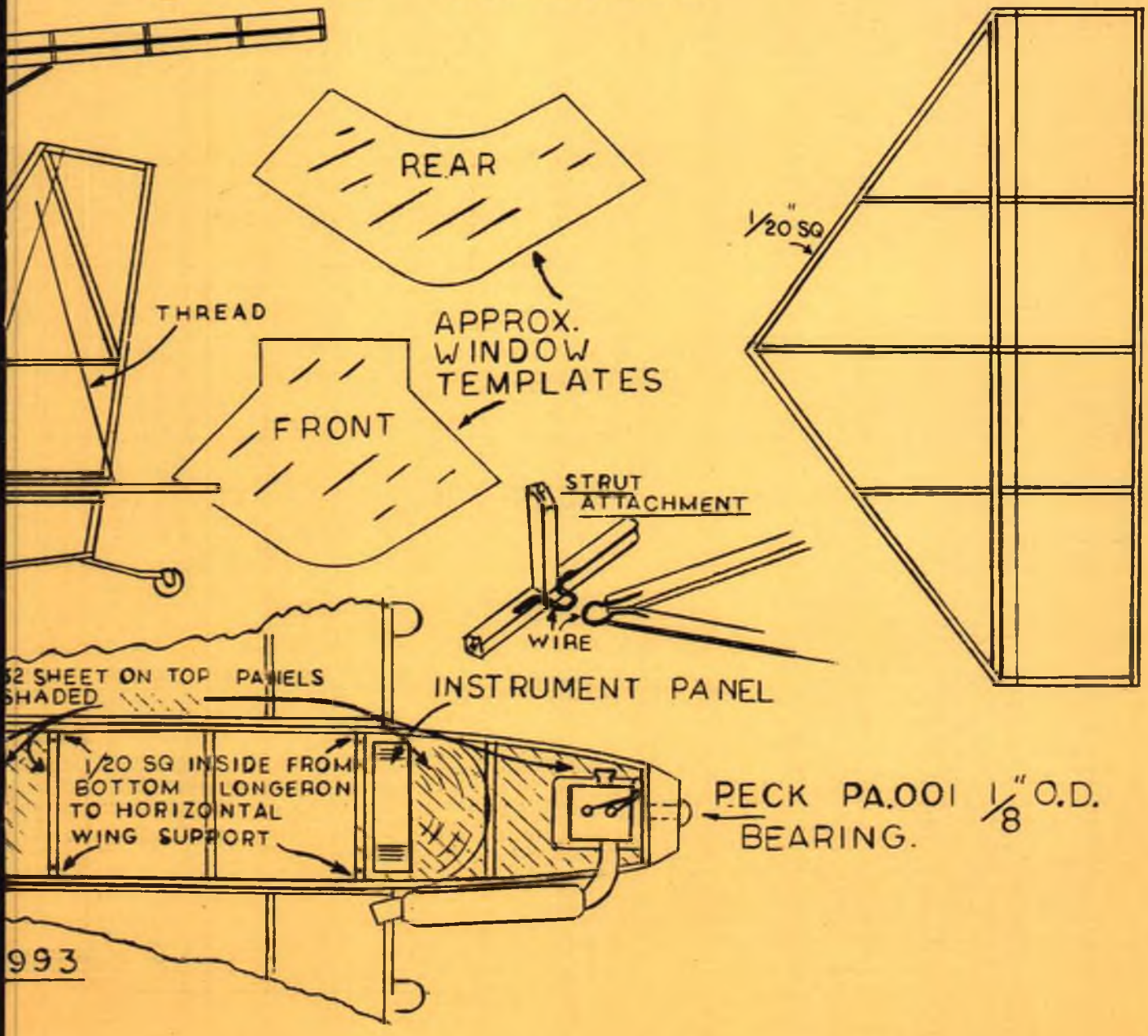


T.E.A.M.
HI-MAX

PEANUT SCALE - 9" LENGTH GEORGE BENSON 6/1



HEDRAL. (A) – STRUT ATTACHMENT POINTS (SEE TEXT)
(C) – 1/32" SHEET REINFORCEMENT.



993

Scale details are made mostly from blue insulation foam and painted with water-based acrylic paint, which won't affect the foam. The finished motor and exhaust weigh only about 1/3 gram, which shows the benefits of using foam for non-structural parts.

the panel behind the side window rear uprights. This provides a firm surface for the dummy engine, instrument panel and front and rear windshields.

Close-up of the completed nose section. Prop blades are 1/32-inch thick white foam, spinner is made from blue foam. About 1/3 gram of nose weight was needed to make the model balance, so you might try experimenting with a slightly heavier prop.

Wing strut attachment is via these interlocking thin copper wire loops. They allow some flexibility, minimizing the chance of breakage during the inevitable impact with hard, unyielding objects.

The wheels are very light and quite realistic, being made from blue foam used for thermal insulation in house construction. Wheels and tires are cut separately from a 1/4-inch thick piece of foam with pieces of sharpened brass tubing. Sand the tire round using fine sandpaper and shape the wheel center so the rim is thinner than the center. The wheel bearing can be a piece of aluminum tubing or a small hub of balsa glued to each side. During final assembly, retain the wheel with a spot of R/C 56 glue. I painted the center and rim silver and the tires black matte with Pactra water-based acrylic paint, which is easy to clean up with soap and water and seems to be compatible with foam.

The engine cylinder is made from discs cut from thin foam; the cooling fins can be cut from paper or balsa. Use R/C 56 to join the pieces. The muffler and exhaust pipe are made from blue foam "cores" taken from the inside of brass tube cutters. Paint the engine assembly with water-based paint.

When all parts are completed, temporarily assemble them with small pieces of two-sided tape, check the fit, disassemble and prepare to cover.

To adhere tissue, I use a clear adhesive gel such as UHU Liquid Glue Pen or Itoya "O'Glue" from stationery supply stores. Apply it sparingly with a small brush. Sometimes thinning with a little water or rubbing alcohol is helpful.

The blue and white color scheme follows Mr. Macy's prototype. Lettering is applied to the tissue before covering, using rub-on letters from office supply stores. If one has access to a photocopier, it is also possible to photocopy the lettering from a sheet of paper with the lettering laid out correctly, onto a sheet of tissue attached to a sheet of paper and fed through the copier. The lettered tissue is cut into pieces and applied to the model.

Visit the flower section of your local supermarket; for a dollar or two you can buy enough thin, unwrinkled cellophane to build Peanuts from puberty to senility! Apply R/C 56 glue lightly with a toothpick and allow it to become tacky before positioning the cellophane. The front and rear windshields are tricky to align, especially at the top of the front windshield.

The prop blades are cut at a 15-degree angle from a thin-wall (1/32 inch) foam cup—*not* the standard 1/8-inch thick foam cup. The blades are glued to a piece of dowel or bamboo or reed at about 45 degrees or whatever has proven satisfactory for you in the past. The prop shaft is .025 music wire with a glass bead between the propeller and Peck nylon nose bearing. Use blue foam if you decide to add a spinner.

When assembling the model, I suggest the wing be initially lightly glued with R/C 56 to allow the incidence to be changed after initial gliding and low-power test flying. When the wing is finally positioned and firmly glued in place, the struts can be attached. Make a stiff paper pattern for the left and right struts in the shape of a long wedge. The three points of the wedge are the wire loop on the lower longeron and the two on the bottom of the wing. These patterns ensure the struts will fit well. Cover each pattern with waxed paper and build the struts over them from 1/32 basswood strips. At the point and at each end, glue a thin wire in place as you did on the lower wing surfaces at A. These wire loops will hook and bend into the corresponding wire hooks on the wing and lower longeron.

Glue the fin to the stabilizer, then add thread to each side to represent rigging. Try silk thread lightly coated with CA and allowed to dry, to act as a stiffener, before cutting them to length. Lightly gluing the stabilizer to the fuselage with a couple of spots of R/C 56 permits easy adjustment by balsa shims, should your Hi-Max fail to "fly like a bird" on its first flight.

For indoor flying, I am using an 18-inch loop of 3/32-inch FAI rubber weighing 0.75 gram per foot. Total weight is 2.25 grams, and it accepts a total of about 1400 turns. At present, I still am working to improve flight times—45 seconds is the best to date—but half a day of indoor flying per month does not keep up with building time. The Hi-Max, however, seems stable, circles steadily and has afforded me a great deal of pleasure. **MB**

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THE O.S. MAX .40PS PYLON RACING ENGINE

O.S. joins the battle for F3D superiority with this 3+ hp screamer

The FAI International F3D RC Pylon Racing class has, along with certain other competition areas, been the driving force for the more extreme advances in two-stroke engine performance. Not surprisingly, manufacture of these highly developed .40 cubic inch (6.5cc) tuned pipe engines is increasingly falling to a mere handful of names—OPS of Italy, Nelson of the USA, MVVS of Czechoslovakia, and more recently, the serious entry of O.S. of Japan, which is ever mindful of the commercial value of successful competition in the prestigious FAI model competitions.

That so few manufacturers venture into this area is understandable, as actual sales are small and reflect the highly specialized and relatively restricted nature of the event itself. In addition, the actual technical demands are extremely high, as are the chances of failure.

An indication of the problems that arise as horsepower and rpm increase to F3D levels is O.S.'s use of extra mounting lugs at the extreme front end of the crankcase—in this case minimizing the crank oscillations that occur as the ball bearings become slightly freer as temperatures rise. The designers at O.S. have obviously seen power/rpm losses resulting from a lack of crank rigidity and the resultant inaccuracies of crank motion.

O.S. .40PS MECHANICAL DETAILS

O.S. has changed its casting methods for the relatively limited production run of this new racing engine. Gone is the customary superb pressure die-cast crankcase; instead, what we see is a wise return to the stronger sand-casting techniques. Combined with the stronger one-piece style crankcase and the forementioned extra front mounting lugs, the result is a stronger overall base than normal O.S. methods might have allowed.

Induction is via a superbly constructed rear drum valve assembly, the use of which is almost becoming mandatory for the highest performance and reliability. Its timing is

wide and late-closing at 64 degrees ATDC. Gas inertia effects make this acceptable, provided the rpm is kept high (above 22,000 at least). Speeds below this lead to considerable reversal and loss of fuel back through the induction system. The use of an updraft entry to the drum certainly prevents any of this waste from being drawn into the engine and causing problems with flooding.

The carburetor is almost nonexistent. There is no throttle, this engine being designed for continuous wide-open running. The throat is a large 14mm by 12mm rectangle into which fuel is dumped after being metered by the sole mixture control—a finely constructed bent-wire needle. Sounds primitive, but in O.S.'s hands it turns out quite differently. It has fine, large diameter threads and a tiny O-ring seal, which together make for highly precise fuel mixture adjustments. The net result of the design of this rear induction assembly is that being comprised of so few pieces, reliability must be enhanced—and it proved to be so during testing.

The crankshaft is a small 10mm in diameter, thus allowing the engine to benefit from the low friction of smaller-than-average ball bearings. A normal Woodruff key drive to the prop driver is used.

Cylinder head consists of two parts, with the separable chamber insert being fitted at a very tight squish clearance of .012 inch. Effective compression ratio comes out at 7.5/1—as high as may be desirable if really meaningful tuned pipe "supercharging" is available.

The cylinder liner is of simple four-port Schnuerle design, and is made of brass plated in the O.S. "Nicasil" method. Exhaust timing is a high 182 degrees, and with a blowdown period of 27 degrees ahead of the transfer timing, suggests an exciting and powerful tuned pipe performance. The standard high-silicon piston is heavily cut away to match the boost port position. At only 6 grams, this piston is well suited to high rpm.

Connecting rod is high-duty aluminium alloy and is bushed at both ends. The lube hole for the big end feeds to the upper side (the continually loaded side) of the crankpin only.

Final overall weight with the O.S. pipe is 15.8 ounces, as compared to the OPS .40 equivalent at 17.6 ounces—not the first time that an O.S. racing engine has turned out lighter than the competition.

SPECIFICATIONS

CAPACITY	.3959 cu. .in.
BORE	.8345 in.
STROKE	.723 in.
STROKE BORE RATIO	.866:1
TIMING PERIODS	Exhaust 182 ; Transfer 128 (angled 20 up); Boost 126 (angled up 60); Rear induction opens 38 ABDC and closes 64 ATDC; Total period 206 ; Blowdown 27
COMBUSTION VOLUME	.55cc
COMPRESSION RATIOS	Geometric 12.79:1; Effective 7.5:1
EXHAUST PORT HEIGHT	.324 in.
CYLINDER HEAD SQUISH	.012 in.
CYLINDER HEAD SQUISH ANGLE	6
SQUISH BAND WIDTH	.185 in.
ROTARY VALVE BORE	.492 in.
CARBURETOR BORE	.55x .47 in. (rectangular)
CRANKSHAFT DIAMETER	.3935 in.
ENGINE HEIGHT	3.35 in.
WIDTH	2.02 in.
LENGTH	3.8 in.
WIDTH BETWEEN BEARERS	1.375 in.
WEIGHT	13.2 oz. bare; 19.7 oz. with O.S. pipe and radial mount

PERFORMANCE

MAXIMUM BHP	3.14 at 25,900 rpm (Bolly pipe); 2.81 at 28,430 rpm (O.S. pipe); 1.38 at 19,756 rpm (open exhaust)
MAXIMUM TORQUE	118 oz.-in. at 25,900 rpm (Bolly pipe); 95 oz.-in. at 28,430 rpm (O.S. pipe); 75 oz.-in. at 17,417 rpm (open exhaust)

PERFORMANCE EQUIVALENTS

BHP/cu. in.	7.93
BHP/lb.	3.45
Oz.-in./cu. in.	298.0
Oz.-in./lb.	129.6

Manufactured by O.S. Engines, Osaka, Japan. Distributed in the U.S. by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021.

Suggested retail prices: Engine, $549.99; Mount, $82.95; Tuned Pipe, $109.95.

PERFORMANCE

Initial break-in was conducted with open exhaust and a few standard low-load propellors, together with two carbon fiber racing props—a Bolly 7.7x6.8 and a Barrie Lever 7.6x7. This naturally proved a fairly clamorous affair!

•Test 1: Open exhaust, FAI fuel (20% castor/80% methanol)

Rpm ranged from 11,000 to 23,000 and revealed the quite restrained performance available when high exhaust timings are employed in the absence of a tuned exhaust device able to harness those high timings... after all, around half of the stroke is given over to the exhaust. The result was a fairly gentle 1.38 horsepower at 19,756 rpm and a maximum torque of 75 ounce-inches at 17,417 rpm.

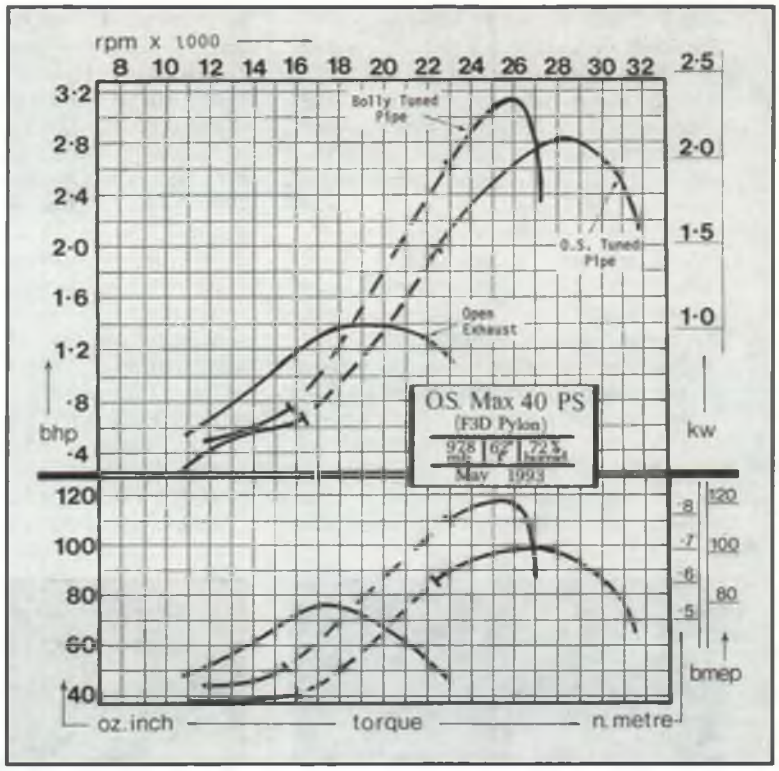
O.S. engines have always been truly beautiful pieces of craftsmanship, and the new .40PS (Pylon Special) is certainly no exception. Note that for this limited production engine, O.S. has gone to a sand-cast crankcase—stronger than a die-cast unit. Note also the extra mounting lugs at the front of the case for rigidity. Barstock aluminum engine mount and tuned pipe are not included with the engine but are available separately.

