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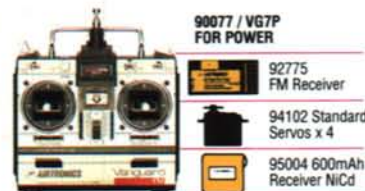
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ON THE COVER

Ana Gamboa adds to the natural beauty of the grounds of the Hotel Irazu, in Costa Rica, where Eloy Marez attended the Tropical Fun-Fly. The Antic belongs to John Marino, a Californian now living in Costa Rica. See story on page 66. Inset: This may be the world's smallest engine-powered flying scale model! 1/72-scale Piper Vagabond was constructed in Czechoslovakia by Frantisek Barta (airframe) and Stefan Gasparin (CO₂ powerplant). Photo by Michal Gasparin.

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WORKBENCH BY PHIL BERNHARDT

WELCOME BACK, MIKE

Model Builder takes great pleasure in welcoming back noted engine expert Mike Billinton, of England, who will once again be taking the helm of "Inside Engines," the MB engine review column that has lain dormant the last couple of years. Mike originally wrote the column for us beginning in November 1985 and continuing infrequently through 1987. As can be seen in his review of the big Super Tigre G4500 that appears in this issue, Mike brings with him an excellent knowledge of the subject, along with the ability to produce some fabulous photographs. "Inside Engines" will cover some of the more interesting model engines currently in production and will appear in these pages on an every-other-month basis.

MAYNARD'S AT IT AGAIN

Well-known and highly respected RC'er Maynard Hill, who seems to thrive on a steady diet of world record RC model performances, recently established his 19th—especially noteworthy because it's the first officially recognized flight to exceed 24 hours. The photo seen here and the following write-up were received just before going to press:

"At 12:06 p.m. on June 3, 1992, at the Pegasus RC Club field near Hagerstown, Maryland, an RC model aircraft, designed by Maynard Hill and developed by a team that included Paul Howey, Tien-Seng Chiu and M. Scott Hill, was launched on a flight that lasted 24 hours, 4 minutes and 15 seconds. The model was certified to meet all the regulations of the Federation Aeronautique Internationale, and the data has been submitted for homologation as a new world record for FAI category F3A-20, Duration.

"The current official record which has now been surpassed is 22 hours, 19 minutes and 15 seconds, set in 1987 by Gian Maria Aghem of Molinella, Italy.

"The Hill team's airplane weighed slightly under 11 pounds at takeoff, including its fuel. It was powered by a 10cc four-stroke engine modified to burn gasoline. The engine was extremely efficient. It was intentionally stopped after 24 hours. After the landing, the fuel tank was found to be still nearly half full.

"The FAI rules permit a team effort in developing the model, but there is a rule that prohibits assistant pilots during the record flight. Maynard controlled the model through the entire flight, a physical stress that was somewhat eased by an electronic device that kept the model near a ground-



It's finally been done: 24 hours plus! And of course, it was perennial record-setter Maynard Hill who did it. Pictured here is Maynard (second from right) and his team of modelers who helped develop the model and its control and telemetry systems. From left: Paul Howey, Tien-Seng Chiu and M. Scott Hill. Model spans 8-1/2 feet and is powered by a four-stroke .60 converted to spark ignition and running on gasoline. More in text.

based RF beacon. A small telemetry transmitter aboard the aircraft reported useful information such as engine rpm, altitude, rudder position, and battery voltage."

HIROBO CUP

Altech Marketing and Hirobo Ltd., producer of state-of-the-art RC helicopters, are teaming up to sponsor the first annual Hirobo Cup RC helicopter contest, scheduled for October 3-4 at Dorbrook Farms Park in Colts Neck, New Jersey. Saturday is being set aside for fun-fly events and a clinic where novices can get expert advice from factory fliers on setting up their machines. Hovering techniques for beginners will be covered as well. Sunday will be a three-round FAI contest featuring some of the world's best pilots, with awards and trophies for the top three. The highest-placing flier using a Hirobo helicopter will receive a free one-week trip to Japan, where he or she will be the guest of Hirobo Ltd. and will have the opportunity to fly against the best Japanese pilots in the Hirobo Cup—Japan competition.

For more information on the Hirobo Cup, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391, or call (908) 248-8738. **MB**

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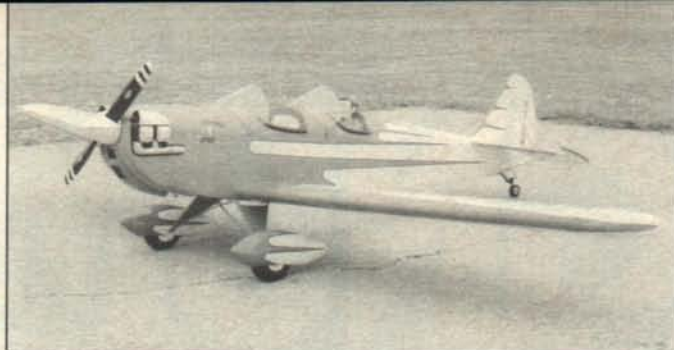


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TWO-PLACE SPACEWALKER

Sig's new 1/4-scale Spacewalker II is just the ticket for those who are taken with the Spacewalker design but for whom Sig's larger 1/3-scale version is just plain too big. With a span of 84 inches, the Spacewalker II is a more manageable size but still qualifies for IMAA and QSAA fly-ins. Power requirements are a .90-1.20 two-stroke or 1.20-1.60 four-stroke.

The airplane is of built-up wood construction with a molded plastic cowl, wheel pants and wingtips. The kit is supplied with all hardware, and also includes scale three-views, decals and patterns for two different scale paint schemes. Suggested retail is \$209.95. Sig supplied us with a sample Spacewalker II kit, which is presently in the final stages of construction and will be the subject of an upcoming review article here in MB. Watch for it!

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

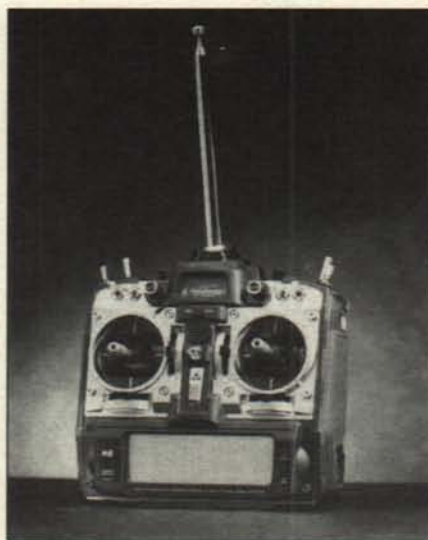
SUPER HELI RADIO

Modern radio systems are becoming so advanced and innovative that it's getting difficult to keep track of the features of each. Take JR's latest, the PCM-10S Heli radio, for example. This is one impressive-looking piece of equipment, a 10-channel system with so many features that we can't possibly list them all here. Just a few examples:

- Able to transmit in PPM, 512 PCM and 1024 PCM.
- A memory for storing the setup data for 10 different models.
- All 10 channels can be mixed in any combination.

- RF failsafe can be selected individually for channels 1-8.
- A multi-function display that shows nine codes per screen for easier and more efficient code selection, and, upon power-up, also indicates which switches (if any) are out of position.

The list goes on and on, but we'll wrap up by saying that the new JR



- PCM-10S will undoubtedly find favor with many of the top heli pilots, what with the extreme versatility it offers.

JR radios are distributed in the U.S. by Hobby Dynamics, a division of Horizon Hobby Distributors, 1405 Fieldstone Rd., Champaign, IL 61821.

HOW-IT'S-DONE VIDEO

- "Applying UltraCote" is the title of a new 26-minute video from Carl Goldberg Models, explaining the entire UltraCote covering process in step-by-step detail. Topics covered include setting the iron's temperature, covering wingtips,

- sealing edges, applying trim without bubbles, patching and repairing, etc. It's important to note that this particular video deals strictly with standard UltraCote; a separate video, due soon, will discuss the peculiarities of working with the sticky-back UltraCote Plus.

From Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651.

VACUUM BAGGING EXPLAINED

Everything you could possibly want to know about the mysterious and sometimes intimidating art of vacuum bagging composite wings and tail surfaces is explained in detail in a new video released by Aerospace Composite Products, a leader in the field. Topics include safety precautions needed when working with epoxies and other materials; an overview of the equipment required; preparation of the Mylars, cloths, and mixing the epoxy; the actual bagging process



- itself; sanding and painting; and how to make repairs. The video sells for \$25.00 and includes an illustrated booklet that reviews and in some cases expands on what is presented in the tape.

To order the video or to get answers to any questions on

vacuum bagging or composite materials, contact Aerospace Composite Products, P.O. Box 16621, Irvine, CA 92714; (714) 250-1107.



HOT NEW MOTORS FOR ELECTRICS

Hobby Lobby's just-released Catalog #20, covering 100+ pages, is full of all kinds of fascinating



new items, many of which are unavailable anywhere else in the U.S. Best of all, the catalog is a freebie; just write them at 5614 Franklin Pike Circle, Brentwood, TN 37027, or call (615) 373-1444 and ask for it.

Hobby Lobby is big on high-performance electric power, and in Catalog #19 they were closing out their stock of Marx GT300 motors to make way for an updated version. The new GT300s are now in stock, in five different winds for operating at 9 to 36 volts, all priced at under \$160. The motors retain their neodym magnets, double brushes and internal cooling fan, and are now supplied with a stator ring, strengthened brushes and a smaller 5mm shaft. Also, the long shaft that used to stick out the back is now gone. Thrust and watts output data are listed in the revised Motor Output Chart included in Catalog #20.

HALF-A PORTERFIELD

Al Lidberg, well known among free fliers for his extensive line of rubber scale and sport model plans, has come out with his first



RC model plan—a 1940 Porterfield Collegiate. At 1-1/4"=1' scale (300 square inches) and equipped with a lightweight two-channel system and a Cox Texaco .049, the model is ideal for the rapidly growing 1/2A Texaco Scale event, or just sport flying at the local schoolyard.

The Porterfield spans 43.4 inches and is very much to scale in outline. Deviations include an enlarged stabilizer, a little extra dihedral and a Clark Y airfoil. What you get for your \$8.40 (\$7.00 plus \$1.40 S&H) is a very professionally done 30x42-inch plan with all parts and patterns shown, a decal with the NC number and Porterfield emblem for the tail, a detailed three-view, and complete instructions.

A 12-page illustrated catalog listing all of Lidberg's plans can be had by sending \$1.50 to A.A. Lidberg Model Plan Service, 614 E. Fordham, Tempe, AZ 85283.

ROYAL HELI ENGINES

The Royal .28 and .46, both of which have been mentioned here in the past several months, are now



offered in helicopter versions, the only difference being the heat sink cylinder head. All other features—the ABC construction, Schnuerle porting, twin ball bearing

crankshaft—remain the same as before. From Royal Products Corp., 790 W. Tennessee Ave., Denver, CO 80223-2835.



PRECISION AEROBATIC ARF FROM EZ

The Mystic 30 is the latest in the line of ARFs offered by EZ Sports Aviation, distributed exclusively by Global Hobby Distributors. It's a 52-inch span, 30-size pattern-type model designed by renowned flier Hanno Prettnner, and, like the other EZ ARFs, requires only minor assembly before it's ready to go.

Engine requirements call for a .25-.35 two-stroke, either stock or with tuned pipe, or a .40-.48 four-stroke. The Mystic 30 carries a suggested retail of \$215; optional retracts are also offered, priced at \$31.50.

From Global Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728-8610; (714) 963-0133.

NEW FROM HITEC

Hitec's Focus 6 "Pro" is an AMA 1991-listed FM RC system that features a six-channel SMT transmitter with a high-gain "rubber duck" antenna, servo reverse on all channels, ATV end-points on the three main flight channels, end-point adjustment on throttle, retract switch, proportional flaps, four HS 422F servos, seven-channel RCD receiver, NiCds all around, charger and complete hardware, priced at \$289.95.

If that sounds like more radio than you really need, consider the new Focus 4, a four-channel AM system, also AMA 1991-listed. It's your basic, reliable RC system with

proof" dual conversion AM receiver, for a list price of \$169.95. From Hitec Radio Control USA, 9419 Abraham Way, Santee, CA 92071-2854; (619) 449-1112.



STICK & TISSUE, VOL. II

Bill Hannan favored us with a copy of the second in the series of his delightful publication, *Stick &*



Tissue International, a celebration of stick-and-tissue model aircraft, their origins, development and continuing importance in our hobby. Highlights of Volume II include a Peanut Pitts Special centerspread plan; an article entitled "Alphonse Penaud and his Planphores," with plans; scale drawings for a 1923 Czechoslovakian racer and the American Arup S-2 flying wing; construction plans for Joe Wagner's "Jolly R.O.G.E.R.," and lots more. The 8-1/2x11-inch book covers 26 pages and contains 55 photos, seven model plans, dozens of illustrations and two three-view drawings. Priced at \$9.95 plus \$2.75 S&H, from Hannan's Runway, Box 210, Magalia, CA 95954.

PERFORMANCE PROGRAM FOR ELECTRICS

The "Aero-Comp" computer software program from USR&D is aimed specifically at those who

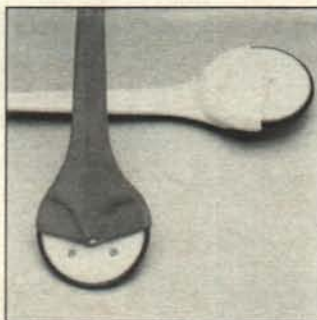


design and fly electric powered models. By plugging in the various numbers, the program will tell you what kind of performance you can expect to see from a given design; similarly, you can use the program to help optimize the performance of a proposed design still on the drafting board by experimenting with its physical characteristics. A complete set of on-line help screens explains how to make the measurements and how to use the program. An IBM or compatible computer is required.

We plan to have a more extensive article on the Aero-Comp program here in *MB* within the next couple of months. In the meantime, you can get more info from USR&D Corp., P.O. Box 561, Denville, NJ 07834-0561.

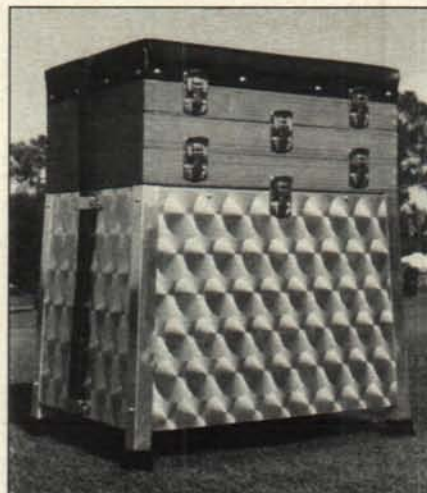
GEAR DOWN... PERMANENTLY

"Soxers," a lightweight, exceptionally streamlined fixed



landing gear setup, is KDI's answer to the cost, weight, time and work involved in installing retracts in high-performance models. The package includes

two 5/32-inch wire landing gear struts, two 2-1/4 inch Slim Line wheels, and a pair of unbreakable vinyl fairings in your choice of red, MonoKote white or MonoKote yellow. Priced at \$24.95 per set, from KDI, 10426 S.E. 206th Pl., Kent, WA 98031: (206) 854-8053 after 4:00 p.m. Pacific time.



CUSTOM FIELD BOX

Model Aviation Technology's German-made field box is of brushed aluminum and wood construction, and has a padded leather top to serve as a place to rest your fanny between flights. The box comes completely assembled and has four storage compartments to hold all your equipment. It's priced

at \$85.00 plus \$4.00 S&H; Florida residents add 6% sales tax. Model Aviation Technology, 12848 Touchstone Pl., Palm Beach Gardens, FL 33418.

BIG CUSTOM KITS

Lance Maresh is the man in



charge at Custom Cutters, a small Indiana outfit specializing in kits for large RC models, both scale and non-scale. He wrote to say that he has recently added Wendell Hostetler's big Cessna 150/152 to his kit line, which already includes two other Hostetler scale designs—the Diabolo and Cessna 206 Stationair—and two non-scale ships, the Variant pictured here and a twin called the Striker.

Custom Cutters kits typically feature built-up wing and fuselage construction, are supplied with rolled plans and all required materials, feature machine cut and sanded parts, and include formed aluminum landing gear. Complete information sheets on all of these models are available by sending an SASE to Custom Cutters, 4302N-750W, Ligonier, IN 46767.

continued on page 83

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7x4, 7x6	11x6, 11x7, 11x7.5, 11x9 ..	1.95

K SERIES



black glass-filled nylon	14x6, 14x8	\$4.95
12x6, 12x8	15x8, 15x10	5.95
13x6, 13x8	16x6, 16x8	6.65

CLASSIC SERIES



NEW black glass-filled nylon	18x6, 18x8, 18x10	\$12.95
16x6, 16x8, 16x10	20x6, 20x8, 20x10	14.95

WOOD SERIES



beechwood or maple	14x6, 14x8, 14x10	\$ 5.25
9x4, 9x5, 9x6, 9x8	16x6, 16x8, 16x10	8.95
10x5, 10x6, 10x7, 10x8	18x6, 18x8, 18x10	13.95
11x6, 11x7, 11x8, 11x10	20x6, 20x8, 20x10	15.95
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□ May '91: Fun Zone construction; "Ninja" and Concept 30SX helicopter reviews; Cape Cod Soaring.

□ June '91: Osprey construction; JR Max 4 radio and Ultra Sport 40 reviews; Coral Springs Jet Rally.

□ July '91: Ryan STA and Medusa construction; Kalt Whisper helicopter, RCD Apollo servo reviews; Nuremberg show report, pt. 1.

□ August '91: Martian Spaceship construction, part 1; Spirit, Genesis, Whisper reviews; Nuremberg show, pt. 2..

□ September '91: Martian Spaceship part 2, and Whirlwing construction; MH-10 mini helicopter and High Sierra reviews; Top Gun report.

□ October '91: ALCO Sportplane construction; RC flight simulator review; F3C team trials.

□ November '91: Shrike YA-8 construction; Ace AT-2000 battery charger, P40E Warhawk, Flyboy, Junior 50 II helicopter reviews; salute to Desert Storm.

□ December '91: Heath Midwing construction; Digipace review; F-4 Phantom Slope Soaring.

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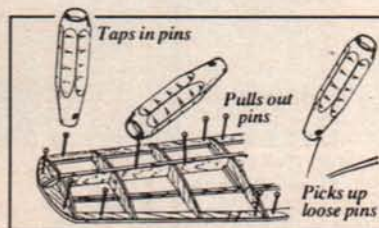
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FREE FLIGHT

BY BOB STALICK

MAGIC MOMENTS

IF YOU HAVE TO
LOSE A MODEL,
HOPEFULLY IT'S
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Do you recall some of those magic free flight moments that come back to haunt your memory during the evenings, during the night, or in flashbacks during those lulls in the day's routine? I had one of those just last weekend at the Hawk's Spring Opener at Harts Lake Prairie, Washington.

Let me set the scene for you: It was a beautiful, sunny day in the high 70s. To the east was the stunning vista of Mt. Ranier. High, white and puffy cumulus clouds were moving slowly to the south as free fliers bustled about, getting in their flights. As it was late afternoon, I had finished all of my official flights and had put away my contest models, when a number of fellow fliers wandered by to chat. After some friendly banter and

encouragement from the peanut gallery, I decided to put in one last flight before the end of the day. I took out my little .010 powered P-Wee-B. I had flown the ship several times during the day, and after a couple of trim flights, it was really performing well.

I rubber banded the wing in place, mounted the stabilizer, fitted a D.T. fuse and filled the little eyedropper tank with 35% Sig fuel. Jack Shafer volunteered to time the flight, and I fired the engine to life. After lighting the fuse and letting the engine suck the fuel to the bottom of the eyedropper tank, I launched into a very strong patch of lift and watched in awe as the tiny ship rocketed skyward in a straight vertical climb. Jack noted that the engine run was

10.4 seconds. The gathered crowd whooped and hollered at the speed and pattern of the climb. It was as picture perfect as I have seen in years; a memory beyond forgetting!

After about three minutes, the ship was merely a speck in the sky, circling nicely to the left and climbing in the thermal, literally jumping higher and higher as the drift carried it south to the edge of the dense forest. After six or seven minutes, the ship peeped in and out of view and disappeared up and away.

Although I would dearly love to get the little model back for future flights, and I hated to lose the early model Tee Dee .010, I still think it is better to lose a model in this fashion than any other way. The memory of the flight is indelibly etched in my



Above: Simon Blake of Manitoba, Canada sent this photo taken at the Western FF Championships held in Calgary, Alberta. Here's Simon with his Eureka Nostalgia model. Left: Simon Blake with his Happy Days FAI model from the 1955 *Zaic Yearbook*. Model is flown in Nostalgia Gas with a Fox .15. Simon recommends this design as a winner!

memory and, I daresay, in the memories of those who were there to witness it. Perhaps a poet might be able to write inspirational verse about the flight, but for me, no words will replace the sight of that model in my own memory. It was one of those magic moments and will live with me forever.

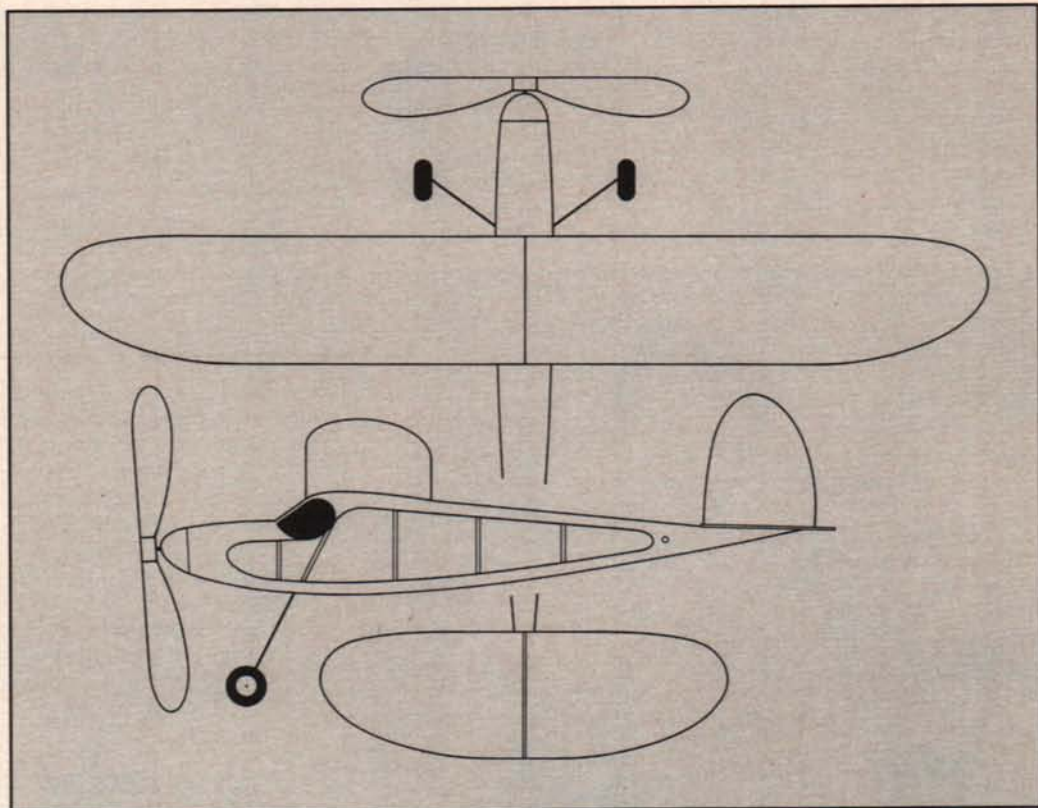
THE CASE FOR .010 POWER

Someone at the Spring Opener noted that carrying the P-Wee-B back from the chase was simply a matter of picking it up and stuffing it in my pocket. One of the appealing aspects of these little ships is that they can be built in a couple of evenings and take very little in the way of balsa and tissue. They are simple and cheap. Except for the Cox .010, the cost of the model is literally a matter of a few dollars.

As I trimmed out the model, it was apparent that the performance was excellent. A 10-second engine run will put it high enough that a two-minute max under ordinary weather conditions is not difficult. The drawback comes when flying in windy conditions; the model is so small that it could easily drift out of sight in much less than two minutes. I did keep mine in sight during the flyaway for well over five minutes, even though it was moving up and away at a rapid clip.

I recently received a nice letter from Thomas Ogden, who shared his experiences with .010 power. In Thom's case, he flew a model called the Hot Canary. Thom noted that his model required very little trim and was easy to build and fly. The Hot Canary was also competitive with other much larger models. The rules that Thom suggests are engine restriction to .010 and 10-second engine runs.

My thoughts about the event are that it could be run similarly to the Pee Wee 30 rules. Engine run could be 10 seconds, controlled by an eyedropper tank with a penalty for overruns but no negating of the flight.



MYSTERY MODEL

The Cox .010 engine is easy to start and adjust, more so than the Cox Pee Wee .020. In fact, I think an .010 event is an improvement on the Pee Wee 30 event.

So, here is a starting point for your consideration for a Cox .010 event:

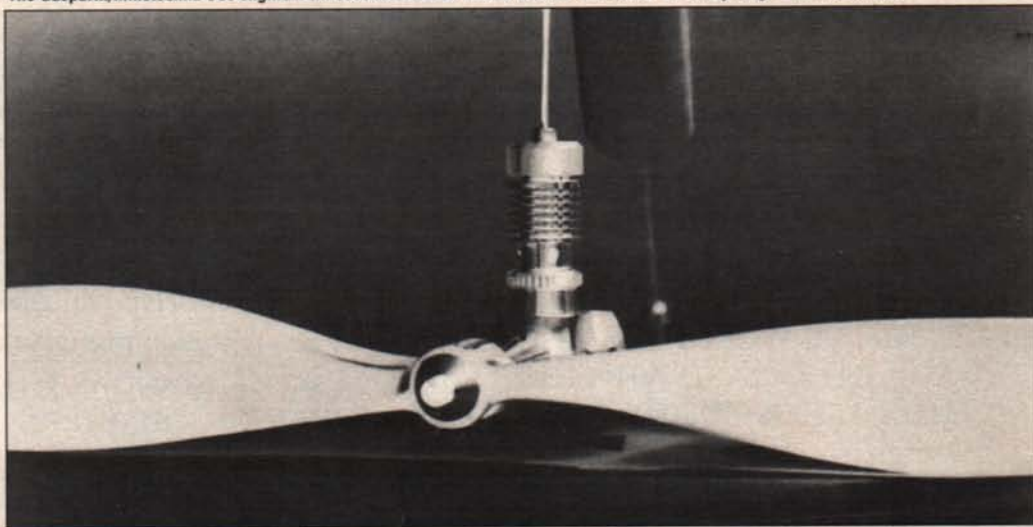
1. Model size not to exceed 25 inches in any dimension.
2. No weight restrictions.
3. Ten-second engine run with eyedropper-type tank required. Overruns would be penalized 1 second of flight time for each 1/10 second of engine run beyond 10 seconds.

4. Two-minute max, with three required for flyoffs.

5. Flyoffs would be by increasing the max by one minute for each flyoff flight. Overruns end the flyoffs.

If you belong to a club that tries this event, write about your experiences. Perhaps the rules

The Gasparin/Mikrotechna CO₂ engine from Czechoslovakia. This is the GM-120 motor. Photo by Jorg Hammerschmidt.



FREE FLIGHT

need some refinement. If so, let me know, and I will update them for the readers in a future issue. If you design your own .010 models or build one from a kit or plans, take a picture and send it to me at 5066 NW Picadilly Circle, Albany, OR 97321.

OCTOBER MYSTERY MODEL

I had to really go back into the archives for this design. In fact, it came from an early post-war model magazine. The ship is a rubber-powered sport flier with a sheet balsa wing and tail



Nice scale free flight rubber scale P-51 built from the old *Model Builder* scale plans book. It's a Clarence Mather design. Builder is Doug Lepak.

Approx Weight (grams) of 36" balsa sheets									
Thick	1/32	1/16	3/32	1/8	3/16	1/4			
Width	2	3	2	3	2	3	2	3	2
Density									
4	2	4	5	7	7	11	9	14	14
5	3	4	6	9	9	13	12	18	18
6	4	5	7	11	11	16	14	21	21
7	4	6	8	12	12	19	17	25	25
8	5	7	9	14	14	21	19	28	28
9	5	8	11	16	16	24	21	32	32
10	6	9	12	18	18	27	24	35	35
11	6	10	13	19	19	29	26	39	39
12	7	11	14	21	21	32	28	43	43

BALSA WEIGHT CHART

surfaces. You may have built one as a kid, if you are about my age. If not, you may recall seeing one of these in your dad's stockpile of models. Even if you didn't, you still have the chance to guess the name of the design and send it to *Model Builder*. The names of everyone with the right answer will go into the proverbial hat, from which one will be drawn at random. If it's yours, you will win a free one-year subscription to *Model Builder*. How can you beat a deal like that?

JULY MYSTERY MODEL WINNER

All 11 of those responding to the July Mystery Model correctly identified Dick Lyons' "Strutter 7C" FAI Power ship, which he flew to 19th place (best of the U.S. F1C team) at the 1975 World Champs in Bulgaria. Of those 11 entries, Norm Reames, of Middleburg, Ohio, was chosen to receive a complimentary one-year *Model Builder* subscription.

The Strutter sported a num-

ber of unusual features, including an underslung fin and a wing support cabane made of bent sheet aluminum, which formed a "V" when viewed from the front. The 63-inch wing had a flat center section with polyhedral tips, and was made using a polyurethane foam core with balsa leading and trailing edge and top and bottom spruce spars, all covered with silkspan and then a layer of tissue over that. Power was a Rossi .15.

Today Dick is active in the Southern California Ignition Fliers O.T. FF club. In fact, he authored the article on the .020 Replica "Kerswap" Old Timer presented as a construction project in the July '92 *MB*. It's pretty clear that Dick hasn't lost his penchant for high performance, as his little Kerswap has proven to be practically unbeatable in .020 Replica events!

BUYING BALSA ON THE ROAD

By Walt Rozelle

This article was printed in the Skyscrapers newsletter,

WORLD CHAMPION!

CONGRATULATIONS TO
JOE WURTS AND
DARYL PERKINS

ON THEIR 1ST AND 2ND PLACE SWEEP
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AT THE 1991 AMA NATIONALS

- 1st in 2-METER, FLYING A FALCON 600
- 1st in STANDARD, FLYING A FALCON 800
- 1st in UNLIMITED, FLYING A FALCON 880

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HLA107	Senior Telemaster	135.00
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HLA111	Telemaster 40	79.50
HLA128	DH82A Tiger Moth	209.00
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JA4440	Ford Flivver	137.00
GR4628	Graupner Chinook	99.00

RC airplanes, partly built, ARF

HLA105	Telemaster 70 ARF	174.00
HLA302	MFA Yamamoto (Cessna)	139.00

RC Sailplanes

HLA120	Topaz II RC	114.00
HLA303	High Sierra	132.00

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GR4207	Elektro-UHU (1.9M)	97.00
GR4272	Cherry II ARF	245.00
GR4264	ASW 22B 270	279.00
GR4270	Elektro-Junior ARF	192.00
HLAN1328	Sunfly	368.00
HLA131	Graduate	59.00
HLA130	Freshman	39.00

RC electric powered airplanes

GR4684	Partenavia P. 68 Twin	133.00
GR4678	Fokker E.III	123.00
GR4681	Zoff	109.00

Motors, drive systems for Electric airplanes

GR297	Motor/prop drive for UHU	33.00
GR1162	Motor/prop SPEED 600 8.4V	34.00
GR1165	Motor/prop SPEED 700 Turbo	48.70
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Motors only, for electric airplanes

GR1789	SPEED 500 Race, 7.2V	15.40
GR1793	SPEED 600, 7.2V	15.80
GR1794	SPEED 400, 7.2V	10.00
GR3307	SPEED 700 BB TURBO 9.6V	39.90
GR3308	SPEED 700 TURBO 9.6V	24.70

Prop adapters for electric motors

GR1171	5.0mm	9.80
GR1269	1/8"	7.10

Graupner Solimar Folding props for electric

GPE06060	6-6, for shaft 3.2	13.20
GPE07030	7-3, for shaft 3.2	13.20
GPE08045	8-4 1/2, for shaft 3.2	17.00
GPE08046	8-4 1/2, for shaft 5MM	19.40
GPE08060	8-6, for shaft 3.2	17.80

GPE08061	8-6, for shaft 5MM	19.40
GPE09050	9-5, for shaft 5MM	19.80
GPE09070	9-7, for shaft 5MM	19.80
GPE10060	10-6, for shaft 5MM	20.10
GPE11070	11-7, for shaft 5MM	22.70
GPE12560	12 1/2-6, for shaft 5MM	23.90

Motor controls for electric airplanes

MT64060	Automatic motor control	18.70
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HT1003	On-off, brake, BEC, 6-9.6V	29.50
STW025	Soft switch 25A (7.2-14.4) BEC	69.90

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HLH210	Pushrod Transfer Linkage, 2	2.49

Hatch latches

HLRE001	Best Hatch Latch	3.90
GR8066	Brass-Steel Hatch Latch	3.55
HLML8506	Neodym Magnet Lock	8.30

Adhesives

HLIMP001	"P.F.M." Adhesive-sealant	9.95
GR9601	Stabilit Express, 1 oz.	9.00
GR9602	Stabilit Express, 3 oz.	17.50

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HLWAN080	1:4 Scale Cockpit Inst.	13.95
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MT12056	3 Gear retracts	28.40

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MER30D	30 RC Diesel	99.00
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MER61RC	61 RC Engine	116.00

Graupner 2-blade Super Nylon Props

GP10060	10-6	4.70
GP11070	11-7	5.20
GP11075	11-7 1/2	5.20
GP11080	11-8	5.20
GP11100	11-10	5.20
GP11110	11-11	5.20
GP12011	12-11	5.50
GP12060	12-6	5.50
GP12070	12-7	5.50
GP13580	13 1/2-8	8.50
GP14011	14-11	10.60
GP14070	14-7	10.60
GP15080	15-8	11.40
GP16080	16-8	12.90
GP16512	16 1/2-12	15.50
GP18010	18-10	18.80

Graupner 3-Blade Super Nylon Props

GP308060	8-6	6.40
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GP310070	10-7	9.10
GP310083	10-8 1/3	9.10
GP311070	11-7	13.10
GP312080	12-8	14.90
GP312570	12 1/2-7	15.70
GP314070	14-7	17.70
GP315080	15-8	22.90
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FREE FLIGHT

Flyoff, edited by Bob Hatschek. Somewhere else in this column is a chart of approximate balsa weights that can be photocopied and kept in your billfold for easy reference.

