

**RADIO  
CONTROL  
AIRCRAFT**

**REVIEW: ME-109 ELECTRIC MOTORGLIDER**

MARCH 1992

# MODEL BUILDER

WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

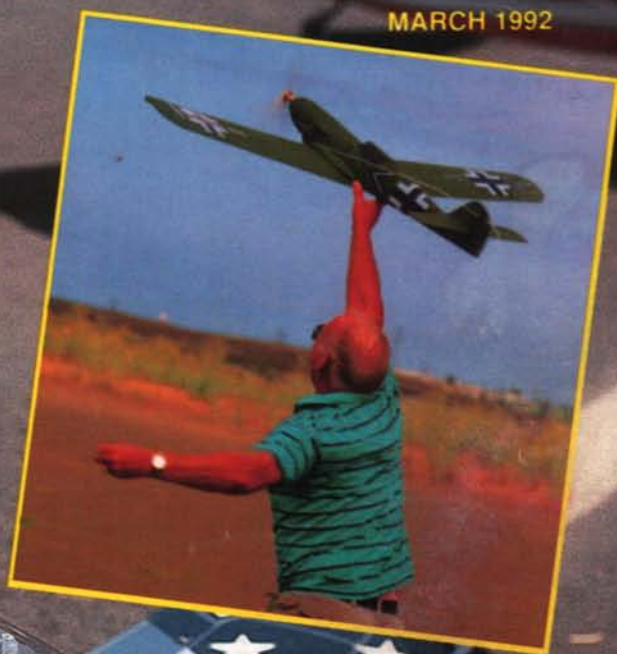
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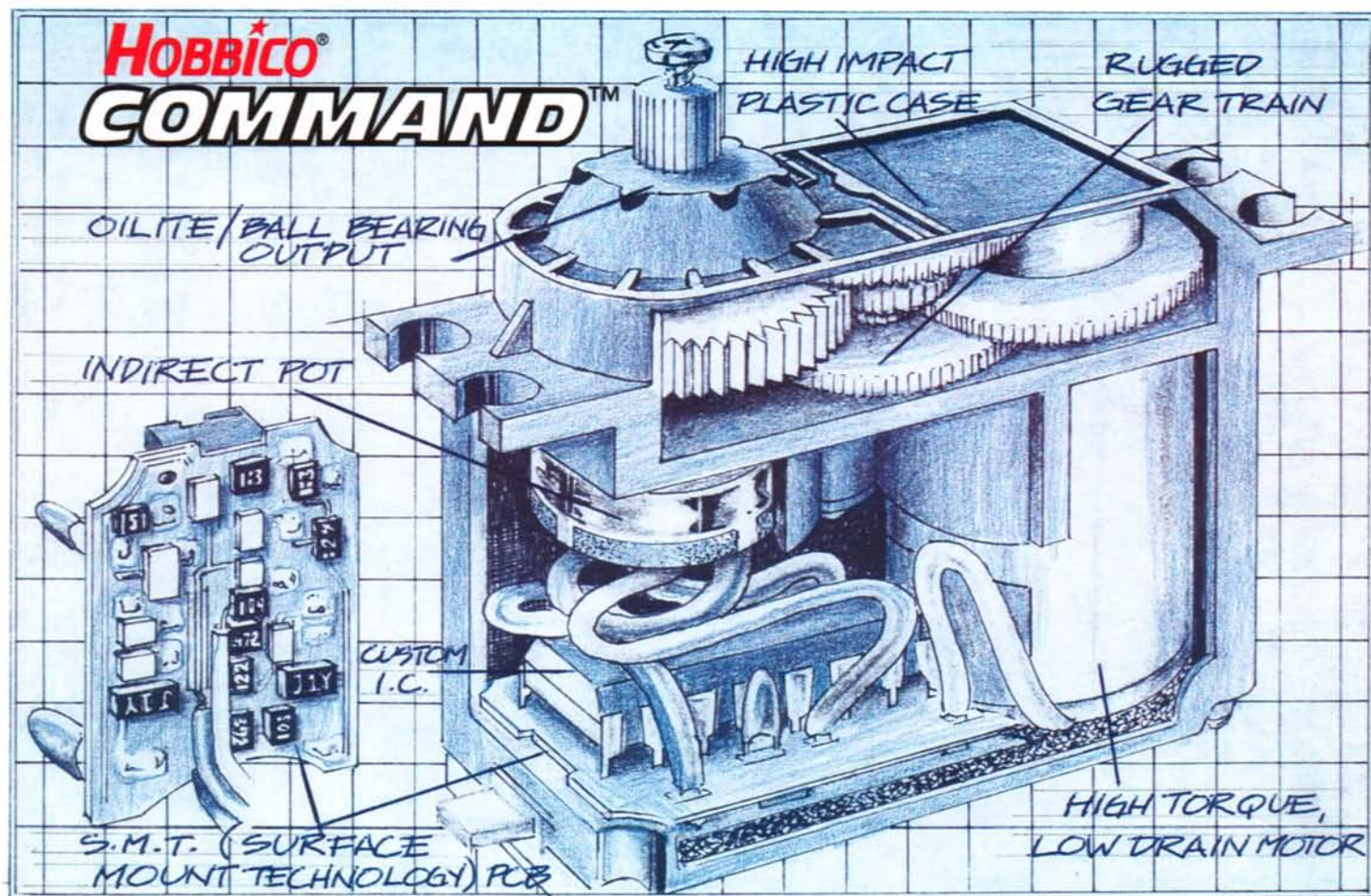
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Servo	Torque	Speed	Weight	Dimensions	Applications
 CS-31	20 oz.-in.	.22 sec. at 60°	.65 oz.	1.3" x .6" x 1.2"	(Mini) Electric Heli or Airplane
 CS-51	38 oz.-in.	.21 sec. at 60°	1.51 oz.	1.6" x .8" x 1.4"	(Standard) On- or Off-Road Cars/Trucks
 CS-55	40 oz.-in.	.23 sec. at 60°	1.53 oz.	1.6" x .8" x 1.5"	(Standard) All Airplanes & Helis (Oilite Bearings)
 CS-57	40 oz.-in.	.23 sec. at 60°	1.6 oz.	1.6" x .8" x 1.5"	(Deluxe) All Airplanes & Helis (Ball Bearings)
 CS-72	130 oz.-in.	.23 sec. at 60°	3.5 oz.	1.4" x 2.3" x 2"	(Large) All 1/4 Scale Aircraft & Cars (Ball Bearings)