•Test 2: O.S. T-3000 tuned pipe and FAI fuel

Starting at a below-resonance rpm of 11,000 and working up the rpm scale, a sudden and "full liberation" occurred at 28,430 rpm with a strong 2.81 bhp. Further moves up the band showed a relatively gentle bhp decline and an ability to easily turn well beyond 31,000 rpm.

There has been some uncertainty concerning precisely where the abilities of the new O.S. .40PS actually lie. The strong impression gained by this writer is that, when loaded to achieve maximum bhp at 28,000 rpm, it is difficult to get the engine/

pipe combination "onto resonance" in the first place. Reducing the load slightly to make this occur more swiftly and certainly results in the engine operating in the post-peak 29,000/31,000 rpm area, and thus below best power. This may explain why the engine reputedly has become seen as a higher-than-average rpm machine—it appears that it's just much easier to operate at the higher rpm. The solution would probably be to lengthen the pipe slightly—a little difficult due to the pipe's one-piece construction.



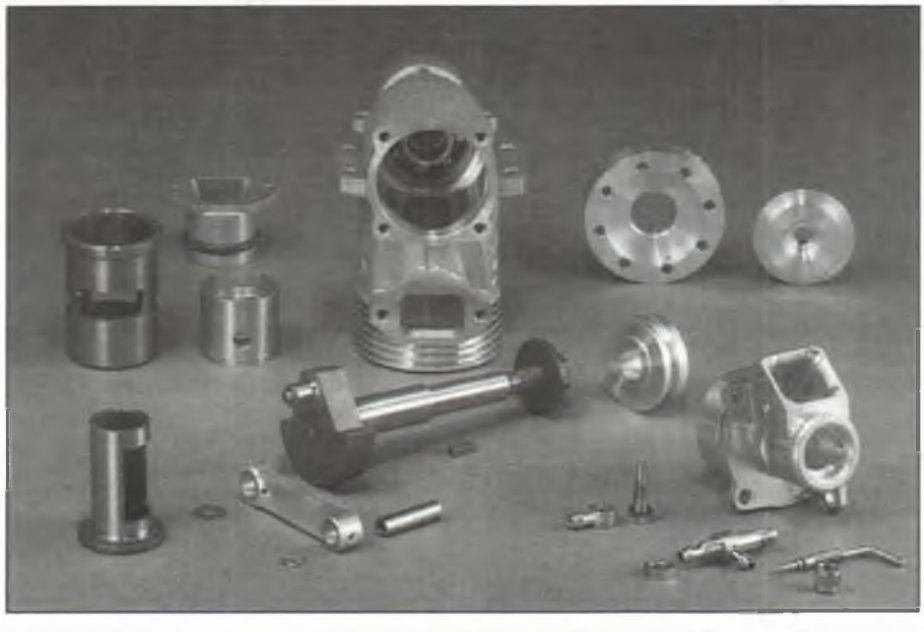
More than most tuned pipe engines, the modern Pylon .40 exhibits quite a massive leap from the off-resonance point up to the correct full-resonance operating area—so much so that in graphic terms the area between 16,000 and 22,000 rpm, for example, is virtually unplottable, and so the graph shows this area as a dotted line. The subsequent test of a Bolly pipe shows this even more markedly.

•Test 3: Bolly P42 carbon fiber tuned pipe and FAI fuel

It happens that this particular pipe is a fixed length device slightly longer than the O.S. piece—230mm as compared to 210mm from the plug to the first maximum diameter. As it turned out, the maximum best resonance point did now occur at the lower 25,900 rpm point, but much more significantly, actual torque values were enhanced appreciably, such as to place the standard O.S. pipe perfor-

continued on page 84

A look inside reveals O.S.'s typically flawless machine work. Cylinder head is made in two pieces and is held in place with eight bolts instead of the usual six. The engine uses a rear induction drum valve assembly; note that instead of being a casting, the rear crankcase cover/drum valve housing is machined from a single chunk of aluminum. Drum valve itself is at lower left. Crankshaft ball bearings use non-metallic retainers—proven to be the best choice for extremely high rpm engines like this.



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HANNAN'S HANGAR

BY BILL HANNAN

"Learn to use your hands as well as your head. There is a kind of practical knowledge and good sense which can flow into the brain only through use of the hands."

Our lead-in quotation, by engineer/inventor/executive Charles Kettering (1876-1958), applies perfectly to our hobby. Don't just sit there reading about model building—*do some!*

GEE BEE GATHERING

The Eugene, Oregon airport's 50th anniversary was celebrated recently with a fine airshow featuring attractions up to and including the U.S. Navy Blue Angels. The local stars, however, were undoubtedly Delmar Benjamin in his Gee Bee R-2 and Steve Wolf in his thundering Samson biplane. Both machines were constructed in Creswell, Oregon, less than 10 miles from Eugene, and both performed spectacularly.

In the evening, a "gathering of the clan" took place at the home of airport engineer Bob Staley and his charming wife Judy. Their house is nearly an aircraft museum, being filled with artifacts, photographs and models of all types including static scale, free flight, control line and RC.

Gee Bee model designer Vern Clements (left) with pilot/owner Delmar Benjamin in front of the Gee Bee R-2 at an airshow in Eugene, Oregon. Photo by Maureen Clements.

From left: Howell "Pete" Miller, who engineered the original Gee Bee R-1 and R-2, his wife Dotti, and Steve Wolf, co-builder of the reproduction R-2 in the background. Henry Haffke photograph.

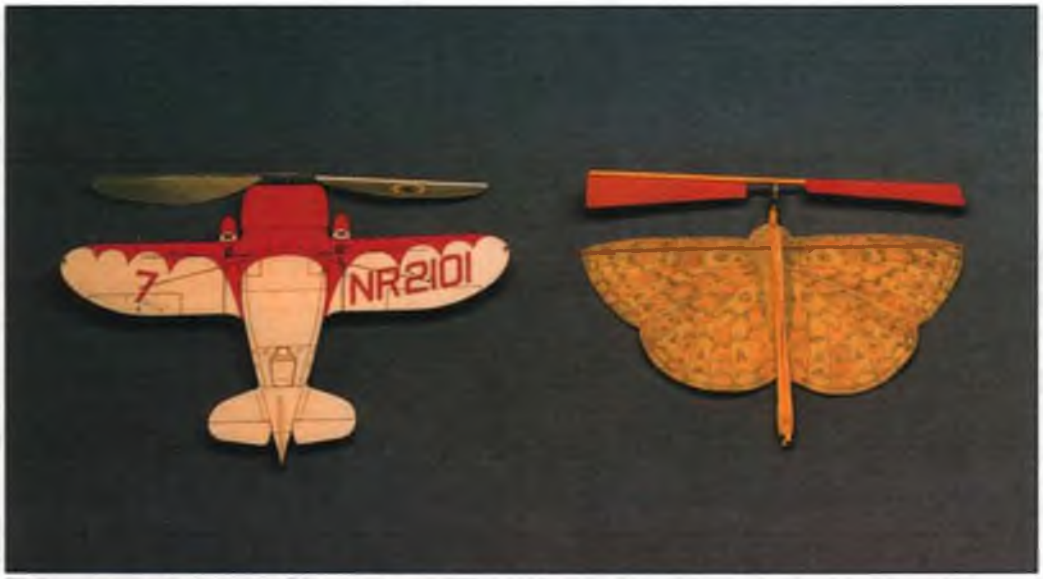
Invited were about 30 Gee Bee enthusiasts (many of whom are also modelers), Delmar Benjamin, Steve and Liz Wolf, TV documentarian Anne Byers, Vern and Maureen Clements, and the Ted Blakely family, who brought along Dr. Norma Granville's personal Gee Bee scrapbook. Attending such an affair is indeed an honor. It is also simultaneously fascinating and frustrating—fascinating because of the exciting conversation and displays, and frustrating because it is impossible for one to be in every room at once!

Among the intriguing subjects discussed were how the compound-curved aluminum Gee Bee wheel pants and cowling were formed; what it's like to fly the R-2 (Delmar and Steve have written a book about the Gee Bee, which is now available); and the recent discovery that the color separation lines on the original Gee Bee R-2, long thought to have been black, may well have been blue. Truly a memorable night and affirmation that airplane people are a very special breed.

WORLD'S SIMPLEST GEE BEE?

As mentioned last month, we present a photo of our little (6-inch span) flyable Gee Bee R-2. Based on the ancient French Dandrieux butterfly toys, the Gee Bee is actually a sort of helicopter which can climb vertically to surprising heights, depending on the rubber power employed. Indoors it can flutter against the ceiling like a confused moth. Simple though it may be, it offers a lot of fun, and attracted attention when wound up and flown by Steve Wolf during the Eugene gathering. When its vertical rolling climb was demonstrated in a hangar at the Truckee-Tahoe airport, Delmar Benjamin remarked: "I wish mine could do that!"

Quickly and inexpensively constructed, the Gee Bee is shown alongside a regular Dandrieux butterfly to show the underlying structure—a balsa motor stick, bamboo wing spar, balsa or bamboo propeller spar with paper blades, aluminum tube thrust bearing and wire rear rubber hook. The tube bearing and rear hook are secured to the motor stick with thread and glue. A wire propeller hook, glass bead or flat washers serve



Bill Hannan's super-simple Gee Bee R-2, inspired by the 1879 French Dandrieux butterfly flying toys. More information in article.

as bearings. Add the rubber motor (two office rubber bands on ours) and that's all there is to it. For more detailed instructions, consult the late Walt Mooney's "Butterfly" article in the February 1978 *Model Builder*. Doubtless most any airplane configuration could be adapted if you prefer, although a little experimentation and adjusting may be required.

Construction plans and instructions for our Gee Bee R-2 "Betterfly," are available for $2 postpaid from: Hannan's Runway, Box 210, Magalia, CA 95954.

OLIVE ANN BEECH

The co-founder of the Beech Aircraft Corporation, Olive Ann Beech, passed away at age 89. Mrs. Beech was involved with the Travel Air company as early as 1924, and served the Beech firm since 1932, taking over as president following her husband Walter's death in 1950. During her 50 years of service the company grew from fewer than 10 employees to more than 10,000. In addition to her executive duties, Mrs. Beech managed to raise two daughters, participate in community services at local, state and federal levels, support youth activities, and become an art patron.

Jack Braly, current Beech Aircraft President, was quoted as saying, in part: " ...her name will live on as long as there are Beech airplanes and people with the desire to own and fly them. Her life was a celebration of the American dream." Our thanks to Beech engineer Dan Walton for sharing the company publication *The Beechcrafter* from which this information was obtained.

HUGHES FLYING BOAT UPDATE

Retired airline pilot Ed Toner recently visited McMinnville, Oregon, new home of the famed "Spruce Goose," and sent us an article from the *News-Register* newspaper. The proposed Evergreen AirVenture Museum is expected to occupy about 250,000 square feet, and will likely display the flying boat in a water-filled nautical setting.

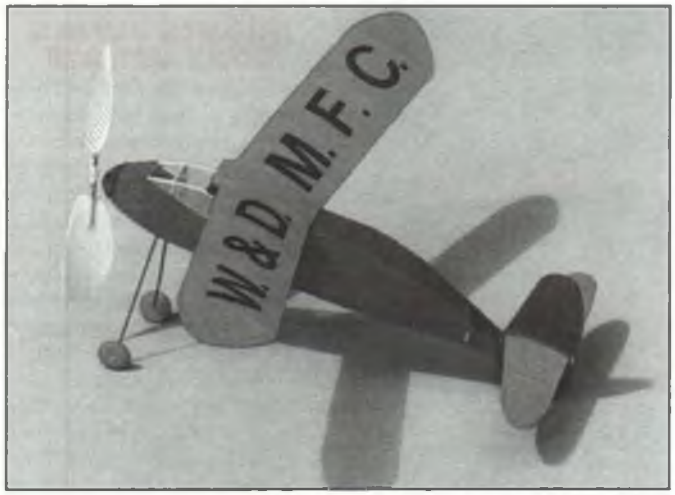
Other planned features include a restoration shop, theater, public amphitheater and administration buildings. Considerable work will be required, and no target date was given for the museum opening. In any event, having the marvelous flying boat again on display should be well worth the wait!

NEW FLYING ACES CLUB BRANCH

The Flying Aces Club "Spirit of the Skies" fun-flying movement continues to spread to various parts of the world. Originally only a small group of Connecticut fliers, FAC membership is now international in scope. Bob DeRosier has announced formation of a Texas division and solicits model builders from the entire Dallas/Fort Worth area to take part in their flying sessions and social activities.

■ LEFT: John Laycock displays his Bellanca Skyrocket, which won Jumbo Rubber at the San Diego (California) Scale Staffel's annual contest in April. Photo by Jim Alaback.
■ RIGHT: Otto Kuhni's latest masterpiece is this 30-inch span 1912 Mersey monoplane. Pusher propeller is driven via an extension shaft from a forward-mounted Gasparin CO_2 engine. Otto Kuhni photo.

HANNAN'S HANGAR



Peanut-size reproduction of a British old-time rubber job called "Isle of Thanet," built and photographed by George Benson, who constructed one many years ago while he was living in England.

Rubber, CO_2 and electric free flight are the principle club interests, and old-timers returning to the hobby are especially welcome. Contact either Bob DeRosier, 10421 Silverock Dr., Dallas, TX 75218, or Ed Deloach, 3428 Bryn Mawr, Dallas, TX 75225. Phone (214) 327-1239 or (214) 363-7836 respectively.

HOW ABOUT THE KIDS?

The Flying Aces Clubs do encourage young model builders, as do motivated model builders such as Fritz Mueller and Mark Garvey. Fritz, who resides in Georgia, demonstrated some of his tiny RC models for about 1,000 people during a Boy Scout Jamboree. He writes: "I was tickled pink, but the kids had more fun watching my free flight planes, especially those not properly trimmed. The biggest hits were a small ornithopter and a whimsical helicopter!

"Yes, to please the kids, that's the way to go. It has to be simple, a bit weird; it should shake, whirl and fly or fly with great difficulty and crash at the end. Kids can identify with that. They were following me everywhere, as if I was the Pied Piper."

Meanwhile, in Iowa, Mark Garvey has been conducting model building sessions in the Science Station Museum. The projects have included basic gliders designed by Dave Haught and Sig "Uncle Sam" rubber-powered biplanes. Flight testing is usually conducted outdoors, however, the recent catastrophic floods and storms have prevented that. Even so, the youngsters were so enthusiastic that they've demanded additional plans and building materials.