"Some of the best balsa I have ever come across was purchased from hobby shops I scouted while out on business trips.

"Although some people have the magic touch and can accurately estimate the weight of a piece of wood merely by picking it up, that talent escapes me. So I make sure that I pack my pocket-sized postal scale and my billfold-sized wood density chart. You will find the scale at almost any office supply or stationery store for about \$5. (Hannan's Runway, P.O. Box 210, Magalia, CA 95954, sells one complete with vinyl pouch for \$5.95. It's called the Pelouze Scale).

"For the price of a dinner, sweet Dolores sewed me a nice little bag for the scale—and it even has a reinforced flap where I can store a few straight pins, which I surreptitiously stick into the wood as a gripping point for the scale's alligator clip.

"Here are a couple of hints for out-of-town wood shopping:

"1. Always call ahead. Make it clear that you want to select some wood. Some hobby dealers don't comprehend your preoccupation with weight and might resent your desire to go behind the counter.

"2. Be patient. You may find some surprises if you look where the good wood doesn't belong. The finest sheets of 1/16x4x48 balsa I ever bought (for rolled Mulvihill fuselages) were in a Midwest "RC wood" bin at a shop in Greensboro, North Carolina. The most beautiful piece of balsa I ever found was in a shop in Mobile, Alabama. It was a sheet of Sig 3/32x3 with perfect 'A' grain and it weighed an incredible 4.1 lb./cu ft. And it was stamped '8-12 lb. RC wood.' I sent that one where it belonged—to a top indoor flier.

"And sometimes you just want to sit down on the floor and cry! I recently spied some strange looking 1/4x1, very light in color and straight of grain. I bought eight pieces and took them home for accurate weighing. Each piece was under 5 lb. density! Experiences like that make me want to shoot the idiot running the saw that desecrated such magnificent lumber.

"3. Postal scale weights are guesstimates. And the chart weights are only approximate. But in an exercise like this you don't really care! If you find a nice piece of 'C' stock that weighs between 4 and 7 lb./cu. ft., you're going to buy it anyway, right?

"When not traveling, I keep the scale and chart in my car, so it is always handy when I dart into a hobby shop. I try always to take a turn around the wood bin when doing so.

"Another note: I have noticed displays of



Rare shot of our columnist without his ever-present hat. Similarity of his .010-powered P-Wee-B to the Starduster is evident here. Sal Taibi was involved in the design's origins.

balsa showing up in a number of unsuspected places lately, like hardware stores and art supply houses. I even found some prime 3/16 trailing edge stock in one of the latter!"

ANOTHER TIP FROM TERRY T.

Terry Thorkildsen always seems to have some idea that improves the way a free flight model can be built or flown. This one comes from a recent issue of the San Valeers newsletter, *The Satellite*.

When you are at the flying field and need more wash-out or wash-in, one way to get it is to cock the wing with respect to the pylon. It is always nice to build in the correct amount of wash-in or wash-out, but this fix can work. If you don't think so, just slowly rotate your wing while you are looking at it straight on, and you will become a believer. To add wash-in effect, move that side of the wingtip closer to the front of the model. To add wash-out effect, move the tip toward the back of the model.

It's really difficult to imagine that I am writing the October column here during the middle of June. In the Northwest, it is the best part of the contest season, and the free flight activity is abundant. If it is abundant in your area, please send some pix of your activities. Close-ups of the model and the modeler are always welcome. Keep the background clutter to a minimum. Put the captions on a separate sheet of paper. Never, never write directly on the picture front or back!

Keep smiling and keep thermaling until we meet again next month. **MB**

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EVERYONE MUST READ AND SIGN

Please read and sign this declaration. Applicants without signatures will be returned.

I hereby agree to comply with the current AMA Safety Code for all model aircraft operations and the NAR Safety-Code for all model rocket operations. I also understand and agree that I will abide by and comply with all changes and modifications that may be made to the safety codes during my membership period. I understand that my failure to comply with the applicable Code will result in failure of liability coverage for any damages or claim so caused. I further understand that written notice must be provided within sixty (60) days of the occurrence of any incident of bodily injury and/or property damage.

I am aware that modeling may present hazards, and I exempt and relieve The Academy of Model Aeronautics, Inc. from all liability for personal injury, property damage or wrongful death caused by negligence.

Signature of applicant _____

Parent or guardian of applicant under age 18 must also sign this form _____

Membership Information

Insurance coverage is effective on the date of receipt at AMA Headquarters of a properly completed application and correct dues payment. Membership ends each year on December 31, regardless of the date a membership application is received. If a subscription is included with the membership, it begins with the first issue available for the year after a correct current application and payment are received; it expires with the issue printed in December (which is dated February of the following year). Membership rates and insurance limits are those in effect at the time of printing. Actual cost of dues and amount of insurance coverage is subject to change. Any such changes will be noted at the time of membership processing so that they may be accepted or not.

OFFICIAL AMA SAFETY CODE - January 1, 1992

Model flying MUST be in accordance with this Code in order for AMA Liability Protection to apply.

GENERAL

- 1) I will not fly my model aircraft in competition or in the presence of spectators until it has been proven to be airworthy by having been previously, successfully flight tested.
- 2) I will not fly my model higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full-scale aircraft.
- 3) Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.
- 4) If my model weighs over 20 pounds, I will only fly it in accordance with paragraph 5 of this section of the AMA Safety Code.
- 5) At air shows or model flying demonstrations, a single straight line must be established, one side of which is for flying, with the other side for spectators. Only those persons essential to the flight operations are to be permitted on the flying side of the line; all others must be on the spectator side. Flying over the spectator side of the line is prohibited, unless beyond the control of the pilot(s). The only exceptions which may be permitted to the single straight line requirement, under special circumstances involving consideration of site conditions and model size, weight, speed and power, must be jointly approved by the AMA President and the Executive Director. In any case, the maximum permissible takeoff weight of models is 55 pounds.
- 6) I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. Note: this does not apply to models flown indoors.
- 7) I will not operate models with metal-bladed propellers or with gaseous boosts, in which gases other than air enter their internal combustion engine(s); nor will I operate models with extremely hazardous fuels such as those containing tetranitromethane or hydrazine.
- 8) I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind) including, but not limited to, rockets, explosive bombs dropped from models, smoke bombs, all explosive gases (such as hydrogen-filled balloons), ground mounted devices launching a projectile. The only exceptions permitted are rockets flown in accordance with the Safety Code of the National Association of Rocketry or those permanently attached (as per JATO use); also those items authorized for Air Show Team use as defined by AST Advisory Committee (document available from AMA HQ). In any case, models using rocket motors as a primary means of propulsion are limited to a maximum weight of 3.3 pounds and a G series motor. Note: A model aircraft is defined as an aircraft with or without engine, not able to carry a human being.
- 9) I will not fly any model using turbojet power (axial or centrifugal flow) unless I have obtained a special waiver for such specific flights from the AMA President and Executive Director and I will abide by any restrictions imposed on such flights by them. (Note: this does not apply to ducted fan models using piston engines or electric motors.)

RADIO CONTROL

- 1) I will have completed a successful radio equipment ground range check before the first flight of a new or repaired model.
- 2) I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.
- 3) I will perform my initial turn after takeoff away from the pit or spectator areas, and I will not thereafter fly over pit or spectator areas, unless beyond my control.
- 4) I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission. (Only properly licensed Amateurs are authorized to operate equipment on Amateur Band frequencies.) Further, any transmitters that I use at a sanctioned event must have a certified R/C-AMA gold sticker affixed indicating that it was manufactured or modified for operation at 20 kHz frequency separation (except 27 MHz and 53 MHz).

FREE FLIGHT

- 1) I will not launch my model aircraft unless at least 100 feet downwind of spectators and automobile parking.
- 2) I will not fly my model unless the launch area is clear of all persons except my mechanic and officials.
- 3) I will employ the use of an adequate device in flight to extinguish any fuses on the model after it has completed its function.

CONTROL LINE

- 1) I will subject my complete control system (including safety thong, where applicable) to an inspection and pull test prior to flying.
- 2) I will assure that my flying area is safely clear of all utility wires or poles.
- 3) I will assure that my flying area is safely clear of all non-essential participants and spectators before permitting my engine to be started.



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HANNAN'S HANGAR

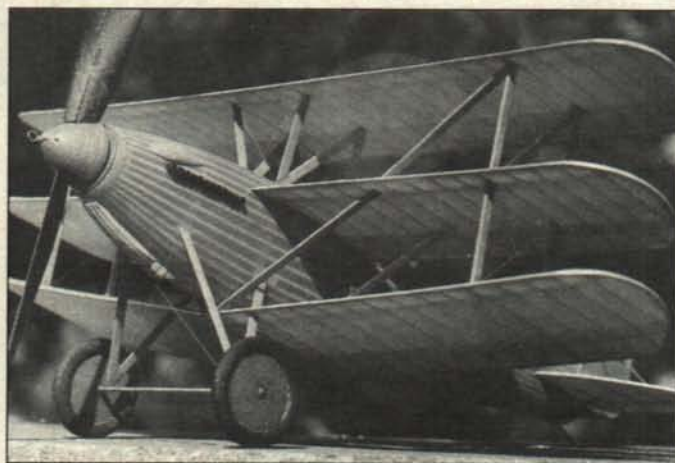
BY BILL HANNAN

"Journalism is the rough draft of history."

Our lead-in line, spoken recently by television's Tom Brokaw, may serve as a suitable preface to our opening topic...

GEE BEE BOO-BOOS

Our July column suffered from several embarrassing errors, which in the interests of historical accuracy need correcting: On page 24, the builder of the fine Gee Bee E reproduction in Connecticut is Jim Jenkins, not Jim Jones (although modeler Jim Jones does beautiful work, too). On page 26, the marvelous Gee Bee model being displayed by builder Vern Clements is, of course, an R-1, not an R-2 as the photo caption states. And our little "Gee Bee Myth Debunker" drawing on the same page contained a mis-

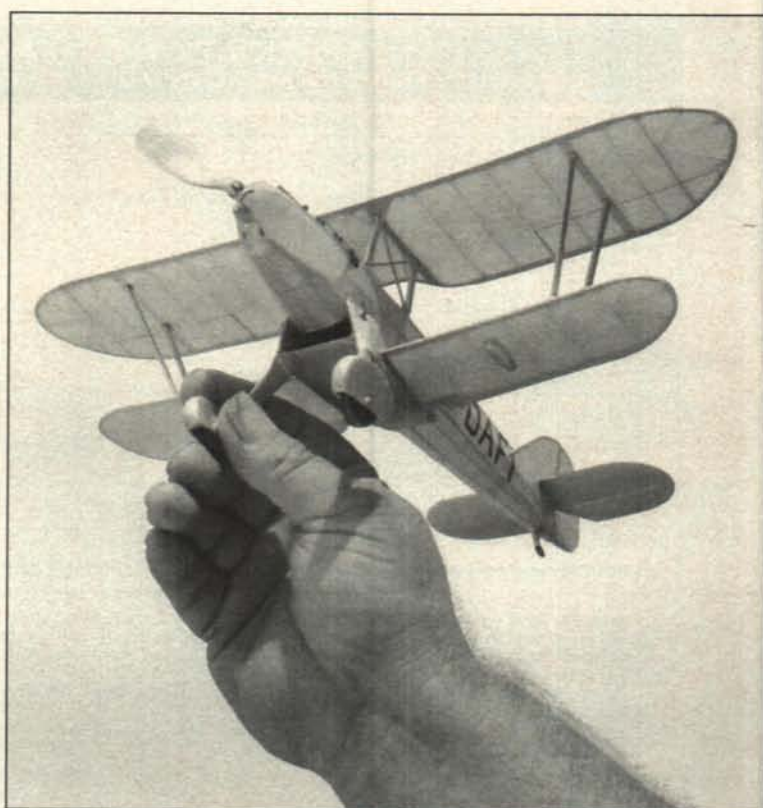


Peanuts can be complicated, too! This Curtiss Cactus Kitten triplane, by Lubomir Koutny, has 90 wing ribs, and is described by its builder as a "very problematic flier."

spelled word, which should have been Schoenfeldt! Apologies all around.

SPEAKING OF GEE BEES

Vern Clements has thoroughly revised and updated his Gee Bee R-2 scale drawings. Truly a labor of love, they represent countless man-hours bent over the drafting board (Vern figures he has spent about seven years researching and delineating Gee Bees). The R-2 drawings consist of two large sheets, one of which contains comprehensive documentation of the aircraft, the other is a detailed construction plan for a



Fine Fairey Fantome Peanut was based on Pres Bruning plans. Model and photo by Jake Larson, of Florida.

rubber-powered model.

For a complete catalog of these and other scale drawings, which also includes news tidbits about full-size reproductions and even an airshow schedule for the full-size Benjamin/Wolf Gee Bee, send \$3 to Vern Clements, 308 Palo Alto Dr., Caldwell, ID 83605.

REALLY BIG PAPER GLIDERS

In the July "Workbench" column the enormous paper glider project successfully completed by high school students under the direction of NASA retirees and modelers was mentioned. Thanks to Hewitt Phillips, we have additional details:

Two gliders of essentially similar design were fabricated from paper, but differing in the choice of adhesives. One, employing aliphatic resin glue, proved more rigid than the other, which relied upon spray contact cement. This floppier glider was designed with a 24-foot wingspan, and made several flights.

Next, the stronger machine, configured with a 28-foot wing, was flight tested. With wingtip "span enhancers" added, bringing the span to 30 feet, 6 inches, the longest flight was achieved. Tiny pieces of chalk imbedded in the nose indicated the exact touchdown point 114 feet from the launching platform, for a new world's record.

And yes, the wings did flex downward on the ground, but in flight the weight of each wing section was nearly balanced by air loads, so there was relatively little bending in flight. All tests were conducted indoors, although thoughts of outdoor experiments are tantalizing!

PISTACHIOS PROLIFERATE

"To fly very cheaply, one must make something very small." So said Henri Mignet, designer of the Flying Flea, during the 1930s. Well, how about something *really* small, say eight inches wingspan, such as Pistachio scale models? Accord-

ing to contest director Dr. John Martin, the MIAMA (Miami Indoor Model Association) Pistachio Inter-Gnats was especially rewarding this year, attracting 41 entries representing countries including England, Israel, Japan, Switzerland and several parts of the United States.

Variety was outstanding, as shown by this subject sampling: Sopwith and Fokker triplanes, Lockspeiser canard, Curtiss-modified Langley Tandem, Waco E, Piper Super Cub, Goldwing ultralight, Gossamer Condor, Hawker Fury, Renard R-17 and a BD-4. The highest duration was 59.3 seconds, turned in by a Messerschmitt M-20.

Are such tiny fliers really new? Not according to Robert Lonseth, of Sylvania, Ohio, who sent us two Avrium Zier plans published in 1932. One was for the original finless version of the Gee Bee R-1, and the other a DeHavilland Puss Moth. And their wingspans? Only six inches! So it can be seen that mini-models have a lengthy heritage. They are indeed inexpensive to build, easy to mail to distant locations for proxy contests, and require minimal storage space.

So what are the drawbacks? Try building one and you'll find out quickly enough. Handling miniscule parts is quite a challenge in itself, likely requiring drastic changes in your construction techniques. Flight

trimming may also be difficult, especially at first. However, the potential satisfaction is considerable, with even non-enthusiasts being amazed by such miniatures. After tackling a Pistachio, even a Peanut will seem huge, and therefore much easier to build. So why not build a Pistachio for next year's Inter-Gnats?

HOW SMALL IS SMALL?

Rubber-powered Pistachios are remarkable, but how about gas-powered variations? The "gas" in this instance is CO₂, an ideal fuel since it is clean, requires no fuel-proofing whatsoever, and does not generate heat. The powerplants have the technical fascination characteristic of internal combustion engines, yet they emit so little noise that they may be flown indoors without disturbing the tranquility.

It may be pertinent to point out that Bill Brown, of Brown Jr. fame, who did so much to popularize spark ignition engines in the 1930s, now concentrates on CO₂ engine production and is largely responsible for their widespread acceptance. His Czechoslovakian counterpart and friend, Stefan Gasparin, makes unusually small CO₂ types such as the jewel-like example shown on this month's cover mounted in a 4.8-inch span Piper Vagabond. Displacing a mere one



Not all projects are small! This full-size Gee Bee R-1 is being constructed for static display only in the Connecticut Bradley Air Museum. Henry Hatke photo.

cubic millimeter, the powerplant placed second in Joe Martin's Sherline Smallest Engine Shoot-Out in the recent expo conducted by the North American Model Engineering Society. According to Fritz Mueller, it was quite fairly edged out by a complex two-cylinder steamboat engine, complete with reversing gear, occupying a mere one cubic inch of space!

EAA BOOSTS SIMPLE MODELS

The June 1992 issue of the Experimental Aircraft Association's *Experimenter* magazine featured an extraordinary eight-page article entitled "Rubber Powered Models in Aviation's Past and Future." Authored by Bob Whittier, the article gives a searching and insightful look at the model aircraft hobby, with special emphasis on the low-cost aspects of recruiting more young aviation enthusiasts. Whittier mentions that now-famous aviators often gained their first experiences with inexpensive kit models.

Also stressed is the changing role played by magazines, which formerly cultivated newcomers but now cater pri-

marily to already established, technically oriented older readers. According to Whittier: "...there is a very real problem with all phases of aviation drifting farther and farther away from the world of young people." He feels that more emphasis on simpler models may provide a constructive solution, and suggests that EAA people are uniquely qualified to revive interest in rubber-powered models among today's youngsters, saying: "Above and beyond being a fascinating hobby, building model airplanes from balsa wood and tissue paper constitutes superb training in the effective use of both hands and the mind." And he adds: "It is possible to say with conviction that this hobby is also character building."

SPEAKING OF RUBBER POWER

John Blair shared Phil (Blue Ridge Models) Hartman's "Observation on Rubber Motors": "Winding long rubber motors divides modelers into two categories—the 'haves' and the 'have knots'..."

And, while we're at it, here's Phil Hartman's "Theory of Propulsion": "Any given pro-

Charmingly simple Peanut Scale Pottier P-100 was constructed from Walt Mooney plans by Dick Howard, of Arizona.



HANNAN'S HANGAR

peller is doing the best it can."

WHAT'S NEW?

Plenty! Kits, plans and publications continue to arrive. Here's a brief look at this month's harvest:

Sky Bunny: Some years ago, Bill Warner authored a series of beginner's articles for *Model Builder*, entitled, "Hey Kid, Ya Wanna Build a Model Airplane?"—which was eventually published in a series of three books. The Sky Bunny, one of the featured models, has just been produced in kit form by Peck-Polymers, and thanks to Vera Peck, we received one for examination.

Spanning nearly 18 inches, the Sky Bunny is an R.O.G. (Rise Off Ground) "stick model" ideally suited as a second construction project, following, say, a Delta Dart or a regular Peck R.O.G. Both of the latter models feature flat wings, while the

newsletter now emanates from The Netherlands. Truly international in scope, it features both English and German text. The sample issue we received contained contest schedules and results, reduced-size plans for a canard model from England, a living-room flier from Japan, a beginner's F1D model from The Netherlands, an ornithopter from the USA, a hand-launched glider from Czechoslovakia, and a Peanut Scale ultralight from Germany. Quite a lineup! Published three times a year, subscriptions to *Indoor News* cover six issues, airmailed to the United States for \$20. To subscribe, contact the editor: Thedo Andre, Meihorst 35-43, NL6537JD Nijmegen, The Netherlands.

Model Power 1949-1969: Compiled by Jeff McCamant, this is 124 pages of model engine advertisements and reviews which originally ap-

peared in model magazines from the U.S. and England. Included are spark ignition engines, glow plug types, diesels, CO₂, Jetex and more, giving an overall view of progress in model propulsion. Only 500 copies of this soft-cover book were published, and are available at \$11.50 each, postpaid, from Jeff McCamant, 413 W. South St., Marshalltown, IA 50158.

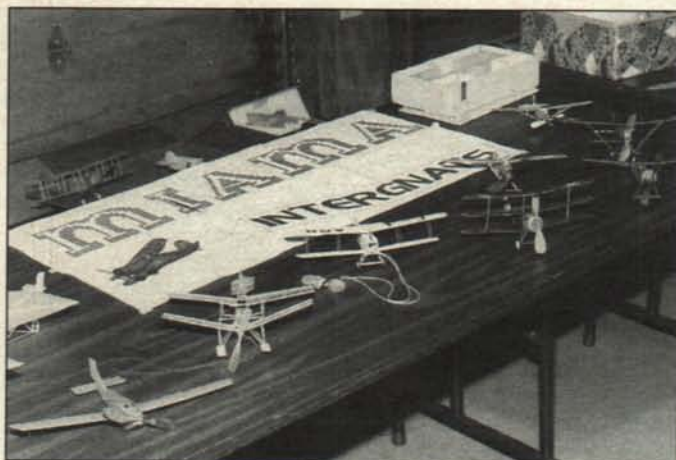
Magazine Indexes: James W. Patten, 5646 South Rt. 68, Lot

107, Urbana, OH 43078, continues his monumental task of indexing model magazines by subjects, having checked over 2,000 of them thus far, including *Flying Aces*, *Air Trails*, *Flying Models*, *Model Airplane News*, *Model Aviation* and, of course, *Model Builder*. As there are many indexes and different subject classifications (such as Rubber Power Model Plans and How-To-Do Shop Articles, for example), we suggest that you send a large, pre-addressed, stamped return envelope for the complete listing. James also offers a low-cost research service that sounds like a wonderful way to avoid having to dig through your own unorganized magazine stacks!

Air Ace Models: From Dennis Norman, well known for his elaborate free flight scale flying models, are the first two in a planned series of packets offering a new approach to scratch-

Air Ace Models, 700 Leader Building, Cleveland, OH 44114.

Bob Holman Plans: Moving to the larger end of the scale model size spectrum, we have Bob Holman's catalog series, offering a truly overwhelming variety of plans, kits, semi-kits and accessories. Some idea of the inventory involved may be gained from the fact that five different catalogs are required to feature them all: *Best in Scale* is primarily RC plans and kit oriented, and costs \$4; *RC Model & Construction Guide* from England includes plans for gliders, power planes and model boats, and costs \$5; *FMT Plans Catalog* from Germany costs \$6; *ASP Scale Drawing Catalog* at \$5 presents three-views published in British magazines over the years; and finally, the *ASP Model Aircraft Plans Handbook*, from England, which features a varie-



Variety! Just a few of the 41 entries in the recent Florida Inter-Gnats Pistachio Scale proxy contest. Greg Bates photo.

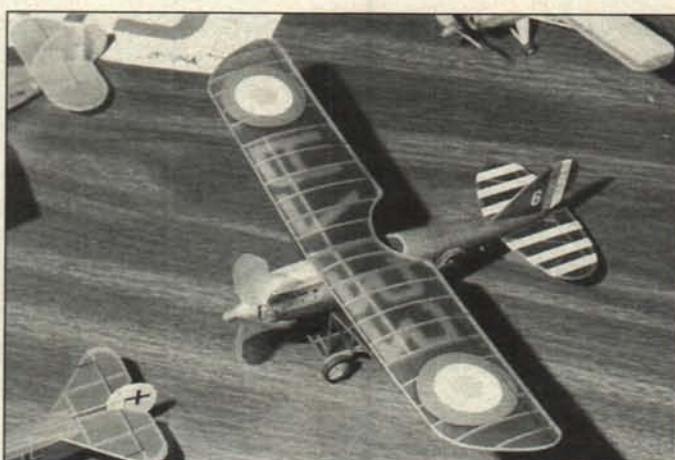
Sky Bunny has curved wing ribs and an adjustable wing mount. Contents of the kit includes full-size plans, instructions, printed balsa sheet, strip wood, music wire for the landing gear, plastic propeller and wheels, tissue paper, rubber strip and required hardware. Priced at \$8.95, the Sky Bunny is available at hobby shops or directly from Peck-Polymers.

Indoor News: Formerly published by Jorgen Korsgaard of Denmark, this 16-page

building. Each includes a Peanut Scale construction plan, proof-of-scale documentation, brief histories, a reference list, and Norman's innovative concept for creating complex color and marking schemes more easily. The directions for applying these techniques would likely be useful for any type of small scale models, and are very thorough. Now available are packets for the P-51 Mustang and the F6F Hellcat, priced at \$6.50 each, postpaid, from

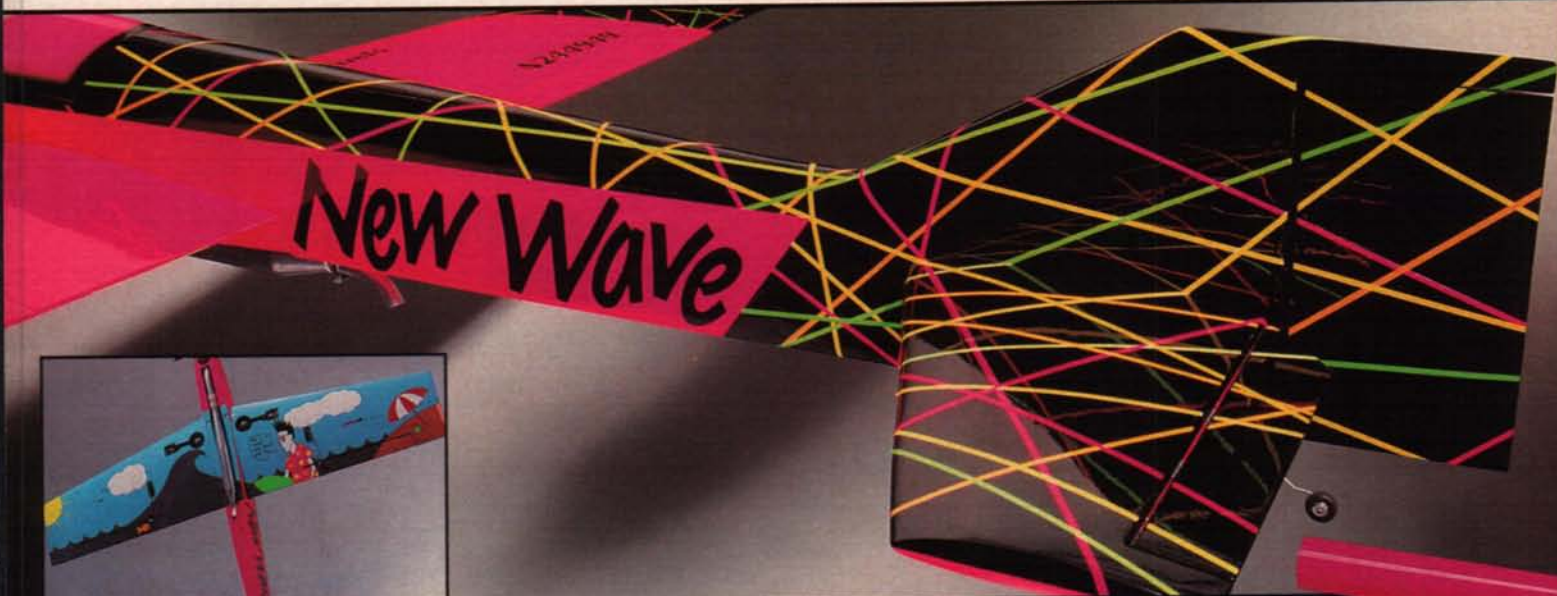
gated collection of construction drawings for everything from very simple fliers to old timers, control liners, autogyros, canards, novelty models, gliders, model engines and much more. At \$5, this catalog will keep you occupied for hours, regardless of your specialty! Bob asks \$2 postage for one or all five catalogs.

When contacting any of our mentioned sources, please tell 'em *Model Builder* sent you. Thank you! **MB**



The Inter-Gnats winning Nieuport N1-D Pistachio, by George Nunez. Photo by Greg Bates.

Colors to make heads spin and eyes pop.



New from MonoKote®—shocking Neons!

For too long, you've settled for a by-the-numbers trim. Wings, red...fuse, white...

While fliers like Chuck Huels create attractions such as the New Wave pictured above—awarded Toledo's 1992 "Best MonoKote Finish" and featuring no less than 13 brilliant Top Flite MonoKote hues. Heads spin. Tongues wag. Eyes pop. And we all grow a little green with envy.

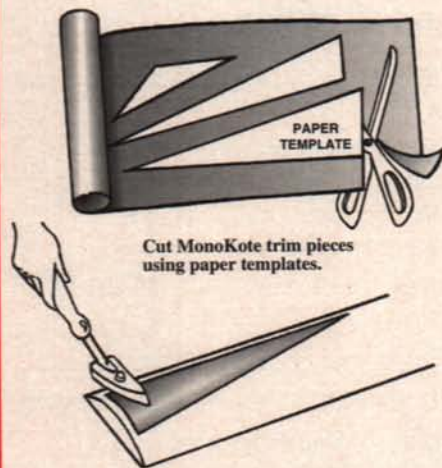
Instead of turning green, why not make your own color statement? One glance over MonoKote's mountain of color choices starts

an avalanche of exciting trim ideas. There are bright opaques. Shimmering metallics. Lush pearls. And—at last!—LOUD, shocking, *in-your-face* MonoKote-quality neons.

Using the simple trimming techniques shown below, you can easily make your next model the main event.

And with a dash of imagination and a little MonoKote, you'll even make Chuck's jaw drop.

MonoKote Hot Tip #9: Three Easy Steps for Applying Trim



1. Whether your trim will be simple stripes or elaborate graphics, first sketch it out on a drawing of your model.

2. Next, measure your plane for stripe length and make paper templates. Use these as guides when cutting your trim designs from MonoKote. To duplicate trim on the model's opposite side, just turn over your templates.

3. Remove the MonoKote backing and place your design on the model. With Top Flite's Heat Sealing Tool, heat the trim along one edge and slowly work across its length, removing all trapped air. Use LOW HEAT (225°-250°F) to prevent air bubbles from forming between covering layers.

New! Top Flite MonoKote Trim Solvent

Top Flite MonoKote Trim Solvent can also be used to apply MonoKote over MonoKote. With a paper towel, wipe solvent on the model surface. Then remove the MonoKote backing and position your design on the model. Squeegee out all air bubbles and allow the trim to dry for 24 hours. The result is a quick, easy and permanent no-heat trim.



Top Flite Customer Service: (217) 398-1884

For a free brochure and the location of the dealer nearest you, please call 1-800-682-8948 ext. 0383. Printing processes cannot capture the true vibrancy of MonoKote Neons. Please visit your hobby dealer to see the colors for yourself.

TF TOP FLITE

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1992 SPORT FLYERS ASSOCIATION SAFETY CODE

1. I will not deliberately fly my model aircraft over spectators.
2. I will not fly my model in the presence of spectators until I have learned to fly safely.
3. I will not use metal propellers.
4. I will not buzz, tail, or harass any aircraft, car, animal, or any object in the air or on the ground.
5. I will test fly any new or repaired aircraft before flying in the presence of others.
6. I will abide by all safety rules established at any field where I fly and any state or local regulations governing model flying. I will always obtain prior permission from property owners before flying. I will not fly any model in a hazardous or dangerous manner.
7. I will not use hazardous or dangerous materials, such as nitromethane or hydrazine.
8. I will not use any explosives in conjunction with model flying whether on the model, in the air, or on the ground. Rockets will be flown in accordance with the Safety Code(s) of the National Association of Rocketry. A fire extinguisher must be present when using pyrotechnic smoke candles. Authorization may be secured from the SFA for special events.
9. I will not power my models with turbine engines.
10. I will not fly my model higher than 400 feet unless it is flown in uncontrolled airspace, or unless it is a sport rocket which has been approved by the Safety Code(s) of the National Association of Rocketry.
11. I will not fly my model within three miles of any airport unless I have received permission from the FAA or I am flying at an authorized radio control flight field.
12. I will always perform a ground check of my model before flight.
13. I will use only those radio control frequencies currently allowed by the Federal Communication Commission.
14. I will extinguish any fuses on my Free Flight model upon completion of function.
15. I will only launch Free Flight models at least 100 feet downwind of spectators, cars, or anyone not directly involved with the flight.
16. I understand that SFA insurance does not cover activities related to the flying of Control Line models.
17. I will retrieve any lost model with great caution, considering all circumstances thoroughly before proceeding, and will never attempt to recover a model from a power line.
18. Whenever possible, I will use a starter or stick to start my airplane. I will not prop with an unprotected hand.
19. The weight limit and size of my aircraft will be in accordance with the local and national rules of the FAA and/or the QSA, and those rules which apply at clubs which have special SFA policies which exceed the coverages provided in the SFA Master Policy.

SAFETY CODE COMPLIANCE AND WAIVER STATEMENT

I will comply with the 1992 SFA Safety Code and my Flying Site Safety Code for all model aircraft operations and the NAR Safety Code(s) for all sport rocket operations including any changes or additions which may occur during my membership period. I understand that my failure to comply with the codes will result in loss of liability coverage for any damages or claim. I understand that written notice must be provided immediately upon the occurrence of any incident of bodily injury and/or property damage. I also understand that no claim will be accepted sixty (60) days after the expiration of my policy. I hold harmless the Sport Flyers Association, Incorporated trade membership organization for any personal injury, property damage or wrongful death which may occur. Current membership and coverage effective through December 31, 1992.

MUST BE SIGNED BELOW FOR ACCEPTANCE.

X

Applicant or Parent/Guardian of Applicant under sixteen years of age

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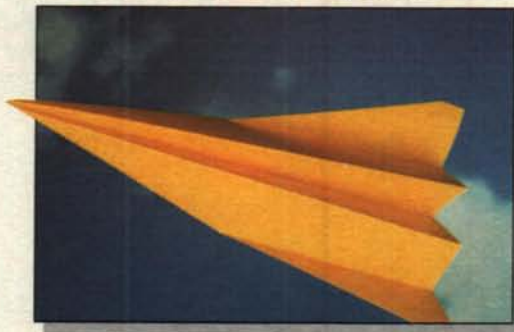
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THE SHOOTING STAR FROM AMERICAN RC

I've had the opportunity to fly every kind of ARF in the book; big ones, little ones, good-looking ones, plain-looking ones. But this is the first ARF I've ever seen that can also be described as "cute"! I'm referring to a new offering I recently received from American RC, called the Shooting Star, an example of their new Micro-Light series of small model aircraft. This delightful little glider popped out of the box absolutely complete and ready for radio installation. It was covered with MonoKote in an appropriate multi-color scheme which was most eye-catching and expertly done.

At first, it seemed so small as to border on the ridiculous, but the possibilities it presents are enormous. For example, an RC airplane of this tiny stature can be carried in any vehicle, including bikes and motorcycles. The flying area required need only be the size of a postage stamp, and the breeze from almost any slope is enough to keep it aloft. To be exact, the wingspan measures 36 inches, with a length from the tip of the nose to the end of the rudder of only 20-1/2 inches. With a wing chord of four inches, the wing area comes out to exactly 144 sq. in., or precisely one square



Easily riding even the slightest updrafts, the length of a flight is limited only by the capacity of the receiver battery—in this case, 100 mAH.