# MODEL BUILDER

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Kent Nagy of Paso Robles, CA, built this beautiful F-86 from a BVM kit, with KBV .82 power, operating flaps, dragbrakes and drop tanks. Coverite "Presto" trim was used for aluminum areas, red-white-blue is painted; marking by Aeroloff. Photo by Bill Rice. Inset: The ME-109 Warbird from Dicky Bird Models is reviewed on page 22.

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	Apollo Type	# Of Servos	Size Inches H x W x L	Wt. OZ.	Stall Torque	60 DEG Spd. Speed	Position Accuracy	Output Shaft Bearing Type	PRICE/SET*
"SPORT-PACK"	05	4	1.43 x 0.79 x 1.6	1.55	42 oz."	0.24 Sec	3/4 DEG.	HARD NYLON	\$54.95
"PRO-PACK"	10	4	1.48 x 0.79 x 1.6	1.55	42 oz."	0.24 Sec	1/3 DEG.	IRON/OILITE	\$64.95
"ELECTRO-GLIDE"	20	3	1.25 x 0.55 x 1.2	0.95	28 oz."	0.22 Sec	1/2 DEG.	SUPER TIGHT	\$74.95
"GIANT PACK"	15	3	1.97 x 1.14 x 2.3	3.5	130 oz."	0.23 Sec	1/2 DEG.	B.Brg./OILITE	\$99.95
Includes Sm. thr.	05	1	1.43 x 0.79 x 1.6	1.55	42 oz."	0.24 Sec	3/4 DEG.	HARD NYLON	