Barbara Feller, assistant director of the Science Station, recently built her very first model airplane, and was thrilled that it actually flew. Mark noted that the female students were much more creative than the males (some parents included) when it came time to decorate the models. While the boys generally tried to use colors somewhat like "real" aircraft, the girls employed flowers, animals and stripes. Instead of making "airplanes," they were making artworks!

Mark concludes: "I don't know how much 'real' science has been taught, but the kids and adults alike have a ball, and the room is generally filled with colorful airplanes of every type."

PECK-POLYMER PRODUCTS

Sandy and Vera Peck favored us with their Summer 1993 catalog, featuring flying scale and sport model kits, accessories, tools, materials, blimps, RC systems, CO_2 and electric power units and much more. Featured merchandise includes many items of Peck manufacture as well as items from other domestic firms and international sources representing countries such as Canada, Czechoslovakia, England, France, Germany, Sweden, Switzerland and Japan. Four dollars will bring you a catalog from Peck-Polymers, P.O. Box 710399, Santee, CA 92072-0399.

FRANK EHLING'S LATEST

Although famed model designer Frank Ehling has been undergoing severe health problems, his creativity continues, and we plan to present drawings for his most recent "Wingless Wonder" in our next column. Watch for it.

SIGN-OFF

Compare the following with our opening quotation: "Building and flying model planes is an art which cannot be achieved overnight nor purchased with cash. If you like to work with your hands, enjoy solving puzzles, building and flying model airplanes is for you." Frank Zaic. ***MB***

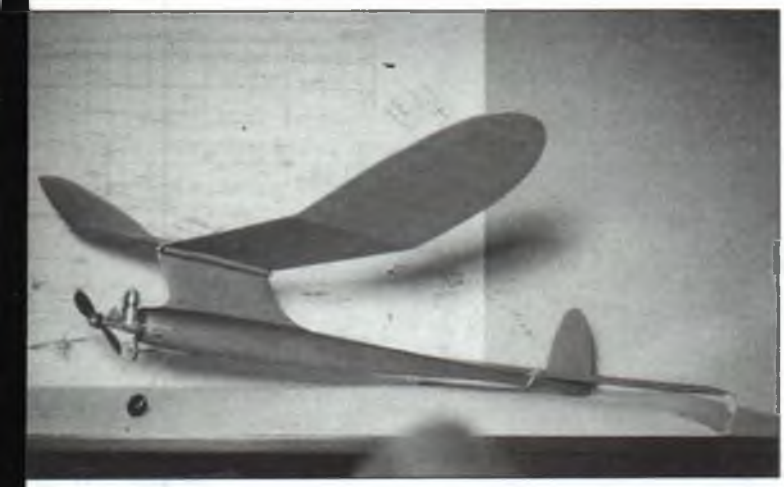
FREE FLIGHT

BY BOB STALICK

Something 'New' for FF Nostalgia—Joe Elgin's 'Ho'Boy'

Many of us long-time free flighters recall the local flier who was always coming out with something "original." These designs were sometimes successful and sometimes not, but with the passage of time, they were usually sent to the attic or trashed when the flier decided to pursue other hobbies. These models live on in our memories and in the stories that we tell each other after club meetings or in the car on the way to a contest. Sometimes they resurface and live again because of someone who recalls them, redraws them, or rescues the real thing from storage. The Mohawk Buzzard Jr. (October *MB*) was one of those ships. This month's feature is another.

Photo taken at the 1953 World Champs, where the U.S. Power Team placed 1st both in individual (Dave Kneeland, third from left) and as a team. Joe Elgin, flying an FAI-size version of the Ho'Boy, is second from left. Photo courtesy of Joe Elgin.



The featured model this month is Joe Elgin's 1/2A "Ho'Boy," a 1951 design recently approved by the NFFS for Nostalgia competition. Features a novel hollowed balsa fuselage construction and a single retracting wheel. *Model Builder* has full-size plans available.

THE HO'BOY

Joe Elgin's 1951 "Ho'Boy" has recently been approved as a legal Nostalgia design by the NFFS committee. This 160 square inch 1/2A model was powered by the then-ubiquitous Atwood Wasp .049, equipped with a timer tank. Because 160 squares is small for contemporary Nostalgia competition, prospective builders may wish to increase the size of the model to the 250 square inch range so it can be flown with a Cox reed-valve .049.

Joe has this to say about the model:

"The Ho'Boy was designed in 1951 for the Wasp engine.

In a photo similar to the one in last month's column, columnist Stalick launches his new F1J Pilfered Pearl. Engine is the AD .06. Placed 2nd at the Western FAI Champs. Photo by Bruce Augustus.

The fuselage was built with laminations of balsa and carved to shape. It was light and clean. The Wasp was replaced with the Albon Dart diesel, which I acquired in England while on the 1951 American Wakefield Team on our way to Finland for the World Champs. Although smaller than the Wasp, the Dart could swing larger props. It was a fabulous powerplant. The model was built by a few of my friends and did quite well at the local meets.

"The FAI .15 version is very similar to the 1/2A, but it is a separate design and not scaled up from the smaller version. I won a place on the U.S. 1953 FAI Power team with the .15 size Ho'Boy. The World Championship was held in England. The U.S. team placed first—Dave Kneeland placed first in the power event." (Note: The NFFS approved version is the 1/2A Ho'Boy, not the FAI size.)

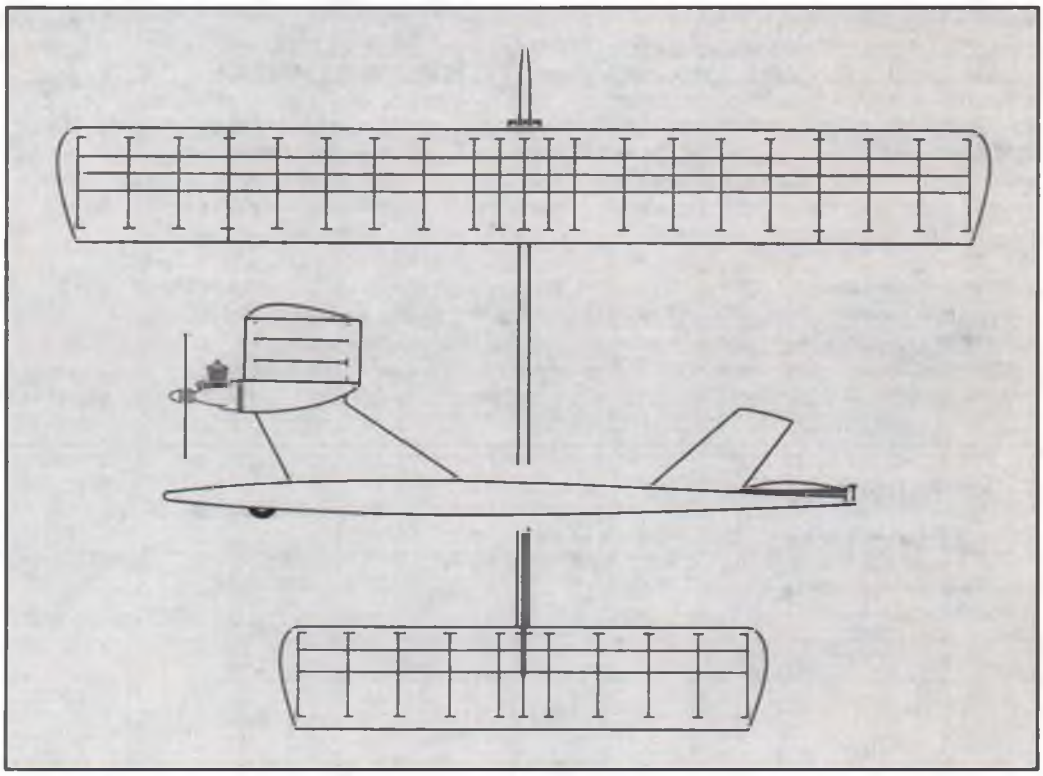
So there you have it. Another Nostalgia model to consider for your fleet—and this one has beautiful curves and lines. It definitely looks different when compared to the plentiful RamRods, Spacers and Top Bananas.

DECEMBER MYSTERY MODEL

This month's stumper is a high-thrustline, front-fin design powered by a Wasp .049. The designer was a prolific builder of free flight models, and this was one of his later efforts. If you think you can identify it, write the name on a card or letter and send it to *Model Builder*. If you have the correct answer and are lucky enough to have your card or letter drawn from the hat, you win a free one-year subscription. Neat deal, huh?

SEPTEMBER MYSTERY MODEL WINNER

It's rare that we get more incorrect entries than correct ones for a given month, but September was one of them. We heard from readers who claimed it was everything from



MYSTERY MODEL

Bob Toft's Snuffy to a Zipper, something called a "2 Anzac," a Pigmy, a Brigand, an Ad Astra, a Buzzer and even a free flight Aeronca Tandem converted to control line (huh?). But there were also five who correctly identified it as the "Wee Bee," a Donald Justice design published in the February 1948 issue of *Air World*. Of those five, Tom Van Hoose of Crown Point, Indiana gets the free one-year *MB* sub.

THE .010 SCENE

It's too late to get your entry materials for the big *Model Builder* MiniPower Postal event for 1993, and it's too early to report the results of the competition, but I do have some news to report about those wonderful little Cox .010 engines.

First, from Larry Renger, Di-

Competition FF ARFs! Sal Fruciano poses with a couple of the ready-to-fly F1A gliders produced by world-class free flight competitor Alexander Andruikov and offered through Starline International. Components for these models are also available. Details in text.

rector of Engineering of Cox Products, Inc. comes the following: "We really are going to run the Cox .010 backplates, and we will make them available through our customer service department. They will also be standard on the production engines in the future." These are the tankless mounts that were included with the original versions of the Cox .010. Because of their smaller diameter, it was possible to build a lighter and more streamlined model. The new .010 engines do not come with this backplate mount and make the Cox tank-mount a requirement, even though most fliers are using eyedropper tanks to meter the fuel.

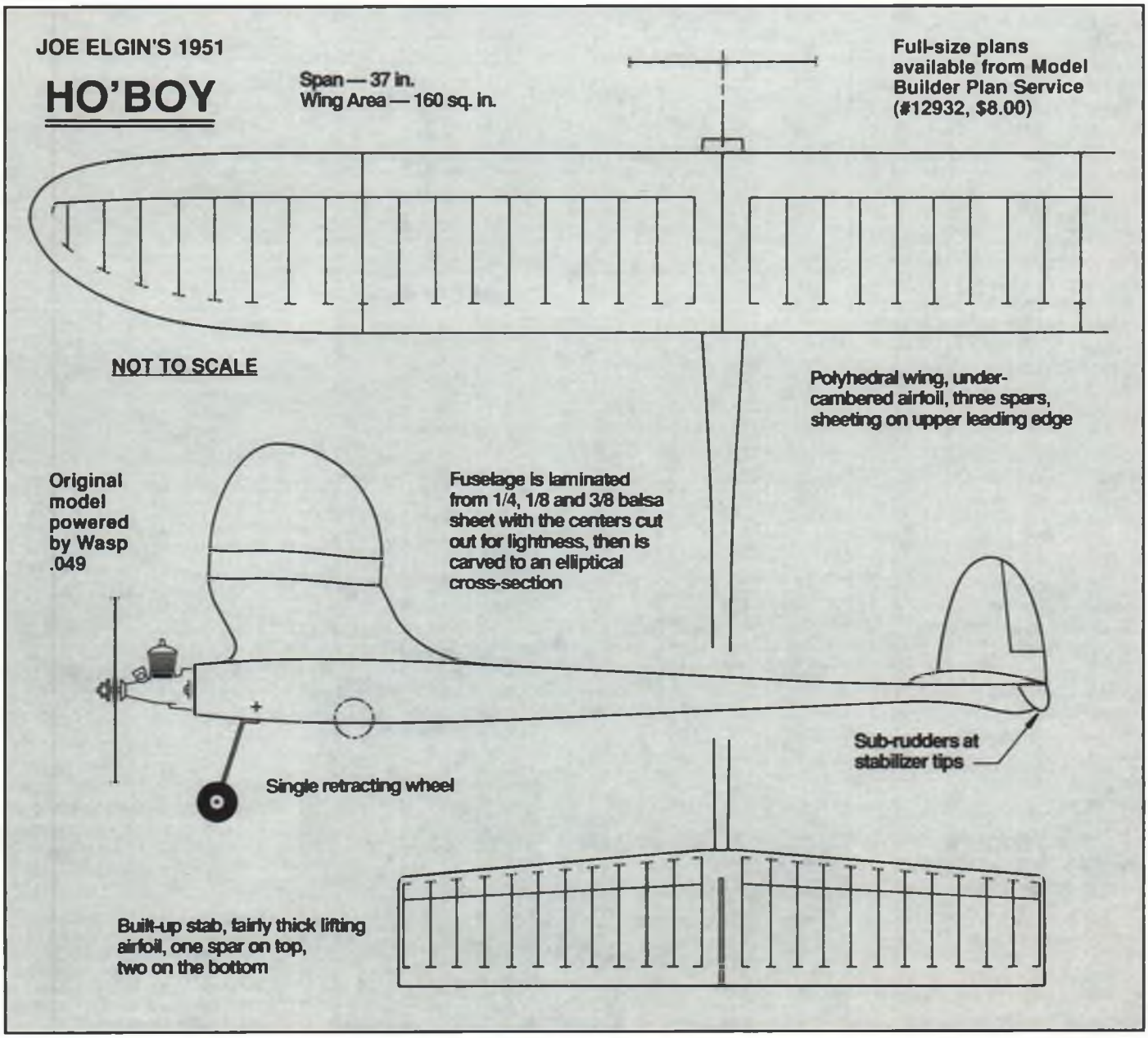
STARLINE INTERNATIONAL

Along with my recent order of goodies from Starline International, Sal Fruciano included his new catalog, which indicates that Starline is handling Wakefield components produced by Alexander Andruikov, the 1991 World Champion Wakefield flier. Included are variable pitch and delayed prop release front ends, propeller blades, a rubber strip heater, carbon fiber parts, tubes and tail booms and connector assemblies, short kits and even completed ready-to-fly F1A models. Although expensive, these items allow the wealthy Wakefielder to get a competitive machine in the air in short time.

If you are interested in any of the FAI events, you need this catalog. It's available for $2 from Starline International, 5146 Cactus Wren Rd., Scottsdale, AZ 85253.

B,Y&O PROPELLERS

For you old timers, the memories of those old Y&O props must stir up wonderful feelings. I recall seeing them when I was a youngster just starting in free flight, but I never owned any. One of our club members, Clarence Bull, never did quite get over



his fascination with them. So, recently, he acquired the Y&O tooling and has set up shop in Harrisburg, Oregon to begin manufacturing this classic propeller once more.

Recently, Clarence held an open house for members of the Willamette Modelers Club at his manufacturing facility, which is a converted restaurant on the main street of Harrisburg. Now Harrisburg is no big city. In fact, fewer than 500 people live in this little farming community, and the main street is literally the only street in town. It's a perfect setting for re-creating the past.