AN EXPLANATION

I want to commend many of my readers for noticing what appears to be a contradiction in my article on the Minicraft Javelin in the June issue of *Model Builder*. Two photographs of the Javelin show the word Futaba emblazoned on the fuselage, while another photograph of the radio installation reveals an Airtronics radio inside the airplane. The explanation is a simple one; I use both of these excellent major brands of radios, and it just happened that for the initial Javelin test flights I used a Futaba, so I applied Futaba decals to the airplane. Later on, during testing, I needed my Futaba radio for another project, so I switched to an Airtronics installation in the Javelin, ending up with Futaba decals on my Airtronics controlled airplane.

foot. Of course, the wing is of a high lift design, meaning that the airfoil is flat-bottomed. The overall configuration of the model is quite conventional both in appearance and type of construction, as the framework is made up of balsa and lite-ply throughout.

The wing is secured to the fuselage with

a set of small rubber bands provided by the manufacturer. The nose compartment has a removable balsa canopy, also covered with MonoKote. On the bottom of the forward portion of the fuselage is a sturdy hardwood skid, one of those touches which are indispensable on any glider.

continued on page 73

Open the box and out pops a completely built Shooting Star glider, with everything packed in a nice plastic bag. It's produced by American RC in Huntington Beach, California, both as a kit and as a ready-for-radio ARF as pictured here.





The red, white, and black color scheme makes this little glider from American RC really visible in the air, a must for small airplanes.



Charlie Strange easily tosses the 36-inch Shooting Star aloft for a ride on the slopes. The ready-to-fly weight is only six ounces.

ULTRAVIOLET AND THE RC PILOT

About twenty years ago, when I was serving in the Navy as an eye doctor, a number of my patients were fellow RC fliers. One day it dawned on me that I was seeing a substantially higher number of cases of early cataracts among this particular group of patients, and the condition was appearing at younger ages than it did in the general population. I went back over my records to try to make some statistical sense out of what was only a suspicion, and pretty soon I was convinced that our practice of looking up into the sky for lengthy periods of time has something to do with the onset of cataracts, which is a loss of transparency of the intraocular lens of the eye.

Now let me make it clear that if you live long enough, you probably will get cataracts to some degree. On the other hand, if there is anything that can be done to postpone their onset until late in life, or to limit their severity when they do show up, it certainly makes sense to take such preventative measures. Most eye doctors will agree that ultraviolet radiation from the sun plays a great part in damaging the lens of the human eye. If you don't believe that, find a bottle or a piece of glass that has been exposed to sunlight for a couple of years. What was once crystal clear can be seen to have turned yellow and opaque.

Accordingly, it really shakes me up to see people flying models airplanes without the benefit of sunglasses or even a hat with an eyeshade to cut the glare. Imagine the total hours of ultraviolet damage one can accumulate in a few years of flying! I am always on a quest to find the perfect eye protection for my RC flying activities, and during the past years I must have tried out hundreds of different types of sunglasses. Some of them did a fairly acceptable job, but all of them had one drawback or another, such as

poor scratch resistance, heavy weight, and various optical aberrations in the lenses.

Six months ago I was handed a pair of sunglasses which literally opened my eyes. Now don't forget, as both an eye professional and an RC flier, I'm a tough customer when it comes to sunglasses, so there has to be something really special about a pair of shades to impress me. It was October of 1991 at the QSAA fly-in at Las Vegas, when Boyd Newman handed me a pair of Zurich wrap-around sunglasses to try out. We were standing in the indoor exhibit hall, so I stepped out into the bright, harsh midday desert sun and slipped the glasses on right over my regular clear glasses.

For me it was like looking into another world, like peering into the third dimension! Objects which I could merely distinguish before now leaped out at me with crystal clarity, and the sharp improvement extended from side to side, a full 180 degrees! The lenses had a gradient mirror coating which was darker on the top than the bottoms, and the higher I lifted my gaze, the more protection I had. I just couldn't believe how clearly and comfortably I was seeing. After undergoing a number of serious eye surgeries in recent years, plus developing cataracts, I knew my vision was less than perfect, but these Zurich sunglasses gave me the feeling of seeing as well as I ever did.

Now let me progress to the end of the story. Since that first day, I have never flown an RC airplane without wearing my Zurich sunglasses. I treasure them and take great care not to damage or lose them. After every flying session, I slip them into their padded nylon case and snap it to my belt for safety. Though I would like to wear them all the time, I refuse to take the chance of scratching them, even though they have a scratch-resistant coating and are completely shatterproof. The only way I clean them is to rinse them in warm water and a mild liquid

detergent, drying them with a soft cotton cloth or chamois.

Whenever I finish flying and switch to my regular sunglasses, there is always a regretful disappointment. One might ask why I don't wear my Zurich sunglasses all the time, and the answer is that they don't come cheap. But there isn't the slightest doubt in my mind that they are worth ten times what they cost, and I have decided to end all this foolish pennypinching and



Here are the Zurich sunglasses which the author found to be the answer to all his glare and vision problems. They come with a thick, padded nylon case and snap buckle.

order a couple of extra pairs so that I can use them full time.

Consequently, I believe the greatest favor I can do for my readers is to suggest that if they have any outdoor vision problems at all, they should get a pair of Zurich sunglasses, either in the single or the double gradient gray tint. The single gradient does a fine job for me, but if you also wish to wear them on water or snow, the additional dark tint at the bottom of the lenses will be very helpful. They easily fit over most prescription glasses, and are so light in weight that you hardly know you're wearing them. Zurich sunglasses are available from Boyd Newman of Newman Optics, 5083 Ridgedale Drive, Ogden, UT 84403. His phone number is (801) 476-1177.—Art Steinberg. **MB**

Kyosho Concept 60 & Concept 30 SR

PART 2 OF 3 • BY JAMES WANG

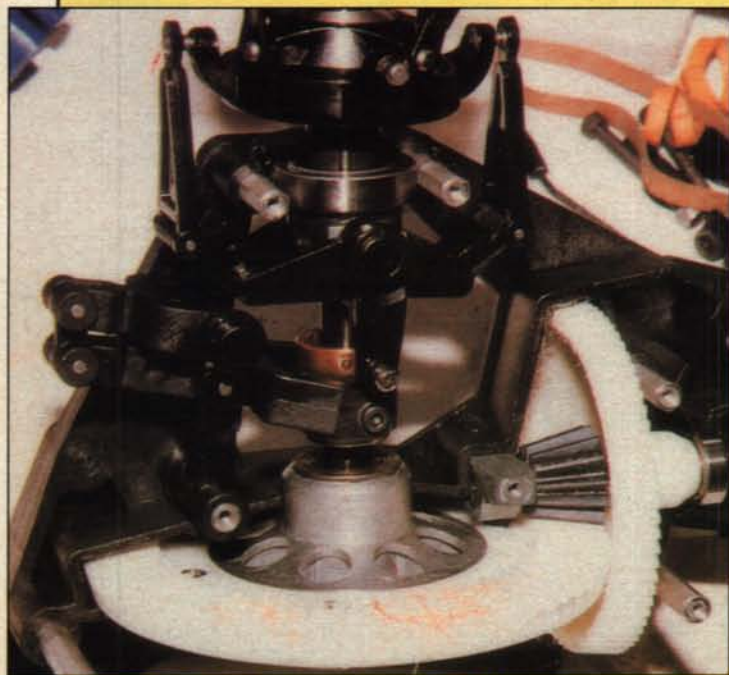
Now let's concentrate on the Concept 60's mechanics. The Concept 60 was very easy to assemble. My friend Mike Donnell and I spent about three days getting the Concept 60 from the box to flying. Mike had the mechanics assembled in two evenings, a total of six hours work. I installed the clutch and fan on the engine, built the wood blades, and put the beautiful decals on the canopy and fins.

When it comes to radio installation and setting up, all helicopters take time. It took me a whole day to install the radio and muffler. We will show you how to set up the Concept 60 next month.

For hover, we found 1300 to 1400 rpm to be the best rotor speed for the Concept 60. The machine also hovers nicely at 1200 rpm, but the controls become soft and mushy. The cyclic and tail rotor controls are still responsive, but the vertical motion becomes difficult to lock on. Using 1600 rpm in hover gives the Concept 60 a "locked on" feeling. The controls are solid and responsive. The high rpm also gives excellent acceleration, ideal for hotdogging. For forward flight, I suggest using 1600 to 1700 rpm. For the 30 SR, the best hover rpm is around 1500 to 1600 rpm. Use 1600 to 1800 rpm for forward flight.



The Concept 60 after the second crash, caused by the base loaded antenna breaking at the circuit board. The model crashed into a forest at full throttle. Amazingly, the only damage was a pair of Zig-Saw GP-9H fiberglass blades and a bent main shaft. This photo was taken immediately after the crash.



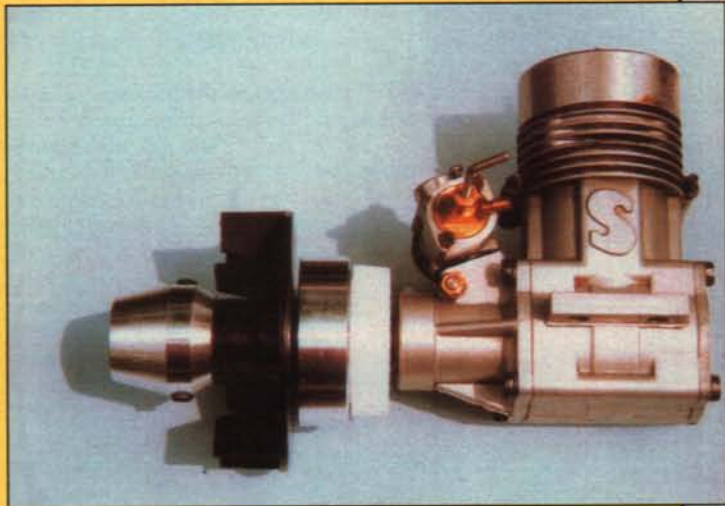
Closeup of the Concept 60's transmission with the left-hand side frame removed, showing the main gear with autorotation bearing, tail drive gear, and the sliding collective collar mechanism and fore/aft cyclic bellcrank.



The transmission is enclosed by the molded plastic sideframes. The Concept 60 is a modular design; the helicopter can be quickly disassembled into a few major groups for easy transport and service.



Left: The bottom half of the main frame. The module contains the engine, cooling system, and servo tray. James added a 1/8-inch plywood plate under the front servo tray to extend the receiver battery and receiver to help move the center of gravity forward. Right: The Super Tigre 60H James used on the test Concept 60. It is a smooth running engine with power comparable to the popular O.S. 60, and is inexpensively priced. Shown here are the clutch bell with white nylon drive gear, and also the six-bladed cooling fan and aluminum starter cone. The starter cone must run true to minimize vibration.



I have noticed that with the Concept 60, an extremely high rotor speed makes the model fly faster, but also degrades the longitudinal pitching stability. This increased Phugoid motion (the bobbing up and down motion in forward flight) makes me nervous when doing high-speed, low-level passes. I've also noticed that the Concept 60 likes to fly with the engine on the rich side and lots of smoke coming out of the muffler, which makes the machine much smoother in hover and forward flight; the engine also seems happier. This may have to do with the gear ratio.

A very nice feature of all the Concepts is that they come with a large fuel tank. The Concept 60 flies for 15 to 20 minutes on one tank. The 30 SR also flies for 15 to 20 minutes with the O.S. engine, but with the Super Tigre 34H I get about three minutes less. The ST 34H seems to have slightly more power at full throttle than the O.S. 32H, but the O.S. runs smoother in hover. Both engines idle extremely reliably.

These little engines run great on 15 to 20% nitro fuel. Using 30% makes the engine run cooler and adds more smoke, but does not boost the top speed. However, using the 30% nitro fuel made a big difference on my Concept 60.

I have tried four different engines on my Concept 60: an old Super Tigre 60H, a brand new Super Tigre 60H, an O.S. 60SFN ABC, and a modified 60SFN ABC. I have also tried four different exhaust systems: the Kyosho Concept 60 muffler, a Hatori 666 muffler, a Super Tigre swing muffler, and a MAC 60-size aircraft tuned pipe. My recommendation is to use a stock, unmodified O.S. 60SFN ring or ABC motor, or the new Super Tigre 60H. I found the Hatori 666 muffler works very well with either engine. Hatori recently introduced their 609 muffler, similar to the 666 but with the exhaust intake location specifically designed for the Concept 60.

The stock O.S. 60SFN and ST 60H provide

the most consistent idle and hover rpm, and plenty of power for forward flight. The modified O.S. 60SFN (with slightly raised timing) does provide more top end power and speed, but does not like to run at the optimum 1300 to 1400 rotor rpm; it wants to sing at 1500 to 1600 rpm rotor speed instead. When I added collective pitch and reduced the throttle to make it hover at 1350 rpm, the motor suddenly felt like it was "coming off the pipe." However, after I added a 0.005-inch thick shim underneath the cylinder head, the predetonation and rough running in hover seemed to diminish. Because the Concept 60 hovers beautifully at 1300 to 1400, I recommend using a stock motor/muffler setup.

The new Super Tigre 60H I used was just released earlier this year. For under \$200, you get a fine Italian-made helicopter motor that comes with a muffler. The 60H is of ABC/ring construction and it has just as much power as the O.S. The Super Tigre seems to like a tuned pipe more than a muffler, due to its higher exhaust timing.

The ideal exhaust for the ST 60H is the Hatori 666 muffler, or better yet, the Hatori or Magna U-shaped tuned pipe. This combination is excellent: quiet and powerful. The Hatori 666 is a muffler design, but it seems to have some tuning effect that minimizes power loss. Standard mufflers typically cause a 10 to 15% power loss.

Even using a muffler, the center of gravity on the Concept 60 still came out just under the main shaft. I added a 1/8-inch thick plywood plate, four inches long, bolted to the front servo tray. This allowed the receiver battery and receiver to be placed well forward to



The main rotor shaft, including the sliding collective mechanism, swashplate, and Bell-Hiller mixer, comes pre-assembled by the factory. Notice the black collar below the swashplate with set screw holes on it; this must be adjusted properly to minimize swashplate wobble. Text has details on how to do it.

substitute for lead weight, but one ounce of lead was still needed. I was surprised that the model was tail heavy because the tail boom is a very thin aluminum tube.

The tailboom is braced by two struts that are nearly parallel to the tail boom. They do not add much vertical support, but they

do provide some horizontal support. The diameter of the Concept's tailboom is larger than on other 60-size machines, therefore, the tailboom is quite strong for its weight.

The tailboom and struts are bare aluminum, but I sprayed them white with Formula-U polyurethane to match the white canopy. I suggest using the decals alone for decorating the fins and canopy; don't try to paint the fins and canopy be-

The Concept 30 SR kit is very easy to assemble. The author recommends the Concept 30 DX or 30 SR as an ideal first helicopter. Its compact size and quietness make it less intimidating than the bigger 60-size models. The plastic truss structure design also makes the Concept 30 very crashworthy.

cause regular paint doesn't stick very well to the special pliable plastic. After the decals are applied, tack the corners down with a thin drop of CA glue to prevent peeling.

One thing that still bothers me is that the motor in my Concept 60 has a tendency to "goggle" if I transition from fast forward flight into hover rapidly. The whole helicopter shudders for a moment, then the motor settles down. This happens with both the O.S. and Super Tigre engines, therefore, it is probably not the engine. I suspect it has to do with the centrifugal clutch. It seems that in a steep descent, the engine is "unloaded," therefore the clutch is

nearly disengaged and slips slightly. Due to the great rotor inertia, the rotor seems to turn faster than the engine. It sounds like the clutch bell is overrunning the centrifugal clutch.

The centrifugal clutch design on the Concept 60 is similar to that on other model helicopters, the

The articulated main rotorhead for the Concept 30 SR. The design is similar to the 30 DX and the Concept 60; the text explains the differences. Shown here are the top and bottom cover for the hub, the seesaw for the flybar, the steel feathering spindle and the one-piece molded main rotor blade grips.

major difference being that the split in the clutch faces away from the engine rotation. While the others face into the engine rotation and bite into the clutch lining, the Concept 60 clutch shoes have to open and drag the clutch before they lock together.

The Concept 60's main rotor also seems to have tremendous inertia—the main rotor spins for a long time before it comes to a stop. This may be due to the fact that the gearing is very free and

efficient, and also because the main rotor head is the aerodynamically cleanest of all the model rotor heads. Because of this rotating inertia, the Concept 60 does excellent autorotations. The stock wood blades are only 145 grams each, but my Concept 60 still floats down in autorotation and gives a two-second hover at the bottom. Try that with other 60-size machines using such a light blade!

Because of the excellent rotor inertia, the centrifugal clutch material, and the gap between the clutch and the clutch bell being a bit larger than usual, I suspect the centrifugal clutch slips a little before engaging completely. I hear this same shudder noise when the engine is unloaded during a stall turn. Now I always transition from fast forward flight into hover slowly, to prevent this engine "goggling" phenomenon.

The Concept's stock clutch lining wears out quickly. The black material lasts only a few dozen flights before it must be replaced. The lining is cheap, but it takes time to install. Tim Lampe of Great Planes says the problem is most likely due to the clearance between the clutch and the clutch bell being too large. The large gap causes the especially soft lining material used by Kyosho to wear out even quicker. Tim says the new clutch bells will have a thicker brass ring insert between the clutch bell and the clutch lining to reduce the clearance. He has been testing the new clutch bell and says it has eliminated the problem.

The Concept 60 has the main gear and pinion gear enclosed in a plastic housing, which keeps everything clean inside. The only drawback is that you can't inspect the teeth or gear mesh. The transmission cover is molded with the sideframe as one unit and adds strength to the helicopter structure, but requires major disassembly to check the gear mesh or inspect the gearing. When we were first building the model, Mike and I had to take the helicopter apart three times before we found the correct number of washers to put under the main gear to get a perfect gear mesh. We suggest you try two washers first (the kit comes with four or five thin 10mm washers).

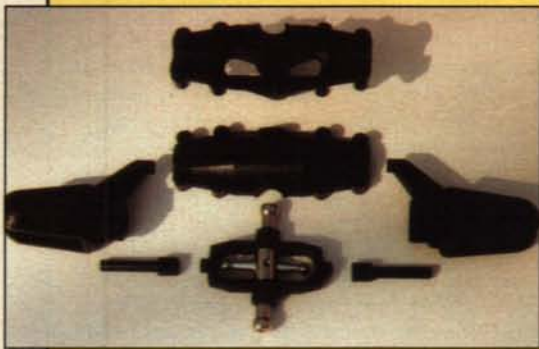
The Concept 60 and 30 SR do not have an extended starting shaft, so there is no need for the time-consuming dial indicator exercise necessary on other helicopters. However, you should try to make the starter cone and fan assembly turn as true as possible. A wobbling starter cone can cause excessive vibration and fuselage oscillations.

Because of the sealed transmission design, some maintenance tasks require the sideframes to be partially disassembled. So far I have disassembled the model five times: once during the initial assembly to remove a spacer washer under the main gear, twice to perform maintenance and twice to correct mistakes made during reassembly. After so many times, I can almost do it blindfolded. All the bugs have now been ironed out and I have not taken the model apart for the last 100 flights.

My Concept 60 has been involved in two crashes, both due to radio interference. The first time was a PCM lockout while flying



The molded glass-filled nylon sideframes, servo tray, landing gear struts, and cooling fan shroud for the Concept 30 SR.



helicopter world

in a rainstorm at an Army base. The rain wasn't pouring yet, but there was lightning in the area. (I wonder if lightning can cause interference?) The model was hovering at eye level, then suddenly the receiver went into hold and the model pounded to the ground. Amazingly, the only damage was a pair of broken landing struts and the original wood blades.

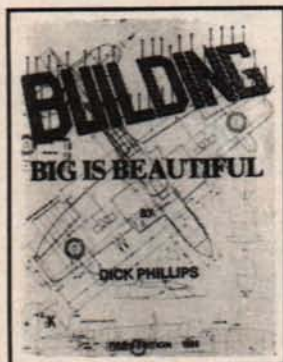
The second crash was caused by the antenna breaking loose from the circuit board, sending the model straight into a forest at 70 mph. We saw the model go into the trees, the rotor chopping its way through—leaves and branches were flying everywhere. From the sound, we thought the model was history. But incredibly, the damage was limited to a pair of fiberglass rotor blades and a bent main rotor shaft. As shown in the photo, the model was otherwise OK.

I have always loved the Concept 30 because it can take abuse.

My original Concept 30 DX, after uncountable encounters with Mother Earth, still boogies. The Concept 60 seems to have inherited that rugged trait.

On the Concept 30s, the steel spindle for the individual flapping blade is quite small, and bends easily in a crash. Always examine the trueness of the spindle after a Concept 30 crash. Even a slightly bent spindle causes undue vibration. Remove the main rotor hub top cover to remove the spindle from the hub. Spin the spindle in the blade grip bearings, and see if it spins truly. The feathering spindle for the Concept 60 is much larger and stronger and is not likely to bend in a crash. This is especially true if you are using the lead-lag hinge because the spindle can lag in a crash, further reducing the likelihood of bending. The stock feathering spindles in my Concept 60 have experienced two severe crashes and they are still fine. **MB**

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WINDY-DAY FLYING SKILLS

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All maneuvers in RC Aerobatics are required to be wind corrected in such a manner as to preserve the shape and symmetry of the maneuver in the track of the model. All straight lines, both horizontal and vertical, will be graded on the track projected by the model. Changes in attitude of the model to maintain a straight track will not be reason for downgrading the maneuver."

The above statement (from the AMA Competition Regulations 1992 and 1993, Radio Control Aerobatics, AMA RC Pattern Judge's Guide, Paragraph B, page 70, sub-heading (a.) Precision) isn't really new. I pulled it out of the bottom of the text where it was languishing as an afterthought, strengthened by the addition of the first sentence where the maneuvers are, for the first time, actually "... required to be wind corrected," and given the place of prominence that it deserves.

The reason this was done is because far too many pilots and judges are either overlooking the straight track idea or simply ignoring it. The portions of the '87 and '89 Nats that were flown in difficult wind conditions made it plain to all observing that a clear majority of the pilots, especially those in the less advanced classes, were having major problems just getting up and down safely, let alone flying recognizable maneuvers.

Things don't seem to have changed much since '89. I recently attended an event where the pilots were challenged by a severe (about 25 mph) crosswind blowing directly out from the flight line. In the space of five hours and 70 official flights, seven aircraft were either damaged or destroyed in landing or takeoff accidents, not counting many minor scrapes and dings. Near-misses were everywhere, and the judges being forced to watch this were passing out zeros like jellybeans at Halloween, whenever they could spare the time from prudently moving their chairs farther away from the carnage.

Once up, things didn't improve much for most of the pilots, with many ending up so far away after three or four maneuvers that it was difficult just to see the airplane, let alone identify or grade the maneuver being attempted! All around, it was a tough day, a very tough three rounds of pattern.

However, somebody in each class won those three rounds, and in most of the classes, that somebody won the contest. In all cases, the people who were able to land and take off safely were also winners. They



NSRCA District 8 Co-VP Eric Hawkinson and his Dash 5, dubbed the 5.2 version because of a nose wheel relocated to the rear. Rick Allison photo.

Darrel Cheshire's Millenium, a Three Men's Models design. Darrel calls it the Millemonium! Rick Allison photo.



won the right to take their undamaged airplanes home for another try on a better day.

Wind is a fact of life on planet Earth, predating the development of RC pattern by some few years. In the course of your pattern career, you will fly in severe wind conditions on many occasions. The only sensible thing to do is to accept this, and learn to deal with it. The way to deal with it, as always, is through proper technique and practice.

Before we get involved in discussing techniques and wind strategies, please recognize that flying turnaround style makes wind correction more important than ever, and more difficult. With the old AMA style pattern, a pilot was able to use the free turnaround to reposition the aircraft to correct for wind drift without penalty. Also, the high speeds and predominance of horizontal maneuvers in the old patterns minimized the effect of wind on maneuver shape. Today, our mostly vertical and more constant speed patterns mean a lot more time spent at low throttle and a slower moving airplane, which is more visibly affected by the wind. We now have a windy, day pilot workload that is much higher than before.

The most important piece of equipment that any pilot has on a windy day is located between the ears and directly under the hat. You need to *think* out there. Be aware of the wind direction and strength before you walk out to fly. Talk to the other pilots who have already flown about conditions aloft, which may be and often are quite different from those near the ground. Have a plan for dealing with key maneuvers you think may prove especially difficult. Rehearse the techniques you might need. In other words, do all the stuff that the pilot of a full-scale aircraft would do before attempting flight under comparable conditions. After all, the problems and responsibilities are identical; only the scale is changed.

Many of the techniques we use in the wind are borrowed from full-scale as well, with one important difference. Where a full-scale pilot might pick a fixed ground point to use as a reference to measure his wind drift, we are the fixed point, operating the aircraft in reference to ourselves and, coincidentally, the judges. It isn't my intention to start another "downwind turn" controversy, but the old saw about the airplane not knowing that it's windy just doesn't apply. We are measuring movement relative to a fixed ground reference. What the airplane appears to be doing up there is in fact what it is doing up there, period. Besides, no airplane of any size ever knows if it's windy. Pilots do, or should.

The task is to make the shape of the maneuver the same as it would be were there no wind. In the Definitions section of the '92-'93 book, under "Wind Correction," the statement that wind correction is required "...in such a way as to preserve the shape of the maneuver in the track of the model..." appears. Note that nothing is said



From Deer Park, Washington. Sportsman Juan Fernandez and his Bridi XLT modified to look like a Boxer. Flies well. Rick Allison photo.

about the maneuver actually *looking* the same. In fact, the alterations of aircraft attitude (relative to ground reference) necessary to preserve the proper track can make the maneuvers look pretty strange at times. An aircraft rising on a perfect vertical line with the fuselage angle cocked at better than 30 degrees to the flight track is a true source of wonderment, and even some hilarity, if you don't happen to be the one doing the flying. If you are doing the flying, you are most likely to be too busy to be amused.

The basic correction skill for crosswinds is the set crab angle. This is nothing more complicated than establishing a fuselage attitude pointed slightly into the wind in order to maintain a straight ground track. Many modern pattern designs will weathervane sufficiently on their own to set an adequate crab angle for a moderate

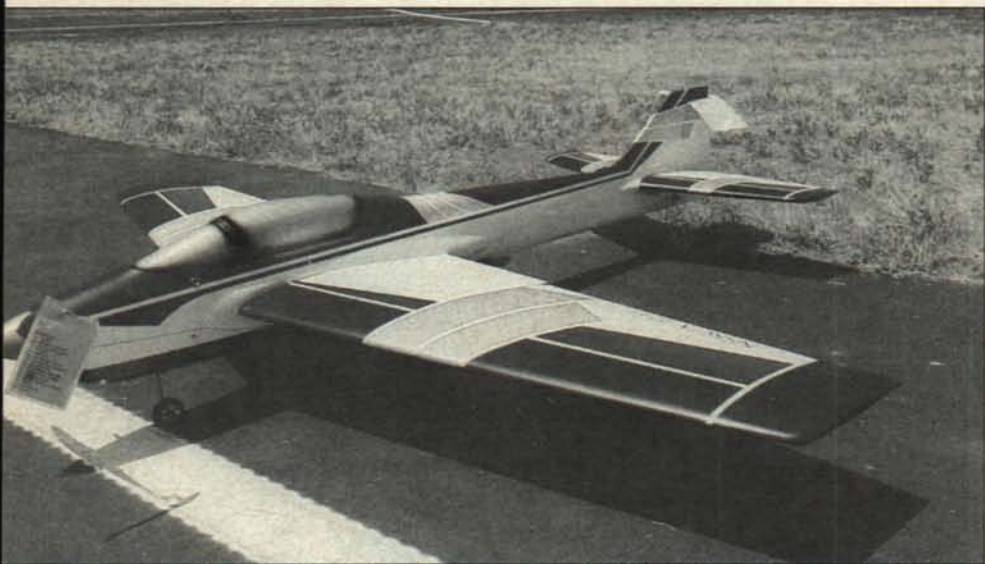
crosswind condition, and it will be sufficient if the pilot just resists the temptation to "correct" the odd-looking fuselage angle. A stronger wind condition might require a little rudder applied into the wind to hold the ground track.

Another useful technique in crosswinds is holding the upwind wing slightly low. If properly done, this is a nearly seamless, invisible, and elegant correction. It is an especially nice technique when pulling or pushing to a vertical line, or for entering looping maneuvers. Be careful not to overdo this one; two or three degrees of bank is usually plenty.

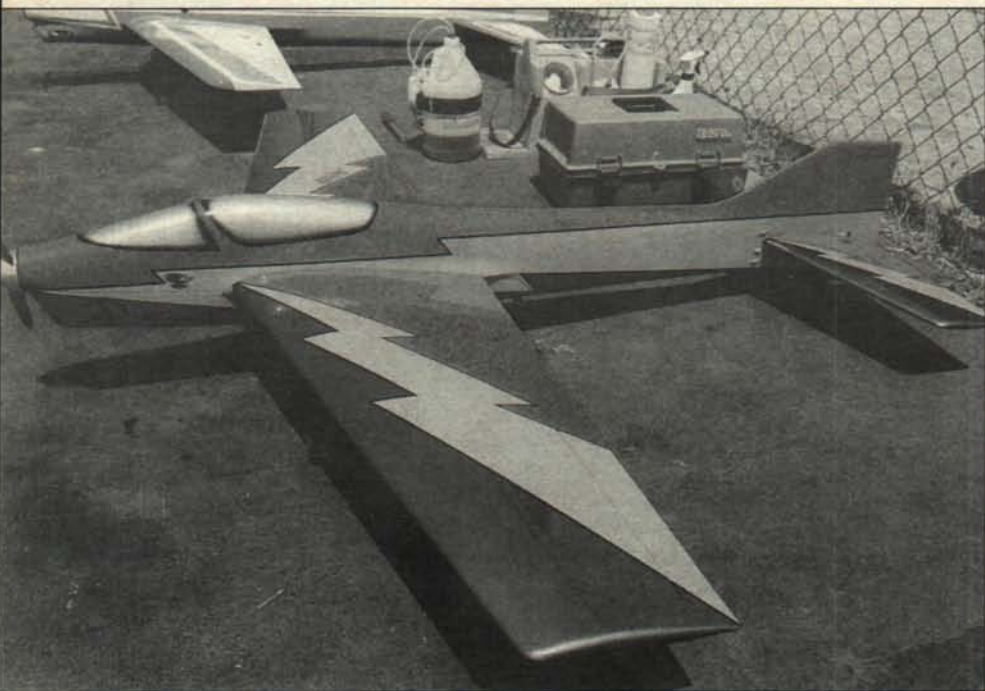
For strong wind conditions with no crosswind component, the main rule is to leave the fuselage angle short of vertical when pulling or pushing into the wind, and to start a bit early, then overpull or push the downwind verticals. Timing is a problem,

Colorfully done all-balsa Boxer built and photographed by Charles Castaing of New Iberia, Louisiana. All MonoKote, power is an O.S. Hanno Special.





Frank Copone's Summit III at Merced. MonoKote wings and stab, with fuselage paint mixed to match by Gene Weber. David Olsen photo.



Gene Weber's LA-1 in Marvel Comics color scheme. Shazam! Photographed at Merced, California, by David Olsen.

because the ground speed upwind is quite a bit slower than the ground speed downwind. The idea is to think ahead just a little, and be ready for the apparent speed change.

In the real world, the wind is hardly ever straight down the flightline or perpendicular to it. Most of the time you will be dealing with wind at some sort of crazy angle to the pretty geometry you are trying to create. You will need a combination of all of the above techniques, in varying degrees, changing as the flight track changes relative to the prevailing wind. This is where the concept of making a plan before you fly and rehearsing the techniques in your mind pays dividends. You need to reduce your decision-making workload by thinking things through in advance.

A strategy that most people find useful

when flying in wind is to pull the pattern in slightly, reduce the overall size of the maneuvers, and keep the airspeed up as much as possible. There are places in the pattern, such as stall turns, where the airplane is necessarily almost stopped and more or less at the mercy of the elements—a kite without a string. It's a good idea to limit that type of exposure by not hanging the airplane up there on the slow end of a long vertical line or huge loop. Stay well within the performance envelope of your equipment, and things will usually look better. Keep the floor of the pattern high enough to avoid the worst of the ground turbulence.

Many people prop for more speed on a windy day. This is just a continuation of the same idea. How effective this strategy will be depends on your particular equipment.

In fact, a great deal depends on your equipment. Obviously, the airplane with the lower drag coefficient has an advantage in the wind. And if ever any advantage goes to a heavy ship, it would be in the wind. Because of their size, power and simple inertia, the new four-stroke ships find their greatest advantage in the wind. Extremely lightly loaded, draggy, and underpowered airplanes suffer in the wind.

Wind is often accompanied by turbulence, which naturally makes a bad thing worse. When the chop gets really bad, all you can do is ride it and take an average on where the airplane is supposed to be. Try to avoid being forced so far into a reactive mode that you forget your basic corrective strategy, and stay loose.

Under the conditions we've been talking about, landings and takeoffs become a real adventure. The basic techniques are again borrowed from full-scale. When landing in a crosswind, keep the upwind wing low during the approach and touchdown. Establish a crab angle to hold ground track with the runway centerline, and kick the airplane straight just before touchdown to avoid a side load on the gear. Avoid getting the nose up too early. Remember, too low and slow with the nose up puts you at the mercy of every gust that comes along. Bear in mind that the airplane will appear to increase groundspeed as you turn final in a direct crosswind. A curving, 180-degree military-style approach usually works better than two 90-degree turns.

Slips into the wind are a very legitimate option, but it takes much practice to build the skill level necessary to use them effectively, especially in gusty conditions.

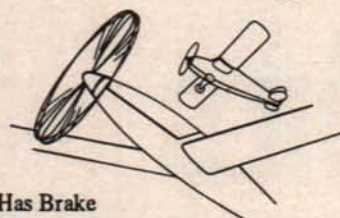
Landing directly into a high wind means carrying a little extra power on approach. Come in high, keep the nose down until the last second, and keep flying the airplane until it stops rolling.

If you can't make a safe landing, take the zero and go around and try again. I never saw the 10 points that was worth an airplane. Besides, under these conditions, we're only talking about five or six points at most, and more likely three or four!