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RECEIVER MODEL	PART NBR	AM/FM MODE	# OF CH.	RCD # THAT IS PLUG COMPATIBLE WITH:						Size-Inches H x W x L	Wt. OZ.	SUGG. LIST.
				AIRTRONICS	FUTABA	FUTABA	JR	HITEC	CIRRUS			
PGP	21	AM	7	300	100	150	150	-	100	0.84 x 1.47 x 2.43	1.5	\$69.95
PGP	31	FM	7	400	-	200	600	500	200	0.84 x 1.47 x 2.43	1.5	\$74.95
MICRO	535	FM	5	2400	-	2200	2600	2500	2200	0.82 x 1.17 x 1.98	0.8	\$84.95

\*Plus \$4.95 S & H/Order, & CA Sales Tax for CA Residents. (Allow 2-4 weeks delivery.)



# BILL NORTHROP'S WORKBENCH



"It's a rough job, but somebody has to do it." That's the somewhat tongue-in-cheek line that goes with the initial advertising by International Modeler Shows (IMS) that it will introduce a new annual radio control model sport and hobby show in Florida, starting the first weekend in May, 1992 . . . to be exact, May 1, 2, and 3.

By strange coincidence, this Orange County, California-based company will produce its first Florida show at the Orange County Convention/Civic Center . . . in Orlando, Florida, which also happens to be the location of many famous tourist attractions, such as Disney World, Epcot, Sea World, Universal Studios, nearby Cape Canaveral, and much more!

Complete details of the show are still being established as this is being written (Dec. 12, 1991), however, feedback from inquiries and early exhibitor registra-

members of the industry to be admitted. At 2 p.m., and until closing at 7 p.m., the doors will open be to the general public. The show will also be open to everyone from 10 a.m. to 6 p.m. on Saturday, and from 10 a.m. to 5 p.m. on Sunday. Admission will be \$6.00 per day, while children under six will be admitted free if accompanied by an adult.

Features of the show will include prominent manufacturer exhibitors (*who will have the option to sell products directly from their booths*), static model competition in many categories for trophies and prizes, live demonstrations of radio control models, a swap shop, a giant raffle, and some other special features to be announced later.

So . . . mark your calendar and set aside May 1, 2, and 3 of 1992 for **IMS FLORIDA!** For further information as it becomes available . . . and if you wish to

Well, back off and listen up!

Realizing that the Expo has far outgrown the environs of Ida Grove, and that its full potential cannot be achieved in this rural area, it has been decided to locate a new sponsor and move the Expo to a geographical area that is more suited to support the Expo's inevitable growth. Therefore, there will not be an Aviation Expo in Ida Grove in 1992, and as a transition such as this cannot be accomplished in a short period of time, it is almost assured that the show cannot be resumed until 1993. Stay tuned for further developments.

## TOLEDO WARM-UP

The Westerville Model Aeronautics Association (WMAA) will be holding its 22nd annual radio control and model show on March 21, 1992, just two weeks before the "Granddaddy" of them all, the Toledo Weak Signals show in its new location, the Seagate Centre, in downtown Toledo. The WMAA show is held at the Aladdin Temple auditorium, 3850 Stelzer Rd., in Columbus, Ohio, from 9 a.m. to 5 p.m. It's a static show, open to all models of airplanes, sailplanes, helicopters, cars, boats, and rockets. Trophies are awarded to third place in each of 13 categories, as well as Best of Show. For further information, contact Marvin Wade, Show Chairman, at (614) 459-0925.