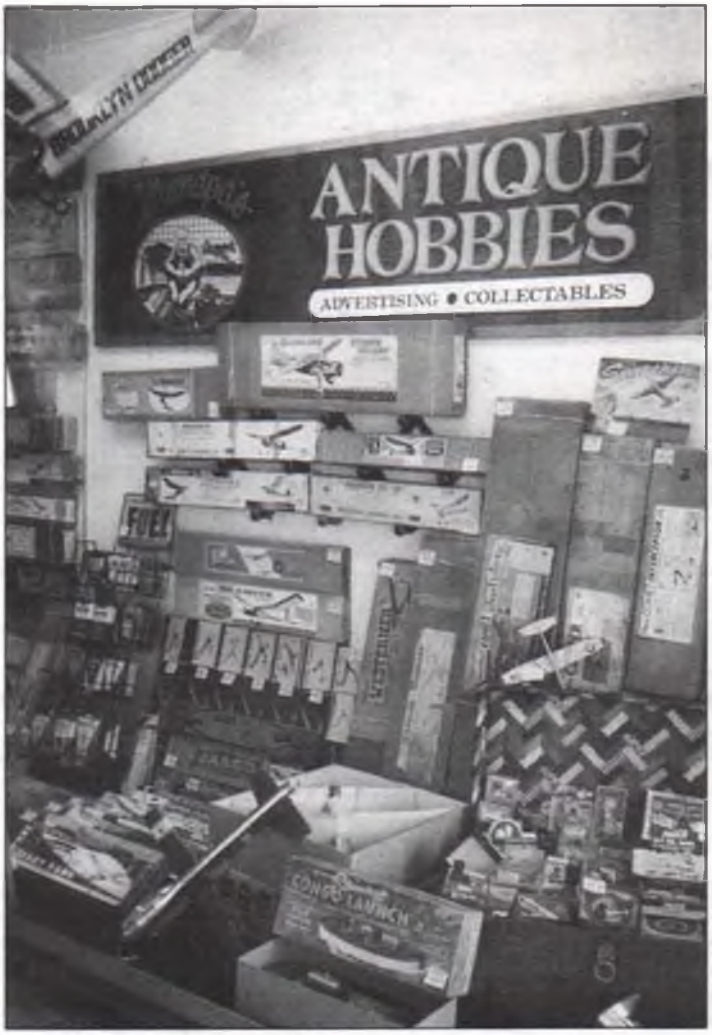
Club members were treated to a tour of these reconditioned facilities. In one room Clarence has outfitted himself with a nice office complete with free flight memorabilia on the walls. In another is the equipment itself—saws, jointer-planers, sanders, finishers and the like. Down a step and out the door is the wood storage area, where blanks are cut to shape and size. Around the corner in a third room is the finishing cabinet. Finally, there is a small shipping room, where the items will be sorted and stored.

This is definitely a custom propeller operation. Clarence envisions being the sole employee for B, Y&O. You will be able to see his wares at some of the trade shows and at the larger Old Timer contests on the West Coast. I have seen the prototype propellers and they are beautifully done—just as you would expect if you have seen any of Clarence's models. Some of the early versions of the propeller will be made from maple, but Clarence intends to make most of them from beechwood. If you are interested in these props, which are available in sizes from 8 to 16 inches in diameter, drop a letter to B, Y&O Propellers, 545 South Third St., Harrisburg, OR 97446, or call (503) 995-6509.

For those who may not know, the Y&O moniker stood for Yates and Orwick. "Madman" Yates was well known as a control line stunt flier in the 1940s, and Henry Orwick was an engine designer and manufacturer. Clarence simply added a B in front of the old Y&O to give himself some credit for reintroducing these gems.

GRANDPA'S ANTIQUES

Vic Cunnyngham, Jr. has just opened up a new business in Pomona, California. Vic, who has been involved in free flight since Elmer was a pup, announces that he has a true 1950s-style antique hobby shop ready to go. He has hundreds of kits and engines on display and for sale. Most are new and in their original boxes. This unique store is located in the center of the antique row of old town Pomona. One side of the shop is dedicated to real antiques (so the rent can be paid), and the other side is a replica of an old hobby shop with close to 400 kits in stock. Catch it next time you are in the area.



A view of the sales counter at Grandpa's Hobbies in Pomona, California—includes kits from Berkeley, Megow and Comet. Looks like a Foote Westerner and a CL jet speed model and an A-J Intercepter there, too. Photo by proprietor Vic Cunnyngham Jr. See text for details.

The address is 265 E. Second St., Pomona, CA 91766.

JIM SUMMERSET PASSES ON

Jim Summerset, maker of those popular Texas Timers, passed away in July. According to information in the San Valeers newsletter, he died in his sleep. Jim was probably best known for his collaboration with Ed Miller on the "Texan" free flight design. Jim was an active AMA gas flier in the 1950s and '60s and was just getting back into action again in Texas. Condolences can be forwarded to his widow at RR 4, Box 365-K, Canyon Lake, TX 78113.

That about wraps and ties it for another issue. Keep your fuse dry during the winter so that you can prevent a flyaway next spring. I hope your winter plans include getting an .010 built. If so, drop me a nice picture of it before it flies away. Until next month, thermals to all. ***MB***

PLUG SPARKS

BY JOHN POND

A Tribute to Jimmy Allen

Photo No. 1. Neat display of original Jimmy Allen memorabilia as collected by Karl Spielmaker of SAM 4 (Michigan). Interest in the Jimmy Allen events has really taken off in that part of the country.

About five years ago, this writer attempted to put on the West Coast SAM Champs at Stead AFB, north of Reno, Nevada. I lined up an imposing array of events plus many modelers and people expert in each particular phase of flying to run the events. At that time, the meet included a very ambitious program of new and "fun" events over and above the regular agenda of FF and RC events. One of these events was the Jimmy Allen Races, to be held in the central portion of the airport directly in front of the grandstands.

The rules I proposed were to include all J.A. designs with three individual flights and a mass flyoff. Unfortunately, the meet got shot down due to lack of confidence and general rejection of the so-called "sand box" flying site.

This columnist is delighted to find that the event has lately been picked up by Karl Spielmaker and the SAM 4 boys. The only thing lacking is the original Jimmy Allen Racing Trophy, to be reconstructed by Bryan Wheeler and Jim Root. Wheeler presently owns all of the plans and dies to the original kits. Who better qualified to run the event and donate the trophy?

The Michigan Antique Modelers annually stage one or two SAM mini-annuals. Their opening contest was held on June 12 and 13 with special publicity and emphasis on the Skelly Oil Jimmy Allen events. Out of 26 events total, this turned out to be one of the most popular in terms of number of entries. A terrific showing for a special event run only once or twice a year!

Photo No. 2. Roger Lane surprised everyone by taking 1st place with a Jimmy Allen Yellow Jacket, a mid-wing design not generally considered to be the best performing of the J.A. models. Roger must have this one trimmed to perfection.

Karl Spielmaker is a hot promoter of Jimmy Allen events and has a tremendous amount of Jimmy Allen memorabilia collected over these many years. He set up a special display on the field (Photo No. 1) of Jimmy Allen kits, plans, stamps, winged awards—you name it. Skelly Oil did not miss a bet in promoting the interest of young modelers.

Incidentally, Spielmaker would love to contact other J.A. collectors for possible exchange and/or trade of such items. Write to Karl at 4690 Burlingame S.W., Wyoming, MI 49509, or call him at (616) 538-3077.

Karl and his SAM 4 boys put on a terrific meet called the "Mini-Champs" at Michigan's Sturgis Airport that included six RC events, three FF Junior events, two J.A. events, and 18 gas and rubber events. A tremendous undertaking for two days!

Who won the Jimmy Allen events? Surprise! A mid-wing design called the "Yellow Jacket" as seen in Photo No. 2, built and flown by Roger Lane. Karl Spielmaker took quite some ribbing from the other contestants, as Karl was responsible for talking Roger into building this little-seen design. Spielmaker says he tried to get Lane to build the good looking (from a competitor's standpoint) model of the J.A. "Sky Chief."

Of the 13 to 14 Jimmy Allen designs available, the biggest surprise was that no one built the Jimmy Allen "Blue Bird" which has, in the past, dominated the field last year and in the West Coast J.A. events as staged by SAM 41.

Photo No. 3 depicts the mass flyoff of Jimmy Allen entries. Every one is a performer! Photo No. 4 shows the results of the flyoff with Roger Lane again winning, followed by Ted Dock and Art Ryan. The latter two need no introduction as they have been flying Old Timers ever since this columnist introduced the O.T. events at the AMA Nationals in 1965!

You wouldn't know it, but that's Art Ryan's son, Randy, seen in Photo No. 5, with the most popular subject on the field, a Canadian Jimmy Allen

Photo No. 3. Looks like everyone's off to a good start in the Jimmy Allen mass launch event. Last man down is the winner!

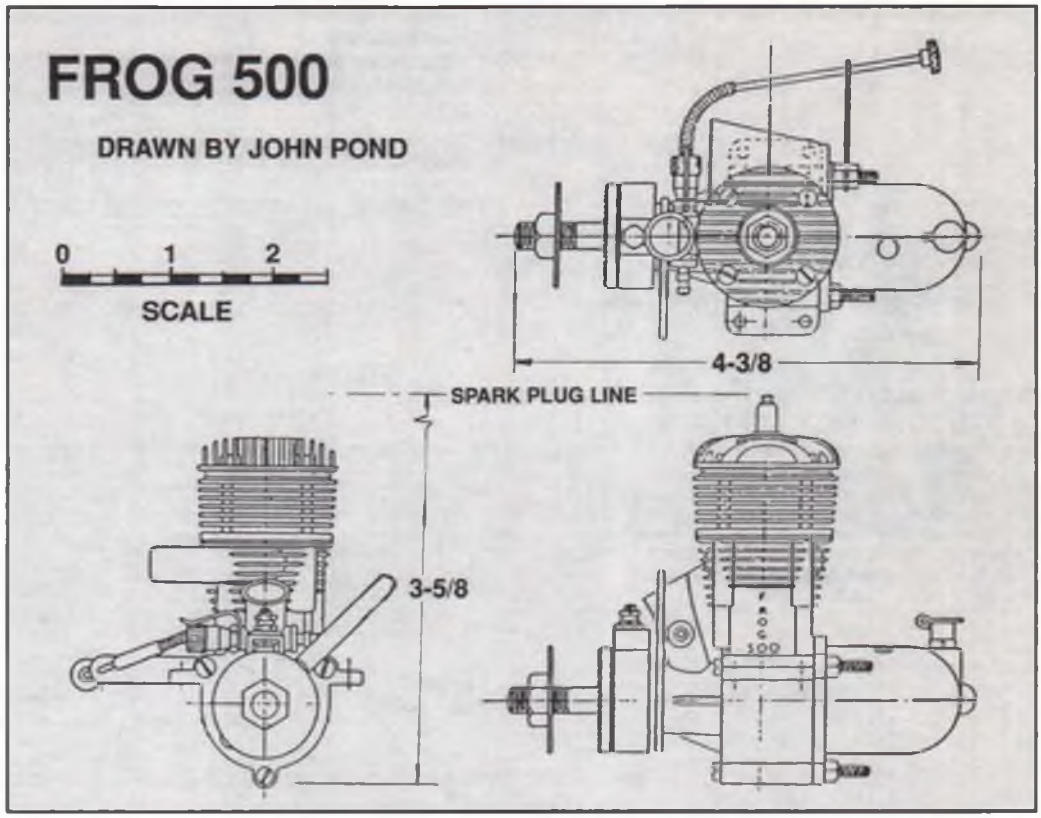
Racer. No less than three made the flyoffs!

Ted Dock came close to winning with his good flying Canadian Jimmy Allen Racer, seen in Photo No. 6. One can readily see the derivation of this design from the sensational 1932 Curtiss Navy Racer. Unlike the full-size prototype, this plane finished a close second! One wonders what would have happened if Ted's son, Denny, were there to push dad along!

Probably the most popular Jimmy Allen model design in the past, the "Sky Raider," was built and flown by Hans Ochsener (Photo No. 7). This model, compared to the other J.A. designs, more closely resembles the state of the art in Moffett and Wakefield design of that era. This design and the J.A. Bluebird used to dominate the Jimmy Allen Races in the 1933-36 era.

ENGINE OF THE MONTH

For this month's subject, we have picked the FROG (an acronym for Flying Rise Off Ground) 500 spark ignition engine. Strangely enough, this version followed the glow version, on account of the heavy demand in England for a larger engine than the 2.46cc Elfin engines being used in control line.



ENGINE OF THE MONTH

Photo No. 4. Winners of the Jimmy Allen mass launch event, from left: 1st, Roger Lane (again!); 2nd, Ted Dock; and 3rd, Art Ryan.

The FROG 500 glow engine was what saved the control line events in the late '40s. At that time, K&B was putting out the famous and good running "Glo-Torp." But in Australia and other British dominions, the import duty on American engines was something fierce. Looking much like a Torpedo, the British FROG 500 was able to step in with startling success and the local price was much more to the modelers' liking.

Based on the success of the glow version, a FROG 500 spark ignition engine was produced in response to the requests for an engine that did not require "hot" fuel and could be quite easily handled in sport models. This engine was widely distributed, in many cases being selected over the Torpedo because of the availability of engines and parts from local distributors and hobby shops. Then too, this was another way of getting around the horrendous import tax (running as high as 50 percent!) on American engines.

Photo No. 5. One of the most popular and best flying Jimmy Allen designs is the Canadian Racer as seen here displayed by Randy Ryan.

Test runs show bhp figures as

PLUG SPARKS

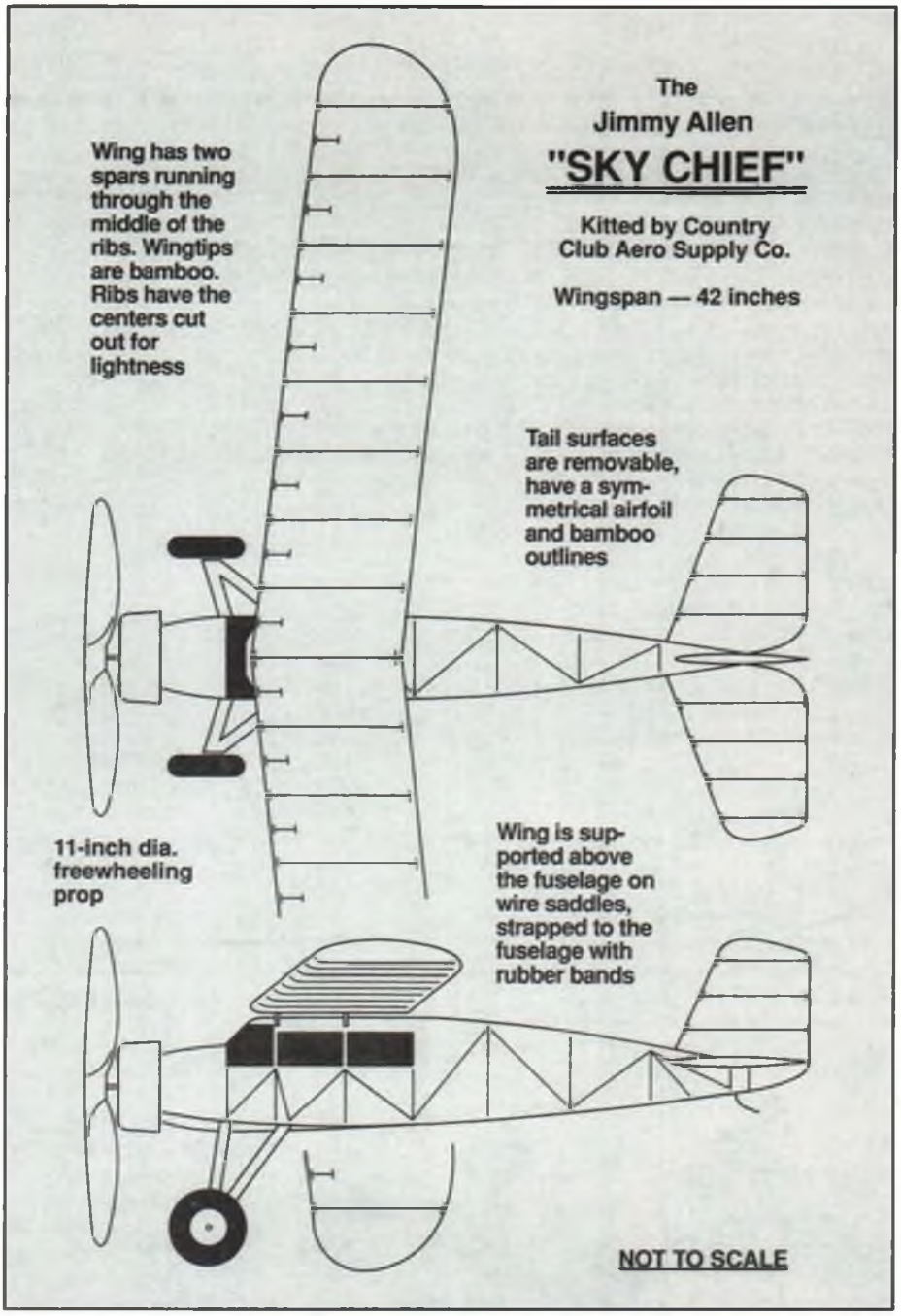
Photo No. 6. Ted Dock launching his J.A. Canadian Racer to a 2nd place win. Ship has nice lines, sort of like the old Curtiss-Page Navy Racer.

high as .42 at 13,200 rpm. Quite a bit of torque was obtained at 5,000 rpm, giving .25 horsepower. The variable speed of the FROG spark ignition engine was a great selling point. This, plus it was only necessary to use gasoline and 50/70-weight oil to get the desired performance.