Takeoffs are not so bad as landings. Come up on the power early in the roll to establish directional control, hold the track straight with the rudder, and hold a little aileron into the wind. Make sure you've got enough speed, and add a few knots for good measure. Make the liftoff gradual and flat. If you get out of shape on the initial roll, abort and try again. See the paragraph on safe landings.

Takeoffs are always optional maneuvers, and good judgment is the most important skill any pilot can acquire. If you evaluate the conditions and find them too extreme for your skills, by all means, stand down and pass the round. It takes a long time to build a good airplane. It is nothing but foolish to destroy it in a moment of bravado. What would you use to practice your windy-day flying skills with then? **MB**

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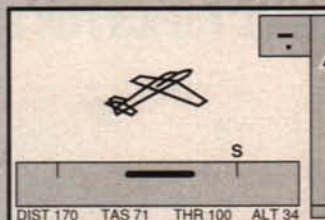
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A TRIO OF EDUCATIONAL TOPICS FOR BIG BIRD ENTHUSIASTS

I never build a plane with any thought that it will crash. That thought still applies but is somewhat shaken after I managed to bend two Big Birds in one week.

In early June, I took my Cessna 180 out for a test flight and, due strictly to pilot error, as you'll see, I managed to knock off the landing gear. I had spent a lot of time refurbishing the Cessna and was anxious to get it in the air, so I let my desire to fly overcome my sense of good flying practices.

It is, of course, never a good idea to test hop at a busy flying field, or if there is any kind of a crosswind. The takeoff roll should be fairly long, especially if the plane is slightly on the heavy side.

So, with a crosswind and low airspeed, I told the Cessna to fly and it said NO! It wandered into the high grass to do some grazing, where it stuck the left main gear in a hole and came to grief.

Stubbing the toe of the 180 was a particularly difficult pill to swallow, because the previous weekend I had spent both days trying to get the engine to run. My Zenoah G-38 had been on the shelf for about 18 months, sealed and with lots of lube in the moving parts.

I finally called my friend, Chuck Willcox, and told him I had exhausted every method known to man to get the darn thing to run. Chuck invited me to his place, where we went over the entire engine and setup again—it was about the fourth time for me.



Jerry Chambers' Extra 300 is a ready-built Bob Godfrey product, weighs in at 17 pounds and is pulled by a Super Tiger 3000. The paint job is outstanding.



Dave Grip is very happy with his 20-pound G-Shark, powered by a Super Tigre 2500 swinging a 20x8/14 prop. The engine only reads 92db on a meter.



This Ultra Hots is *really* hot with a Moki 1.8 engine up front. The 86-inch plane weighs 15 pounds and uses a JR 10-channel radio. Weldon Golgoff, pilot/owner, also employs a Jomar glow driver on the engine.

We had cleaned and checked the Walbro carburetor so many times I was afraid we were going to wear out the fasteners. The spark was hot from the C.H. spark ignition system, we had good fuel flow and a clean intake. Fuel, air and spark (should) equal a running engine.

As we had tried everything else, Chuck suggested we remove the C.H. unit and try the original magneto setup. We did so and still no start. After another 45 minutes of tinkering, the engine reluctantly came to life, slowly gained power and eventually ran properly.

The magneto was removed and the C.H. setup re-installed. The engine burst to life with no indication that there had ever been a problem. Chuck and I discussed the mystery over a cool beer (our reward) and neither of us could find any reason the engine had been so stubborn to start. Maybe the Zenoah was pouting because it had not been used in a model for such a long time.

Anyway, I was not a happy camper when I wrecked the big Cessna, because that left me with only the Big Bee for the summer flying season.

On June 6, 1992, I drove up to Bellingham, Washington where the Bellaire RC Club was holding its third annual Big Bird fly-in. On my first flight with the Big Bee, the engine quit unexpectedly. I misjudged the wind strength and was unable to make the landing strip, but did manage to strain the plane through a tree, which tore up the left wing.

It's been a number of years since I balled up a flying machine. I didn't like the feeling then and I like it even less now. If it ever happens again, it will be too soon.

Right after a crash is a bad time to decide the future of the wreckage. Let some time go by and then, with a cooler head, go over the damage and decide if the plane is repairable. Always pick up *all* of the pieces, no matter how bad you are feeling about bending your favorite Big Bird.

It is absolutely amazing to see the results of a few minutes use of your favorite instant glue on broken ribs. It is often possible to repair your Big Bird using splices that are often stronger than the original, so do not give up too quickly.

• • •

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Built from Bill Northrop's plans, this 2 1/2' Travel Air 2000 has a 72-inch wingspan and is powered by an O.S. .75 four-stroke. Owner Ed Mahoney says the plane was built by Fritz Bruning of Sequim, Washington.



Ted Sanders did an excellent job of constructing and finishing his Byron Corsair. It weighs 23 pounds and is powered by a Sachs 4.2 cu. in. engine that has C.H. spark ignition system installed. Robart retracts are also used.



A fine building job on this Fokker D-VII, built from Rich Uravitch plans by Ted Sanders. Super Tigre 3000 provides plenty of power for this 18-pound, six-foot fighter.



This Concept Fleet biplane flies great with a Zenoah G-62 up front. Don Belisle also uses smoke to wow the spectators. Radio is a Futaba.

sion. There are just about as many different engine oils on the market as there are engines.

For years, McCulloch oil mixed at 40:1 has been one of my favorites for chainsaw-type engines, because it seems to burn clean and yet leaves a nice protective film on the moving parts. However, I would *never* attempt to mix the oil 40:1 with methanol and run it in a typical model airplane engine.

Some months ago a friend of mine said he was going to try some chainsaw oil in his four-stroke glow engine. I told him I thought it was a bad idea because of the difference in ratio of oils. He claimed

that the can said 40:1 would work. I pointed out that regular model glow fuel is a 4:1 mix or 20%.

Most four-stroke fuels are between 10 and 15% lube, 9:1 and 5.7:1, respectively. He finally saw that a 40:1 mix was going to be a mighty lean mixture of oil for his engine. I also pointed out that the chainsaw oil might not have the lubricating qualities that his four-stroke engine required.

I was surprised to find that Walker Machine recommends their fine Sachs engines be broken in with a very generous 25:1 oil mixture. Other engines specify 50:1 or 80:1. The only way to go is to follow the instructions for your particular engine until it is broken in, then try the more exotic, leaner oil mixes. Don't overdo it, however. Keep in mind that an engine can be quickly and severely damaged by going to too lean an oil mixture.

In researching this project, I called Jim Davis, owner of Davis Diesel Developments, who told me that synthetic oils do not exist. The products labeled synthetic oils are actually polyglycols that were not originally designed as lubricants. Their lubricating qualities were an unexpected by-product. Polyglycols are in the same chemical family as anti-freeze. These are divided into two types, esters and glycols. The glycols are the basis of the synthetic lubes we use in our fuels.

Now, while anti-freeze is in the polyglycol family, do *not* run out and mix up some anti-freeze and alcohol or gas for use in your favorite big engine. Use only oil specified for use in internal combustion engines.

Bruce Edwards, 8304 53rd St. Ct. West, Tacoma, WA 98467-1816; telephone (206) 564-4416. **MB**

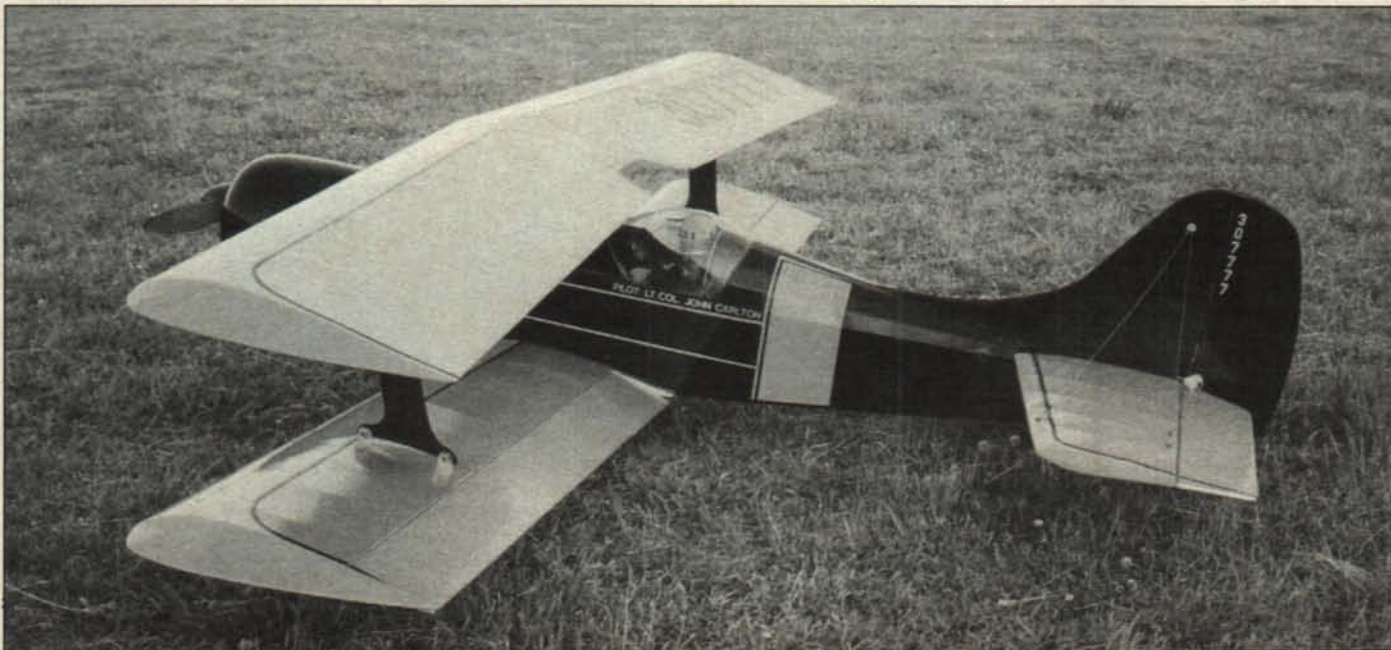


A three-quarter rear view of Harold Jones' Westland Lysander shows the extraordinary detail of this fine scale model. Model spans 82 inches, weighs 12.5 pounds and has an O.S. 70 Surpass for power. The radio is a seven-channel Futaba.

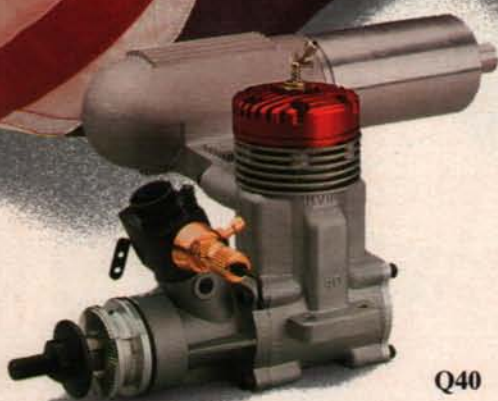


Balsa U.S.A.'s Fly Baby biplane builds into a good flying Big Bird, according to Chick Young. His big biplane weighs 19 pounds and uses a Quadra engine.

This highly modified Super Lazy Ace by John Carlton does sparkling aerobatics even with ailerons on the lower wing only. The big biplane is powered by a Sachs 4.2 engine.



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.40 Pylon

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READ ALL ABOUT IT!

PHOTOS BY JIM CAMERON

One person with an interest in control line model aviation, with access to some materials and a dash of dedication, can gradually progress toward competence in building and flying. Add a second person with the same interest and dedication, and the two can progress 10 times faster by working together and sharing their skills, knowledge and ideas and by exploring the hobby as a team. That's why so often in this column we recommend that beginning modelers join clubs and attend as many contests and other organized events as possible.

There's a third ingredient that can make our two beginning modelers progress 50 times faster—the written word. That's why so often we mention various club and specialty newsletters available to control line modelers. We receive many modeling publications on a regular basis; there's never been a time when we've opened such a publication without learning something new about the hobby.

For the last couple of years we've been describing individual newsletters in our "newsletter of the month" feature. As promised from the start, we've compiled a list of the newsletters we know to be available that are of specific interest to control line fliers. Some are the publications of national organizations devoted to a particular sector of the hobby. These are particularly useful to anyone with a particular interest in that sector, but often are informative as well to people with a general interest in control line flying.

Other newsletters are published by clubs for their members and for exchange with other clubs. These are useful to fliers in their geographical areas who like to keep up on local activities, but most of these club newsletters also provide considerable technical information that is useful to any CL modeler.

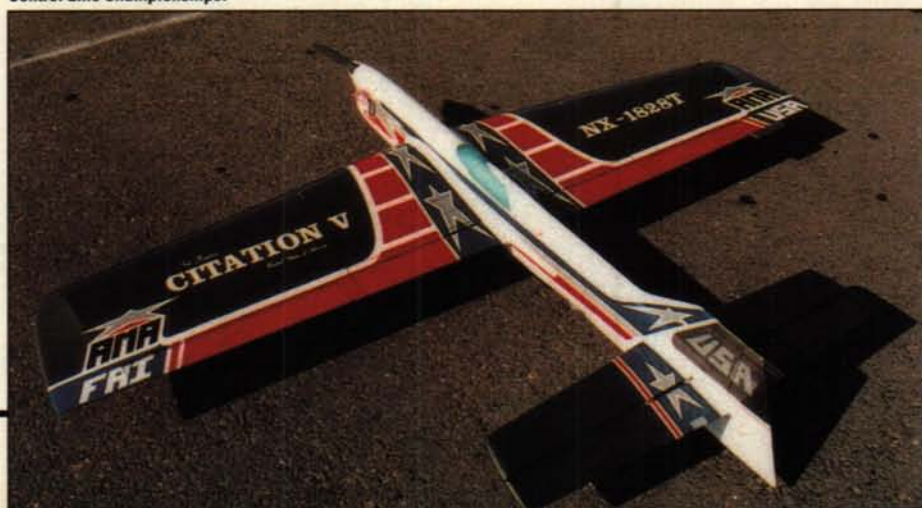
Our list follows, in alphabetical order. We expect that this list is incomplete, and we hope that any newsletters not listed here will be brought to our attention so that we can compile a supplemental list for a later issue. Most club newsletters are available on a subscription or exchange basis for out-of-region readers. Annual subscription rates are listed, if available. Even if a subscription price is not listed, potential readers should expect to be asked to help defray the costs of publishing and mailing, as all of these are non-profit publications.

Aerolines, the newsletter of the Northwest Fireballs club of Portland, Oregon,



Paul Walker captured the 1992 Northwest Regional Control Line Championships Precision Aerobatics Concours d'Elegance award—as well as first place in Expert Precision Aerobatics—with his new Total Impact.

Ted Fancher's Citation V entry in Expert Precision Aerobatics. All photos are from the 21st Annual Northwest Regional Control Line Championships.



contains news of northwest Oregon and southwest Washington CL flying. A contest calendar and technical articles are part of the package. *Aerolines*, c/o Dave Royer, 1705 N.E. 86th Ave., Portland, OR 97220.

Aeromail, news of the Norfolk Aeromodelers in Virginia, contains information about regional CL activities, technical articles, contest flyers and club news. *Aeromail*, c/o Terry Bull, 1428 Woodside Ct. S., Chesapeake, VA 23320.

Airwaves, the newsletter of the Pacific Aeromodelers Club of Vancouver, B.C., is one of the most detailed CL newsletters available in the West. It's full of Northwest CL news, photos, technical tips, photos, contest schedules and product news. *Airwaves*, c/o Frank Boden, 4791 Shepherd St., Burnaby, B.C., Canada V5H 1L6.

Cabane, a newsletter for contest directors, is published by the Academy of Model Aeronautics. It contains the latest news relating to rules and contest administration. Bob Underwood, Academy of Model Aeronautics, 1810 Samuel Morse Drive, Reston, VA 22090.

Direct Connection, the periodical of the Knights of the Round Circle, contains detailed news of Southern California control line activity. It covers the various Southern California flying sites, offers technical tips, a contest calendar and classified ads. Subscriptions are \$8 per year. *Direct Connection*, c/o Patty Bridgeman, 805 N. Mantle Lane, Santa Ana, CA 92701.

Eugene Prop Spinners Newsletter contains club and contest news from the Eugene, Oregon area, plus technical tips and Northwest contest news. *Prop Spinners*, c/o Mel Marcum, 2065 Providence, Eugene, OR 97401.

Flying Lines is an independent CL newsletter serving the Pacific Northwest. Northwest competition records and standings, and the region's CL bulletin board. It contains detailed contest results, technical columns, an extensive contest calendar and classified ads. Subscriptions are \$14.50 (\$18 Canada). *Flying Lines*, c/o Mike Hazel, 1073 Windemere Dr. N.W., Salem, OR 97304.

Hangar Talk, published by the Cholla Choppers of Tucson, Arizona, contains club news, technical tips and Southwest CL and contest news. *Hangar Talk*, c/o Albert Gluck, 5810 E. Chiracahua Tr., Tucson, AZ 85715.

Hi-Low Landings is the newsletter of the Navy Carrier Society, the special interest group for Navy Carrier fliers. It's a professional-looking publication full of contest results, national standings, technical tips and photos. *Hi-Low Landings*, c/o Michael Pugh, HCR 51 Box 220, Stephenville, TX 76401.

The Hot Head is the newsletter of the Vancouver Gas Model Club of British Columbia. It includes western Canada CL and FF news, a contest calendar and classified ads. VGMC, 2929 E. 22nd Ave., Vancouver, B.C., V5M 2Y3.

Jets caters to the pulse jet enthusiast and is of particular interest to jet speed fliers. It contains technical and historical articles.



Gordon Delaney of Salt Lake City wowed the spectators with his beautiful—and beautiful sounding—twin-engined CL stunt plane. It's powered by two O.S. 35 engines.



Subscriptions are \$12 per year (\$15 international). *Jets*, c/o Al Doyle, P.O. Box 60311, Houston, TX 77205.

MACA News is the official publication of the Miniature Aircraft Combat Association. It has combat-related articles, advertisements, contest calendar and results, and lots of discussion of combat issues. National standings are published periodically. Dues are \$15. *MACA News*, c/o Chip Giordano, P.O. Box 1000, Toms River, NJ 08754.

New England Combat News is an independent newsletter for combat enthusiasts that concentrates on Northeast contest ac-

tivities but is a "must read" for all combat fliers. It's chock-full of product ads, technical tips, contest news, schedules and aircraft plans. Free to New England competition fliers or donors to the New England contest fund, \$6 for others. *New England Combat News*, c/o Neil Simpson, 129 Podunk Road, East Brookfield, MA 01515.

Circlemasters Flying Club contains news of the Milwaukee, Wisconsin area. The newsletter features an area events calendar, airplane drawings and product news. Dues are \$9 (\$4.50 for modelers 12 to 19 years old)

continued on page 84

Not all the color was in stunt. Here's a hot pink Class A Speed plane campaigned by Ron Salo of Richmond, B.C.



A PAINTED FINISH FOR PATTERN PLANES ON A DIET NOW THAT'S LIGHT!

BY WAYNE APOSTOLICO AND GENE RODGERS

A show-quality paint finish that weighs as little as MonoKote? You bet!

A painted finish that looks great and adds only seven or eight ounces is the result of careful finishing techniques. The better control line stunt fliers have been doing this for years. There's no reason pattern planes can't use many of the techniques that have produced so many PAMPA award winners.

You can finish your pattern plane in paint as light as MonoKote by following the process described here. Many pattern pilots struggle to keep their models as light as possible and have, therefore, gone to MonoKote or other heat-shrink films. With the techniques presented here, you can combine light weight with a beautiful trophy-winning painted finish.

I was pleased with my all-balsa Diamond Mark III and its 11-ounce finish (5-1/2 ounces of glass cloth and Safe-T-Poxy over balsa and 5-1/2 ounces of paint over the glass). Gene Rodgers promptly unveiled his LA-1 with a finish of six ounces *complete*. Both techniques are the same, except I used a glass base and Gene used a dope-and-silkspan base. The latter technique is presented here, as it's the lightest method we've found. Using these techniques, my new Sapphire's finish, complete, weighs eight ounces.

SURFACE PREPARATION

It is essential that your wood and glass surfaces be finish-sanded smooth with *open-coat* 320-grit sandpaper. Open-coat sandpaper is resistant to clogging and is generally white in appearance. All dings and dents need to be filled and sanded. We use lacquer glazing putty.



Examples of what can be done with the techniques presented here are Gene Rodgers' LA-1 (above) and the author's Diamond Mk III (below). The LA-1 uses the silkspan-and-dope technique described in the text to provide a base for the finish, while the Diamond has glass over balsa—more durable, but at a weight penalty of 5 ounces over the LA-1.



After sanding the surface smooth, two coats of Sig Lite Coat clear butyrate dope are brushed full-strength on the balsa surfaces. Dope dries quickly and can be easily sanded with open-coat 320-grit sandpaper. We use a Styrofoam sanding block because it gives slightly to conform to the shape of the surface. I also use two 3/4-inch pieces of plywood glued together to give a solid, straight, 1-1/2 inch thick surface for sanding. Sand off the balsa fuzz and insure that the surface is smooth.

Now you're ready for the next

with the same brand of thinner that you will use later in the paint. We use R&M Thinner PNT88. The bottom surfaces are covered first, then the top.

After the edges are dry, the surface is lightly spritzed with water to tighten the silkspan and remove wrinkles. When the water dries and the silkspan has shrunk, thinned Sig Lite Coat clear dope is brushed through the silkspan to attach it to the underlying surface. You may have to work out air bubbles with your fingers to insure that the silkspan is securely attached

to the balsa. Trapped air bubbles will expand when exposed to the sun and make your beautiful surface pucker with air bubble zits. Not a pretty sight!

When the dope has dried, you can remove

the overhanging silkspan by folding the extra back over itself and using 320-grit sandpaper to sand off the excess. Dope the edges down and when dry, sand off the fuzz.

FILLING THE SURFACE

The next step provides the smooth foundation upon which the quality of the final finish will depend.

Scented or unscented talc (baby powder) is poured into Sig Lite Coat dope that's been thinned 50 to 75% with the same lacquer thinner as previously used. The mixture is stirred to place the talc in suspension. The excess will fall to the bottom of the jar—don't worry,

this is normal.

Three coats are applied to all top surfaces and two coats to the bottom surfaces, allowing each coat a couple of hours drying time. Dry sand the dope and talc

mixture between each coat with 320-grit open-coat sandpaper.

Let the base coats of this slurry mixture dry at least two days. You can use your attic (if you have one) in the summertime to force dry. If you don't use forced drying, several days of drying at room temperature are needed to gas off the solvents. Sanding the final coat prematurely will result in a very smooth finish initially but will show surface imperfections over time as the solvents gas off.

SANDING

Use 320-grit open-coat sandpaper with a block to sand the surface. The idea is to remove all of the excess filler without cutting into the silkspan fibers. If you do cut into the fiber, it will be necessary to apply more of the slurry mixture to the affected areas, let dry and resand. Experience has shown that about 1/2 ounce of weight (after sanding) is added per coat of the slurry mixture on an 800 square inch wing surface.

The surface should have a slight sheen to it after sanding. If it doesn't, add another coat of dope/talc slurry and allow to dry. Dry sanding, although dustier, is recommended over wet sanding, as wet sanding cuts so fast that you can



Author recommends using a gram scale such as this one to keep an accurate track of how much weight is added with each step.

easily cut into the silkspan fibers. Use a good-quality dust mask when sanding.

PRIMER

The next step is simple and fills all of the minor surface imperfections that remain.



To fill the grain of the balsa surfaces, the shaped and sanded parts are covered with 00 silkspan, doped in place.

step—applying the silkspan. Dope and silkspan over balsa isn't quite as bulletproof as a glass-covered surface, but it's the tradeoff you have to make to save five or six ounces of glass and epoxy. We are using 00 silkspan, much like the award-winning control line stunt finishers use.

COVERING

The 00 silkspan is cut with



Overhanging silkspan is trimmed off with 320-grit sandpaper.

one to two inches of overlap around all edges. It is laid over the surface dry and attached around the edges with Sig Lite Coat butyrate dope, thinned 50 to 75%. The dope is thinned

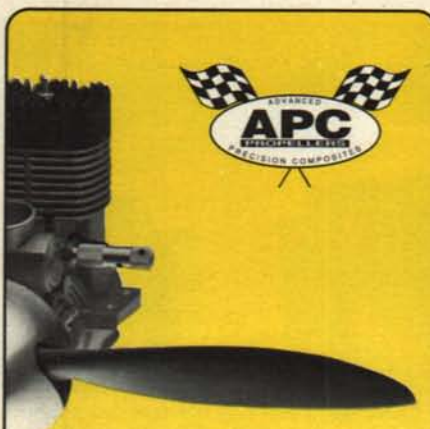


To get the lightest possible finish, it's important that there be no overlapping colors, i.e., no multiple thicknesses of paint. For masking between colors, the very best results are obtained with Scotch brand Fine Line masking tape.

Shoot a light coat of Dupont or R&M gray lacquer primer thinned 50 to 75% with R&M Acrylic PNT88 lacquer thinner. Because the primer has a color base to it, wet sanding is preferred—you can see how fast



An example of graphics sprayed on through stencils. Materials and techniques for making your own stencils were described in the author's article, "The ABCs of Airbrushing," which appeared in the June '92 Model Builder.



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11 x 3, 4, 5, 6, 7, 8, 9	\$2.49
11.5 x 4; 12 x 6, 7, 8;	\$2.89
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9 x 6; 10 x 6, 7, 8; 11 x 6, 7	\$3.95
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COMPETITION:

6.3 x 4; 6.5 x 3.7; 7.8 x 4, 6, 7; 9 x 6.5, 8.5; 9.5 x 6.5N, 7N, 7.5N, 8N, 8.5N; 10.5 x 4.5	\$3.95
11 x 10, 11, 12, 12W, 13, 14;	
12 x 9, 9W, 10, 10W, 11, 11N, 11.5, 12, 12N, 12.5, 13, 13N, 14; 12.5 x 9, 10, 11, 11.5, 12;	
12.5, 13; 13 x 9, 10	\$7.95
13.5 x 9, 10, 12.5, 13.3, 14; 14 x 6, 8, 10, 12, 13, 13.5, 14; 14.4 x 10.5, 12, 13, 14.5 x 14N; 15 x 8, 10, 11, 12; 16 x 8, 10, 12	\$12.95

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your sandpaper is cutting as the color disappears.

Sand off virtually all of the primer. The objective here is to fill the paper weave with primer. Be careful not to sand into the silkspan fibers or it will be necessary to repeat several steps, starting with the slurry mixture to reseal the surface.

Now inspect the surface carefully. Low spots or surface imperfections can be identified by using backlighting reflected across the surface. Hold the wing up to your eye with a lightbulb or flashlight at the other end of the wing pointed at you and reflecting off the surface. Any imperfections will show up as shadows, and will be quite noticeable. These surface blemishes should be filled with acrylic lacquer glazing putty; it comes in red and gray colors in tubes. Choose the color most suitable for your needs. The longer you can allow the entire project to dry before final sanding, the better.

SILVER COAT

The next step is to shoot a dust coat of silver. The purpose of the silver coat is to give a uniform base color, over which final colors are painted. This dust coat is sanded lightly with 320-400 sandpaper, either wet or dry. Do not sand through the silver coat!

COLOR COATS

You can save weight on your aircraft by color coating only those areas that are to be final finished in that color. For example, let's say you are using blue and orange trim on a white base color scheme. None of the colors should overlap. The traditional method of finishing is to paint the entire aircraft white and then paint your trim colors over the white. You now have two colors on the surface, a base white coat and trim color covering the white. Why add the extra weight? Mask off each color separately so that no color overlaps any other color. It's more work, but you definitely save weight.

Use one color coat only, which consists of a dust or tack coat and then a heavier coat for coverage. Look for consistent color only, not a heavy flow gloss coat. It won't be very glossy at this stage; this is okay, as we're going to sand the color surface which will dull the finish anyway. Don't worry, we'll bring the gloss out at a later stage—the surface will gleam like a mirror.

After the first color coat has dried, you can pull the tapes and mask the second color. The same spraying process is applied, with a tack coat first and then a color coat sprayed for consistent color. Don't load up the surface with unnecessary color, as excess paint only adds weight.

SANDING COLOR COATS

Use 400-grit wet/dry sandpaper with a Styrofoam sanding block and block sand the color coats to a smooth, dull surface with no imperfections. If you've done your base coats properly with proper filling and sanding, you'll have a color surface that is smooth but

dull at this point. Gloss comes later.

DECALS

We're at the stage where your decals and lettering are applied to the surface. Small lettering is done with dry transfers, which is like a decal but doesn't have to be dipped in water to transfer it to the plane's surface. You simply lay the letter or number against the surface and gently burnish the backing sheet to transfer the character from its waxpaper backing to the plane's surface.

Dry transfer lettering is available at stationery or art stores in various type styles and sizes, and is a great way to personalize your aircraft. The transfers will be sealed with a clear coat in the next step.

You will need a good gram scale to track the weight gain as you go through your finishing process. Weigh all of the parts before and after each stage of finishing to track the weight increase, and keep a log for future reference.

CLEAR COAT

One coat of clear lacquer, thinned 50 to 75%, is now applied over the color. The clear coat consists of a dust or tack coat, then a light flow coat.

Let the entire project dry *completely* before you proceed to the next step. The longer you let it dry, the more permanent your glossy finish will become. If you wet sand and rub out the surface before the color/clear coats have gassed off their solvents, you will have a brilliant, glossy surface...but not for long. As the solvents gas off, the surface becomes microscopically irregular and loses its brilliance.

You may be able to salvage the surface with more rubbing compound, but you only have a very thin layer of clear coat on the surface, much of which has already been sanded and polished away. It's likely that you'll sand and polish right into the color coat, which will not be as durable to fuel stains, cleaning fluids, etc. If you can let your project dry for a couple of weeks before final sanding and compounding, you'll have a finish that looks good and will last indefinitely.

After the clear coat dries as noted above, wet sand the surface with 1000-grit sandpaper until the surface is dull in color. You can now compound the surface to bring it to a mirror finish. Elbow grease and two to three evenings of work is required to bring out a show-stopping finish. We use white Turtle Wax polishing compound and a smooth cotton cloth, usually from an old T-shirt.

PREPARING A GLASS FUSELAGE FOR FINISH

Glass fuselages have a center seam that needs attention before moving into the priming and painting stage. An X-Acto blade works well in scraping the seam smooth. A sanding block with 280-320 sandpaper is then used to further smooth the seam. Bubbles in the glass seam can be filled with

continued on page 47

peanut scale

MICROPLANO VELOZ

THREE-VIEWS ARE NICE TO HAVE, BUT IN THE CASE OF A RARE BIRD, ONE SOMETIMES MUST RESORT TO A LITTLE CALCULATED FUDGING IN ORDER TO PRODUCE A SET OF BUILDING PLANS. BEING A FUDGER FROM WAY BACK, WALT HAD NO DIFFICULTIES!

BY WALT MOONEY

(Back by popular demand! This is another in a series of Peanut plans by the late Walt Mooney that appeared in Model Builder in the 1970s. But to continue the series, we need your help. We'd like your Peanut and Pistachio plans for future issues. Submit them to Model Builder, 34249 Camino Capistrano, Capistrano Beach, CA 92624.)

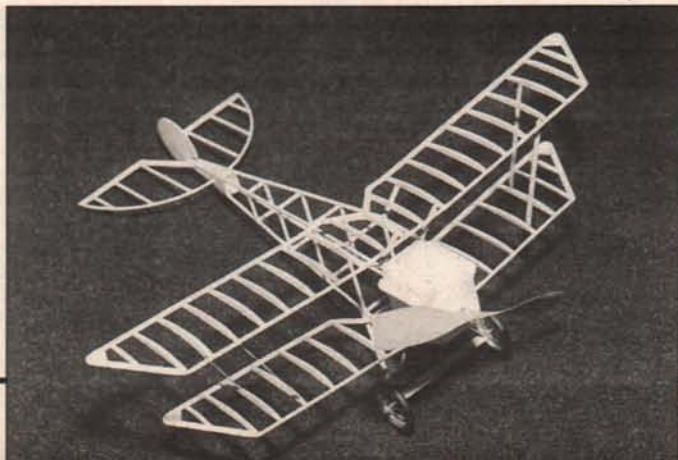
Several months ago I purchased a copy of the 1919 issue of *Janes All the Worlds Aircraft*.

Like I always do when I get another source of three-views, I went through it to see if there were any interesting designs for a model or two.

Hola! Que tal? There was a real interesting airplane—a biplane fighter designed and built in Mexico during the last year of WWI. Now I'd never seen a Mexican biplane from this era, so it immediately took my eye. It was a very simple aircraft to model, with a different configuration, while still retaining

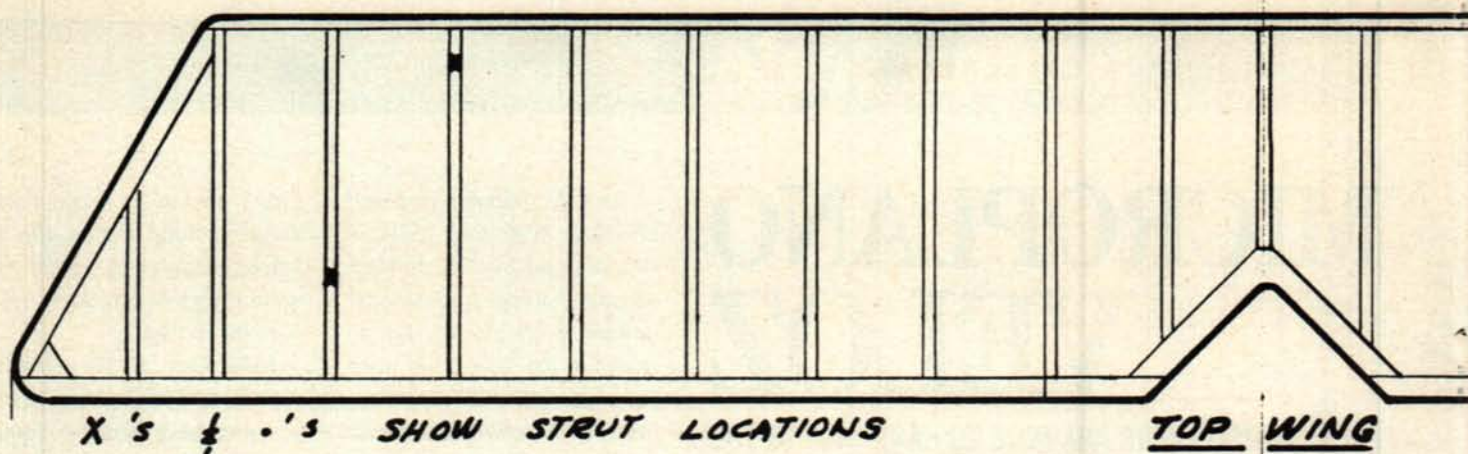


Bones of the Veloz display the easy construction resulting from its squarish lines. You may want to add a spar to the top surfaces of the wings to prevent them from bowing upward when the tissue shrinks—see text.