## MACHINIST "SHOOT-OUT"

Sherline Products, Inc., 170 Navajo St., San Marcos, CA 92069, manufacturers of machinist equipment, announces a contest to be held during the North American Engineering Society (NAE) Show, at the Yak Ice Arena, Wyandotte, Michigan, on May 2 and 3, 1992. Object of the competition, which results in a first prize of \$1,000.00, is to build the smallest possible working engine (that runs on compressed air or fuel). Winning engine is to be determined by size, complexity, and craftsmanship, each category being judged 0 to 10



Jerry Nelson's at it again! Well known by RC modelers from 15 or more years ago as an innovator, Jerry has developed a method of building all-aluminum RC models. His Nelson AL-1 semi-scale design spans 97 inches, weighs 28 pounds, is powered by a Saito 270, and uses an Airtronics Vision radio. More info in text.

tion, upon establishing the time and location of the show, indicate strong support by major manufacturers, who enjoy a high percentage of product sales in this land of retired living and year-round radio control hobby activities.

Time schedules and format of the Florida show are expected to follow that of the 15-year established IMS Pasadena, California show pattern, with Friday morning from 9 a.m. to afternoon at 2 p.m. being set aside only for dealers and other

be an exhibitor, but may not be on the IMS exhibitor mailing list . . . call (714) 732-6057, FAX (714) 723-0913, or write to IMS at P.O. Box 10127, Costa Mesa, CA 92627.

## HOLD IT!

If you're one of the thousands of regular attendees of the fabulous annual Byron Aviation Expo, and are aware of the difficulty of finding lodging within reasonable driving range of Ida Grove, Iowa, you are probably already making plans for 1992.



# DEAR JAKE

and multiplied by the other category scores to establish a total score. Engine must be small enough to fit in a one-inch by one-inch by two-inch box. Any of the eight cash prizes will be doubled if the entry is built on Sherline equipment. Contact Sherline for complete "Shoot-Out" rules.



A true modeler as well as a model industry leader, Shigeo Ogawa, founder of O.S. Engines, died on November 4, 1991. He was a pioneer in model engine development, and started O.S. Engine company in 1936. Current management will continue to run the company without interruption.

## FLY ALUMINUM!

What is believed to be the first ever all-metal (aluminum) flying radio controlled model aircraft has been developed, built, and successfully test flown by Jerry Nelson, of Reno, Nevada. Jerry's name should ring a bell with those who have been around RC modeling for at least the past 15 years. An innovator in radio control modeling for many years, Jerry was a top pattern flier dating back to the days of reed radios, and was once the US RC Precision Aerobatics team manager. He was the founder of head-to-head pylon racing and the NMPRA; developed, flew, and produced kits for the first all-fiberglass constructed RC sailplane; established the first national aerobatic RC biplane organization; and was a member and chairman of the AMA's RC Contest Board.

The Nelson AL-1 is an origi-

nal all-aluminum constructed RC model aircraft based somewhat on the RV-4 full-scale homebuilt. It also bears marked resemblance to the Corby Starlet homebuilt. Basic structure is .012 thick 2024T-3 clad aluminum. Jerry will have displayed the model in his booth at the 1992 IMS Pasadena show in January, prior to publishing of this issue of *Model Builder*.

For more information about this and future exact scale all-aluminum RC aircraft from Jerry, contact him at the Ted Nelson Company, RC Aircraft Products Division, P.O. Box 20637, Reno, NV 89510, phone (702) 323-4955, FAX (702) 323-2982.

## INTERNATIONAL STICK & TISSUE

This is the full title of the latest book to come from *Model Builder's* "Hangarman," Bill Hannan. As anyone in the know would suggest, assembling all there is to gather about the history of model airplanes into written and illustrated form is somewhat akin to the infinite collecting of match book covers. However, Bill is chipping away at this task in a methodical, enlightening, and best of all, entertaining manner with his series of books that, in their cleanly detailed and precise manner, are very similar to the quality of the models he himself has built over the years. The 28-page, soft-cover book contains nine pages of construction plans for scale and sport rubber powered models, as well as many photos from his vast collection, and is topped off with Bill's articles about Models in History, an examination of Penaud (there's an accent over the 'e' that this keyboard does not have) and his Planophores (complete with photos and sketches), plus photos and sketches, with description, of models our fathers or grandfathers (depending on the reader's age) would have flown in the early 1900s. Altogether, another tempting morsel of reading and study that can only bring about anxiety for the next edition!

continued on page 86

## Advice for the Propworn

BY JAKE

### DEAR JAKE:

Last weekend I crashed my airplane through the sunporch of my uncle Tom's cabin, injuring Harriet Beecher's Toe.