The FROG 500, being quite similar to the Torpedo .29, was very much like its American counterpart with a bore and stroke of .750-inch and stroke of 680-inch respectively. Both beam and radial mounting were provided on the crankcase. Weight of the engine was 7.75 ounces including a formed detachable aluminum tank bolted to the rear crankcase cover.

MODEL OF THE MONTH

Inasmuch as we are featuring the activities of the SAM 4 "Mini- Champs" in this



MODEL OF THE MONTH

Photo No. 7. SAM 4's Hans Ochsner about to launch his Jimmy Allen Sky Raider, a cabin ship, for another perfect flight. Text lists a couple of sources for those big turned balsa wheels.

issue, it is only appropriate that we should feature a rare Jimmy Allen model known as the "Sky Chief" to complement the writeup.

We are indebted to Karl Spielmaker, who relayed the drawing received from Brian Wheeler. Wheeler, who owns all of the drawings, artifacts, etc. of the Jimmy Allen program, discovered this "lost" copy of the Sky Chief. Jimmy Allen plans were put out under the aegis of Skelly Oil, Heckok Oil, and finally Richfield Oil Co.

When the Airplane Model League of America (AMLA) got started under the auspices of the *American Boy* magazine and directed by AMA Hall of Famer Merrill Hamburg, it began to grow by leaps and bounds, a result of the tremendous wave of enthusiasm generated by Charles Lindberg's famous non-stop flight to Paris.

It wasn't until late 1931 that *American Boy* magazine found they had a tiger by the tail, with over 100,000 members and mounting costs of running meets. In retrospect, the main reason for the demise of the AMLA was the Great Depression. Sponsors were hard to find.

About this time (1931/32) a Midwest concern, Skelly Oil, started a program dedicated to model aviation. A radio program, "The Adventures of Jimmy Allen," featuring Jimmy Allen and Speed Robertson, was a weekly program that fired the imagination of every aviation-minded modeler. During this time, no less than 14 different plans/kits were offered for those contestants entering the Jimmy Allen Races being held with

Photo No. 8. A quite rare design, the Scientific Gold Star as reproduced by SCIF newsletter editor David Boals. Photo by Mik Mikkelson.

Kansas City as a base.

The Sky Chief plan being featured this month reflects the state of the art in competition rubber-powered models of the 1934 era. One of the features that was quite common in those days was the sweepback in the wings, supposedly giving lateral stability

continued on page 83

THE LSF NATS AND OTHER GREAT STUFF

Our weary columnist sits back and lets his readers write the column for once

It's a rare month when I have absolutely no time to produce an entire, original column for *MB's* readers, but this is one of them. However, I promise that what you read this month will be just as good, if not better! I've included a couple of the best practical articles from recent club newsletters, as well as a short report on the 1993 LSF Nats. Sit back and enjoy!

Herk Stokely prepares to launch a Falcon 800 for the duration component of the sportsman multi-task (SMT) event at the '93 LSF NATS. Fliers had to complete two rounds of 8 minute duration and land in a 25-foot tape. Next, two rounds of 4 minute distance tasks were flown, the last rounds being the speed tasks. Best speed times were about 32 seconds for four laps; in distance the leading pilots were turning in 12 laps in the allotted 4 minutes. Alan Schwerin photo.

THE 1993 LSF NATS

by Dr. Alan Schwerin

The climate, location, facilities and most of all, the hospitality, must be right, as both the AMA and LSF Nats returned to the area they had frequented before. With its mild temperatures, good lift and relatively dry weather, the Vincennes/Lawrenceville venue is clearly becoming recognized as prime soaring territory. Fairly centrally located, this year's LSF Nats drew pilots from all over the country, ensuring a diversity of flying talent and types of aircraft flown. From floaters like the two-meter Spirit to the sleek, sophisticated unlimited class Infinity and the elegant composite Magic, the contest attracted eager novices and seasoned experts alike. And what united these fliers was a common thread—the desire to share in a unique experience—namely, participation in a national soaring contest.

With the F3B World Champs running concurrently with the LSF Nationals, and the AMA Nats completed only the month before, it became clear early on that this would be an open contest. Without the dominance of exceptionally talented fliers such as Joe Wurts and Brian Agnew, the spoils were spread among a number of competitors. Mike Fox took Hand Launch and F3J, Michael Lachowski F3B, Josh Glaab Two-Meter, Toni Matyi Standard, Rusty Shaw Unlimited, Pat Flinn Cross-Country, and John Gunsaullus Sportsman Multi-Task. Overall attendance was slightly down from last year, possibly because of the nearness of the AMA Nats and the big MASS tournament in Huntsville, Alabama. Nevertheless, the fact that for the most part the same faces showed this year as last, is testimony to the caliber of the contest and to the esteem some of the nation's leading pilots hold for this important event.

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TO TRIM OR NOT TO TRIM—THAT IS THE QUESTION

By "Mr. Wizard," Heart of Texas Soaring Society

The subject of trim has been hashed over many times, but after talking with a few of our club members I feel it may be worthwhile to give trim another look. A well TRIMMED ship is a joy to fly and not that difficult to develop. TRIM (in capital letters) will refer to flight performance including center of gravity (CG), and drag. Trim, the control, will be in lower case.

See if you can answer the following question: *What flight difference will you notice if a heavier battery is used in a plane with which you are familiar?*

Elevator trim is used to adjust the pitch attitude of a plane so that it will maintain a desired airspeed. There should be no argument with this statement. A plane that responds like this to trim is said to have positive pitch stability. Stability here means that the ship will tend to return to a trimmed pitch attitude and speed. A plane that will not maintain an airspeed it has been trimmed for is said to have neutral or negative pitch stability.

We hear many different, and at times conflicting, bits of information about where the CG of a glider should be and how to TRIM the ship. This makes it difficult to

organize these ideas into a reliable body of information. One of the difficulties we have discussing TRIM for model sailplanes is that there is no one right way to do it. "Correct" TRIM for the beginner will be very different than that for the expert.

Some hot-rock pilots want their plane to fly at maximum efficiency with the elevator at a near-zero lift angle under most conditions. To do this, the CG must be at a point where the plane has very little if any positive pitch stability. In this maximum efficiency condition, there is only one trim position (at reasonable airspeeds) where there is no pitch change while flying off in dead air regardless of the initial pitch angle when you let go of the stick.

This ship cannot be trimmed to maintain a constant airspeed. For the small increase in efficiency, the pilot must now pay constant attention to pitch control.

As far as I'm concerned, this increased efficiency is not worth the extra demand on the pilot. I like my ships to have positive pitch stability. In other words, if disturbed by a gust or by me, I want the ship to slowly begin to return to its original attitude on its own. For this to happen the ship must be made more nose heavy than the hot-rock likes.

The positive pitch stability that would be helpful for the beginner will be achieved if the CG is between 20 and 35 percent of the mean aerodynamic chord. The most efficient CG for those pilots demanding maximum efficiency from their weapon will be between 35 and 48 percent of the MAC.

Try this test: from a stable, level glide, lower the nose and release the stick. Let the model fly hands-off for a bit. The ship will of course begin to accelerate, and if it has positive pitch stability, the nose will start to come up, bleeding off excess airspeed in the process, until the nose is higher than in a normal glide. As the model slows, the nose will drop and the cycle will repeat. The ship will continue to porpoise up and down a few times, decreasing the pitch change with each oscillation before settling down to the original speed it was trimmed for before the pitch was disturbed. The period of time between each porpoise is determined by overall drag, CG and trim. This period will become shorter as the CG is moved toward the leading edge of the wing, and will increase as the CG is moved toward the tail.

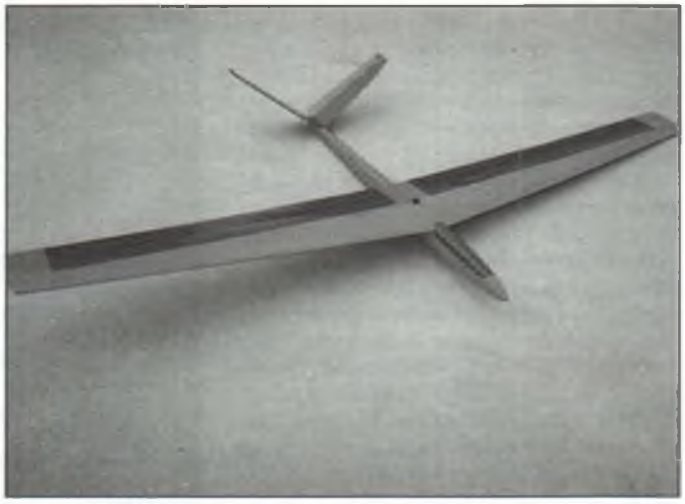
As the porpoise period stretches out almost to infinity, the CG is nearing the point of maximum efficiency for your ship and its airfoil. As you can see, this would satisfy the dive test we have all heard about. The only problem is that at this CG position, we will find that the ship

Terry Luckenbach attended the LSF Nats with his unlimited class Probe and also had a couple of two-meter versions. Design uses the thick, moderately cambered Eppler 214 airfoil, which seems to carry the weight very well. Photo by Alan Schwerin.

A nest of Scorpions, ready to strike! Mike Fox, designer of the original 100-inch standard class Scorpion, has brought out an elegant, gentle two-meter version, dubbed "Lil Scorpion," that is proving to be very competitive. Alan Schwerin photo.

At the 1993 LSF Nats, Dr. Alan Schwerin photographed this beautiful example of the 138-inch span Magic Mk. II as produced by Weston Aerodesign (416-974-0968). Weighing in at around 70 ounces, Herk Stokely's ship has a wing loading of around 9.35 ounces per square foot. With its long tail moment, light wing loading and full-span turbulators, the Magic appeared docile on tow and reacted more graphically to lift than other models with lower aspect ratios.

Recent correspondence from George Spitzer, editor of the F3B/USA F3F/USA newsletter, included this photo of his modified Greco Technologies Javelin HLG. It features the SD7037 airfoil and foam-core wings V-bagged with multiple layers of 3/4-ounce glass cloth. Building a new plane was made necessary by a car burglary while George was on his way to a contest in Arizona.



The Hurricane is Greco Technologies' entry into the fast-growing 60-inch slope racer category. It features the SD8000 airfoil, flaperon/elevator control, balsa fuselage and low-drag V-tail. Looks pretty fast to us! Contact Greco at P.O. Box 10, S. Pasadena, CA 91031, or call them at (213) 680-2070 for info.

tends to nose over into a steeper dive after we establish a nominal dive angle because the CP (center of pressure or center of lift) moves to the rear as airspeed increases. This CP movement acts like a change in CG. But leave the dive test to the pros. Most of us would like a nice behaving, fun ship that does most of the flying for us and does little to raise pulse rate or blood pressure.

While on the subject of CG position, note that moving the CG toward the nose can be overdone. The CG is too far forward when the hands-off porpoise becomes more violent rather than dampening back to the original pitch angle. We have all seen inexperienced pilots perform switch-off launches with their beginner gliders. If the towhook is in the right place, the model usually does a good launch, then at the first disturbance it goes into more and more violent porpoises, eventually stalling at the top of each one. Removal of some of the nose ballast will slow the period of the porpoise, giving drag a chance to slow the ship before it pitches up too steeply, which tends to dampen the oscillations.

"And the answer is..."

Your answer to the original question should have been: A heavier battery will cause your plane to be quicker to respond to deviation from its (re)TRIMmed, stable flight path (pitch and speed constant). The resultant porpoising will have a shorter period, and you probably will not notice the small increase in sinking speed. Good luck with your TRIM and remember—you trim for airspeed.

(Columnist's note: The so-called "dive test" works best for planes with all-moving horizontal stabilizers, and thus with infinitely variable wing/stab incidence. This test sometimes fails to show desired results on sailplanes with fixed stabs that have lots of built-in incidence (3 to 4 degrees or more). With these kinds of ships, a 50-60 percent CG can still produce pullouts after modest dives, even with lots of down trim! But with the CG so far aft, these sailplanes are anything but stable to fly, and in fact are quite squirrelly. I would recommend staying within the manufacturer's recommended CG range. If you aren't happy with this setup, shim up the wing's trailing edge 1/16 inch at a time and retest with a progressively rearward CG. When you find the "perfect" setting, make it a permanent change to the wing saddle.)

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WHY I FLY THE "WRONG" AIRFOIL

By Barry Kurath,
Northwest Soaring Society

What's the *very best* airfoil? Every sailplane flier has an opinion. Usually, it's the one that the current hot pilot is flying—SD7037, RG15, or a fast Quabeck. I believe that most of these opinions are wrong, at

least for most pilots. These airfoils are well suited for a highly skilled, aggressive pilot—maybe five to ten percent of contest fliers. The rest of us would do better with an airfoil that is more forgiving of mistakes, because we do make them.

At first I often struggled in light lift for several minutes to gain a mere 30 feet, only to tip-stall and lose it all. If I had started with an airfoil more suited to a beginner, rather than the then-hot E205, this would have been far less of a problem.

Then, five years ago, I bought a sailplane from Harley Michaelis. It had an S2091 airfoil and some washout. The stall characteristics were wonderful! I began to progress much more rapidly through the ranks. I have been flying planes with the S2091 for five years now, and occasionally threaten to win a contest.

I believe that too much emphasis is placed on high speed flight, minimum drag, and best L/D. Not enough value is given to gentle stall characteristics and maximum lift, both of which are important while thermalling, and should be considered seriously by novice and intermediate pilots.

In their book *Airfoils at Low Speeds*, Selig, Donovan and Fraser had this to say:

"In the quest for lower drag it is easy to forget the importance of the stall. An airfoil may have a very low drag coefficient, but if the airplane abruptly tip-stalls while thermalling, far more altitude will be lost trying to recover than might have been gained by the marginally lower drag."

Recently, I had a friend try out my current plane, a Jouster with an S2091 airfoil. It has a very pronounced droop to the nose of the fuselage. He launched, began a search pattern into the wind, and soon hooked into a nice thermal. Each time he circled and the plane came around to face him, the droopy nose fooled him, and he thought the plane was diving toward the ground. He abruptly forced the nose up to level which, of course, caused the plane to stall. After repeating this maneuver eight or ten times, with eight or ten full stalls, the plane had actually gained considerable altitude! Most ships would have been on the ground after such rough handling.