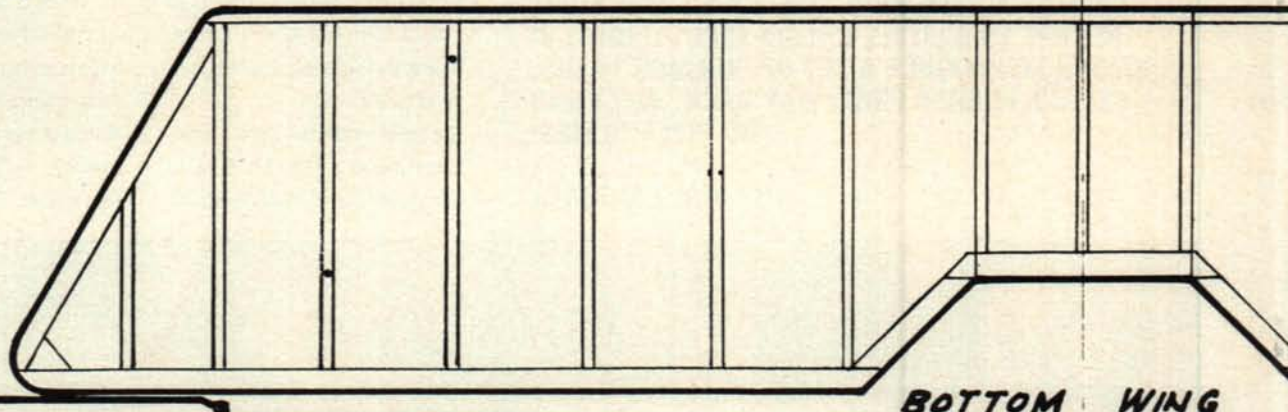


that vintage look.

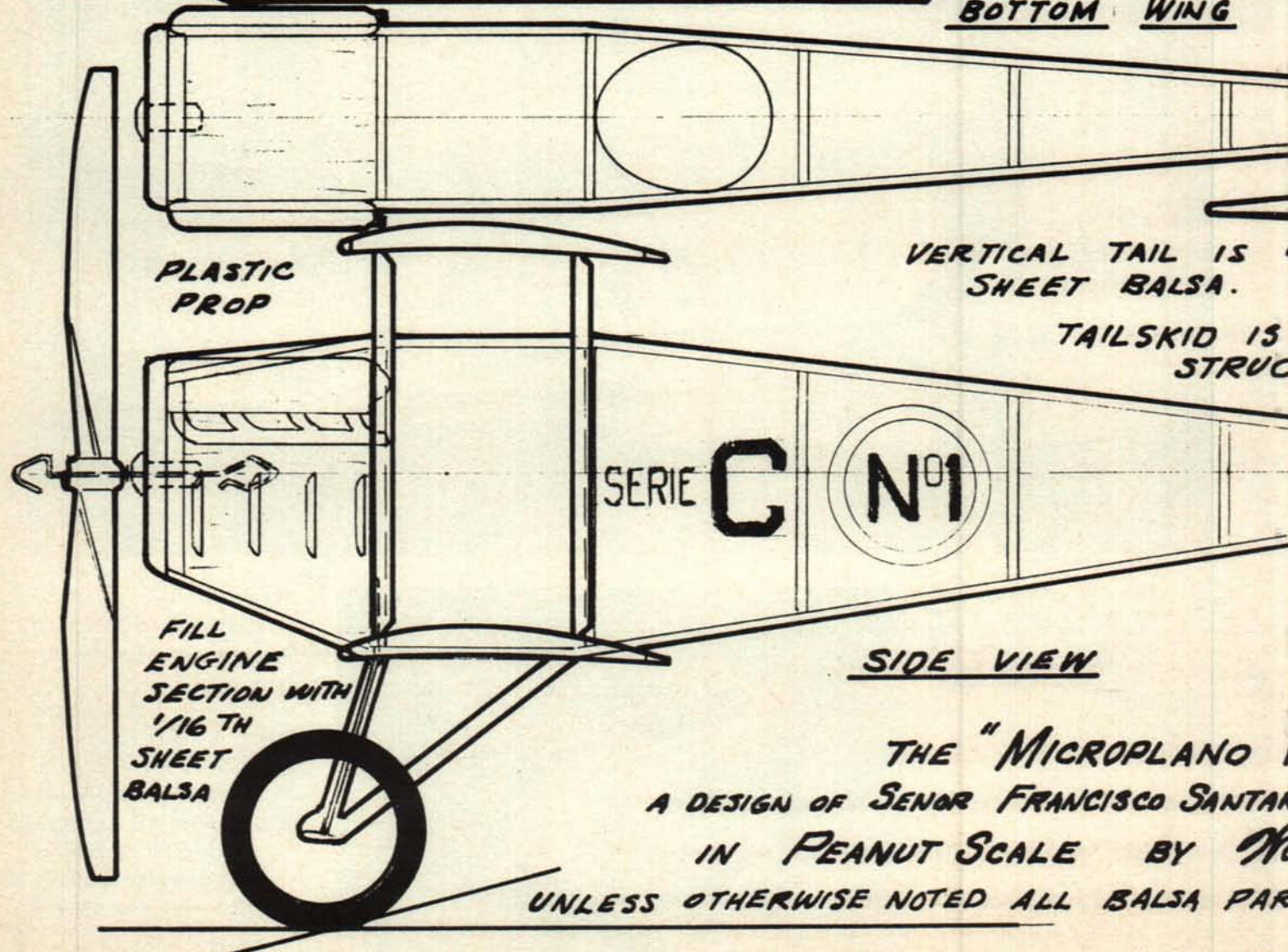
Unfortunately, there was no three-view—but wait a minute! There were good photos, one of them an exact side view, and another of the airplane uncovered, showing lots of detail and all the cross sections. The others give a good look at the wing and tail planform. Also, all the important dimensions are there.



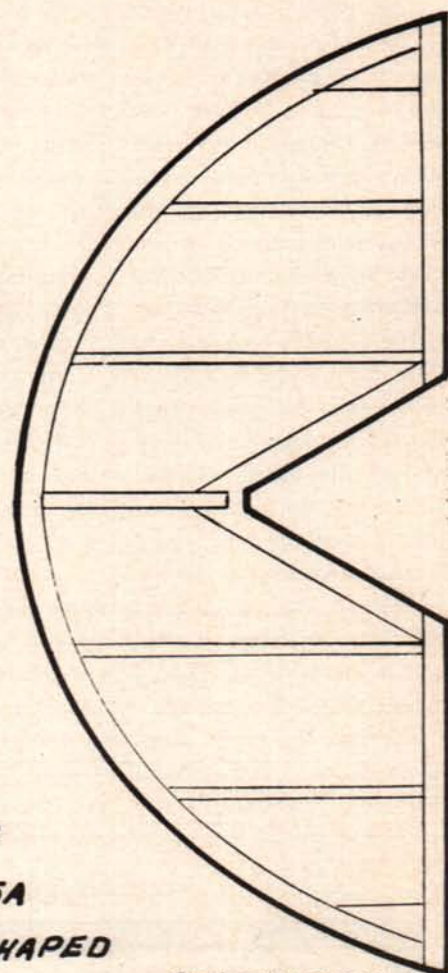
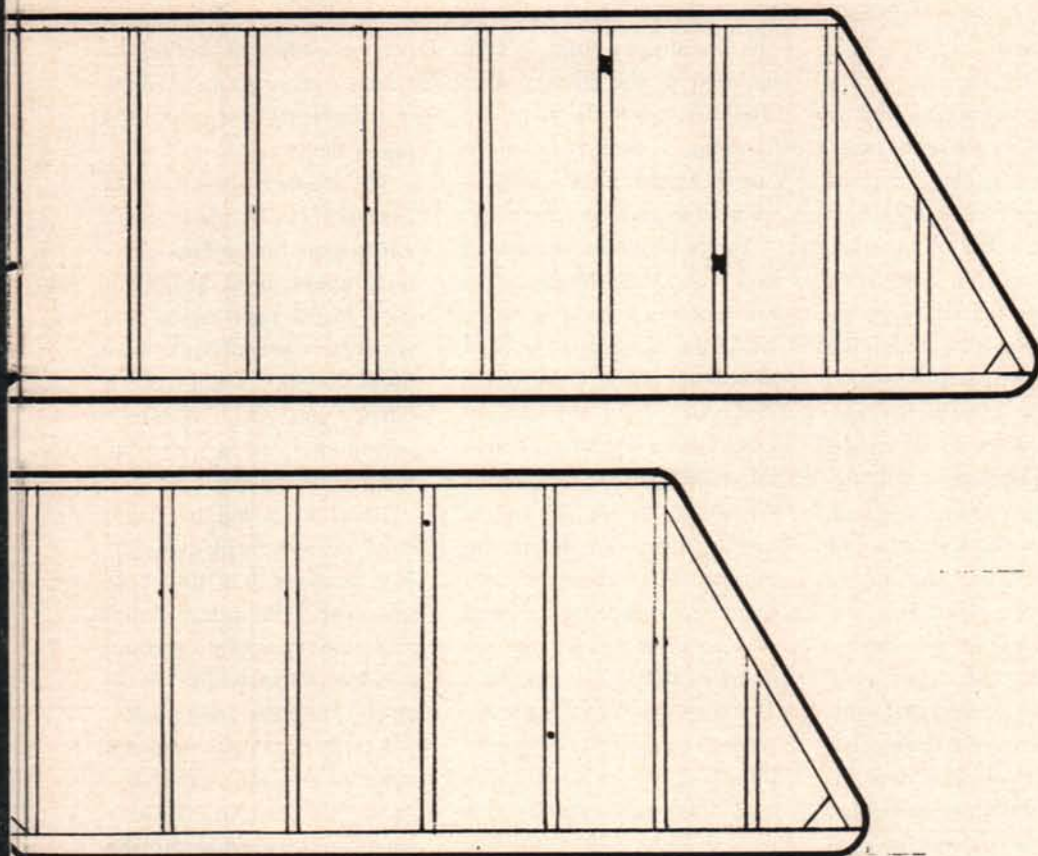
TOP WING



BOTTOM WING



THE "MICROPLANO"
 A DESIGN OF SENOR FRANCISCO SANTANA
 IN PEANUT SCALE BY N
 UNLESS OTHERWISE NOTED ALL BALSA PAR



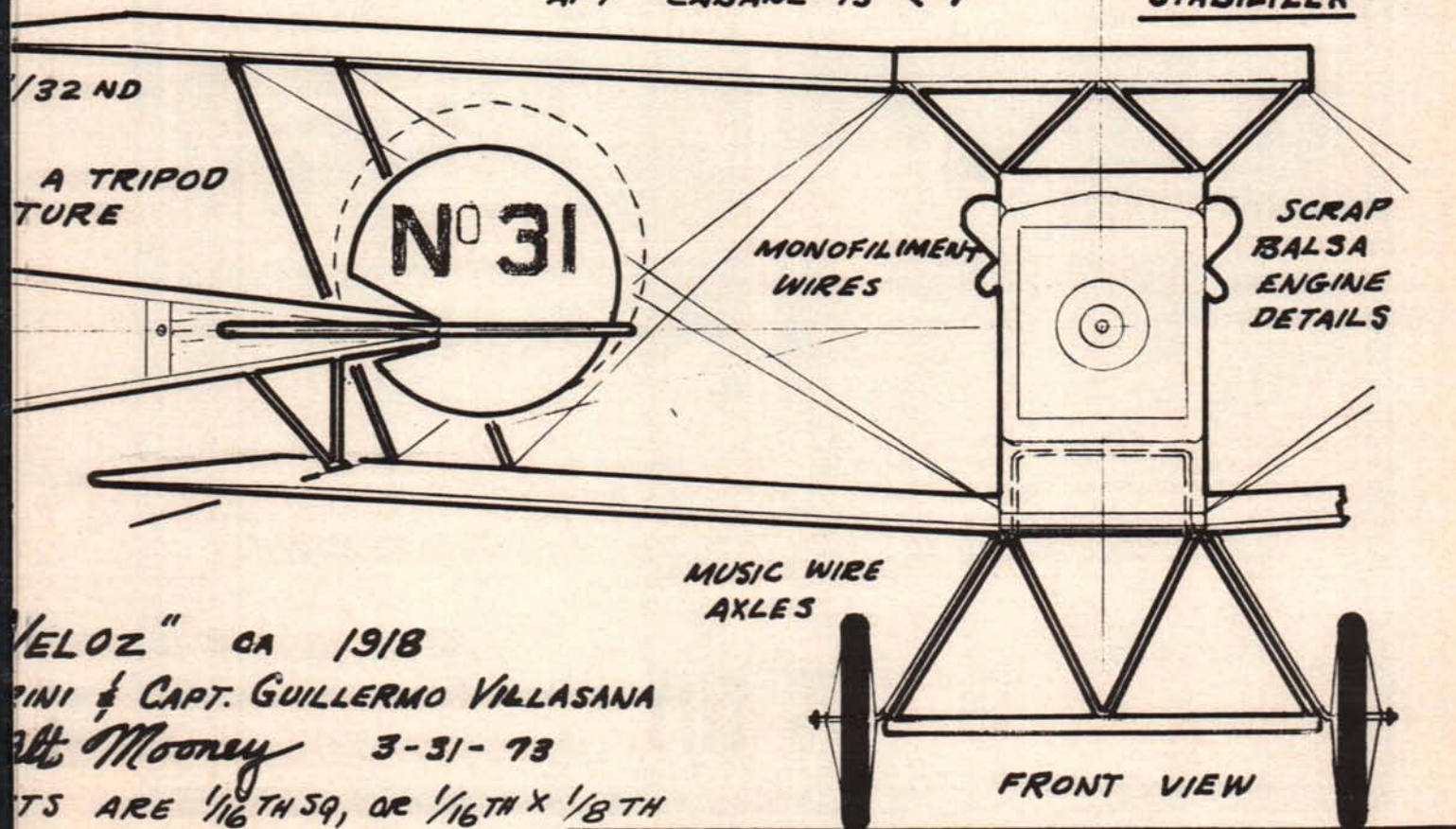
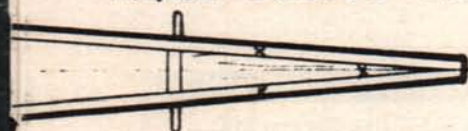
MAKE STRUTS FROM $1/64^{TH}$ PLYWOOD OR

$1/32^{ND}$ HARD Balsa

FWD CABANE IS W SHAPED

AFT CABANE IS \ /

STABILIZER



"VELOZ" ca 1918

INI & CAPT. GUILLERMO VILLASANA

alt Mooney 3-31-73

TS ARE $1/16^{TH}$ SQ, OR $1/16^{TH}$ X $1/8^{TH}$

Sooooo, in the best tradition of military intelligence, and with a great deal more to go on than one usually gets for that type of job, I developed the three-view and the Peanut Scale version shown here. Intentional deviations (also called "premeditated inaccuracies") from scale include the addition of dihedral and an enlarged horizontal tail.

The model is quite easy to build. Its fuselage is simply a square box structure without formers or stringers. The wings are built using the conventional leading and trailing edge and ribs. The horizontal tail is conventional and the vertical is made from sheet. The nose is filled with balsa sheet on the sides and bottom, and the top nose uses a thicker piece carved to shape.

It is really the details of this model that make it different and therefore interesting. For instance, the tailskid is made of

three pieces as a tripod, with its apex towards the ground. The wings have no stagger; that is, one is directly above the other. There are only two interplane struts on each side, but the front strut is nearer the fuselage than the rear one. The lower wing leading and trailing edges are actually below the body. The vertical tail is a circular disc with a notch in it to clear the fuselage.

All the struts on the model were cut out of 1/64-inch plywood. Hard 1/32-inch sheet will also do, but the plywood works great. The front cabane strut is a "W" in front view. This was assembled over the plans before attaching it to the upper wing. The forward landing gear struts are attached to the lower wing structure and the rear ones are cemented to the fuselage bottom longerons just behind the wing.

The wire landing gear is made to lay just along the outside of

the forward gear struts. It is not bonded to the struts and is therefore free to flex in a hard landing. Fulton Hungerford spoke wheels were used because they look so good.

Engine details make the front end worthwhile. Make up the valve covers from scrap balsa. Make the exhaust stacks from aluminum tubing. If the tubing you have is hard, and kinks or cracks when you try to bend it, anneal it (make it soft so it bends easier). To do this, first light a candle, then run the tubing through the candle flame until the tube is completely covered with soot. Let it cool, wipe off the soot, and proceed to bend. This annealing technique really works. I learned it from watching an experienced metalsmith as he used it on a much larger scale in order to form the first aluminum cowl for the prototype Helio Courier. He used an

acetylene torch to soot up the panels and anneal them whenever they got work-hardened by his forming tools.

The propeller used is one of the North Pacific plastic ones, cut to size, and a Peck-Polymers nylon thrust bearing is used in the nose block. The wings have a tendency to bow up as the dope shrinks. If this offends you, add a 1/16-inch square spar notched into the top of the wing ribs.

The vertical tail has been enlarged from the plans by 1/8-inch diameter. It is still a little too small. The model Dutch rolls some. I would recommend a rudder 1/4-inch larger in diameter than shown on the plans.

As for the numbers, don't ask me why the fuselage has a No. 1 and the tail has a No. 31. That's what the photos of the real plane show, so I put it on the model. "And that's the truth!" **MB**

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Wing Area: 840 sq. in. Engine: 1.20



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Fresh Aire II
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Wing Area: 900 sq. in. Engine: 1.20



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Wing Span: 66" Weight: 8.5-9.0 lbs.
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THAT'S LIGHT! continued from page 42

baking soda and CA glue. Bob Violett's pinhole filler can also be used. Resand the seam after filling.

The next step is to block sand the fuselage with 320-grit open-coat paper to remove the high gloss. The surface is now ready to prime with acrylic lacquer primer thinned 50 to 75%. Most of the primer will be dry sanded off with 320- to 400-grit paper.

Any remaining surface pinholes can be filled with lacquer-based glazing compound, available in tubes at auto finish stores. Spread the filler into the pinholes with a razor blade and sand smooth after drying. Prime the surface over the glazing compound. It is recommended that the surface be allowed to sit for a few days before final sanding, to allow the solvents to gas off.

A final sanding with 400-grit paper will prepare the surface for the silver color. Sand the primer down to the glass, leaving just the surface imperfections filled with primer.

SILVER COAT

The next step provides a uniform silver color base upon which top colors are added. Omitting the silver base will require a much heavier color coat to obtain a uniform opaque color.

A silver "dust coat" is sprayed to cover the surface. This coat is thinned 50 to 75% and is not sanded. The remaining color coat process is the same as previously described.

As you progress through the process of finishing your project, careful weighing of each step will allow you to monitor how much weight is being added. If you've followed the process described above, your finish will weigh no more than six or seven ounces, be durable and look great.

TOUCH UP: DINGS, DENTS, HANGAR ZITS, ETC.

Acrylic lacquer is a real joy to work with. It goes on nicely, polishes out like glass, is light and you can spray colors almost as fast as you can pull the tapes, remask and shoot another color.

Another advantage is ease of repair. Simply do your woodwork using standard repair techniques, then reprime, sand, shoot color, clear, let dry, sand and rub out. You won't be able to tell there was a repair done after you finish sand the area and compound the surface. Spot repairs are easy with acrylic lacquer.

FUEL STAINS

Exhaust residue hasn't affected our planes, but raw fuel, if allowed to sit on the surface, will cause it to fog. Use a little extra care to see that raw fuel doesn't sit on the surface. If the surface fogs, it's simply a matter of rubbing out the surface with a little compound and the shine will return. **MB**

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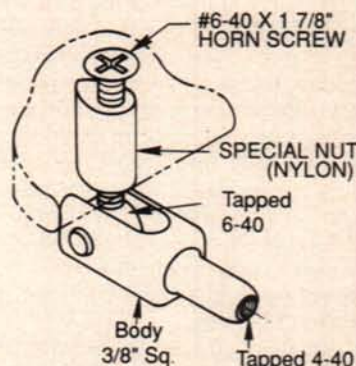
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BY CURT NEHRING & ROSS THOMAS

Great Planes' Spirit 100 RC Sailplane

TWO FOR ONE! THE OPTION TO BUILD EITHER A POLYHEDRAL SPORT WING OR AILERON/FLAP COMPETITION WING MAKES THIS ALL-WOOD SAILPLANE SUITABLE FOR NOVICE AND EXPERT FLIERS ALIKE.

Geez, that's a lot of wood!" That was our first impression after opening the large, full-color carton containing Great Planes' Spirit 100 sailplane. It's a Standard Class competition glider with a 99-1/2 inch wingspan, wing area of 946 square inches, flying weight of 50 to 65 ounces, and a wing loading of 7.6 to 10 ounces per square foot.

The kit itself was neatly packaged, the wood rubber-banded and grouped in stacks of like material, while the hardware and assorted miscellaneous accessories were supplied in sealed packets. Plans are printed on a large, nicely finished single sheet. Reproduction quality is among the best we've seen, with clearly legible descriptions of each item. The Spirit 100 comes with a 56-page, step-by-step construction booklet that features concise, thorough explanations of everything from parts to tips on thermaling. For a scale-like appearance, an unpainted, vacuum-formed cockpit insert with pilot and clear canopy is also included.

The kit includes all of the parts required to build either of two wing options: Wing #1, a polyhedral design with optional spoilers, makes for an easy-to-fly sailplane that will stand up to the rigors of everyday flying. It uses the Selig 3010 airfoil, which yields a wide speed range. Wing #2, for more advanced fliers, has the Selig 7037 airfoil along with flaps and ailerons.

Because we chose to build the latter, we needed a radio system that could meet the special needs of a high-performance competition sailplane.

Versatility and an almost unlimited capacity to provide full-house glider applications were the reasons for selecting the Airtronics Vision (VS8SP) radio for the Spirit 100's guidance system. Obviously designed with the radio control soaring enthusiast in mind, the VS8SP can address all necessary functions needed for a competition sailplane, including CROW, rudder/aileron mixing, differential, flaperons, extensive camber changing, and preset launch and thermaling modes. Although the VS8SP is



Avid soaring enthusiasts Ross Thomas (right) and Curt Nehring both belong to the Harbor Soaring Society, one of several prominent Southern California glider clubs.





our radio of choice, we're certain that virtually any less sophisticated six-channel system with mixing capabilities would be adequate, though substantially limited in performance.

BUILDING THE SPIRIT 100

Assembly begins with the empennage, which is of built-up balsa construction. The elevator is pre-tapered solid balsa and needs only to be trimmed and shaped. The completed structure is light, extremely rugged and highly functional, although rather squarish in appearance. Using a French curve, and without sacrificing strength, we took the liberty to make a slight cosmetic change in the shape of the vertical stabilizer, providing an eye-catching sweep to the tail. This portion of the kit builds very quickly and was ready to go in just over an hour.

Assembling the inboard wing panels could be confusing to the less proficient builder, because the framework is assembled over a drawing that represents both the polyhedral and straight-wing versions. It is a very "busy" drawing and there is a slight difference between the two wings, so careful attention is recommended.

Die-cutting was superb; the ribs virtually fell from the sheets. Part numbers embossed in the wood were barely legible and required

marking, as directed in the instruction booklet.

Handy plywood clamps and gauges are supplied in the kit as devices to aid in assembly and alignment of wing parts. These items are quite helpful in avoiding the temptation to "eyeball" for straightness.

One of the first things we noticed in selecting wood parts from the box is that the general appearance is good. We did find a substantial weight difference in the sub-trailing edges, a few repairable gouges and a knot critically located in the middle of a piece of spar material. We chose to replace these parts to insure the integrity of the wing.

A few interesting observations were made during the initial assembly of the inner panels. The spars are basswood, not spruce. No wing rib cap strips are used, and shear webbing is applied to the fore and aft faces of the spar. There is also no spar doubler or other reinforcement immediately outboard of the wing joiner box. In our case, winch-launching is the rule rather than the exception, so structural rigidity in this area is heavily considered when constructing any wing. We were tempted to strengthen the wing with carbon fiber, but didn't. Because this was a review model, most of the changes we made were purely cosmetic. A fellow club flier who was also flying a Spirit 100 had experienced severe cracks where the wings meet at the trailing edge over the flap linkage canal, and cautioned us about the potential for failure. We eliminated the linkage by using two flap servos, one in each panel, and reinforced that area with 1/32-inch plywood.

One unique feature is the use of aluminum, pre-angled and sandwiched between laminations of plywood, to form the wing joiner. The end result is incredibly efficient and definitely a noteworthy addition to this kit.

The outer panels are of simple design to provide a satisfactory amount of polyhedral, providing additional stability. They assemble in the same fashion as the inboard wing, except for the D-tube sheeting (which could be easily added if so desired).

Wingtip blocks are provided and need only a small amount of sanding and shaping. When finished, the Spirit 100's two-piece wing is held in place by four nylon bolts, two per side. We opted for two mini and two micro servos, boxed into the wing to operate the flaps and ailerons. The kit supplies hatch covers. We used MonoKote hinging on all control surfaces with the exception of the rudder, where Easy Hinges are easily adapted.

The fuselage is one of the simplest we've seen. Balsa sides and plywood formers interlock in "jigsaw" fashion, providing ample strength. To insure airframe integrity, a liberal application of balsa doublers and triplers are secured to the inner fuselage sides, strategically placed from nose to tail. For those of us who are contest-oriented

continued on page 80



Typical of Great Planes kits, the Spirit 100 is exceptionally complete. Two full sets of wing ribs are provided for assembling either the polyhedral sport wing or the flap/aileron competition wing—your choice.



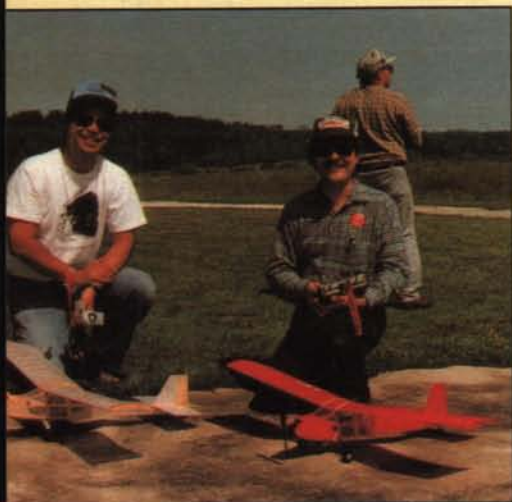
Completely conventional built-up wood construction is evident here. Instead of using one servo to deploy both flaps, as shown on the plans, the authors gave each flap its own servo, located in the wing roots. Aileron servos will be installed just outside the polyhedral break. Note the absence of leading edge D-tube sheeting on outboard panels.



Left: Terry McGill with his seven-cell/05 Stinger. No specifics on motor type, but the model is impressive in the air. Jerry Holcomb photo. Above: Jerry Holcomb explains his nearly completed Piper Pawnee Ag plane. An Astro Cobalt 40 is installed and promises good results with the sport scale project.

CELEBRATION OF

SEE WHAT FERTILE IMAGINATION AND GOOD



Far Left: Ben Almojuela and Bernard Cawley with their Showmasters. Jerry Holcomb photo. Left: Tom Brightbill with his Dodgson Saber, one of the best of the modern Open Class soaring machines, prior to putting in some impressive flights off the winch. Above: Ben Almojuela's "Showmonster" is a double-size copy of Ken Willard's Showmaster, powered by an Astro 60 on 24 cells.

A welcome "rite of spring" for Pacific Northwest modelers is the first organized electric flight event of the season, the annual Celebration of Silent Flight. Sponsored jointly by the Evergreen Model Aircraft Club (EMAC) and the Portland Area Sailplane Society (PASS), 1992's edition took place over the weekend of May 2-3.

Last year's inaugural was a one-day fly-in that enjoyed virtually perfect early May

weather; this year, organizers Jerry Holcomb (EMAC) and Barry Kurath (PASS) planned for the whole weekend. Saturday was nearly a repeat of last year, with temperatures nudging the 70s and moderate winds generally following the runway heading at the Fern Prairie Modeler's field at Washougal, Washington, located at the edge of the Columbia River just northeast of Portland, Oregon. A total of 33 fliers showed up

with a varied mix of 62 electric and soaring models, and Saturday saw constant flight activity.

A sailplane winch was set up in an area that did not interfere with electric flight operations off the runway, and a number of RC hand-launch fliers used an area in a far corner of the field. This decentralized operation was kept organized by a transmitter impound and an efficient flightline control sys-

tem that limited the number of models in the air at any one time. There were no conflicts either of frequency or of air-space over the entire weekend.

I wish those of you still "on the fence" about electric flight could have seen Saturday. A wide variety of airplanes flew consistently throughout the day. Many powered gliders were in evidence, too. The only organized event of the weekend was on Saturday: an all up/last



Left: An overview of "sailplane row" on Saturday morning. Above: Not complete in time for flight, this really pretty PT-19 by Roger Breedlove was scratch-built from plans. Uses a Hobby Lobby seven-cell motor with belt reduction.

SILENT FLIGHT

EQUIPMENT CAN BRING TO ELECTRIC FLIGHT!

BY ROBERT A. BENJAMIN



Left: Randy Smith is justifiably happy with his new Goldberg Cub with geared Astro Cobalt 25. Randy chose to modify the Cub by eliminating the ailerons; with extra dihedral it flies excellently. Jerry Holcomb photo. Above: Jerry Holcomb hovers his Kyosho Concept EP helicopter for professional cameraman Brian Walker. Notice the straight-out wind streamer to the left of the heli!

down flight based on a 21-cell battery limitation. This was won by Rob Woods, flying a beautiful red Playboy Cabin based on the Leisure kit. The duration task was made more interesting by the requirement that all models descend on call at one point during the flight, pass under an imaginary ten-foot "limbo" obstacle, then reascend under power to look for new lift. This effectively removed the luck factor that might have

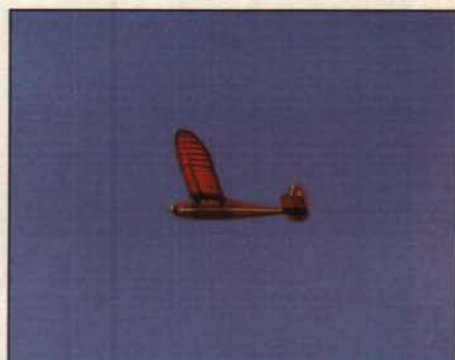
been introduced by finding a super thermal early on.

Outnumbering the soaring types was a wide assortment of sport aerobatic and scale electrics. Typifying this new look in electric flight was the tableful of small, high-performance airplanes ranging from flying wings to fighters, brought by Larry and Roland "Pete" Peterson of ModelTronics. Pete explained that they have chosen to concentrate on optimiz-

ing what can be done with small motors. They offer several custom-built ferrite motors designed for operation on six to eight cells that will perform on a level with the cobalts. Pete's "Pure Wing" and "PsychoMax" designs are capable of legitimate straight-up performance! They are introducing an all-foam, fun-scale Spitfire of 56-inch span that flies as though it had a hot glow .25 on board.

Ben Almojuela and Bernard

Cawley came down from Seattle with a car full of airplanes that included a pair of Showmasters, built from a Ken Willard design intended for limited-area flying with 1/2A glow engines. Ben and Bernard fly theirs on 02/035 Astro Cobalt motors and do justice to Ken's original intent—but it is Ben's "other" airplane that grabs your attention. Ben doubled all the Showmaster dimensions and came up with the "Show-



Left: Lohring Miller grabbed everyone's attention with his experimental autogyro. A rotor design based on a magazine article was mated to a Great Planes Electrobreak fuselage; eight cells and a direct drive Astro Cobalt 05 weren't quite enough for sustained flight. Tests on Sunday after the fly-in was over proved that it is stable and controllable, but needs a little more power. Above left: A BODST RC hand-launch glider flown by fourteen-year-old Dale Bamberg poses for the camera. Dale's dad Mike built the airplane, and Dale was doing a fine job of flying it. Above right: Rob Woods' Leisure kit Playboy Cabin, minus landing gear, with which he won the all up/fast down event on Saturday.

CELEBRATION OF SILENT FLIGHT



Left: Bob Robinson flew a P-51 modified from a Dynaflyte kit. The Mustang uses an Astro Cobalt sport wind 60 running on 28 1200 mAH cells. Bob flew it Saturday afternoon on the four-blade, 14x6 prop shown. Above: Bob Benjamin with his prototype Tigercat, which flies on a geared Astro Cobalt 40 and 21 1200 mAH cells.

monster." At 84-inch span and about 7-1/2 pounds, and powered by an Astro Cobalt Sport Wind 60 running on 24 1700 mAH cells, it is highly impressive, although Ben and I agree that the Monster doesn't come close to utilizing the full potential of the Astro 60.

Converting conventional gas engine kits to electric power is becoming common today. Randy Smithisler of Puyallup, Washington has been flying electric for several years. He got started using inexpensive six-cell ferrite-powered models such as the Mirage and ElectriCub. Last year we convinced him to put a geared Astro Cobalt 05 in the Cub, at which point Randy agreed that it really came alive and became a whole new airplane! Based on that success, he decided that he needed a bigger one and started work on a Goldberg Anniversary Cub kit. He approached me for advice at the start of the project, replaced most of the light-ply in the kit with good quality balsa and installed a geared Astro Cobalt 25 with 14 1700 mAH cells and an Astro 207 throttle. The finished

airplane weighed just over seven pounds and turned out to be an example of excellent craftsmanship.

This was an electric model larger than anything he had ever flown and Randy was a little skeptical as to whether anything "that big and heavy" was going to fly. Even though he had brought the model to my shop for a thorough checkout before the fly-in, he was justifiably nervous. At an appropriate time during the day on Saturday, the field was cleared to allow me to check out Randy's new airplane, and the Cub confirmed beautifully that large electric models with good quality motors and accessories are a real class act.

Using the grass adjacent to the runway, the Cub made several effortless 50-foot takeoffs. Smooth, scalelike cruising flight required half throttle or less, and the airplane handled the moderate, although bumpy, winds with no problem. Several flights of about six minutes were made, followed by crowd-pleasing long, smooth landings in the grass and taxi runs back to the

pits with plenty of power left for what could have been substantially longer flights. Randy went home with a whole new vision of what electric flight can be.

Mother Nature served up a mixed offering on Sunday. The day dawned bright and clear, with promise of temperatures that climbed into the 80s, but with an easterly wind that at times exceeded 20 mph blowing steadily from the Columbia River Gorge. The "good news" was that the wind was consistent and, although it blew directly across the runway, it was in line with an area that had been mowed for sailplane operations.