Harriet's mother wanted her daughter to sue me, so I told her I was a member of the AMA. Now she thinks I'm a doctor and wants Harriet to marry me instead.

My question is: Since my radio was Japanese, my engine Italian, and my airplane was an ARF made in Taiwan, do I need a passport to flee the country?

Worried in Westminster  
Dear Worried:

Believe it or not, Bill Northrop tells me he is actually related to Harriet Beecher's Toe on his father's side, through his Ankle Remus, I believe he said.

Despite the international flavor of your airplane, I don't believe you'll need a passport to avoid Harriet's clutches. A visa should be adequate.

But by all means, don't forget to bring that visa, because at Uncle Tom's Cabin, they don't take American Express.

Jake  
P.S. - I used to tell young women I was a member of the AMA, then asked them to take off their clothes.

Jake

### DEAR JAKE:

What's the last word on your "Best of Dear Jake" book? Literary Guild in Laredo, TX  
Dear Guild:

The last word, if you don't count the back cover, is "end," as in "The End." The last word, if you do count the back cover with its notes on the author, is "Bozo."

Jake

### DEAR JAKE:

There have been some great aviation motion pictures over the years. One of my all-time favorites is the "Spirit of St. Louis" with a young Jimmy Stewart. That harrowing overweight takeoff from Roosevelt Field and that miraculous sun flash to awaken him from certain doom over the Atlantic are truly unforgettable.

"The Flight of the Phoenix" is another classic high on my list. That one really hits home for us hobbyists because the hero is a model airplane designer who conceives and fabricates a patchwork airplane from the broken parts of a downed cargo aircraft. The thing actually works and the marooned crew was able to fly themselves to safety.

Many others come to mind, such as "On a Wing and a Prayer," "Those Magnificent Men in Their Flying Machines," and "Memphis Belle." What's your favorite aviation movie, Jake?

Movie Goer in Middlesex, NJ  
Dear Movie Goer:

My favorite airplane movie is "Airplane," not just because the loonies in the airport get punched out, but because Barbara Billingsly speaks Jive so well.

Jake

### DEAR JAKE:

"The Great Race" was a better movie than anything you or Movie Goer mentioned, if only because Peter Falk broke off half of Jack Lemmon's frozen moustache in the Arctic.

Rodney in Redwood City  
Dear Rodney:

Where's your aviation connection? Falk and Lemmon blowing up their own bicycle powered balloon when a bomb they dropped got stuck in the undercarriage was a funnier scene from the same movie, plus it involved aviation. Or how about Buddy Hackett flying a twin Beech through a billboard in "It's a Mad, Mad, Mad, Mad World"? Now that's entertainment, and it was aeronautical. Come on, Rodney, get on the same page!

Jake MB



# over the counter

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

## FUTABA'S 120AC FOUR-STROKE

When it comes to high-performance 1.20-size four-strokes, the mighty YS Futaba 120SF has never had to take a back seat to anything—until now. The new YS Futaba



120AC supercharged, fuel injected powerplant is claimed to deliver even more brute power and should prove to be a favorite with the F3A aerobatics and RC Scale crowd. Here's what the Futaba brochure has to say about it:

"The 120AC incorporates a special air chamber, crankcase pressure and a double throttle valve to increase the fuel/air charge much like a tuned intake manifold. A new piston design that creates more crankcase pressure and a larger exhaust valve are also used to produce more power.

"Another important feature of the 120AC is a sealed rear crankshaft bearing which is shielded from residual fuel by two steel rings and is lubricated by the regulator system. The rear bearing size has also been increased to improve durability.