After he got used to the weird shape of the fuselage and finished the flight, he said, "That's a plane with no bad habits." I agree, and that's the kind of plane I need. The Jouster mushes down just 10 feet after a stall and exhibits no tip-stall tendencies, even when banked over in a turn.

So here's my opinion about the "very best" airfoil: it depends. It depends on who is flying the plane. If you are an aggressive, highly skilled pilot who will cruise to the limits of visibility searching for lift, then can work your way up from 100 feet in a light bubble of lift, maybe the current "hot" airfoil is right for you. If, on the other hand, you are a little timid about going too far from the landing zone, and are uncomfortable working your plane in light lift at great distances, you may do well to select a more conservative airfoil like my favorite. **MB**

THE SCHNEIDER SPORT ELECTRIC

The fun of float flying combines with electric power in this attractive scale-like low-winger, from one of the most respected designers of electric powered model aircraft.

BY BOB BENJAMIN

The Schneider Sport Electric was designed to fly the way you are used to seeing "wet power" models fly, on readily available Astro Cobalt 25 or 40 geared electric systems. At 5-foot span and 7 pounds, it's big enough to handle rough conditions, yet small enough to transport easily, and best of all, it looks like an airplane. Not only that, but as you can see by the photos, this airplane flies on both wheels and floats, and converts from one to the other in minutes.

It may occur to some of you that you have seen this airplane before, and it just so happens that you are right. The Schneider Sport Electric is a derivative of the Schneider Sport 60 that has been kitted by Stream, Inc. for the past several years. The Schneider Sport series was developed by Tom Strom, founder of Stream, to be a scale-like sport model reminiscent of the Schneider Cup racers of the late 1920's, and to serve as a vehicle to introduce Stream's unique float system, which offers efficiency, very simple setup, and the capability of operating properly *without a water rudder.*

About a year ago, Allan Poinsett of Stream approached me at one of the local club flying fields and initiated a discussion on electric powered airplanes. What eventually resulted was a commission from Stream to develop an electric version of the Schneider Sport 60. My response to this challenge was to develop an entirely new airplane in the shape of the Schneider Sport; that is, to redesign the structure completely, as the original "wet power" design, while it works very well, is seriously overbuilt for electric power. To guarantee that the finished model would perform as expected, I incorporated an airfoil and incidence arrangement based on

The Schneider Sport Electric is a versatile design that can be changed from wheels to floats or vice versa in a couple of minutes. Design is based on the Schneider Sport "wet power" models kitted by Stream, Inc., but with a completely redesigned structure. Floats, cowl, landing gear, etc. are all stock Stream units.

my successful Tigerkitten and Tigercat electric designs.

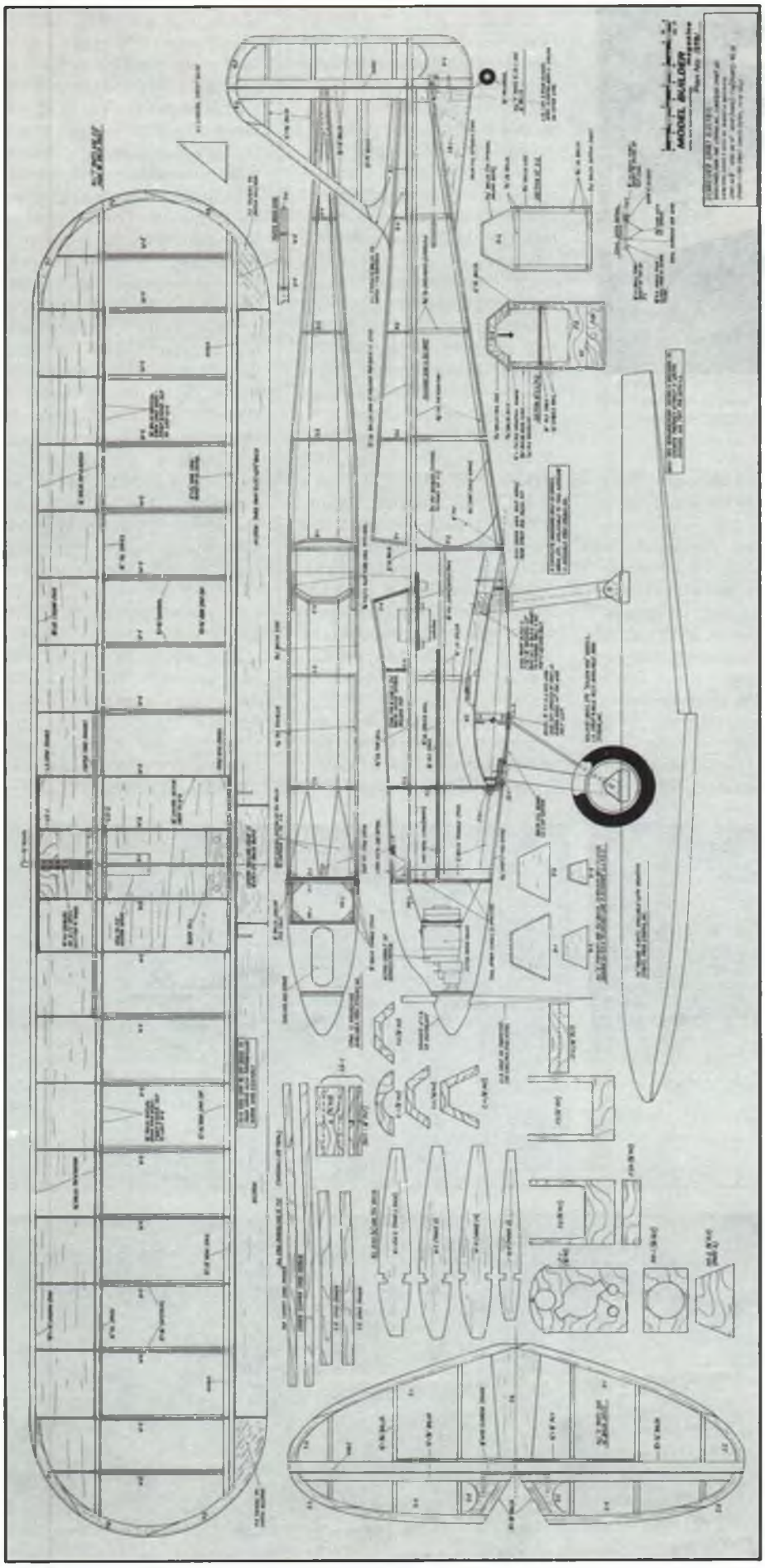
The end product of this effort is at first glance indistinguishable from the standard Schneider Sport 60 and flies as though powered by a good four-stroke .45 or .50 It is not a trainer, but if you are comfortable flying any of the common sport low-wing designs on the market, you should have no trouble with this airplane. If you have the required proficiency to build and fly the model, there is no reason that it should not serve you well as your first electric.

Tom Strom designed the floats used with the Schneider Sport series to be both efficient and attractive, with an appearance reminiscent of the same vintage represented by the airplanes. My tests confirm Tom's claims that the floats present a minimum of aerodynamic drag and allow exceptionally easy planing and takeoff. Moreover, I found it true that by following Tom's procedures, the Stream floats, used as designed, offer the option of good water handling and excellent flight characteristics without the complexity of a water rudder system.

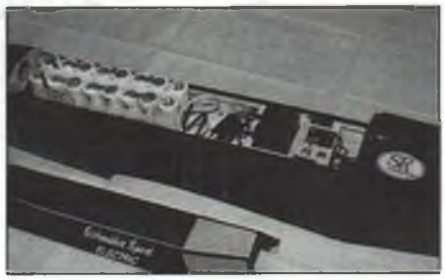
I know there are many of you who honestly aren't comfortable with the idea that electrics will perform the way we say they can. With this in mind, a 21-minute, professionally made, broadcast quality video has been produced and is available to help you decide whether this airplane and/or electric flight in general might be for you. The "Schneider Sport Electric" video is available from Videoland Productions, Inc., 805C College St., Lacey, WA 98503; (206) 491-1333. Cost is $14.95 plus shipping. Phone orders using your Visa/Mastercard, American Express or Discover card are welcome.

It was anticipated from the start that the electric version of the Schneider Sport would appear as a magazine construction feature and would also serve as the basis of possible future kit production. With this in mind, as much commonality as possible with the Schneider Sport 60 kit was retained. The entire float assembly, including all struts and hardware, as well as the nose cowl, landing gear assembly and most of the kit hardware pack will fit the electric version without modification. In addition, an optional ABS top cowl/rear deck is available; one of these was used on the prototype. Contact Stream, Inc. directly for parts ordering information: P.O. Box 1113, Newport News, VA 23601; (804) 591-0720.

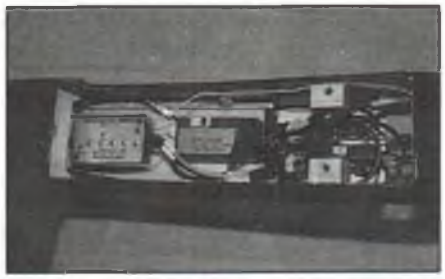
Power for the Schneider Sport Electric prototype is an Astro Cobalt geared 25 system, controlled by an Astro Model 207 speed control. First flights were made using the nominal battery pack of 14 cells—specifically, SR 1200 Max cells. The airplane performed well with this power. If you can keep the total flying weight at around 6-1/2 pounds, you can expect excellent performance on 14 cells. Prior to making the flights for the video presentation, I installed a pack of 16 SR 1800 Magnum cells. The extra voltage is well within the design limits of the motor and provides really crisp performance, and the extra 50 percent current capacity of the 1800-mAH



Removing the cowl reveals the Astro 25 installation on its built-up plywood mount. There's plenty of room up front for a geared Astro 40 and 18 cells, for those who *really* want to tear up the sky.



Forward fuselage top is removable for quick access to the battery pack. Batteries rest on top of a removable plywood tray, speed control and receiver are directly underneath.



Underside view with the wing removed shows the Astro 207 speed control, Airtronics receiver and rudder and elevator servos.

cells allows flights on the order of 7 minutes with proper power management.

The fuselage will easily accommodate a geared Astro Cobalt 40; a pair of 1/4-inch square hardwood spacer blocks between the motor brush holders and the back of former F-1 is the only adjustment necessary. There is also enough space for the nominal 18-cell battery used with the 40. Although I haven't yet tried this combination in my airplane, I have no hesitation in recommending it for those with some experience in electric flying.

CONSTRUCTION

(Editor's note: It's always been Model Builder's policy to include a reprint of the author's construction notes with each plan we sell, and the Schneider Sport Electric is no exception. However, because the building instructions Bob supplied with his text are quite lengthy, we've decided not to present them here. Instead, the following are Bob's notes on electric float flying, with emphasis on the special characteristics of the Stream floats. The complete set of building instructions will be furnished with each full-size plan order.)

BOB'S FLOAT FLYING NOTES

Although many good articles on the sub-

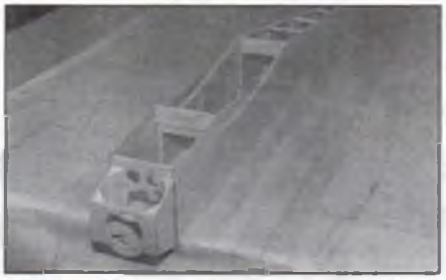
Here the sheeted left-hand wing panel is being joined to the partially finished right panel via 1/8-inch ply upper and lower spar joiners. Note that the spars are shear webbed on both sides with 1/16 balsa.

The individual fuselage components ready for assembly. Fuselage sides have had the plywood doublers, WS (wing saddle) pieces and longerons added.

Tail surfaces are simple built-up structures of 1/4-inch balsa.

Motor mount is built of 1/8-inch plywood and gets epoxied to the firewall (F-1). Diagonal cutouts in the big hole in F-1 are to clear the Astro cobalt's brush holders.

Wing construction is completely conventional—just be sure to keep it light!



The basic fuselage structure is assembled in place upside down over the plan with F-1 just off the edge of the building surface.

ject of float flying have appeared in the various magazines, many of you will not have seen them and may not have access to the relevant back issues. Moreover, the Stream float system is different from what most modelers are used to in that it is designed to operate without a water rudder. This alone makes some explanation necessary.

There are a number of aircraft and float or hull configurations that will allow you to fly from water, but the twin float arrangement used here is the most common. The floats support the airplane while at rest on the water and while moving slowly by displacing water equal in weight to that of the airplane, and are designed to plane or ride up onto the surface of the water to minimize water resistance so the airplane can accelerate to takeoff speed. On landing, the floats plane until speed decreases, then sink back into the displacement mode. Good float design maximizes the ease with which the floats plane and leave the water, and allows for steering while in the displacement mode.

By virtue of careful design, the Stream floats operate in the displacement mode without the use of a water rudder. This eliminates extra weight and complexity and makes converting from wheels to floats as easy as possible. Most float designs, when used without a water rudder, will not turn the airplane reliably when in displacement, especially when trying to turn crosswind. The Stream system accepts the reduced ability to make tight turns at very low speed in any appreciable wind in the interest of offering a float system that is incomparably easy to set up. By using moderate power, on the order of 1/4 to 1/3 throttle, airplanes equipped with these floats can be water taxied very satisfactorily, and with a little practice can be operated safely wherever traditional setups can.

The Stream system offers one real advantage over traditional floats. In full-scale operation, water rudders are retracted prior to beginning the takeoff run, as they become dangerously sensitive at planing

continued on page 82

SCHNEIDER SPORT ELECTRIC

By Robert A. Benjamin

SPAN	62-3/4 in.
WING AREA	664 sq. in.
FLYING WEIGHT	7 lbs. (wheels). 8-1/2 lbs. (floats).
WING LOADING	24-29 oz./sq. ft.
OVERALL LENGTH	46-1/2 in.
POWER	Geared Astro Cobalt 25/40; 14-18 cells.
RADIO	Four channels required.

BY BOB BENJAMIN

Astro Flight's Model 112PK Super Charger

This upgraded version of Astro's Model 112 charger combines the convenience of automatic peak charging with the ability to handle up to 36 cells.

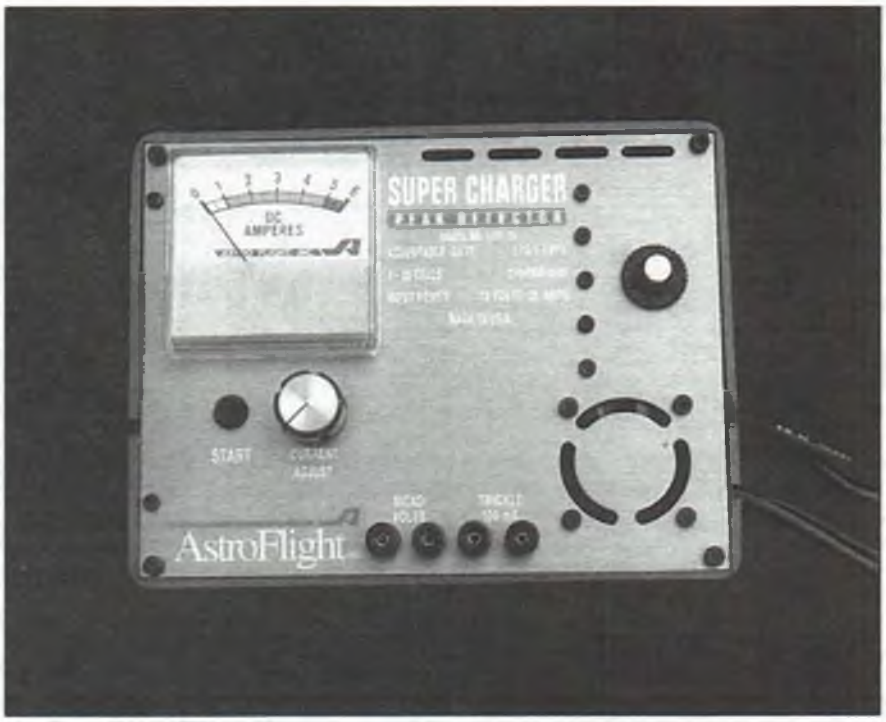
Astro Flight has earned a reputation for producing some of the very best electric flight equipment, and the newly introduced peak detecting Model 112PK Super Charger will only enhance that reputation. To my knowledge, the Model 112PK is the only model aircraft battery charger on the market capable of handling the 36-cell battery packs for which the new Astro Cobalt 90 was designed. It is suitable as well for charging the smallest battery packs in common use and is also one of the easiest chargers to use.