After grumbling for awhile and drinking up most of the available coffee, we decided that the more heavily loaded models could safely use the impromptu "cross strip," which we did for the rest of the day. Owing to the wind, only about a dozen modelers showed up to fly on Sunday, but those who braved the breezes flew electric airplanes all day without incident. Several of the sailplaners took advantage of Sunday's

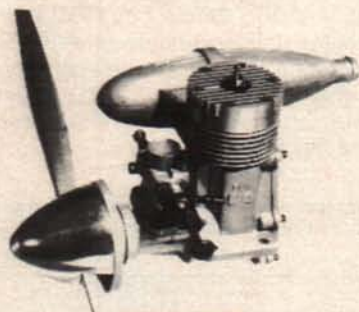
wind to provide excellent demonstrations of slope soaring in very localized lift that occurred above a 10- to 15-foot embankment.

As the "cross strip" was narrow, we electric fliers alternated with the sailplanes and gave our more heavily loaded airplanes a workout. I made several flights each with my Astro 15 powered Tigerkitten and Astro 40 Tigercat, making carrier-type powered approaches into the 150-foot landing area. Just when I thought I had suitably put Nature in her place, Jerry Holcomb went one better by bringing out his Kyosho Concept EP electric helicopter and providing a demonstration of precisely controlled flight in the wind in front of a professional video crew. This sort of flying belies the still-too-common impression of electric models as lightweight glider types requiring hand-launch and near-calm conditions!

With the excellent equipment now on the market and your fertile imagination, the future of electric flight is truly exciting! **MB**

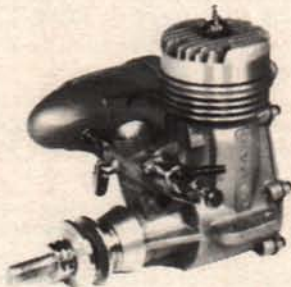
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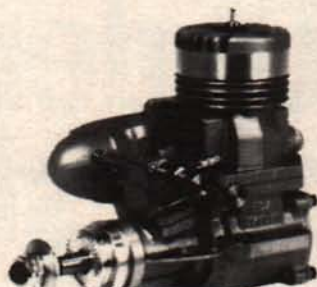
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Mother Nature out of a free ride to the top, and you did it without manipulating electrons, stretching latex rubber or burning combustible chemicals. You are truly amazing!

Once a year for the past nine years, the Inland Soaring Society of Riverside, California, has hosted scores of like-minded thermal chasers to a hand-launch glider contest. The format is varied and challenging, and the entrants come from far and wide. For my money, the annual ISS contest is the Western States RCHLG Championships; an impressive, traditional gathering of elite chuckers. *continued*

The top three 9th Annual ISS RCHLG fliers, from left: Gary Anderson (1st), Keith Schwemmer (2nd), and George Spitzer (3rd). One new kit airplane and two time-proven original designs. Creativity is still alive and well in RCHLG!





■ Above: Group photo of the participants of the 9th Annual ISS RCHLG Contest, taken between Rounds One and Two. (Not all 36 are present due to crashes in Round One, but it's close.) Lots of variety is still seen in this event, one in which an all-wood aircraft can be very competitive. ■ Right: Chuck Rundle (left) and Mark Grand pose with Mark's stock 50-inch Zephyr and his blown-up 57-inch Zephyr. Mark used the former to place third last year and the latter to place 22nd this year. ■ Below right: The winnah! By virtue of excellent skills, choice of air and glider, Gary Anderson took home the beer stein trophy. New T-tail version of the popular Brian Agnew Vertigo performed outstandingly. ■ Below Left: When you have a thermal in sight you have to act fast. That means catching and immediately throwing again as Ben Clerx is demonstrating here with his Vertigo. ■ Left: Juan Chi of the Pasadena Soaring Society took a Dynallite Skeeter kit, added cross-bracing in the wings, tightened and modified the tail, and came up at 17 ounces ready to fly.





■ Top left: Dr. Norm Thompson flew his original design, the "NT2." Features unusual wing planform, pod-and-boom fuselage, ultralight construction (6 ounces total weight), SD7037 airfoil thinned to 80% of original thickness, and 1-inch wide strips of ventilated medical adhesive tape for turbulence at the leading edge. ■ Top right: Charlie Richardson and the C.R. Aircraft Models "Climax," which is unusual in that it has an all-flying vertical stab. Airfoil is SD7032 at root and SD7037 at tip. Turns very nicely and is actually aerobatic. ■ Right: An absolutely elated Dan Petersen just finished a 1,000-point round (five-minute max) with his scratch-built "Dingo." All-moving rudder, modified S3021 airfoil, and 16-ounce flying weight make for some great flying. ■ Below: Keith Schwemmer demonstrates the proper technique for launching an HLG: follow through and grab that control stick ASAP! His "Mosgitta" helped him place 2nd this year and 2nd last year! ■ Above: Barely under control in the Round Four flyoff, Don Van Gundy's Vertigo has coughed up its guts and has its receiver and battery hanging down like a wild pendulum! Plane landed safely with only the pilot's ego bruised.



This year on June 13, there were 36 fliers ready to heave-ho come nine o'clock. That healthy number didn't include such "regular" ISS HLG heavyweights as reigning F3B World Champion Joe Wurts, last year's winner Brian Agnew, Larry Jolly, John Lupperger, Mike Reagan, Ed Depue, Bob Davis, Dennis Brandt, John Brown, Keith Finkenbiner, Allan Guthmiller, Tony Martin, Mike Charles, Craig Robinson, Frank Green, and Don Nigg, to name just a few ... all who have won, placed, or come very close in past years. However, this year there were lots of new faces, and that's very good for the sport!

The weather was absolutely perfect for RCHLG flying with no clouds, light breezes, plenty of dry ground, and lots of warm sunshine. Thermals were numerous and strong. Every ten-minute round had lift cycling through. Some had lots of lift, giving

everyone at least one chance of getting up and away.

WHAT WERE THE TASKS?

There were three qualifying rounds and one flyoff round flown. Thirteen guys made it to the final round, where they tried to better their total scores in two heats of man-on-man competition. All rounds were ten-minute slot format with specific tasks to be accomplished inside the ten minutes. You had to be on the ground at ten minutes or you received a zero for the flight. C.D. Ian Douglas kept everybody informed of the elapsed time during every heat that he wasn't flying in personally.

Round One was unlimited throws to score the longest flights possible inside the ten-minute slot. Your best three flights could count. Man-on-man scoring gave the winner 1,000 points and everyone else a nor-

malized score based on the percentage of the winner's time.

Round Two was unlimited throws to achieve a five-minute precision max. This was perhaps the easiest task.

Round Three was six throws to achieve a maximum of (almost) five two-minute maxes. This was the toughest task of the event.

Round Four was a repeat of Three with just the top 13 lucky fliers.

WHO WON, AND WHAT DID HE FLY?

Gary Anderson of the Torrey Pines Gulls won the meet. He flew a very impressive, new T-tail version of Brian Agnew's Vertigo. What's more, he threw it into lift nearly every time! It was the most remarkable sight I've seen, and reminded me very much of how Joe Wurts flies. In fact, going into the fourth round, which was a flyoff round,

Gary had a perfect 3,000-point score!

Gary took extra care building this, his fifth Vertigo HLG. This time he made sure the trailing edge of the Eppler 387 wing was as close to perfect as any balsa-sheeted wing could be. The problem is the foam core beds end at the core's trailing edge, which is nothing more than a knife-edge of light white foam. When you add the 1/16 sheeting top and bottom, the thickness you add brings the new T.E. back another 3/8 to 1/2 inch and is now hanging out in the breeze behind the foam core beds, taking whatever bend or curl it desires.

To cure this, Gary reinforced the T.E. with a strip of carbon fiber sandwiched between the skins, then he supported the protruding T.E. assembly at just the right downward angle to achieve the proper shape. Sanding the T.E. to knife-edge sharpness was then easy, thanks to the C/F strip. The modified T.E. is a little tougher, too.

Gary's T-tail Vertigo flew at 13.9 ounces which translates to a 5.3-ounce wing loading.

WHO ELSE PLACED?

Keith Schwemmer, of the Central Valley RC club, again took second place with his own design called the "Mosgitta." (Keith, as you may or may not know, designed the Genesis flying wing which he flew in previous ISS RCHLG contests and which is now being kitted by Peck-Polymers.) The new Mosgitta design resembles a reduced-scale Sagitta 900, thus the diminutive name.

The Mosgitta features the Selig 3014 airfoil. This section was designed for multi-task and slope flying. Closely resembling the more famous S3021, the S3014 is perhaps a better choice for RCHLGs. According to Selig in the Soartech 8 journal, the S3014 was derived from the S3010 with only minor modifications. Of the two airfoils, the S3014 "looks best at an R_n of 60,000." This is of particular note to hand launch glider designers, who fly at this low-speed, small-chord size range. It has a mean camber of 2.57% and a maximum thickness of 9.46%.

The fully-sheeted Mosgitta wing is constructed with great care using rather fragile, lightweight 1/32-inch balsa top and bottom, and 1/32 balsa ribs. The spar is I-beam style with 1/16x1/4 spruce caps. Shear webs are 3/32 balsa, vertical grain. All-up weight is a mere 11.9 ounces. If conditions are light, he balances the model at 43-44%, if windy, at 35-38%, by adding or subtracting nose weight.

George Spitzer of the Pasadena Soaring Society finished third with his three-year-old original design with no name. Featuring a pod-and-boom fuselage and 1/32 balsa sheeted foam core wing, this O.D. weighs around 14.5 ounces for a 5.8-ounce wing loading. The wing has about 345 square inches spread out over a smallish 52-inch span (the AMA Class A max is 1.5 meters or almost 60 inches, and most RCHLGs are

nearer the full span than this). The Spitzer O.D. features the Selig S4061 airfoil from the root to the poly break, then it transitions to the S3021 at the tips.

WHAT ELSE WAS FLOWN?

By far the most popular designs were kit aircraft. I didn't count any kit planes, but I'd estimate the two most popular were the Brian Agnew Vertigo and the Dynaflyte Skeeter. The San Diego based Torrey Pines Gulls recently held a kit-bash contest with the Skeeter, so about six of them were still around (in various stages of design modification) to fly at the ISS event.

One of these modified Skeeter kits took top honors in the "beauty" contest at the beginning of the meet. The judging criteria were good looks, good design, and best overall impression. Steve Condon, president of the TPG club, won the event. He modified the vertical and horizontal stabs to resemble Rich Spicer's Synergy (an F3B plane), thus the name-bash "Skeeteryg." The new, all-moving stab design features the symmetrical Selig S8020 airfoil. He also extended the wingspan by one rib bay on each side and gave the newly created panels extra sweep and polyhedral (a la Will Schuemann). The wings are now two-piece take-aparts that get taped together before flight. Overall, the weight was amazingly light at 13.5 ounces with no nose weight required for balance. For his efforts in kit bashing, Steve won an engraved glass beer stein.

From the comments I heard, the Skeeter is a good bet for the money. One flier, Garth Warner of Escondido, California, found better performance from his Skeeter by lowering the incidence of the wing by 3/32 of an inch at the trailing edge, then balancing the model at 35%. At 13.5 ounces, his stock Skeeter is a relative lightweight. The Skeeter uses the well-proven S3021 airfoil.

The other most common kit plane was the Vertigo. Two Vertigo owners I spoke with had each purchased five of these \$65 kits. Now that's a sure sign of customer satisfaction!

The Vertigo now comes in T-tail and the original V-tail configurations. Harvey Jenkins, one of the five-plane owners, had a V-tail version with its wings covered in obechi veneer instead of balsa. The weight came out about an ounce heavier than typical, at 15.5 ounces.

TIME TO THROW UP A GLIDER!

Seriously folks, RC hand-launch glider flying is lots of fun. If you think you'd like to give it a try, I hope you've found a tid-bit or two here to help you get started.

Any questions or contributions to the editorial cause are welcome. I prefer phone calls to time-consuming letter writing if you just have questions. Reach me at (714) 245-1702 (FAX, voice, or recording) weekdays after 6 p.m. but before 10 p.m. Pacific time zone. My address is 3610 Amberwood Ct., Lake Elsinore, CA 92530. MB

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EXPONENTIAL CONTROL REVISITED

A COUPLE OF MECHANICAL DEVICES YOU CAN BUILD TO GET EXPONENTIAL CONTROLS WITHOUT INVESTING IN A BIG-BUCKS RADIO SYSTEM.

Today's more expensive RC sets have adjustments which provide exponential control on selected control surfaces. Without exponential, the angular travel of the servo arm is directly

proportional to the angular travel of the control stick on the transmitter. Technical types would say that the servo output is "linear," but don't let that confuse you. The motion isn't in a straight line, but is angular or rotary. If we use a system where the output is not directly proportional to the input, we call it "non-linear."

This linearity or non-linearity affects how well we fly our RC models. We can fly smoother if moderate stick movement causes little control surface movement near center, but when we move the stick toward its extremes, we want lots of control surface movement for aerobatics and landing flare. Said in another way, with our usual setups, if we adjust the controls so there is as much travel as we want for aerobatics, the plane is so sensitive that smooth, straight flying is more difficult.

Actually, the way we install the pushrod linkages in our airplanes does result in non-linearity, but it is in the wrong direction. The unfavorable non-linearity occurs at the servo arm. The non-linearity produced by the control surface horn is favorable, but since its extreme angle is less than that of the servo arm, we end up with a net unfavorable non-linearity. I explained this geometric phenomenon in more detail in the April 1990 *Model Builder*.

The "Line Drive" unit sold by Model Products Corp. eliminates the unfavorable non-linearity at the servo, making the pushrod throw proportional to the servo angle, but it doesn't provide favorable non-linearity beyond that provided by the control surface horn. The Line Drive unit can be mounted off-center to provide non-linearity in the correct direction, but when so mounted the non-linearity is quite limited, and it then provides less pushrod throw than I like for an optimum installation.

The Line Drive unit does (by a drum and cables) the same thing the old linear rack-and-pinion servos did. Those servos are almost unknown now, and they had problems of their own.

Line Drive is a good product if you don't need lots of exponential, and to my knowledge is the only mechanical linearity-altering device currently available. Write Dick Remington's Model Products Corp.,

P.O. Box 100, Allamuchy, NJ 07820; or telephone (908) 850-1508.

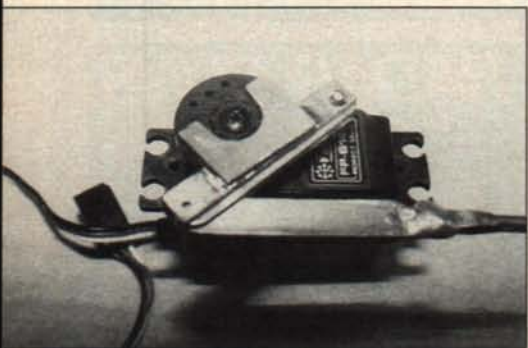
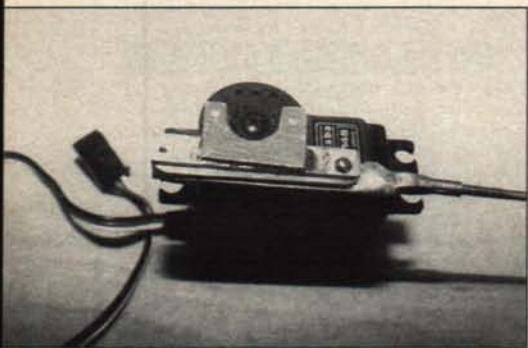
The more expensive RC sets provide an electronic solution to the problem, decreasing the sensitivity of the control near neutral and increasing it at the extremes. This is called "exponential." To get this desirable non-linearity, the designer uses an electronic circuit that produces an exponential function in mathematical terms. Most pattern pilots use exponential on at least part of the controls all the time. They should. It makes for smoother flying and better maneuvers.

The more expensive sets also have "dual rates," which means that by the flip of a switch on the transmitter, we can switch from lots of control surface travel to little travel. I have dual rates on my transmitter, but I never use them. It is too confusing to have to remember when I should be in low rate and high rate. It also makes for erratic flying, because the reflexes also have to be trained to compensate for the two different rates. I have enough to do while flying without taking a thumb off a stick to fumble around for a dual-rate switch. Friend and competition pattern flier, Kip Jackson, says he never uses dual rates either.

POTS

When the transmitter sticks are moved, they rotate potentiometers, commonly referred to as "pots." The transmitter pots vary voltages, which in turn vary the width of pulses, which are transmitted to the receiver. In the model, these pulses are compared with pulses generated by a pulse-width amplifier in each servo, which are controlled by the feedback pots in the servos. If there is a difference between this pulse width and the received pulse width, the servo runs to make the pulse width the same and then stops. The pot elements are linear in both the transmitter and the servos, so the servo arm angular movements are exactly proportional to the control stick angular movements.

That is what we have in all our radio control equipment, to the best of my knowledge. To get non-linear control on the more expensive systems, the circuit designer tucks in an additional circuit, which



The author's linkage-type exponential device. Not the easiest thing to make—see text. As with any of the mechanical devices used to get non-linear pushrod travel, the idea here is to increase the distance between the centerline of the pushrod and the servo output wheel when going to either side of neutral.

introduces variable exponential non-linearity into the control circuits the pilot selects, so the servos no longer linearly follow the transmitter sticks.

Non-linear pots could be used in either the transmitter or the servos in place of exponential circuits, to give us the desired non-sensitive control in the center but still lots of control surface travel. Non-linear pots are fairly common in the electronics industry, and can be manufactured with any non-linear function desired. But non-linear pots aren't cheap, and they introduce additional quality control and tolerance problems. For these reasons, the RC radio manufacturers have steered clear of them.

Kip Jackson points out that he programs his computer transmitter for different amounts of exponential on different channels, and with just the amount he wants for each of his pattern planes, based on extensive flight tests. I can understand that, and wish I could fly well enough to sense those small differences. Such top-notch pilots need adjustable exponential.

But basic exponential is something we can all use, and I love it. I suggest that the radio manufacturers provide us with fixed always-on exponential on their inexpensive sets. We would fly better and safer with it, and enjoy flying more. I am told that the electronics to do this would be quite inexpensive.

MECHANICAL EXPONENTIAL DEVICES

My sheepskin says "mechanical engineering," so I will leave the electronic solutions to those qualified, but I have been independently developing mechanical solutions to the need for exponential. We talked about this subject in MD&TS in April 1990, and again in the July/August 1990 issue. I showed a mechanical device for converting the proportional output of the servo to the non-linear output we would prefer. I have been flying several ships with those and improved devices. Have a look at those photos and figures. They work fine and most of them could be manufactured inexpensively, but let's talk about them.

Some modelers have recommended pull-pull control setups using dual horns and dual servo arms, and cable or cord, instead of our common push-pull system using pushrods. These don't provide exponential control, but the proponents claim other advantages. Until recently I had never bothered to install a pull-pull setup in any of my models, because I was satisfied with pushrods. In trying to develop a better mechanical linkage for getting exponential control, however, it suddenly occurred to me that the job would be much easier in a pull-pull system.

In order to explain the operation, let's review a few fundamentals. The longer the servo arm compared to the control surface horn, the greater the control surface throw and the more sensitive the control will be. With the usual setup, the servo arm is

effectively the longest (the right angle distance from the servo shaft to the pushrod is greatest) and therefore the most sensitive at the neutral position of the control, when we would like it to be the least sensitive.

My goal was to somehow make the right angle distance from the servo shaft to the pushrod least when centered and greatest at either extreme position. That was done with the off-center circular drum mechanism I described in the July/August 1990 issue, but it was difficult to make and the amount of non-linearity available was limited.

When we switch over to the pull-pull system, it is easy to get that servo-shaft-to-pushrod distance least at neutral and greatest at the full-throw positions. We do it by using what amounts to different servo arms at one full-throw position than we do at the other. Study Figure 1. Instead of becoming effectively shorter as the servo travels either way from neutral, as a single arm centered

at neutral does, each of these dual arms becomes effectively *longer*, because the working arms start at an extreme position and move *toward* the right-angle position, instead of away from it.

The hardware is made by bolting two large diameter plastic servo wheels together with short spacers between them. Remove the mounting boss from one wheel and drill it the same size as the boss on the other wheel, so it will slip over the boss. The location of the screw holes determines how much non-linearity we get, as these screws effectively become the servo arms when the cable bears against them.

Match drill the servo wheels with a tap drill for the screw size chosen, then redrill the holes in the wheel with the boss with a clearance drill. The screws will self-tap their own threads in the plastic of the lower wheel. Use short metal or rigid plastic tube spacers over the screws between the two wheels to control the wheel spacing and to

FIGURE 1--"EXPONENTIAL" Servo control "wheel" for pull-pull cable controls

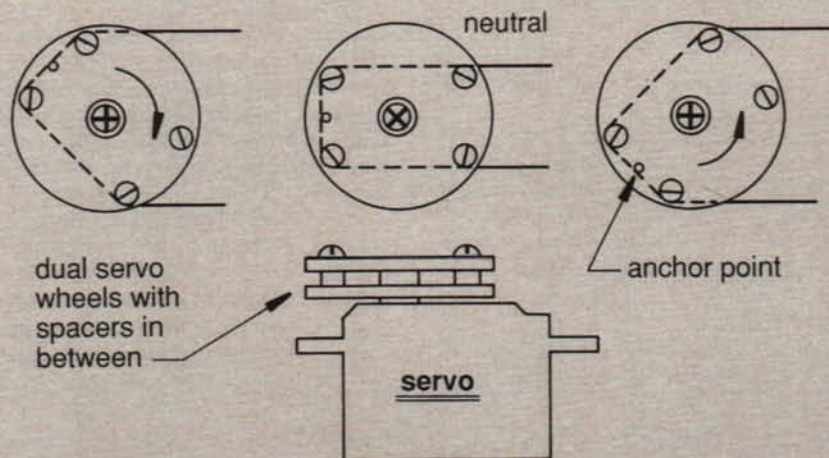
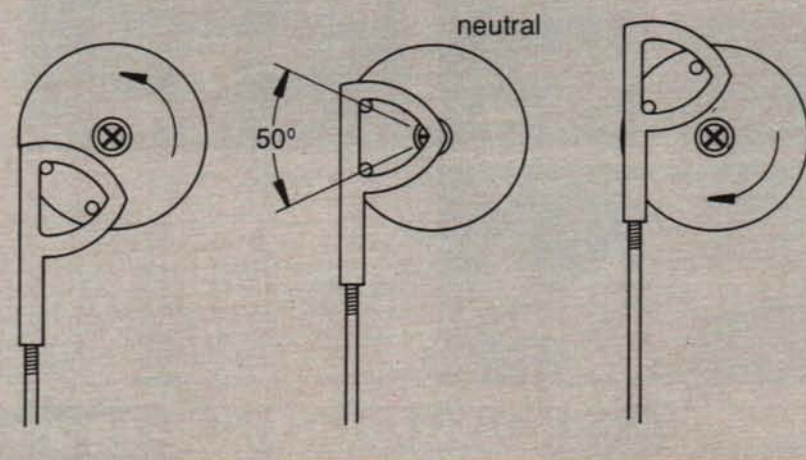
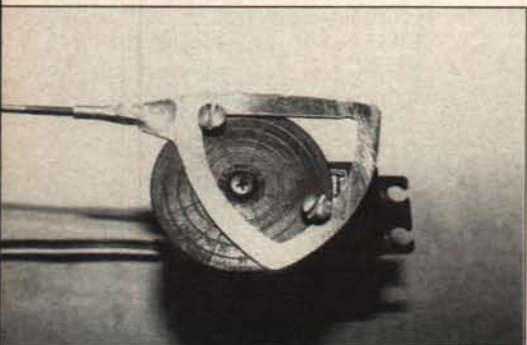
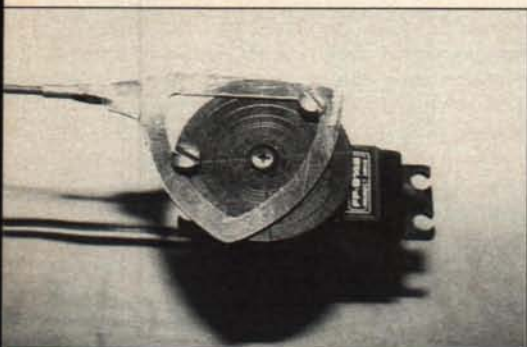


FIGURE 2--"Two-tooth rack" device to eliminate unfavorable non-linearity





This heart-shaped cam device proved to be the best of the author's push-pull exponential devices. Shown also in Figure 2.

give the cable or cord a smooth surface to bear against.

I used Kevlar cord (about 1/32-inch diameter) to rig my pull-pull system, and used spacers 1/16-inch long. These spacers would be about right for a flexible steel cable system, too. The slot between the two wheels provides a track to keep the cable or cord in position. (Don't use nylon for control cables—it stretches.)

After screwing the wheel assembly together with the spacers, saw or file off the

excess length of the screws so they won't interfere with the top of the servo. A fifth screw is put in at one end, without a spacer, as a post for tying and gluing the ends of the cord or cable.

Figure 1 shows the device in neutral and in both full-deflection positions. The wider and shorter the pattern of the four screws, the less the non-linearity. My flight tests with the unit shown tell me its proportions are about right. If the controls are too insensitive near neutral, flying the plane becomes scary. Nothing seems to happen when you move the stick a little, so you move it some more, and then all hell breaks loose!

Analysis shows that the cord or cable won't become slack at certain positions of the control, if the following conditions are met: A line through the clevis holes in the dual control surface horns must intersect the hinge line; the pattern of spacers on the servo wheels must be rectangular, and that rectangle must be centered on the servo shaft; and the lines must be long enough that they remain close to parallel at all positions of the control.

I have a lot of flights on a pull-pull system with this "exponential" device, but as I still like pushrod systems best, I put my inventor's cap back on to see if I could come up with better exponential devices for push-pull systems. The first one turned out to be a direct push-pull version of the pull-pull device shown, which is also a variation on the drum concept.

This push-pull device uses the rectangle concept of the pull-pull version, but because all the work is done on one side of the push-pull device, the back half of the rectangle is not used. As the device uses cord or cable, which cannot transmit compression, two opposing cables are used, each in

tension, one to push and the other to pull the pushrod. This was still pretty easy to build and worked okay, but once I get started on something, I can't stop until I've looked at all the ways of doing the job.

The pull-pull cables in that device were a bit messy to work with, so I wanted to get rid of them. It was obvious that in this rectangular configuration, the opposing cables were only flexing at the corners of the rectangle, so in theory I should be able to replace them with a linkage system, where the link joints are located at the corners of the rectangle. Done. See the photos of this linkage device in the neutral, full-up and full-down positions. It also worked fine, but it took great care in building to get the links exactly the same length and to keep the slop in the link bearings to a minimum.

The last pushrod-type non-linear device I designed and built is a variation on one I tried unsuccessfully two years ago. This one you will recognize in the photos by its semi-heart-shaped cam. The cam part solved the problem I had with the concept before. I have been flying with this one lately, and it works fine. It was not easy to make by hand with acceptably-low backlash, but it would be an excellent design to injection mold in production. Figure 2 shows the unit at neutral and at both extremes of travel.

This unit can be designed for any desired non-linearity. The one shown in Figure 2 is designed for an essentially linear output, which just cancels the usual unfavorable non-linearity. Actually this device amounts to a two-tooth rack gear.

The radio manufacturers provide the servo arms and wheels, and they could sell us either the pull-pull mechanical non-linear device or any of the push-pull versions (preferably the heart-shaped type.) Or an RC fittings manufacturer could provide them for us. I would much prefer that the exponential be generated electronically in the transmitter, however, because then the linkages are simpler.

But I hope someone puts some inexpensive form of exponential on the market soon. Now that I have had the fun of developing these mechanical devices, I would rather buy exponential in the future instead of having to make more units for myself every time I rig a new model. I, for one, do not need all the gizmos on a computer RC transmitter. It should not be necessary to pay the price or spend the time to learn how to use a computer radio just to get exponential.

PARTING WORDS

"Cut-and-try is no virtue when the problem could be solved more easily by analyzing it; conversely, trial-and-error is no vice when the alternative is empty speculation."—J. Gregory Krol.

Instead of, "If it ain't broke, don't fix it," Bruce Gissing, a Boeing vice-president, recommends, "Since it ain't perfect, improve it." **MB**

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By any standards, the 45cc, 4-1/2 pound Super Tigre G4500 is a large model engine—well suited to Giant Scale model aircraft.

It's of more recent origin than the other comparable single-cylinder units—the OPS 30cc Maxi (3-1/2 pounds and 3.3 horsepower), and the O.S. Max BGX-1 35cc (3 pounds and 4 horsepower). The common factor linking all three is that their mere existence owes much to the now firmly established Giant Scale or "Big Bird" model aircraft, and their clear requirement for

own, not only because of the large investment in tooling, but also because they were now competing against products from a quite different area of industry, one enjoying the advantages of a considerably higher quantity of sales. These industrial engines are, technically speaking, relatively quite advanced in construction compared with most model engines. Significant differences are roller bearing steel connecting rods; aluminium cylinder blocks internally chromed; twin-ringed piston; spark igni-



Crankcase and front housing are both strong and light due to good ribbed design. Carburetor at the back keeps the operator well away from those fearsome 24x8 propellers, and uses the ratchet-style coarser tapered needle favored on later Super Tigre engines. Radial/beam mount is a shortened, modified version of the 60cc in-line twin mount.

engines larger than generally conceived of by model engine manufacturers.

The pioneer Giant Scale modelers brought into use a varied selection of industrial two-stroke gasoline engines (Quadra, Zenoah, Sachs Dolmar, etc.), all of which were conversions of chainsaw or blower units. It took awhile for the model engine manufacturers to respond with powerplants of their

tion; gas/oil fuel; diaphragm pump carburetors (Tillotson, Walbro), and recoil starters.

So, on the grounds of cost and technical qualities, the model engine manufacturer had a doubly difficult competition to meet.

It's fair to say that those large model engines which have come to fruition as a result of this process, such as the S.T. G4500

reviewed here, have all been serious, high-quality engines. The G4500 is instantly recognizable as a Super Tigre model engine, owing nothing to the Zenoahs and Kawasakis. In fact, the overall appearance and construction quality of the G4500 is a quite pointed comment on the totally utilitarian nature of those industrial engines mentioned—they were not remotely designed to be looked at, and indeed are usually totally covered by cooling/structural plates, etc.

away from the fearsome arc of those scimitar-like 24x8 propellers. This sub-crank and its separate rear housing require some very accurate machining, because the fit of the crankpin to the rear sub-crank has to be carefully controlled. The total weight of this subassembly and cover (close to 12 ounces) is an indication of its role in providing rigidity to bottom end.

It's worth a warning here that it's possible to insert the crankpin into the space on *either* side of the sub-crank driving hole in the rear



Top: This view of the G4500's innards reveals the two-piece crankshaft; the rear sub-crank is actually the rotary induction valve, but does double duty by helping to support the main shaft. Lubrication to the front crankshaft bearing is via the "flinger" taper cut into the main shaft journal. Piston is high-silicone aluminum with a single ring, running in a steel liner. Beautiful workmanship throughout! Above: Casting quality is up to Super Tigre's usual high quality. The bolt-together muffler is the same one used on the small S.T. 2000 and 3000 series engines.

Internally, the Super Tigre's quality of construction is high indeed, and must represent a large investment in time and effort.

A clever design point of the G4500 is the rear induction rotary drum, which also serves as extra counterweighting for the crankshaft as well as getting the carburetor

rotor without being aware of it—this alters induction timing quite a bit! It's also likely to be a bad practice structurally, as the main crankshaft and pin would no longer have the support of the subassembly.

At over 1-1/2 inches cylinder bore, the G4500 has a quite over-square bore/stroke

SUPER TIGRE G4500 (45CC TWO-STROKE SINGLE)

Dimensions and Weights:

Capacity—2.768 cu. in. (45.367 cc)

Bore—1.575 in.

Stroke—1.421 in.

Stroke/bore ratio—.9022/1

Timing periods:

Exhaust—155°

Transfer—Main: 114°

Supplementaries: 104°

Boost—114°

Rear Induction—

Opens @ 42° ABDC

Closes @ 50° ATDC

Total period—188°

Blowdown—20°

Compression ratio—9.17/1

Exhaust port height—.398 in.

Cylinder head squish—.026 in.

Cylinder head squish angle—1.5°

Squish band width—.267 in.

Carburetor bore—.45 in.

Crankshaft diameter—.669 in.

Crankshaft thread—10mmx1.25mm

Engine height—6.0 in.

Width—3.37 in.

Length—6.75 in. (rear of carb to front of prop driver)

Width between bearers—2.56 in.

Weight Bare—4 lbs. 5.5 oz.

Weight with muffler—4 lbs. 13.25 oz.

Radial mount weight—12.3 oz.

Performance on 5% nitro

Max. BHP: 4.59 @ 9,400 rpm (open exhaust)

3.76 @ 8,380 rpm (muffled))

Max. torque: 640 oz./in. @ 5,140 rpm (open exhaust)

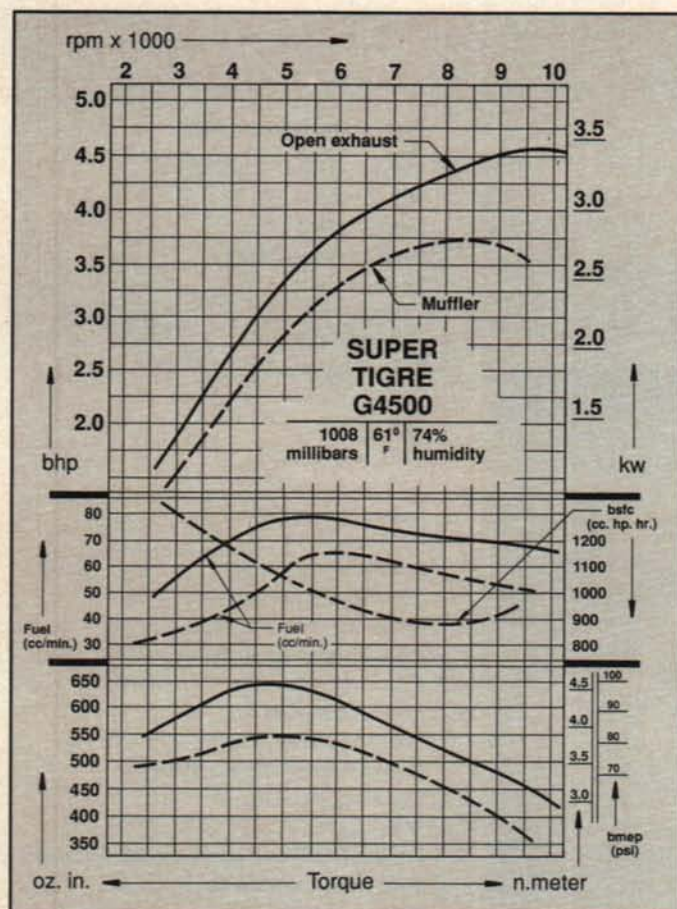
550 oz./in. @ 4,970 rpm (muffled)

RPM:	Open Exhaust	Muffler
24x16 Punctilio	—	3,890
24x10 "	—	4,600
24x12 "	5,130	4,930
24x10 Airflow	5,240	5,120
24x8 "	5,470	5,400
22x8 Mastro	6,553	6,080
24x8 Zinger	—	6,290
20x10 Mastro	6,702	6,360
20x10 Kavan (glass)	7,950	7,120
18x8 Top Flite	9,254	—

Performance Equivalents

	Open Exhaust	Muffler
BHP/cu. in.	1.66	1.36
BBP/cc	.101	.083
BHP/lb.	1.057	.778
BHP/kilo	2.33	1.71
Oz. in./cu. in.	231.2	198.7
Oz. in./cc.	14.1	12.12
Oz. in./lb.	147.3	113.9

Manufactured by Super Tigre SRL, Bologna, Italy;
distributed by Great Planes Model Distributors, 1608
Interstate, Champaign, IL 61821.



ratio which allows lower engine heights.