The Model 112PK Super Charger replaces the earlier Model 112 Constant Current Charger, which has become the most popular charger on the market for the larger electric power systems (up to 28 cells). As the name implies, the 112's circuitry compensated for the changing internal resistance of a battery pack under charge and kept the preset charging current at the desired level. The Model 112PK retains this constant current feature while expanding the charging capability up to 36 cells and adding an entirely new automatic peak detection feature.

An explanation is in order, as not all readers may be familiar with this latter term. While the procedure for charging nickel-cadmium cells at the lower "overnight" rates usually used with radio batteries is not critical as to shutoff time, when electric flight batteries are charged to capacity in as little as 15 minutes, termination of the charge must be timed carefully to avoid overcharging and cell damage.

Less-sophisticated chargers rely on predetermined charge rates and a built-in timer for safe fast charging. Peak charging, which means charging a battery to its maximum safe capacity, relies on the characteristic of the cells we use to accept charging current until maximum charge is reached, at which point the pack's voltage peaks and begins to decrease. While it's possible to monitor this voltage change with a digital voltmeter (DVM) and shut off the current at the peak, it's safer and much more convenient to rely on circuitry designed to do the job automatically. This new unit provides accurate, automatic peak charging in its simplest form.

The Model 112PK Super Charger is designed to operate from a 12-volt DC power supply, such as an automobile battery. A suitably long set of leads with a pair of insulated alligator clips is provided for hookup. A shorter pair of leads equipped with an Astro "Zero Loss" connector is furnished for output connection to the battery pack being charged. On the front panel are a current meter reading from 0 to 6 amps, a charge current adjusting knob, a push-to-start switch, a circuit breaker reset button, two voltmeter jacks, two 100-mA trickle charge jacks, and air vents for the integral cooling fan.



Astro Flight's Model 112PK is about as simple to use as one could ask. Just hook up the battery, push the start button, and adjust the current—the charger does the rest. In addition to its automatic peak detection circuitry, the unit features an integral cooling fan, DVM jacks, and two additional jacks for topping off your receiver pack while the flight batteries are charging.

Operation is straightforward and clearly explained by the instruction sheet furnished with the charger. Appropriate precautions are explained to insure that connection to a 12-volt battery is done correctly and safely.

As I prefer a portable setup, I built my 112PK into a field box containing a deep-cycle 12-volt battery and connected the charger directly to it, with a heavy-duty SPST toggle switch installed in the negative lead to permit turning off the charger when not in use. This installation can be seen in the photo.

In the event you use a connector other than the Zero Loss, an adapter cord can easily be made to interconnect the two. As

I regularly charge large battery packs in the airplane, I made up an extension cord equipped with an Astro charge plug which mates with the charge jacks in my airplanes.

With everything hooked up and the current control set to zero, you now push the start button and then slowly dial in the recommended charge current for your battery pack as indicated by the table included in the instructions. When the pack reaches peak charge, the charger will automatically shut itself off. It's that easy!

The voltmeter jacks allow connection of a DVM to read charging voltage. While this is not really necessary, it provides the opportunity to monitor the performance of the pack being charged and can be used to evaluate battery condition. The other pair of output jacks provide a constant 100-mA current intended for topping off a receiver pack while the motor battery is being fast charged.

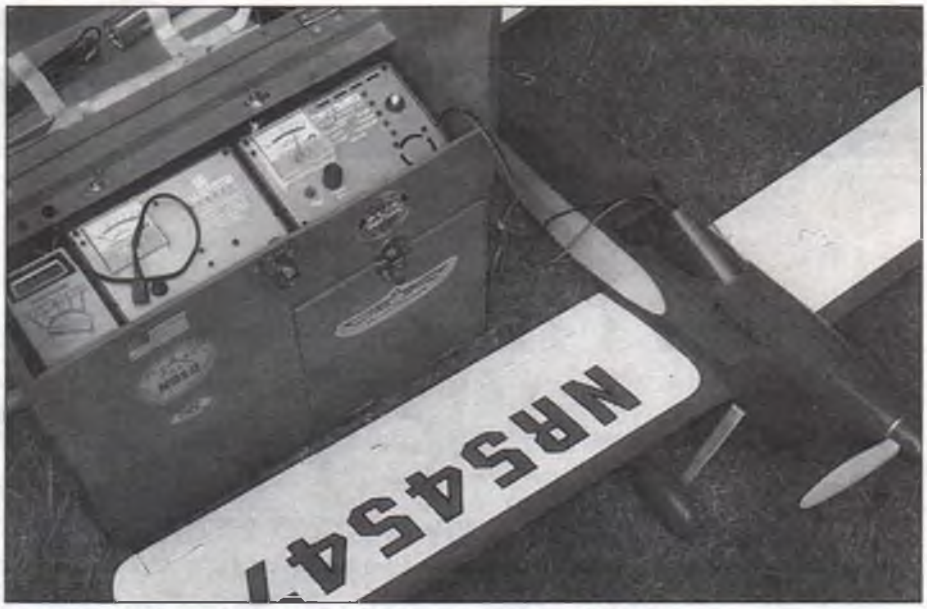
Field tests with several different flight systems showed the Model 112PK to perform exactly as advertised. Using a seven-cell 1200-mAh pack, the charger maintained the 5-amp current selected without deviation, and turned itself off neatly. I monitored the charging process with a DVM and verified that the cutoff was concurrent with the point of maximum charge—that is, just after the DVM indicated that the voltage had begun to drop.

Astro Flight indicates that the detection circuitry allows the charge to progress to about 10 millivolts per cell beyond the voltage peak, at which point the cells should feel just perceptibly warm and will be almost exactly at 100 percent charge. This "fine tuning" eliminates all guesswork at the field when you need to rely on maximum performance from your battery.

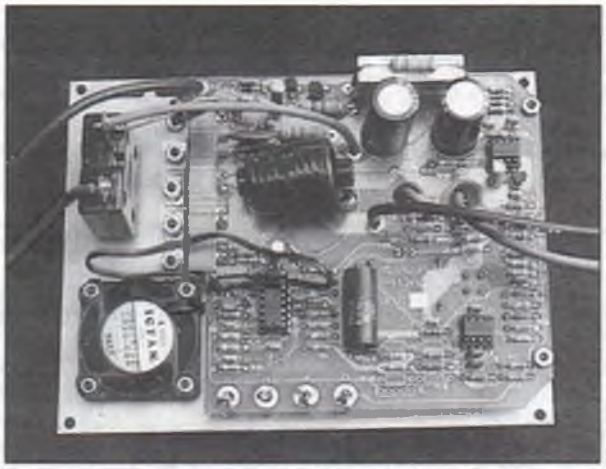
I repeated the test on packs of 14, 16 and 21 cells. As before, the Model 112PK maintained the charging current selected without variation and stopped the charge at exactly the point the monitoring DVM indicated it should.

I then hooked up the new charger to the Astro Cobalt 90 system in my Ace R/C Big Bingo (see the article in the March '93 *Model Builder*). At the time, the model was equipped with a 36-cell pack of SR 2500 Max cells. Astro Flight explains that the available charge current to very large packs such as this will be reduced somewhat below the 5 amps commonly used with smaller batteries; this is mostly to keep the input to the charger within limits that will prevent running down the input source (your automobile battery).

When charging 30 cells or more, 20 amps input power is required. The instructions indicate that the maximum available charge to 36 cells will be about 3 amps, and that to prevent embarrassment at the end of the flying session, you might want to start your car's engine before charging packs of this size too many times. The resulting higher input voltage (about 13.8 volts) won't hurt the 112PK, and will insure that you will be able to start your car later!



Bob installed his new Model 112PK in his field box alongside an old reliable Model 110. The toggle switch just above each charger's meter is used to turn on the input power. Here the 112PK is being used to charge the 14-cell system in one of the Tigerkitten prototypes.



The Model 112PK's innards. Bob took this photo mainly to satisfy your curiosity about what's inside and remove the temptation to take your own unit apart. DON'T DO IT! The operating voltages necessary to make this charger work with large battery packs are high enough to command your immediate attention!

Using only my freshly charged 40-amp deep-cycle portable battery, I initiated a 3-amp charge to the nearly depleted 36-cell pack. The 112PK delivered a steady current, again cutting off at the point indicated as optimum by the DVM.

In summary, the Astro Flight Model 112PK Super Charger performs exactly as advertised. It is the only charger of which I am aware that will handle the battery packs used with the Astro Cobalt 90, while being at the same time a very versatile, easy-to-use peak charger that is well matched to virtually any battery pack you are likely to be using. At a suggested retail price of about $189, it is more expensive than many basic chargers intended for use with small flight systems, but if you are a serious electric flier with any interest in using larger motor/battery combinations now or in the future, this charger would be the one to buy! ***MB***

The JR X-388S Heli Radio

With almost as many features as the top-of-the-line JR PCM-10S but costing considerably less, the X-388S is rapidly becoming a favorite among experienced helicopter fliers.

BY JAMES WANG

The new eight-channel JR X-388S computer radio has programmable features designed for helicopters, fixed-wing powered aircraft, and gliders. The helicopter and airplane systems have different transmitters, the difference being primarily in the switch locations. The heli version has all of the switches and knobs optimally placed for heli fliers. Otherwise, the internal features and memory space are identical.

The helicopter version is available with four different receiver/servo combinations. Ranging from the most expensive to the least expensive, they are:

1) X-388S heli transmitter with nine-channel JR 649S SPCM receiver and five JR 4131 dual ball bearing, coreless motor servos.

2) Transmitter with 649S SPCM receiver and five single ball bearing 517 servos.

3) Transmitter with nine-channel 529 FM receiver with five 517 servos.

4) Transmitter with 529 FM receiver with five 507 servos.

All heli versions come with a 1000-mAH NiCd receiver battery.

I discussed the JR SPCM and FM receivers and JR servos in my three-part JR PCM-10S review (June, July and August 1993 *Model Builder*). Here I will only go over the helicopter features of the X-388S transmitter.

Besides the heli features, the X-388S also packs many programmable features for RC airplanes. All are covered in the 183-page instruction manual; 47 of those pages have to do with helicopters. It has excellent pictures of the inside and outside of the transmitter, and clearly defines every switch and knob. It gives clear, step-by-step examples of setting up the programs. Practical applications are given to illustrate the capabilities. I like the practical applications, and I think Horizon did a good job of writing them.

This radio is called the X-388S because it is designed for three types of models (airplanes, gliders, and helicopters), is an eight-channel system, and has memory space for eight different models. The transmitter programs are backed up by a tiny lithium battery, just in case the NiCd dies. The lithium battery is claimed to last five years. The transmitter has an eyelet for a transmitter neck strap, but a strap is not included in the system.

JR's X-388S system is intended to bridge the gap between the popular JR x-347 and the top-of-the-line PCM-10S. It has programmable features for airplanes, gliders and helicopters, memories for eight different models, and eight channels. The large liquid crystal display and the six buttons on the front are for programming.

The transmitter has a direct servo control (DSC) feature that allows you to connect a special cord between the transmitter and the receiver and operate the system on the ground without transmitting a signal. This feature is useful for checking out your model or adjusting the programming when someone else is flying on your frequency.

The radio is programmed via six pushbuttons located at the front of the transmitter. The transmitter chirps each time a programming button is pressed. After reading and understanding the manual, the radio becomes easy to operate, however, beginners will probably still have problems setting up their first model helicopter with this radio. It's not that the instruction is poor; it's simply that the radio is so capable. It's like programming a state-of-the-art, super-duper hi-fi VCR for the first time. Beginners should seek the help of a more experienced heli flier who owns an X-388S or even a JR x-347. The two radios have similar programming styles.

I find the X-388S to be quite easy to program, but it still took me two evenings to go through all of the features in the book.

Anyone getting into helicopter flying should seriously consider the X-388S. Most of the fancy features will be useless to a beginner, but they become mandatory for advanced aerobatics. During the beginning stage, the fancy features can be inhibited, so that an accidental flick of the switch will not affect anything.

Another reason this system is great for beginners is that two X-388S transmitters can be linked together via a JR buddy box cord. The training cord allows the instructor to have primary control of the helicopter. The instructor can also select which control(s) he wants the student to handle. For example, in the beginning, the instructor may want to control the cyclics and let the student take the tail rotor and collective, or just the tail rotor alone. I think this is the fastest way to learn.

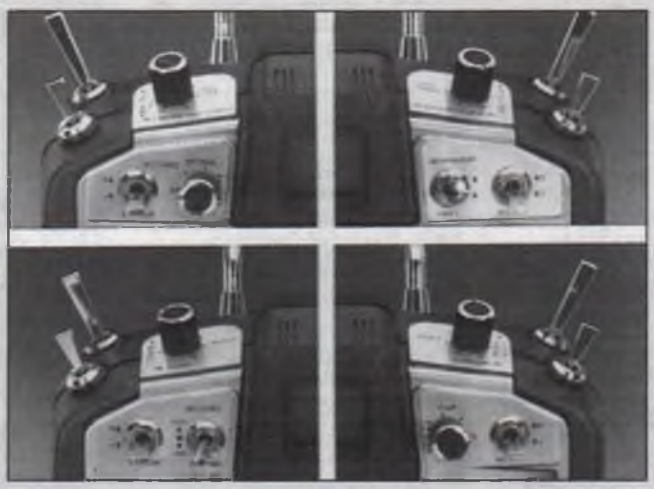
Now let's run through the capabilities of the X-388S heli radio. It has dual rates and exponential, and stunt trim on aileron, elevator and rudder. (In truth, these should be called roll cyclic, fore/aft cyclic and tail rotor control instead of aileron, elevator and rudder. But I will stick with the airplane jargon used in the JR manual.) There is an auto dual rate feature that can automatically change the aileron, elevator and rudder into low rate or high rate when idle-up is turned on—a nice idea. I programmed mine to have 100 percent full throw in idle-up and 85 percent throw (low rate) in the normal mode. This is because I use idle-up for hotdogging.

I like the stunt trim feature in JR radios. The stunt trim automatically kicks in a pre-set amount of aileron, elevator, and rudder when idle-up is turned on. I use idle-up strictly for forward flight, so I programmed in some stunt trim offsets to give hands-off straight and level flight. This usually means 2-3 percent down elevator, 4-5 percent right cyclic, and 8-12 percent left rudder when idle-up is turned on.

There are three throttle curves (normal, idle-up 1 and idle-up 2), as well as four pitch curves (normal , idle-up 1, idle-up 2 and throttle hold). I use idle-up 1 for hover, slow forward flight, and fast vertical climb. I use it for fast vertical climb because the tail rotor pitch mixing is set up such that when I punch full throttle/collective, the nose does not yaw. Idle-up 1 is for doing FAI-style, smooth aerobatics, such as loops and rolls. The throttle only goes to 50 percent open and collective to -4 degrees at full negative stick position. Idle-up 2 is for all-out 3-D hotdogging. It has 100 percent throttle opening and -8 degrees collective at full negative stick.

Each throttle curve and pitch curve is defined by five points. They represent the stick position at low stick, 1/4 stick, 1/2 stick, 3/4 stick, and full stick. The factory preset values for the five points in the throttle and pitch curves are 0, 25, 50, 75, and 100 percent. For the throttle curves, I recommend 0-25-45-75-100 for normal throttle; 50-42-48-80-100 for idle-up 1; and 100-45-50-82-100 for idle-up 2. For the pitch curves, I recommend 15-40-65-85-100 for normal throttle; 10-38-62-85-100 for idle-up 1; 0-38-60-82-100 for idle-up 2; and 5-38-65-85-100 for throttle hold. These values work very well with most .30 and .60-size helicopters. Of course, each model and engine combination requires more fine tuning and slight deviation from my recommended values, but try them as a start.

The X-388S heli system is available with four different servo/receiver packages. You can choose between a nine-channel NER-529 FM receiver or this latest nine-channel NER-649S SPCM unit. All four packages include five servos, from the 507 standards to the ball bearing, coreless 4131s.



Top two photos show the switch locations for the helicopter system transmitter; the three knobs are for hovering pitch, hovering throttle and pitch trim. Bottom two photos show the switch locations for the airplane system transmitter.

On the X-388S, the hovering throttle and hovering pitch knobs only affect the normal mode throttle and pitch curves. On the Futaba Super 7 and Airtronics Infinity 660, the hovering knobs also affect the idle-up and throttle hold curves. Which system is better is a matter of personal preference. Each has their advantages. The X-388S does have one extra knob that its peers do not have, and that is the pitch trim knob. This feature shifts the entire collective pitch up or down by about plus or minus 2 degrees. This can be quite useful. I also like the fact that idle-up 1 and 2 are activated by a single three-position switch, instead of having two separate switches. There is an inverted flight switch, but I don't use it. I preach learning the switchless inverted technique because it opens up a whole new realm of flying potential.

Other very nice features on the X-388S are the separate tail rotor mix programs for the normal throttle and idle-up modes. This allows you to have a regular linearly shaped tail rotor mix for the normal mode, and a U-shaped tail rotor mix for idle-up. The U-shaped tail rotor mix is great for switchless inverted flight and loops and rolls. Unfortunately, the low point of the U-shape must be at center stick. It would be a great improvement if future systems allowed the bottom of the U-shape to be defined by the user.

Besides having rudder offset, the X-388S also has tail rotor acceleration. This feature automatically kicks in a prescribed amount of right tail rotor when throttle is punched, to keep the nose of the model from yawing—great for hotdogging.

In conclusion, I think the JR X-388S system packs enough features to satisfy most any heli flying style. In features it approaches those of JR's top-of-the-line PCM-10S, but at much lower price. Check it out for yourself at your local hobby shop. ***MB***

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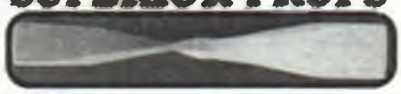

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PATTERN *continued from page 42*

flown strictly "by the book," both so that the prestige of making them is enhanced, and so that the concentration of the judges is not burned out on fliers who have "no chance" of placing high.

The argument for the expanded format has some small force of tradition and expectation on its side; since at least '88, 20 or more pilots have been taken into the FAI finals at each Nats. Proponents of the large finals say it gives talented newcomers moving up in the order a chance for some recognition and a realistic goal to shoot for; a chance that would not exist in the smaller, "by the book" format, where the bigger names tend to dominate the top of the order. At least, the argument goes, the large format creates a little room at the bottom for new talent to squeeze in.

Which faction is right? There is no easy answer. A small finals is definitely more prestigious, at least for those who make it, and easier to run. A large finals is definitely more popular with a majority of the pilots, but a majority of the pilots don't finish in the top 20 percent. The "judge burnout" argument doesn't hold much water. Scoring 10 pilots three times each equals 30 flights to look at. Scoring 21 pilots once equals 21 flights. As far as "by the book" goes, I've never attended an FAI (or AMA) event run strictly, 100 percent by the rulebook—and the FAI Sporting Code states that a finals is not even required, except for World and Continental Championships.

If enough qualified judges can be found to staff the extra lines, or if there is enough time to fly the larger number from a single line, my vote goes to the large finals (but still, no more than 20 or so) at big, open contests like the Nats and N-PAC. The Masters Team Selection is different, but I don't know of anyone who seriously advocates an expanded finals there.

Regardless of finals format, Chip Hyde made the '93 Nats pretty much his contest all the way by winning two out of three finals rounds in decisive fashion. I was one of the extra judges laid on for the finals, and I think you can call that observation and

those that follow pretty much the result of a ringside view.

Dave von Linsowe jumped up from fourth after the prelims to second spot with some good work in the tough B pattern. The big USA Star flies very well in light to moderate winds, and Dave's well-executed and close presentation shows off the pattern well. Bill Cunningham didn't budge, both going into and coming out of the finals in third place. Bill had his Malibu working really well and appeared to be trying out a much closer, more defined style than he showed at the Masters. Tony Frackowiak moved from sixth to fourth, showing good maneuver shapes and some nice wind correction. This made the Nats finish order a repeat of the Masters in June; with the addition of Chip on top, our new Team USA finished in the same order as they did in Corvallis.

Dave Patrick made a strong move up from eighth to finish fifth, dropping fellow Canadian Ivan Kristensen to sixth overall. Chris Lakin climbed into seventh with some nice flying, with Geoff Combs and Mike Klein in eighth and ninth respectively. Mike McConville had a little trouble and dropped to tenth from seventh position going in. Rounding out the rest of the finals crew, in order, were Jason Shulman, Greg Marsden, Steve Helms, Steve Rojecki, Gene Rodgers, Donnie Weitz, Jim Bennet, Dean Koger, Frank Kelley, Greg Frohreich, and Frank Noll.

It was obvious again, as it was at N-PAC and the Masters, that the B pattern just isn't being flown most places in the country. As a group, the finalists looked considerably more ragged flying the B than they did during the prelims with the more familiar A schedule. Those who didn't have as much trouble moved up in the standings; it really was as simple as that.

While many of the better pilots are flying the B schedule nearly as smoothly as the A, precision is suffering. A lot of the maneuver shapes flown in the B pattern are being poorly executed. In particular, the Square Vertical Eight, the Vertical Eight, and the Hourglass are being pounded unmercifully. The 1/2 Cuban Eight with 1-1/2 Snaps down into the Square Loop with Half Rolls is another sequence taking a brutal beating, and amazingly enough, many pilots seem to be having trouble with the Triangle Rolling Loop, which was taken from the old pattern now being flown in Masters. Go figure.

And figure this: if you would do well and move up when the B schedule becomes the norm next year, consult the diagrams and the rulebook for the proper geometry and learn to hit the high-K stuff listed above. Of course, once everybody starts seriously practicing the B this off-season, a few may figure out that the maneuvers aren't really supposed to look like a neo-cubist's nightmare. All the same, right now, a window of opportunity exists for those with fuel, time, and a plan. With that pleasant thought, I'll exit, paragraph right. ***MB***

SCHNEIDER *continued from page 71*

speed. Very few models use a retractable rudder, with the result that a heavy hand on the stick at high speed can cause an upset. With no rudder in the water, high speed control and "step turns" are much less demanding.

To taxi the model on the water, add power until the front of the floats begin to rise and the airplane begins to squat down at the tail. You will see that as speed increases, so does the spray thrown by the floats, but you will also notice that it is thrown out to the sides and does not get into the prop. If no significant wind is blowing, you will find that as soon as the plane is moving fast enough for the nose to begin to rise, you will have rudder control and will be able to steer the airplane well. As ambient wind speed increases, the airplane will show an increasing tendency to want to turn into the wind, and you will need to increase power to maintain directional control. At no time should you need to add power to the extent that the floats are beginning to plane.

The hardest thing will be to turn out of the wind. The trick is to use short bursts of increased power and full rudder. The Stream floats have a wide enough forebody that you can safely use forward stick (down elevator) while doing this to get weight off the rear portion of the float and tighten the turn. With a water rudder airplane, this would be counterproductive; keeping the tail down with back stick keeps the water rudder submerged and effective.

I would suggest that you commit a couple of battery charges to taxi practice before flying the airplane. Be sure to keep enough charge in reserve to get back to the beach; you will be using a lot of current even at moderate power settings compared to what would happen in flight, as the prop will not be unloading. Don't go to full power until you intend to take off, as this airplane will be ready to fly before you are!

When you are confident that you can put the airplane where you want it on the water, you're ready to fly. The rule with any floatplane is to take off directly into the wind. Arrange your flying site so that you can do this without compromise. The ideal water surface condition is lightly rippled, with winds of 5 to 10 mph. Strong or gusty wind and heavy chop is the signal to go do something else. Glassy water can be a real problem with improperly designed floats, but this airplane and the Stream floats handle it effortlessly, as the video proves.

Taxi the airplane out just far enough to assure a clear takeoff path and reduce power; the airplane will align itself into the wind. Smoothly add full power. With some float setups it is helpful to hold full up elevator as the plane begins to accelerate, then push the stick forward slightly to ease the floats into a planed condition. With the Stream floats the Schneider Sport Electric will plane without help; just stay off the elevator and use the rudder as necessary to maintain heading.

If there is any wave action at all the airplane should fly itself off the water within 50 feet or so of the point at which it planes. On very smooth water, once you see that the floats have planed and the airplane has accelerated, *gently* ease the stick back and the airplane will leave the water. Don't pull the model off the water abruptly, as it is heavier with the floats mounted and you might end up dunking it and going swimming. Once the airplane has gained a little speed, go ahead and fly it normally.

Plan to land while you still have battery

continued on page 85

PLUG SPARKS *continued from page 63*

much in the way dihedral provides axial stability.

The fuselage layout is quite reminiscent of the old Bellanca monoplanes, with their downward-sloping top longerons. This style of fuselage was popularized by Gordon Light in his string of successful Wakefield models.

Kits were produced by "Pop" Schreiber (from whom Bryan Wheeler inherited all of the Jimmy Allen plans) of Country Club Aero Supply. This company enjoyed a surprising amount of mail order business. The model structure features a lightly built framework of strip balsa, with bamboo being employed for wingtip and tail outlines.

For transportation, all parts were designed to be removable. Anyone contemplating building one of these models would do well to modify the tail section to a pop-up dethermalizer. Incidentally, the wheels shown are still being manufactured by Jim Root in both balsa and celluloid types. For availability and prices, contact Jim at 3412 Norton St., Independence, MO 64052. Might also mention that Ken Sykora of Oldtimer Model Supply, P.O. Box 7334, Van Nuys, CA 91409 also offers a good selection of turned balsa and hardwood wheels, including the big 3-inch balsa wheels used on the Jimmy Allen Blue Bird.

SOUTHERN CALIFORNIA ECHOS

Photo No. 8 is further proof that small models fly great. Seen is David Boals (SCIF newsletter editor) holding a Scientific Gold Star. This was one of two designs produced by Dick Korda for Scientific after his sensational win in the 1939 Wakefield meet at Bendix, New Jersey.

Two models, the Gold Star and Victory (a small version of Korda's winning Wakefield design as produced by Megow), both of 32-inch wingspan, were kitted by Scientific Model Co. with outstanding sales. After WWII, Berkeley Models engaged Korda to produce a few rubber designs for kit production. The Scientific designs have survived all these years and are still a popular subject! ***MB***

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INSIDE ENGINES *cont. from page 50*

mance in question.

This increased performance at 3.14 horsepower was audibly an improvement, and the enhanced torque reading was itself double-checked to verify its accuracy. Whether due to the black color of the Bolly pipe or its inherent design differences from the O.S. pipe, the ability to get onto correct resonance when properly loaded for maximum power was much improved as compared with the O.S. pipe.

In all cases, even slightly over-lean fuel settings usually led to loss of the glow plug element whenever the pipes were operating anywhere near their maximum power points. This seems clear proof that the engine squish and compression ratio setup in standard form is very close to the allowable limit beyond which plug loss would be almost continual. It was found (as usual!) that only the thick-element plugs such as the OPS 300 or Rossi 8 had much chance of surviving successive runs; differences in performance between those and the thinner, more fragile element plugs were undetectable. The extra cost of these hardier plugs is considerably more than compensated for by their much longer life under extreme conditions—such as those found here. **MB**

ADVERTISER INDEX

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SCHNEIDER

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power left to taxi back to the beach. Set up an approach that is a little higher and closer in than you would use on wheels. Get level on final approach while you still have 20 feet or more of altitude and fly the airplane down to the water in a level attitude. Land a little faster than you would on wheels—at least at first. The idea is to let the floats touch the water with the afterbody (rear bottoms) parallel to the surface; that is, you put it back on the water in the same attitude in which it left. With some practice you may find that this airplane lands most smoothly on water with a gentle touch of power added just before touchdown. Keep a bit of power on as the floats settle, and use your new water taxiing skills to bring the airplane back to the beach, where you will be most justified in celebrating loudly! Following that, practice, practice, practice and send pictures of your Schneider Sport Electric! ***MB***

MODEL DESIGN *cont. from page 15*

does the choice of airfoil.

If the wing section is other than symmetrical, the camber will affect the need for aileron differential, because a wing panel with considerable up-aileron will be operating at negative lift, and the negative lift curve of a cambered airfoil is much different from that of the normal one.

By my theories, if the model were completely symmetrical with respect to the horizontal plane, it wouldn't need any differential. Kip and I agree that on aerobatic airplanes it isn't needed so much for turns as it is for rolls, and that a change in wing placement, aileron sweep angle (if any), airfoil, or most of all, change in dihedral will affect the optimum amount of aileron differential.

The optimum aileron differential may be different at different speeds, since more aileron deflection is required at lower speeds. Also, note that the mechanical aileron differential most of us use is trigonometric and therefore non-linear.

Here's another question to consider regarding aileron differential: Is it in the wrong direction when the plane is flying inverted or in outside maneuvers? Don't jump to conclusions too fast. Dihedral becomes anhedral when the ship is inverted. With anhedral we might need reversed aileron differential—and we have that when we are inverted. Also, if the airfoil is non-symmetrical, its need for aileron differential will be reversed when inverted.

Kip says that in a pattern ship, aileron differential is adjusted to make vertical rolls as axial as possible. In trimming out airplanes, pattern fliers test with vertical rolls, because there the airplane is unloaded. Gravity is not affecting the rolls and no down elevator or rudder corrections are needed to keep things axial. How axial the vertical rolls are is strictly a function of the airplane and its settings, including aileron differential.

Differential is programmable in computer radios, and for Kip's current pattern ship he has determined by test that one *percent* aileron differential is optimum. Two percent is seen by flight tests to be too much, and zero is too little! But that airplane is close to symmetrical.

Some full-scale aerobatic pilots are beginning to play with aileron differential, by the way. (They always catch up with us modelers sooner or later.) Most sport RC modelers use aileron differential, "because it's the thing to do." How much differential is needed, if any, usually isn't known. "Just put in some." I suspect we have often used much too much.

It's clear that we have an inadequate understanding of a very complex set of interrelated parameters. Unfortunately I have raised more questions here than I have provided answers for. But except for high-level competition fliers in pattern, thermal soaring and perhaps pylon racing, aileron differential really doesn't make much difference, other than to satisfy our intellectual curiosity.

I've now taken the mechanical aileron differential out of my zero-dihedral, symmetrical-section sport aerobatic airplanes, and I can't tell the difference in their flying. Until I get a computer radio (which is unlikely) and become an expert pattern flier (even less likely), I'm going to forget differential. I would be delighted to publish any other opinions (or better yet, facts) on the subject.

PARTING WORDS

In *RCM&E*, an English model magazine, I learned that it only rained twice there one week; once for three days and the other for four.

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