Cylinder exhaust timing is quite high at 155°, and with a blowdown of 20° (ahead of the small shallow transfers at 104°, and the main transfers and boost at 114°), looks to be a candidate for some future tuned pipe use. Head compression ratios could be aiming the same way, in being a fairly soft 7:1.

Carburetor throat diameter is significantly small for a 45cc engine at .450 inch; inside diameter of the rotary drum is .590 inch.

PERFORMANCE

The excellent machinework and adherence to close tolerances have allowed Super Tigre to relax a little on the running-in requirements. After a short break-in on a bench, the engine can be mounted in a model and flown. Just be sure to avoid over-lean settings as usual, and don't use over-heavy propellers until the engine has some running time on it, to keep the bearing and piston face pressures down. The recommended propeller sizes are from 18x10 to 22x8, but it's advisable to put some time on the engine before fitting the large diameter/larger inertia props, which increase stresses within the engine.

An initial problem with this test engine was an inability, even with a massive six-foot gravity fuel head, to achieve sufficiently rich running. Because of the possible consequences of an over-lean run, much agonizing and carb-stripping took place before the decision was made to drill the spraybar slightly oversize to absolutely ensure adequate richness for the non-pressurized fuel tank runs on open exhaust.

Use of standard muffler pressure would of course guarantee a rich enough setting for the first critical minutes, particularly so because of the higher back-pressure provided by the rather small muffler, which is the same used on the 20 and 30cc singles.

Fuel used for torque/rpm tests in both open exhaust and muffled modes was 5% nitro, with the recommended rather low percentage

continued on page 72

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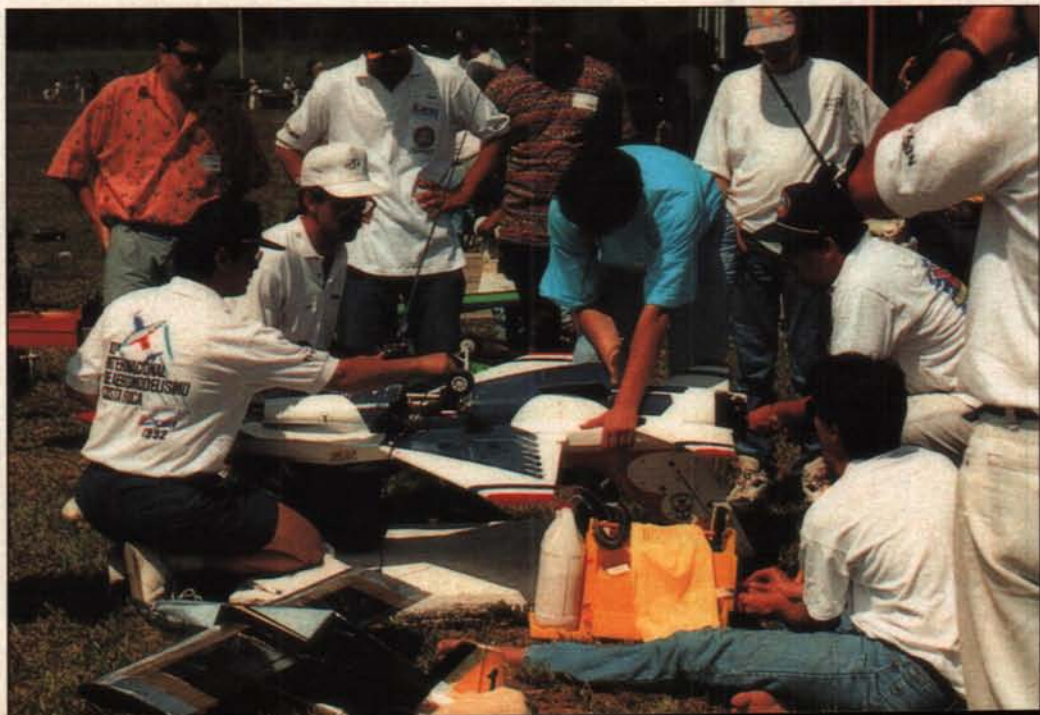
a decade of rc fun in costa rica

BY ELOY MAREZ



OUR ROVING CORRESPONDENT ONCE AGAIN TRAVELS TO CENTRAL AMERICA FOR THIS, THE TENTH RUNNING OF ONE OF THE MOST ENJOYABLE FUN-FLYS ANYWHERE.

Above: The long flight line and spectator area of the Tropical Fun-Fly, an event now seen for the 10th time. Area extends the same distance in the opposite (left) direction. Right: Jets seem to require large pit crews, and of course a lot of advice from bystanders. Here we see Luis Alfaro's award-winning Byron F-16 being readied for flight.



Dateline San Jose, Costa Rica, *The Tico Times*, May 29, 1992: "Model Airplanes, Which Soar at Exhibition Meet, at Costa Rica's 10th International Annual Model Airplane Exhibition May 18 at Club Campestre Los Reyes."

Some translation, or at least explanation, is in order: "Tico," as in *Tico Times*, refers to the self-appointed nickname by which Costa Ricans refer to themselves; "Club Campestre" is a country club by the name of "Los Reyes"—The Kings.

So read the above cited newspaper on the date shown. To me, the key words are "10th Annual."

Every year, announcements are received inviting us to numerous "First Annual South Treestump RC Flying and Pie-Eating Contests." You must have noticed how few invitations ever follow to the second annual such doing! Or to the third! One doesn't even have to remove one's shoes to count the number of RC events that have reached their *tenth* anniversary.

They are definitely few and far between.

I am proud to report that once again I was a guest of Aeromodelismo Costa Rica, the RC club in the capital city of San Jose, to this great fun-filled weekend. There are few of the established RC events that I have not attended more than once, and I can unequivocally state that at none of them have I seen so many people enjoying themselves quite as much—including all family members.

Aeromodelismo Costa Rica

seems to find, year after year, the perfect mix of model airplane flying and other entertainment that confirms completely the unofficial slogan of the country: "Pura Vida," meaning literally "The Good Life." That is, in my opinion, one of the reasons that this event has reached its tenth year, another one being—well, how can you go wrong when you start with a country that is known as "The Garden Spot of the Americas"?

Proof positive that good things come in small packages, Costa Rica, barely the size of West Virginia and with less population than many large U.S. cities, makes up for its size in natural beauty that runs the gamut from rugged volcanos to the whitest sandy beaches, from rain forests to tropical gardens, raging rivers to placid lakes. Costa Rica is a mecca for those of many interests—surfing, deep sea fishing, white water rafting, biologists, naturalists and ecologists, and those who come "just to get away from it all." Said natural beauty extends to its people—well, to its ladies, anyway. As one of my friends, New Jersey's Bob Calandra, put it, "I fall in love every thirty seconds."

Another reason for the success of the Costa Rica Tropical Fun-Fly, as with all other successful events, is due to the major efforts of a few hard-working and dedicated individuals. Chief cook and bottle washer here—and I have personally observed him doing a lot of the equivalent of both—is



Top: Without a doubt, the most enthusiastic group, here every year after a grueling car trip, is the contingent from Panama. An international event is planned there for '93—watch for announcements. Left: "Now don't let go until I tell you!" Frank Reyes instructs Albert Estraviz as they ready Frank's Best Finish Staggerwing Beech for Costa Rica's skies. Above: No, it's not a C-3; it's a "Headwind," a VW-powered homebuilt. This 1/4-scale version belongs to Luis Brunner, a friend of the author's since they were both flying Orbits.



Top: The PILOTS! As with all well-run events, proceedings start with a pilots' briefing, then it's "Off we go, into the wild blue yonder, and let's hope it doesn't rain!" Above: Another view of the crowded flight line, with a wide variety of styles and sizes of models to be seen. Though relatively small, the Costa Rican group makes up for it with enthusiasm. Right: Not one to leave anything to chance, Florida's Stu Richmond expresses his faith in the Gods of Aviation and implores their blessing during his upcoming flight.

Julio Pastora. Year after year, Julio has managed to provide the sort of leadership and inspiration that an effort of this magnitude cannot do without. However, he is the first to admit that he does not do it all, and this year, major public recognition was made to a number of individuals, amongst them two local ladies who contributed many hours and much labor to the fly-in. These ladies are Maria Baker and Flor de Barbena—as you may expect, wives of modelers. Actually, Maria is a more than slightly successful RC car competitor, but she has promised to mend her ways and join us in flying next year. We'll see!

Yet another reason for the success of the Tropical Fun-Fly is that its popularity extends past the local modeling community and us visitors. It is now an established annual event here in the capital city, on a par with other fairs, car races and holiday events. No, we don't yet draw the crowds that major soccer games do, but we are gaining on them!

For weeks before the date (always the second weekend in May), reminders are broadcast on local radio and television stations, published in the newspapers, and posters are seen all over the city. Come Sunday morning, one needs to get on the road early to beat the traffic congestion and be assured of a decent place to park. This year's spectator crowd was estimated at 4,000 plus!

Everybody in the country seems to get into the act. We are talking major contributors such as LACSA Airlines, which provides excellent Skybus 320 service to Costa Rica from many major U.S. cities. LACSA takes you and your airplane box there, no matter how large it is! In addition, they contribute to an unbelievable degree; would you believe, among other courtesies, two trips to Cancun, Mexico and one to Lima, Peru donated to the raffle!

Another major contributor is the RC'ers home in Costa Rica, the Hotel Irazu, which provides not only first class service to all of us guests, but helps with box storage and provides a large banquet hall for our formal and informal gatherings. The list of contributors and friends is long, all seeming to say: "Bienvenidos"—Welcome!

For you serious competitors, stay home! Oh, there are judges, and there are trophies, but the idea is more to fly a lot, enjoy old friends and make new ones. There were some 50 airplanes of all types on the field, and quality flying is certainly to be seen, from the world class aerobatics of Dave Von Linsowe, to the out-of-the-rut sport models flown by my good friends Raphael "Pepo" Cano and Adalberto Alguero, who make the trip annually by car from Panama.

Had there been a "People's Choice" category, no doubt it would have gone to Jason Knoll who, at age 11, was no doubt playing hooky from school. In addition to the multitude of Ticos and a large contingent from the U.S., this year's event was graced by RCers from France, Holland, and Mexico. The record for the longest distance traveled

is still held by a couple of Pakistanis who made the trip some four years ago.

Flying is the theme, but again, it is not given the do-or-die importance we're accustomed to seeing at U.S. contests. For example, on Sunday afternoon, over the sound of whatever is in the air at the moment, we hear drums. Samba drums, at that. As the runway clears, it is taken over by a dancing group from the neighboring city of Santa Ana, youngsters from probably six to sixteen, in various colorful costumes. In perfect unison, they entertained us with various drum-accompanied dances to samba and cumbia music. The ovation was also fantastic.

The event is even popular with U.S. modelers' wives, if you can believe that. And why not? There is a barbecue one night by the pool at the country club; a formal dress-up dinner for trophies and farewells, with live music, typical dancing and a mariachi band; there is a yacht trip out to an island in the Pacific, with a fresh seafood lunch on the beach, swimming and scuba diving.

There are tours to the volcanos, trips to the beach where the water is warm, trains to the jungle, and if all else fails, one can always go shopping. And yes, we did manage to get in the full quota of flying, with awards going to:

Best Crash, Jeff Prince; Best Finish, Frank Reyes; Most Realistic, Luis Alfaro; Most Unusual, Panama Team of Pepo Cano and Al Alguero; and Best of Show, Dave Von Linsowe.

No one goes home empty-handed. We all received an engraved desk plate containing a mint Costa Rican banknote of a type no longer in circulation and now a collector's item. It has joined other important mementos on my bookcase, a visual reminder of those more important memories that live inside us—in this case, of a decade....think about it, a decade of RC fun in Costa Rica! Truly "Pura Vida"! **MB**

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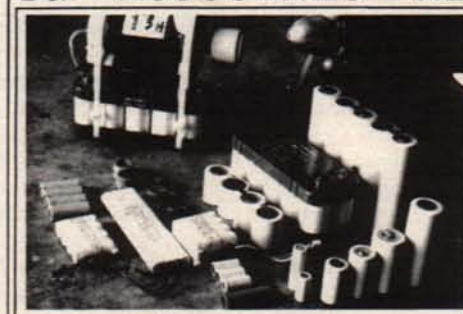
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ELECTRONICS CORNER

BY ELOY MAREZ

A Look At The Airtronics #92745 Micro Receiver

Airtronics receivers have guided a number of my airplanes through the skies for many hours—all, I am happy to report, with the greatest success. I recently tried one of Airtronics' latest efforts, the tiny #92745 dual-conversion narrow-band FM receiver, and I can report the same degree of operational success.

This miniature electronic wonder measures a miniscule 2.25x0.96x0.82 inches and weighs one ounce—28 grams to be precise. Now that is *small*, but equally important is that this little receiver sacrifices nothing in the way of operational features. Circuitwise, the four-channel Micro receiver very closely resembles its big brother.

The receiver's small size is due mainly to clever engineering, while maintaining a high degree of serviceability. Even though it took two PC boards to shrink it to this size, all necessary tuning adjustments are easily accessible and frequency

and is included in its current listing of certified narrow-band equipment. All my shop and field testing, though not at the level of that required for AMA listing, confirms the necessary criteria. This is a receiver that I would not hesitate to fly in my favorite airplane.

Note that this is an FM unit, and as such is compatible with all Airtronics FM and FM-switchable transmitters. At the time of this writing, the retail price is listed at \$99.95, with the larger 92784 being listed at \$129.95.

LABELING YOUR HOME-MADE EQUIPMENT has always been an unpleasant experience. After years of wrestling with plastic tape writers and rub-off lettering which never came in the right titles, I am happy to have discovered a method bound to please even the most discriminating builder. Brother, a major supplier of office equipment, produces a small machine that prints out

ferred perfectly. The tape is then pulled off and only the markings remain. In the interest of longevity, I always protect the lettering with a clear coating of some kind. My favorite is K&B Super Pox, sprayed if at all possible. Brushing it on also works, though you have to do the job in a single stroke—repeated strokes will sometimes distort the printing. After an hour, though, it is there forever.

At over \$100, the little machine is not cheap. Nor are the tapes, from \$10 to \$15 per cartridge, depending on the type. Your best bet is to convince your boss down at the shop or office that the company needs one, after which you can borrow it for your own projects. Just don't tell him this was my suggestion!

CARA PRODUCTS' BATTERY CHARGERS are new and improved. I know, "new and improved" often means "different color and higher price." That's not the case here, though. CaRa's new "Smart Charger"



Left: The Airtronics #92745 Micro receiver, FM, dual conversion, narrow band, seen here with its big brother for size comparison. Comes highly recommended—see text. Right: The Brother P-Touch II Lettering System, a modern tape-writer which can be used to make labels and markings as required for your projects.

changes and other service requirements are no more difficult than on larger equipment. I guess I'm looking at this from a viewpoint that is not of primary importance to the RC flier. But, proper design and construction do also result in maximum reliability, and that is something we can all appreciate.

The other side of the coin is equally attractive: the Micro receiver meets all AMA specs



labels on your choice of colored tape, in various sizes and styles—even vertical! The P-touch II Lettering System has capitals and lower case letters, and all imaginable punctuation.

They also have a rub-off lettering tape. You spell whatever you want, hold the tape over the object you want lettered, rub over the text with a ballpoint pen or similar object, and presto! The lettering is trans-

ferred perfectly. The tape is then pulled off and only the markings remain. In the interest of longevity, I always protect the lettering with a clear coating of some kind. My favorite is K&B Super Pox, sprayed if at all possible. Brushing it on also works, though you have to do the job in a single stroke—repeated strokes will sometimes distort the printing. After an hour, though, it is there forever.

This line of chargers is designed to revive those 6-, 12-, and 24-volt batteries that have become such an important part of our field support equipment. These chargers are fully automatic; they apply a charge until the battery is fully charged, after which they reduce the input



The "Electronics Corner" workbench servo tester, correctly and properly marked with rub-off labels produced on the Brother unit shown. Not cheap, but very professional appearing.

to the proper trickle current at which the battery can be left connected indefinitely. It's a kind of "connect and forget" system that assures having full battery power anytime you take to the air.

The original chargers, still available, are produced in a 500 milliampere version at \$46.95. A higher output, 2 ampere unit for 6- or 12-volt batteries is also available at \$58.95. These chargers work extremely well, and two of them—a 12- and a 24-volt version—have had a home in my shop for many years. They are simple to use, but do not take kindly to having their outputs short-circuited or reverse-connected. I have solved this problem with polarized plugs that can only go in one way. To completely remove the possibility of damage, the newest Smart Charger has built-in protection against user mistakes. In fact, in addition to reverse polarity, this charger is also protected against short-circuits across its output. How much protection could you ask for?

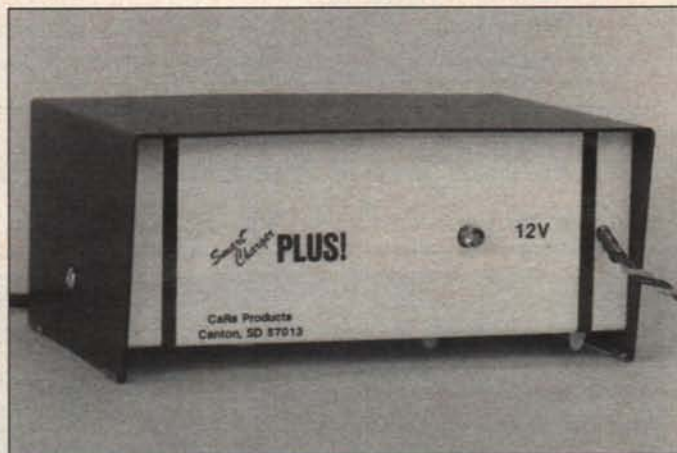
Another feature of the CaRa chargers is that they operate on pulsed current, at 120 Hertz. Such a charging method seems to increase the reliability and longevity of these batteries, especially gel cells. Gel cells do not have a good reputation with modelers, but it is actually not caused by any inherent fault in the batteries, but by poor

charging habits. Your gel cell investment deserves a good charger. CaRa Products is at P.O. Box 221, Canton, SD 57013; (605) 987-5924. Drop a request with SASE for a brochure describing these and other interesting battery care products!

BEC'S AND MOTOR CUTOFFS in electric powered models still seem to confuse more than a few, especially beginners. Advertisements, instructions, and even editorial content are sometimes not too clear or even correct in these matters.

A BEC, a mistaken and confusing nomenclature if there ever was one, is simply a voltage regulator. It is used to power RC equipment from the motor battery, eliminating the need to lug around the extra weight of a separate receiver battery. Its function is to lower battery voltage, say from a six- or seven-cell pack, to that of a four-cell pack, as needed by the receiver and servo(s). That's all it does. Period!

A voltage-operated motor cutoff is something else entirely. In the case of a single on-board battery, this circuit is designed to sense the battery voltage and cut off current to the motor while there is still enough battery life left to operate the radio system. The actual cutoff might be done with a common relay or some solid-state device—this point is unimportant, ex-



The Smart Charger for 12- and 24-volt wet- and gel-celled batteries is now completely protected from short circuit and reversed battery connections.

cept again that all of this is different and separate from the basic BEC circuit.

In actuality, there are a lot of BEC-equipped speed controls and throttle-channel equipped motor controls on the market. And there are also a lot of automatic motor cutoff-equipped devices to be had. But the important point to remember and explain to newcomers is that all BEC-equipped units, be they receivers, speed controls, or motor controls, do not necessarily provide this automatic motor cutoff while you still have enough battery power to control your way home.

REED RELAYS—HELP! A letter postmarked Salem, Oregon, came in from an old-time penpal, Jordan Flakser, who writes:

"I was wondering if you might be able to help me. Many years ago I bought a Tower Hobbies discharge analyzer which has 'gone west.' I hate to chuck it. I've checked out the bulbs, they're OK. The only things that I can't and haven't checked out yet are the reed relays for the transmitter and receiver. Both are 4V relays. Since a relay is an electro-mechanical device, I thought they would be the first to go. Any help would be greatly appreciated."

This is one I never heard of. Or maybe I did, and as they say, the memory is the first thing to go. (Or is it the second? I for-

get.) I have no memory of this particular device, nor did my search of my papyrus and stone tablet files turn up anything.

Anyway, as Jordan says, a relay is electro-mechanical—an electrically operated switch, if you will—and they can fail. The reed relay is composed of two magnetic strips, often glass enclosed, inserted into a common coil of wire. When current is passed through the coil, the magnetism produced causes the strips to touch, switching on whatever is connected to them.

In this case, the thing to check is the coils—a simple resistance check across the coils is in order. Be sure the thing is unplugged from the wall socket, if it is AC powered, and that the batteries are disconnected. There should be a few hundred ohms across the coil; I would guess 200-500. If a complete open or dead short is indicated, they have indeed "gone west." Being as old as they are, finding exact replacements might be a problem not worth dealing with.

But we are getting ahead of ourselves. Maybe one of you kind readers out there is more familiar with this item, has faced this same problem before, or has more information on young Jordan's battery tester. If so, please drop a line, I'll be glad to pass on whatever information comes my way. Eloy Marez, 2626 W. Northwood, Santa Ana, CA 92704. **MB**

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SUPER TIGRE continued from page 64

of 5% castor oil and 5% ML 70 Synthetic. Super Tigre strongly advises against use of the modeler's traditional 20% oil content fuel, thus adding further to the ongoing controversy concerning oil amount and type! It appears that using 20% oil in large-bore glow engines affects the regularity of combustion...seeming again to prove that the traditional 20% contains a large surplus of oil to protect the needle twiddlers among us.

Super Tigre's horsepower claim is 4.5 at 8,000 rpm, and on this test the only difference was the engine's ability to turn up to 9,500 before horsepower gently declined. Power was definitely restricted by installing the muffler.

Steadiness of running, good idling and pick-up through mid-range were all notably good, and as can be seen from the power graph, once the engine was run in, there was a markedly strong torque even down to the 2,000 rpm area. In the open exhaust mode, rpm was restricted to 10,360 at the top end; indications were that the smooth-running G4500 would easily have gone up to 11,500 or 12,000. The consequently declining power/torque levels, though, suggest little point in operating the engine past the 8,000 rpm area. The resultant BMEP figure (Brake Mean Effective Pressure) of near 97 psi was the highest recorded by this writer for a non-tuned pipe two-stroke engine.

BMEP is a very useful efficiency parameter, enabling comparison between engines of differing size and type (two- or four-stroke). It shows how well the cylinder is filled and how strong the resultant power stroke is. Broadly speaking, it's a measure of the power per cylinder capacity.

BSFC is another efficiency parameter showing specific fuel consumption (here, expressed in cc of fuel consumed for each horsepower per hour of running). The efficiency in this case is the ability to get as much power as possible from as little fuel as possible. Marathon Mileage Car engines are the top-runners in this area and frequently achieve BSFC figures of around 250 to 300, but that is using the much more frugal gasoline as a fuel (methanol consumption is nearly double that of gasoline—hence the much cooler running), and so the 860 BSFC reached by the G4500 is also an indication of quite high two-stroke efficiency.

SUMMARY

The Super Tigre G4500 is a big, handsome single-cylinder model engine built with all the know-how of one of the longest-serving and well-respected engine manufacturers around.

It proves difficult to fault the engine in any way, following the test session, and its "fitness-for-purpose" seems absolutely secure in the chosen area of Giant Scale aircraft. **MB**

TINY RADIO NEEDED

One important fact soon became obvious, and that was the need for a tiny radio. There just isn't enough space in the fuselage for anything but one of the highly miniaturized systems available today. Fortunately, master modeler Charlie Strange just happened to have a brand new Cannon four-channel radio he was anxious to test, so he inherited the Shooting Star project. Actually the entire radio installation took no time at all, probably no more than an hour, so we found ourselves planning a flight test only one day after I handed the Shooting Star over to Charlie.

But first there was the formality of weighing this miraculously small airplane. The manufacturer says that the flying weight is "as little as six ounces," and I was kind of suspicious of that phrase, as it sounded like it might be some sort of escape clause. But our glider, with its Cannon micro-sized receiver and two servos, plus a diminutive 100 mAH battery and switch harness, weighed just six ounces right on the nose! With a wing area of one square foot, it doesn't take a math genius to figure out that the wing loading is only six oz./sq. ft.

Well, there's little left to say about the Shooting Star except that it flies beautifully despite its seemingly Lilliputian dimensions. Slope soaring? No problem! Hand toss? You bet! And for high-start launches, American RC offers an exclusive new micro launch system which allows you to launch your Micro-Light series glider hands-free.

TEST FLIGHTS

During our flight tests, we did discover that the Shooting Star is no heavy wind machine, as its light weight results in minimum penetration. Any real breeze makes it a real battle to keep the airplane headed upwind, but adding ballast should help alleviate that condition somewhat. It seems a shame to add weight to a model which has been so carefully designed to be as light as a feather. One important recommendation is to provide maximum rudder and elevator response, as when she tries to turn downwind you will need every bit of rudder you can get to keep her straight.

So here's this great little ready-to-fly model you can take anywhere and fly almost anytime, one that is easy to handle and beautifully made, obviously totally hand constructed to a very high standard. So what's the downside? None really, though some may balk at the price for this pocket-sized beauty—\$100 retail. If that is too much for your budget, the good news is that a complete kit is available for only \$20, and that should make it easy for any modeler to have a Shooting Star of his own! To order either the kit or the ready-built version, contact American RC, 16181 Ganges Lane #3, Huntington Beach, CA 92647, or give them a call at (714) 841-4282. **MB**



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PLUG SPARKS

BY JOHN POND

Texaco Reborn

HOW ONE OF THE
MOST POPULAR
O.T. FF EVENTS
GOT ITS START
SOME 25 YEARS
AGO

Texaco! For the real old timers (such as me), this name evokes many pleasant memories of large models and long, satisfying flights. With the 25th Anniversary of the SCAMPS (Southern California Antique Model Plane Society) Texaco event, the time has come to review some history that many of SAM's newer members will find interesting.

I dug up my old 1967 *Sig Air Modeler* magazines, a short-lived publication edited by Larry Conover, and found my original article entitled "Return of the Big Bombers" in the May-

June 1967 issue. This was the first introduction to the revival of the Texaco event. This, plus recollections by Gene Wallock (SCAMPS newsletter editor) and Jim Adams (SAM president) have rounded out this treatise nicely.

To begin with, back in 1967, Bud McNorgan (seen in Photo



Photo No. 3. Typical of the "big birds" is this 9-1/2 foot Fiske Hanley, winner of the 1937 Texaco event, built by Jerry Sanford of Salt Lake City, Utah.

No. 1 with a Berkeley Buccaneer), who was very active in the newly born SAM organization, conceived the idea of reviving the unlimited duration flights that fired the imaginations of the early gas modelers.

One of the first questions to be asked was, if we are going to have a Texaco event, where was the original trophy first offered by the Texas Oil Company? This columnist, who was also intensely interested in this phase of Old Timer modeling, took on the task of tracking down this old trophy.

Mostly by a stroke of luck, I ran into Frank Ehling, AMA's Technical Director, and explained the problem. Frank was equal to the occasion. Starting a big cleanup program at AMA headquarters some time before, he had come across the original Texaco trophy. Unfortunately, time had not been kind to it, as it was badly corroded and damaged. Frank was able to identify the trophy by the name of Leo Weiss, the 1935 winner. However, seeing no use for the old trophy, Ehling discarded it.

Further investigation revealed the startling fact that no one in the Texaco Oil Company could recall or find any records of that company's sponsorship. On the bright side, the company had no objection to the revival of the event and the use of the name "Texaco."

Despite these setbacks, McNorgan began a campaign to finance a new perpetual tro-

phy, to be awarded along with a smaller permanent trophy for the yearly winner. Wouldn't you know it, Johnny Brodbeck of K&B volunteered to finance the new SCAMPS Texaco trophy. Not enough can be said for Brodbeck's sponsorship in the early goings of the Old Timer movement.

With everything in order and the old Gardner Field site at Taft chosen as the location, the only task left was to choose a C.D. Who better qualified than the "old pro," Sal Taibi? To assist in processing the models, I brought down my bound volumes of the model magazines of that era. Certainly eliminated any controversy about the authenticity of the models!

As expected, most of the good flights (over 20 minutes) occurred in the afternoon. This accounted for the win by the late John Keller and his Super Cyclone powered Thracy Petrides PB-2. John's rather spectacular flight of over 39 minutes won over Hugo Lung's excellent time of 34 minutes, 34 seconds. Keller is seen in Photo No. 2 holding the Texaco trophy, which now has 25 names added to it.

Most everyone would agree the large models, such as the 9-1/2 foot Fiske Hanley seen in Photo No. 3, were superior soarers, but the afternoon thermals were not particular as to the size model they supported. Photo No. 4 shows Bob Hensler's 3rd place winning



Above: Photo No. 1. Bud McNorgan, founder and promoter of the Texaco event, is seen with a good old Berkeley Buccaneer. Right: Photo No. 2. Winner of the first SCAMPS Texaco trophy, the late John Keller used a PB-2 to post a flight of 39:10. Trophy was donated by John Brodbeck of K&B.



Marsden Pacific Coast Champ.

1. John Keller, PB-2, 39:10
2. Hugo Lung, Miss Philly VI, 34:34
3. Bob Hensler, Marsden, 33:30
4. Harry Barnes, Marsden, 30:16
5. Jim Adams, Scram, 26:45

Texaco models come in all sizes, from big 10-footers like Jim Adams' KG-2 (Photo No. 5) to relatively small ships such as the DeAngelis Kloud King pictured in Photo No. 6. The event generally favors the larger models though, as they naturally build heavier and are therefore allotted more fuel, glide better...in theory, anyway...and are definitely easier to see at high altitudes.

Here is a rundown of SCAMPS Texaco winners from

1967 to the present:

- 1967 John Keller, PB-2, 39:10
- 1968 Don Whitacre, Quaker Flash, 43:10
- 1969 Jim Adams, KG-2 (Photo No. 5), 57:47
- 1970 Chuck Partch, Nimbus, 48:32
- 1971 Russ Johnson, Powerhouse, 49:46
- 1972 Cliff Silva, Roll, 78:29
- 1973 Chuck Partch, Nimbus, 31:58
- 1974 Jim Adams, Scram, 30:44
- 1975 Jim Adams, Ehling, 27:10
- 1976 Gene Wallock, Nimbus, 24:40
- 1977 Cliff Silva, Roll, 37:30
- 1978 J.G. McNorgan, Fiske Hanley, 31:26
- 1979 R. B. McKenna, Super Buccaneer, 23:05
- 1980 Cliff Silva, Roll, 39:00
- 1981 Roger Wegner, Powerhouse, 30:33
- 1982 Brad Levine, Trenton Terror, 58:38
- 1983 Lee Norcross, Record Breaker, 18:12
- 1984 Fred Caballero, Powerhouse, 52:40
- 1985 John Zaferis, (?), 23:57
- 1986 Bob Dittmer, Powerhouse, 24:04
- 1987 Art Watkins, Roll, 34:57
- 1988 Jim Kelly, VB-2, 29:31
- 1989 Jim Kelly, VB-2, 31:38
- 1990 Bill Cohen, Dallaire, 15:14
- 1991 Jim Quinn, Trenton Terror, 11:35
- 1992 Jim Kelly, VB-2, 24:33

Quite an impressive list, huh? If you think that was fun, the SCIFS also instituted an annual Texaco event, held in the spring. The SCAMPS meet takes place in the Fall.

With RC Old Timers becoming more prevalent, the RC Texaco event blossomed in California and was introduced at the Lakehurst NAS SAM Champs by this writer. We will follow up with a report of the history of this popular RC O.T. event.

ENGINE OF THE MONTH

This month, we are truly indebted to Dick Dwyer, MECA Coordinator, for the use of his Pepperell diesel engine. On one of his visits to the Pond residence, Dick brought a selection of Pepperell engines in a display case. After a lengthy discussion, the 1948 diesel was selected as most representative of the Pepperell line, as several hundred were manufactured.

Ira Pepperell is probably the most widely known of all New Zealand engine manufacturers. Actually, Ira owes his start in engines to his father, who also produced engines in the 40s. Ira is still active, although he has lost the sight of one eye. He is probably in his early sixties. Dick Dwyer, who collected most of his Pepperell engines during his trip to New Zealand, keeps in touch with Ira on a regular basis.

The amount and diversity of engines produced by Ira



Photo No. 5. Another biggie! Jim Adams produced this fine flying Forster .99 powered KG-2. A very stable flying machine.



Photo No. 6. The late Harry Lowe fires up his Brown Jr. engine in a Mickey DeAngelis "Kloud King." Photo was taken in February of 1968 at the fabled Sepulveda Basin site near Los Angeles.

Pepperell is nothing short of amazing when one considers that the total population of New Zealand is only two million; the amount of sales would seem considerably limited. What is more astonishing is that Ira has produced engines over a 40-year period.

Looking over this 2cc (.12 cu. in.) diesel, one is immediately struck by the throttle valve on the air intake—quite reminiscent of the Arden engines. The power developed was quite comparable to the English E.D. Competition engine.

The engine was produced

Photo No. 4. The Judson Marsden 1937 Pacific Coast Champ was an excellent subject for Bob Hensler Texaco entry. Power is an OK .60.

from aluminum castings with a machined steel cylinder. Interestingly enough, the crankcase and gas tank were made integral with two backplates (engine and tank).

Anyone desiring more information on Pepperell and his engines should contact Dick Dwyer, who is a devout collector of New Zealand engines. Dwyer's address is 1837 Flood Dr., San Jose, CA 95124; telephone (408) 377-2414.

MODEL OF THE MONTH

After much feedback regarding the "Blipo," featured here in the May 1992 issue of *Model Builder*, we couldn't help but follow up with another interest-



PLUG SPARKS



Photo No. 7. The O.T.C. Junior Brown Jr., an exciting college project for the students and departments of the Ozark Technical College—more in text.

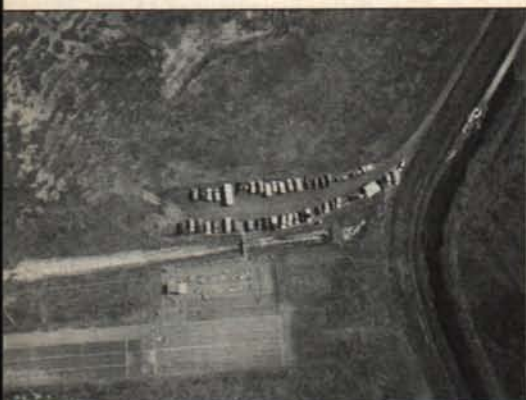


Photo No. 8. Aerial shot taken from a model airplane at a recent SAM 21 meet at the SAC/RC field at Fremont, California. Dig that Astroturf runway!



Photo No. 9. Little known and seen Al Pardocchi "Air Warden" built and flown by Marvin Miller, who makes the replica Anderson Spitfire engines.

ing design by Charlie (C.B.) Barron, called the "A-Box."

This model was originally designed and built by C. B. Barron, of the old San Antonio Gas Model Association. The design promptly proved itself, taking a second and third in SAGMA meets.

The A-Box is a Class A gas model built to 1941 AMA rules, using a Bantam .19 engine. Wingspan is 47 inches, chord 6.5 inches, giving a wing area of 288 square inches.

This writer got quite enthused over this

simple design, considering a scaled-up RC version for a Schnuerle .19 engine. The fuselage was built, but never completed. Plans are still on hand. Looks like a potent model!

Meanwhile, a letter from Barron's Texas buddy, Fred Lehmborg, arrived, which gave quite a bit of history on Charlie. To begin with, Charlie moved from California to San Antonio, Texas at an early age. There, he met Lehmborg at Brackenridge High School and developed a lasting friendship based on the glider and rubber-powered models they developed in discussions during lunch hour.

It was not until Fred received a Bunch Warrior engine for Christmas that Charlie's interest was drawn to gas models. This led to the Blipo design when Barron won an Ohlsson .23 at a rubber contest.

The A-Box followed the Blipo in 1941. Based on his flying experience, Barron warns not to change the incidences shown for the wing and tail. He found the best power results with two degrees down-thrust and two degrees right-thrust. The plans are listed in the Pond Old Timer Plans catalog, number 39G5, priced at \$6.50 plus \$1.30 postage and handling.

O.T.C. .19

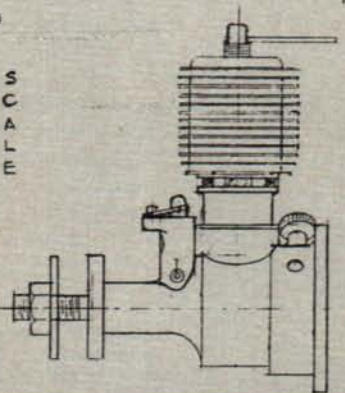
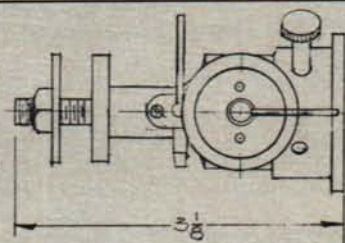
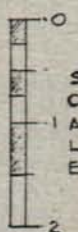
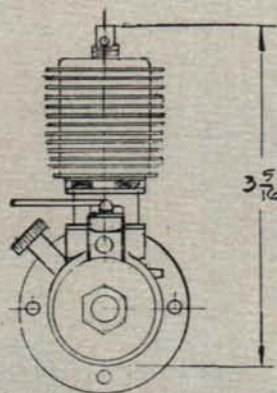
One of the most innovative ideas to come along in some time was reported by Bob Rومان of Springfield, Missouri. Bob writes to say that a college project to produce an Old Timer engine is being promoted by Scott Beshears of the Heart of the Ozarks Community Technical College.

The interesting thing about this project is that many departments will be involved:

ENGINE OF THE MONTH

PEPPERELL 2cc DIESEL

DRAWN BY JOHN POND



the manufacturing center (machine shop); the commercial art class to provide the industrial graphics; the drafting section, to make all working drawings; the printing section, which will provide the company logo along with all official information and packaging; and the marketing class, which will be directly involved in the starting of a company along with all the legal aspects. In short, this project promises to be a very rewarding experience for many of the students.

Seen in Photo No. 7, the engine owes its derivation to Bill Schmidt of SAM 56, who created the idea for a Junior Brown Jr. using a basic Lindberg Hornet A crankcase, Hurler timer assembly and the basic Junior Brown Jr. casting kit developed by Roger Schroder.

This engine will be called the O.T.C. 19. The company name will be G.R.E.A.T., an acronym for Graff Rare Engines and Associated Technologies. In producing 100 to 200 engines, over 700 students in 25 different programs will be involved.

Stock will be sold at \$5.00 a share, probably available in October or November of this year. Of course, a portion of the money made from the sales of engines will go toward purchasing new machine tools. Anyone interested in buying one of these engines or purchasing stock can do so by contacting Mr. Scott Beshears, Graff Career Center, 815 No. Sherman, Springfield, MO 65802.

SAM 21 ANNUAL

Originally called the West Coast SAM Champs, the name of this major California contest was changed in deference to a request by SAM officialdom, as it appeared to conflict with the SAM Champs name. Regardless, it is now officially called the Howard Osegueda Remembrance and is one of the biggest meets in terms of prizes and entries.

This year, SAM 21 was able to arrange for the use of the Southern Alameda County R/C Club field. Imagine getting the use of a field covered with Astroturf! Take a look at photo No. 8, taken from a model, showing the field in the salt flats (or mud flats as the case may be). The shot was taken in the early morning, before many of the fliers had even arrived.

As usual, the contest had a truckload of prizes. The raffle for the Airtronics RC set was won by Nick Nicholau of SAM 30. That makes three times! We're not going to sell him any more tickets!

One of the contestants was Marvin Miller, pictured in Photo No. 9 holding a little-seen Al Pardocchi "Air Warden." Miller is known for his excellent reproduction of the Anderson Spitfire. His work is impeccable. This is all due to the excellent restoration work accomplished by Miller in restoring the original Spitfire dies used by Mel Anderson.

Plans are underway to hold the 1993 SAM 21 Annual at this same field. Astroturf! Try it! You'll like it! **MB**

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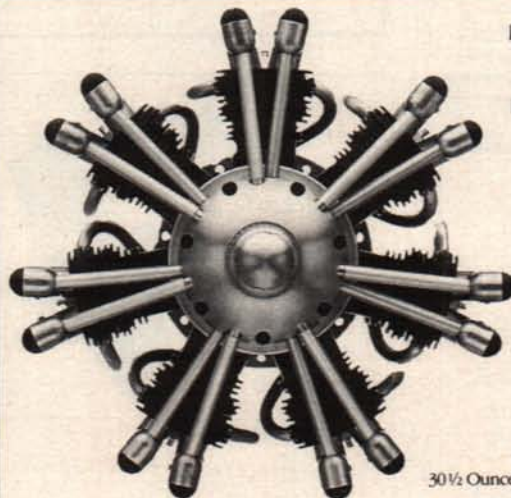
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By Glenn R. Coates

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SPRIT 100 continued from page 49

fliers, this design consideration is a plus when an unscale-like "doink" is required to achieve those all-important landing points.

The interior is surprisingly roomy, with space for most standard servos. An interesting feature is the substantially sized ballast box; its structure provides increased rigidity to the fuselage and easy access on windy days. Whether you choose to use the box or replace it with a heavy-duty, standoff-equipped towhook, the concept is still novel and quite innovative.

When doubling the fuselage sides, we

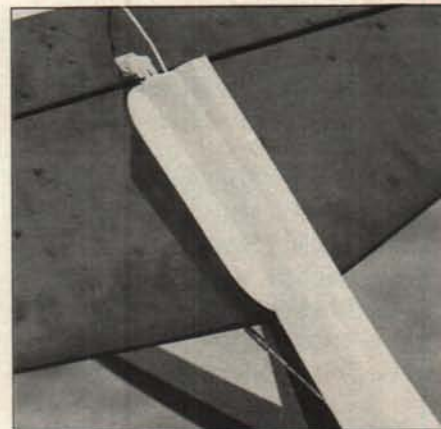
were hesitant to use CA glue, doubtful that it was up to the task of keeping everything in one piece under the almost sacrificial abuse of a normal contest landing. After some discussion, we decided to use an old technique we've frequently used to affix topside leading edge sheeting to our wings. A bulletproof bond can be achieved by applying aliphatic resin (carpenter's glue) between two halves of the wood and ironing them together with a household iron at the lowest temperature setting. This type of iron is preferred over a normal covering iron only because it generates heat to a larger area—such as fuselage sides. Two words of caution: First, the wood will scorch, so move the iron

more frequently than normal. Second, ask your wife for permission!

After the glued fuselage sides have set up, and before assembly, some thought must be given to pushrod installation. Although almost any form of pushrod can be adapted to this particular fuselage, we selected the steel push/pull cable method to reduce the likelihood of trim variations that occur with plastic pushrods in weather conditions where temperature fluctuation is considerable. Steel cables adapt nicely to the Spirit 100's fuselage, but as with any similar installation, the housing should be supported and secured every few inches and checked for free movement.



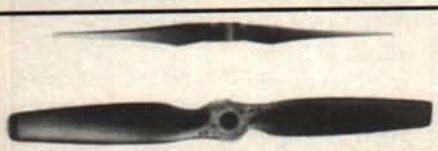
Scale-like cockpit treatment is a nice touch, consists of a lightweight molded ABS tray glued to the wood canopy frame.



Triangular corner gussets on the underside of the stab come highly recommended for strengthening the stab/fuselage junction.

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In many of the kits we've seen, power and glider alike, the plans indicate the rudder pushrod exiting the fuselage too far forward. This usually creates unnecessary slop at the control surface. The Spirit 100 was no different in this respect, so the cable was moved rearward in an effort to reduce the risk of any irregular in-flight behavior. The last couple of inches of the cable was then tinned with solder for stiffness. The elevator cable and antenna tube posed no problem, both exiting the fuselage at the tail end.

The remaining components (nose block and tail feathers) require little assembly other than the traditional alignment, gluing and sanding. In completing the fuselage, one slight modification was made. Opting for a more slimmed-down, bottle-shaped Spirit 100, we trimmed former F7 strictly as a cosmetic enhancement that we use regularly and feel adds appeal to the usual boxy look of most built-up wood fuselages. A hardwood tail skid was also added, providing protection to the rudder during landings.

In conjunction with this, we suggest another minor but effective method of reinforcing the empennage. By shaping two lengths of square balsa stock and gluing them beneath the horizontal stabilizer at the fuselage in wedge fashion, a support platform is developed, reducing fatigue and damage in this vulnerable area.

The vacuum-formed pilot and cockpit interior are easily finished with standard

plastic model paints. We added a headset (paper clip), sunglasses (black cardboard), the stick (thumb tack) and towline release knob (servo mounting screw) for added realism. The instrument panel gauges were cut from a magazine ad and glued in place. The clear canopy can be dipped in dye and tinted to any desired shade.

Although the entire sailplane was covered and trimmed in Super MonoKote, some consideration should be given to fiberglassing the fuselage, if only for the sake of the battering it will take getting hammered into the landing tape many times during the contest season.

Pre-flying the Spirit 100 includes camber settings, and Great Planes doesn't hesitate to offer some very workable suggestions. If the radio permits, they encourage using a three-position switch or side lever to set the camber. This method is preferred because the settings will be exact for full trailing edge deflection. Two combinations are mentioned, but the easiest appears to be: Position #1—neutral; Position #2—reflex at 1/32 to 1/16 inch; and Position #3—positive camber and full trailing edge droop at 3/32 to 1/8 inch.

The manufacturer offers a generally accepted wing configuration for launching. They suggest the flaps should be set up to lower three times as much as the ailerons; for example, 15 degrees down flap to 5 degrees down aileron. This, of course, makes sense, because it introduces a wash-out effect. It should be noted that this is just a starting point, and that any presets are purely speculative and must be perfected through flying and experimentation. In addition to this, the wing should be brought back to neutral at the top of the launch and certainly prior to any attempt to zoom.

There was no coin toss between Ross and I for the rites to test pilot our Spirit 100 on her maiden flight—he doesn't know how to run the video camera! Actually, his experience with similar full-house sailplanes was really the deciding factor.

Other than compensating for a slight crosswind, the first non-flap-assisted launch was virtually uneventful. As with any aileron-equipped glider, the Spirit 100 is most effectively steered on launch utilizing rudder input alone. This permits a predictable, polyhedral-like ascent. Only a limited amount of wing flex was noticeable and the Spirit came over the top and off the line into a normal zoom launch.

Although not a floater, this is a light ship, so turning upwind afforded an appreciable gain in altitude and ample time to trim for level flight. Surface control deflection seemed adequate to accomplish any desired attitude. A few degrees of flap slows the Spirit substantially, increasing lift while centering in thermals.

Surprisingly, penetration is excellent, and the option of full-span reflex will further assist this performance—a factor necessary in exiting heavy sink areas. Escaping a boomer is easily accomplished by applying full flaps

and holding down elevator for a gracefully picture-perfect dive-bomber-like descent.

Setting up for final approach is equally simple. If you've never flown with ailerons, this may convince you to switch. With the decrease in airspeed just moments before landing, there is generally a tendency for the polyhedral pilot to experience some element of crosswind blowover, typically sending the glider slightly off path from the intended target area. This effect is virtually eliminated with an aileron ship. In addition to this, full flaps with down-elevator compensation, or full CROW (aileron up, flaps down), rapidly reduces landing approach speeds, assuring an excellent opportunity to pinpoint spot landings.

Our first flight lasted approximately fifteen minutes. Ross caught a massive thermal shortly after launch and skyed out. The Spirit performed flawlessly. A few degrees of flap produced exceptional thermaling ability. The Spirit 100 was no slouch in the speed department, either, covering a considerable amount of sky in a short period. This glider has a lot of character and appears to be extremely comfortable just dancing on a wingtip in tight turns.

EPILOGUE

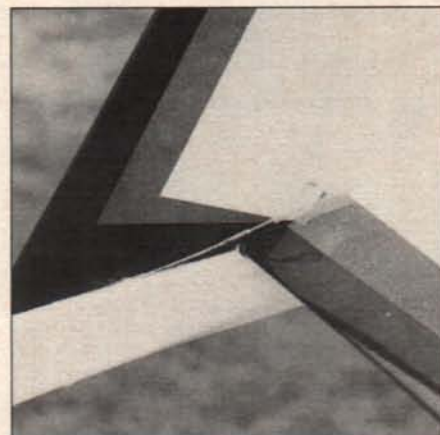
As noted early in this article, we were disturbed by a natural stress point at the end of the wing joiner box, and were equally uncomfortable with the shear-webbing arrangement. For greater strength, we would have preferred a D-tubed three-piece wing, I-beamed with spruce and carbon fiber. In an effort to give the basic kit a fair appraisal, these considerations were intentionally overlooked. However, as a result, winch launches were somewhat restricted and held to the "light" side.

Not long after this review was finished and submitted to *Model Builder*, the Spirit's right wing literally exploded at the top of a downwind launch, primarily failing at the end of the joiner box. Close inspection indicated that: 1) The upper spar failed and broke crosswise; there appeared to be a twist in the wood grain. The left wing spar remained intact, but showed hairline cracks developing; and 2) Aliphatic resin glue was absorbed by the sheeting and ribs, but did not penetrate and adhere to the basswood spar. The fuselage survived with only minor damage to the tail.

Although the Spirit 100 has proven to be a fine flying glider, our feeling is that it is not a true "contest" sailplane when built strictly per the plans. Other reports (besides ours) of wing failure at the end of the joiner box during aggressive zoom launches are enough to warrant some modifications to the two-piece wing, if the model is to be flown in serious competition. Note that whichever way you choose to do it, structural modifications to the stock wing are needed only if you plan on engaging in no-holds-barred competition flying; standard high-start launches or slope flying shouldn't be cause for concern.



The Spirit's fuselage is roomy enough for standard size servos, which is what those building the polyhedral "sport" version would most likely have on hand.



Rudder pushrod exit point was purposely moved aft from the point shown on the plane so as to reduce the length of the unsupported steel cable pushrod. Exposed cable seen here has been tinned with solder to increase its stiffness.

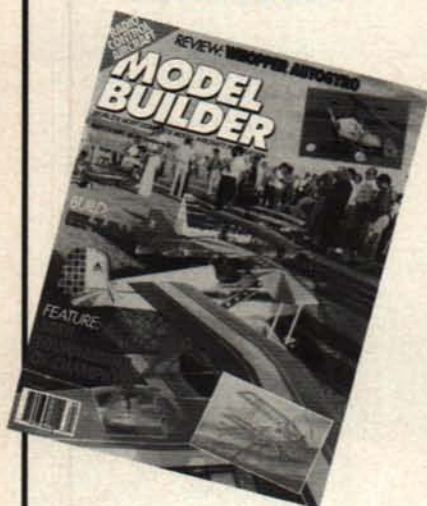
To strengthen the wing, we recommend replacing the basswood spar material with spruce and eliminating the blunt joiner box, substituting two unequal-length plywood braces. Alternatives would be to laminate an I-beamed spar with carbon fiber, or to build a three-piece wing held in place by a dowel at the leading edge and a single bolt at the trailing edge.

Great Planes has gone to great lengths to design a quality Standard-Class transitional glider geared to beginning or advanced pilots, fun fliers or the contest-oriented. For the polyhedral pilot interested in experiencing a multi-functional sailplane, one based on cutting-edge technology but without the cost, the Spirit 100 affords them the chance. Great Planes has managed to introduce the RC model soaring enthusiast to features that are rapidly becoming the standard in modern performance sailplanes.

For additional information, contact Great Planes Model Mfg., P.O. Box 788, Urbana, IL 61801; telephone (217) 367-2069. **MB**

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DEAR JAKE

Advice for the Propworn

DEAR JAKE:

I read in a science magazine that solar flare activity is expected for the next few years. Doesn't that cause radio frequency interference? Should I put my RC stuff away for awhile and wait for the solar storms to die down?

Concerned in Camden, NJ

Dear Concerned:

Solar flares are nothing more than localized atomic explosions on the Sun's surface. They're nothing to worry about, unless your house is on the same block as one. The RF interference associated with them occurs at frequencies very different than our RC bands.

There is a solar phenomenon that you do have to watch out for, however. It is very rare, occurring once every 25 years or so, but it has a devastating effect on all radio communications.

A certain alignment of the planets in our solar system results in a distortion of the Sun's gravity field. Occasionally, this gravitational distortion is so great that the Sun's characteristic circular shape is actually flattened into an oval. The oval shape of the Sun during these occurrences distorts both the phase and magnitude of the entire solar system's electromagnetic field. When this happens, the probability of a transmitted radio signal finding its way to the intended receiver is very low indeed.

So always keep an eye on the astronomical charts, and never try to operate an RC car, boat, or plane when there is a Total Eclipse of the Sun.

Jake

DEAR JAKE:

I have a 500 milliampere-hour battery pack in my RC trainer aircraft. It operates the receiver, three standard servos (for aileron, elevator, and rudder), and a mini-servo for throttle. How long can I safely fly before I need to recharge the battery?

Ben in Billings, MT

Dear Ben:

You can safely operate your airplane until the battery has about 20 percent of its capacity left. Then you should stop flying and recharge it.

Jake

DEAR JAKE:

I understand that, but that's not what I was asking. I meant specifically, with my battery and the load on it that I described, how long

(like in minutes) can I fly?

Ben Again

Dear Ben Again:

Of course, sorry. With your set up, you can fly until the battery has about 20 minutes of operating life left.

Jake

DEAR JAKE:

You're an RC snob, just like everybody else. You never write about anything except radio controlled this and PCM that. You act as though the other branches of our hobby (free flight, U-control, etc.) don't even exist.

Suppose I told you I wanted to build a model ship. Just to look at, or maybe to let it sail all by itself across the little pond in our park. What kind of advice could you possibly give me, huh?

Alec in Altamonte, FL

Dear Alec:

Put a radio in it.

Jake

DEAR JAKE:

The rape of the Earth's natural resources must stop!

Model airplane people are not guiltless in the crime of environmental destruction. The rain forests of South America are being ravaged so that modelers can feed their balsa wood habit. The wanton harvesting of balsa trees must cease.

Save the rain forests! Ban model airplanes!

Activist in Berkeley, CA

Dear Activist:

What in blue blazes are you talking about?

Anybody who lives in a forest where it rains all the time is not going to build any model airplanes! Where are they going to fly them? And when? Jeez!

You "Save the World" freaks really frost my flakes. If you're worried about the destruction of rain forest resources, why don't you go after people who swat mosquitos?

Jake

DEAR JAKE:

I sent away for a set of plans and all I got was a piece of paper that said:

1. Cruise through high school.
2. Go to college to party.
3. Marry a rich girl.
4. Invest with insider information.
5. Retire to Bimini.

What kind of plan is that and what am I supposed to be able to build from it?

David in Decatur, IL

Dear David:

Sounds like the Master Plan my teenage son has on the wall over his bed, and the only thing he's built so far is a massive pile of dirty laundry.

Jake MB

COUNTER continued from page 10

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MODEL BUILDER, MODEL AIRPLANE NEWS, other magazines for sale, SASE, Milton Sheppard, 670 Concord, Glen Mills, PA 19342.

GIANT SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041-C Heatherwood, Orrville, OH 44667.

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and a newsletter subscription only is \$5. Circlemasters, c/o Art Weber, 17560 Windemere Road., Brookfield, WI 53045.

On Line, the newsletter of the Skyliners CL club, contains news of Indiana activities. **On Line**, c/o Jim Correll, 2703 Knob View Dr., New Albany, IN 47150.

Orbiting Eagles is published by the Orbiting Eagles of Omaha, Nebraska, contains club news, technical articles, and a regional events calendar. Orbiting Eagles Model Club, 8147 Read St., Omaha, NE 68122.

The Pits is the newsletter of the Metrolina Control Line Society of North Carolina. Photos, club news and airplane plans are among the features. Individual dues are \$15, families are \$20, and juniors are \$7.50. Newsletter only, \$10. **The Pits**, c/o James Duckworth, 629 Mariposa Road, Stanley, NC 28164.

Prop Wash, a classy newsletter published by the Garden State Circle Burners of New Jersey, is a thick, detailed publication with an emphasis on precision aerobatics. There is lots of technical and historical material as well as club and East Coast CL news and a "swap and shop" column. Subscriptions are \$6. **Prop Wash**, c/o George Kalinowski,

39-13, Wenonah Drive, Fairlawn, NJ 07410.

Revolutionary Torque, a general CL newsletter from New Zealand, is a 15- to 20-page roundup of contest news and technical information. Subscriptions are \$20 (NZ), plus \$10 (NZ) for postage to the United States. **Revolutionary Torque**, c/o Andrew Robinson, 63 Blake Street, Waitara, New Zealand.

Round & Round is the publication of the Glue Dobbers of Tulsa, Oklahoma. It includes club news, a contest calendar and technical articles. Dues are \$15. Newsletter subscriptions only are \$6. Tulsa Glue Dobbers, c/o Deacon Mel Buckner, 4924

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E. 2nd St., Tulsa, OK 74112.

The Skywriter, the newsletter of the Seattle Skyriders, covers Northwest contest activity and Puget Sound area club news. Dues are \$20 for new open members (\$15 renewal), \$10 for new AMA senior members (\$5 renewal), and \$5 for new junior members (free renewal). *The Skywriter*, 11422 87th Ave. Ct. E., Puyallup, WA 98373.

Speed Times, the newsletter of the North American Speed Society, contains detailed technical information on all aspects of worldwide speed competition, as well as the latest speed flying news, photos, editorials, product references and contest calendars. Dues are \$15. *Speed Times*, Box 82294, North Burnaby, B.C., Canada V5C 5P7.

Stunt News, the newsletter of the Precision Aerobatics Model Pilots Association, is the most professional-looking newsletter currently published for CL fliers. The April issue contained 28 pages of technical and historical articles, PAMPA news, airplane drawings and photos and product ads. Dues are \$15 U.S., \$20 Canada, and \$25 elsewhere. PAMPA, 1019 Creek Trail, Anniston, AL 36206.

Topclass News is the official publication of the Topeka (Kansas) Control Line Association. It features club news, cartoons and a calendar of events. *Topclass News*, c/o Travis Taylor, 3201 "H" Randolph Ave., Topeka, KS 66611.

TR Inquirer, *Journal of Control Line Racing*, has burst on the scene with a stated focus on FAI team race. However, the newsletter has become a national forum for discussion of everything that relates to all kinds of control line racing—a long-needed publication. It contains contest news, discussions of rules, classified ads and a national racing contest calendar. Subscriptions cost \$6 U.S. and Canada, \$10 elsewhere, plus

a one-page article and a technical tip sometime during the subscription year. *TR Inquirer*, 521 Jansen Ave., San Dimas, CA 91773.

NORTHWEST REGIONALS

The Northwest Regional Control Line Championships over Memorial Day weekend in Eugene, Oregon, was one of the most successful in the 21-year history of the contest, with an all-time record number of competitors coming from every Western state and Canadian province. Weather was in the 80s for the three days, which started with speed and carrier flying at noon Friday and ended at 4:30 p.m. Sunday.

There was a strong entry in every category except combat, with carrier, racing and stunt events showing increases. Speed and scale and balloon bust entry was excellent, and there was a significant increase in junior participation.

Precision aerobatics was highlighted by the debut of several beautiful new planes, including Paul Walker's Concours-winning Total Impact, Gordon Delaney's impressive, take-apart twin-engined plane and spectacular new planes by Alan Resinger and Ted Fancher.

Combat total entry was down, but five fliers showed up to fly AMA fast combat under the field requirement that all planes have automatic flyaway shutoffs. The shutoff concept continues to spread, and fliers worked hard to make the contest work under the rule. The shutoffs are still in the experimental stage and there was a lot of tinkering, but the contest went off without problems—and without flyaways.

Quite a few national speed records were claimed as speed fliers scrambled to fill the record books under the new safety rules. Speeds were down with the new 10 percent

nitro fuel rule and the new jet fuel formula, but everyone managed to get their flights in after some experimentation.

A large contingent of California fliers collided with Canadian go-fast guys on the racing circle for one of the region's best two-day racing meets in recent memory.

Scale saw an increase in precision entries and the usual array of fine profile and sport entries, as the Regionals is becoming a scale showcase.

Led by profile, carrier experienced a huge entry in all four classes (profile, Class I, Class II and .15) that taxed the two-day time schedule but put on quite a show for spectators and other fliers.

It was a baked, hot and happy bunch that collected their 123 trophies and merchandise prizes for the 40 competition categories.

Competition grand champion was Paul Gibeault of Calgary, Alberta, Canada. Second place grand champion was Michael McCarthy of Glen Ellen, California, and third was Dick McConnell of Seattle, Washington. Paul Walker of Kent, Washington won the Precision Aerobatics Concours d'Elegance trophy, Gordon Delaney of Salt Lake City, Utah won the Nostalgia Stunt Concours, and Don McClave of Portland, Oregon captured the Old-Time Stunt Concours. Bobby Graff of the sponsoring Eugene Prop Spinners was the top junior.

The first Regionals Sportsmanship trophy was awarded to Jim Cameron of Portland, Oregon, who organized and directed a teach-to-fly session for spectators during the contest, using planes he designed and built. Jim also worked as a combat official, took pictures for several publications and managed to squeeze in some racing competition!

Here are the winners of the 1992

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Regionals competition:

Mouse Race Class I (junior)—Wes Mullens, Seattle, Washington, 7:19.93; Mouse Race Class I (senior-open)—Paul Gibeault, Calgary, Alberta, Canada, 4:34.59; Mouse Race Class II—Bob Boling, Richmond, California, 11:19.85;

Rat Race—Jeff Cleaver, Port Ludlow, Washington, 53 laps; Slow Rat Race—Nitroholics Racing Team (Mike Hazel/John

Thompson), Salem/Cottage Grove, Oregon, 7:18.46; Scale Race (Goodyear)—Roy Andrassy, Calgary, Alberta, Canada, 16:07; Northwest Goodyear (junior)—Tim Strom, Seattle, Washington, 10:52; Northwest Goodyear (senior-open)—Joe Rice, Richland, Washington, 9:15; Northwest Sport Race (junior)—Tim Strom, 9:36; Northwest Sport Race (senior-open)—Ken Bugar, Poulsbo, Washington, 9:50; Northwest Super Sport

Race—Ken Bugar, 7:53.

Balloon Bust (junior)—Todd Ryan, Pasco, Washington; Balloon Bust (senior-open)—Dick McConnell, Seattle, Washington; 1/2A Speed—Bill Nusz, Carmichael, California, 132.39 mph; 1/2A Proto Speed (junior)—Brent Hazel, Salem, Oregon, 58.91; 1/2A Proto Speed (senior-open)—Bill Nusz, 100.71; A Speed—Chuck Schuette, Vancouver, Washington, 151.07; B Speed—Frank Hunt, Merced, California, 157.14; D Speed—Bill Nusz, 181.2.

FAI Speed—Paul Gibeault, 158.14; Jet Speed—Bill Nusz, 170.23; Formula 40 Speed—Paul Gibeault, 148.4; .21 Sport Speed—Chuck Schuette, 134.98.

Class I Navy Carrier—Roy Beers, Ariel, Washington, 196.75 points; Class II Navy Carrier—Rick Wallace, Sequim, Washington, 205.07; Profile Navy Carrier—John Hall, Sumner, Washington, 227.41; .15 Navy Carrier—John Hall, 187.16.

Beginner Precision Aerobatics—Bobby Graff, Eugene, Oregon, 255 points; Intermediate Precision Aerobatics—Michael Hawk, Gilroy, California, 437; Advanced Precision Aerobatics—Darrel Harvin, Bremerton, Washington, 498; Expert Precision Aerobatics—Paul Walker, Kent, Washington, 577; Old-Time Stunt—Don McClave, Portland, Oregon, 298.8; Nostalgia Stunt—Don McClave, 501.5.

Fox .35 Combat—Tom Strom, Seattle, Washington; Slow Combat—Jeff Rein, Bothell, Washington; 1/2A Combat—Dick Salter, Seattle, Washington; AMA Combat—Norm McFadden, Lynnwood, Washington.

Precision Scale—Grant Hiestand, Burbank, California, 468.9 points; Sport Scale—Fred Cronenwett, Canoga Park, California, 145.3; Profile Scale—Grant Hiestand, 160.35.

As always, photos, questions, contest news, technical tips and other Control Line information is welcome. Write John Thompson, 1145 Birch Ave., Cottage Grove, OR 97424. **MB**

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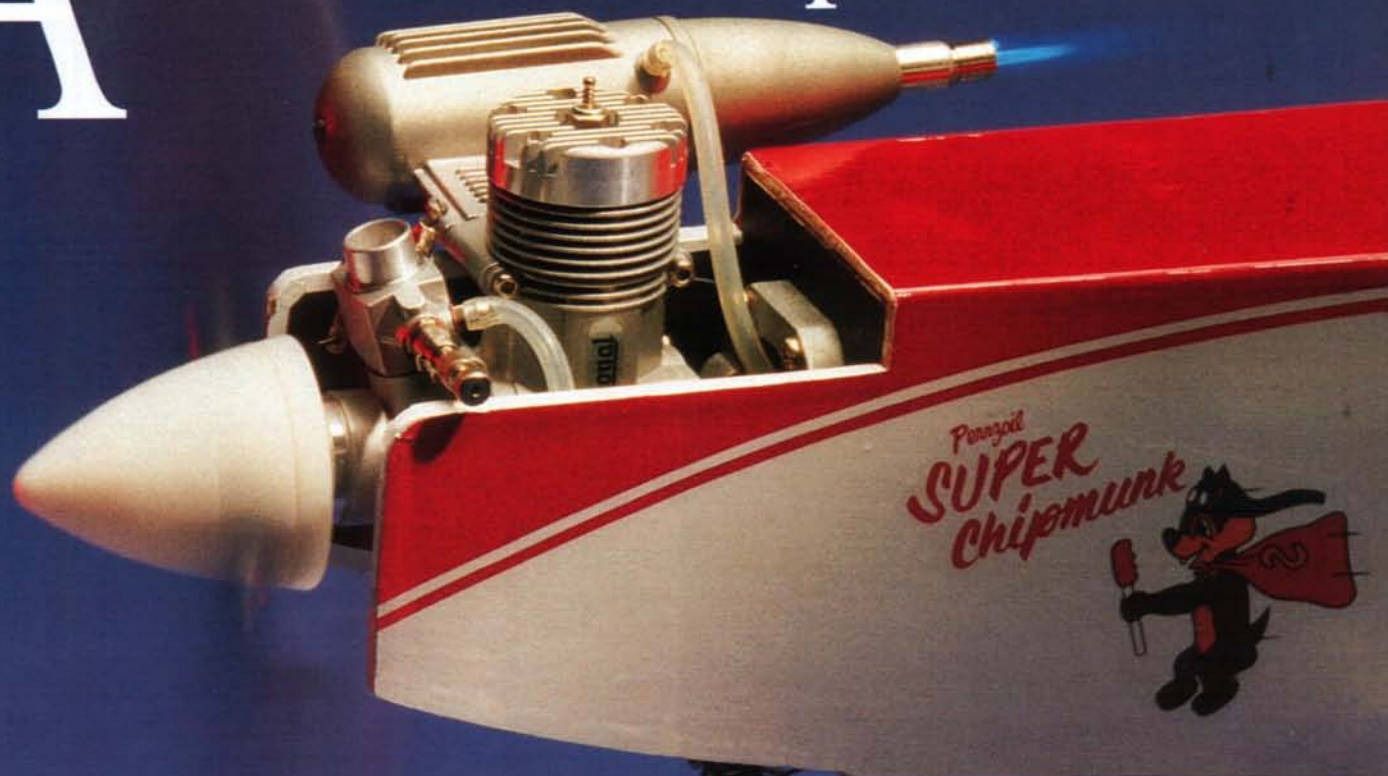
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