"The unique engineering of the 120AC produces superior performance during steep climbing or inverted flight, and is not susceptible to four-cycle detonation."

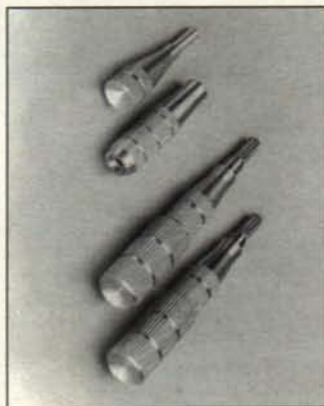
Check out the new 120AC at your favorite hobby shop. It's distributed by Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

## COMPETITION HELICOPTER

The new Kalt "Baron Alpha II"



RC helicopter from Hobby Dynamics is a full-blown .60-size competition machine that serious heli fliers are going to want to take a real close look at. Its features include the all-metal, ball bearing supported Kalt 10 SII rotorhead, 9.78:1.55 gear ratio, heavy duty ribbed aluminum side frames, large rotor disc, and a special high-performance tail rotor drive system, to name just a few. Suggested retail price is set at a penny under a thousand dollars. Keep an eye on our "Chopper



Chatter" column, we bet you're going to be hearing a lot about this machine in the future.

Hobby Dynamics also has the recently introduced extra-long JR Propo control sticks that are a drop-in fit on any JR transmitter that has adjustable sticks. They're machined from aluminum bar stock and retail for \$14.95 per pair.

From Hobby Dynamics, P.O. Box 3726, Champaign, IL 61826-3726.

## HIROBO'S COBRA CHOPPER

If it's a scale helicopter you're looking for, consider the awesome Hirobo TOW Cobra AH-1S III being imported by Altech Marketing. It's a .60-.80 size machine based on Hirobo's competition proven SST



mechanics, which we know are considered by heli fliers to be right up there with the very best. The rotor head is the SSR-III with overhead flybar. Detail-wise, the fiberglass reinforced plastic body carries TOW launchers, a gunsight, wipers, door handles, turbine exhaust and the rotating forward gun. At rest or in the air, this is one mean looking dude!

For more info on the new Hirobo TOW Cobra or to get the latest Hirobo catalog, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391; or call (908) 248-8738.

## FIBERGLASS ACCESSORIES

A company by the name of R/C City, 96 Railroad Ave. #F, Suisun, CA 94585, manufactures some very nice fiberglass scale and pattern model kits and also offers various



aftermarket fiberglass parts for other manufacturers' kits. Case in point is the lightweight epoxyglass cowl and wheel pants for the Carl Goldberg Models "Extra 300" RC aerobatic ship shown in the accompanying photo. The cowl is priced at \$30, the wheel pants go for \$25 for the pair, and shipping and handling adds another \$5. For a complete catalog of R/C City's products, send a dollar to the address above. You can also speak personally with the folks there by calling (707) 428-3119; their FAX number is (707) 421-2336.

## NSP'S 'ALCYONE' SAILPLANE

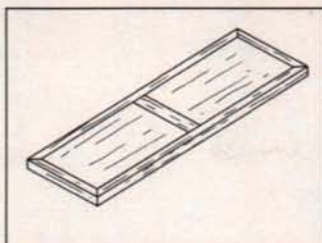
For those RC sailplane pilots who would like to get involved in high-



performance thermal soaring but are wary of the costs involved, the new Northeast Sailplane Products "Alcyone" (pronounced "Ahl-see-yon") may be just what you need. It's a 121-inch competition sailplane produced by Culpepper Models and is based on the highly competitive Chuperosa, a 1991 Nats winner.

The Alcyone uses ailerons, elevator, rudder and flap controls but is set up such that only three servos are required instead of the usual six used by most gliders in its class. The airfoil camber distribution allows up to 90% of the speed range of full trailing edge camber without the considerable expense of a four-servo wing.

Speaking of airfoils, the Alcyone



ordered three for our own personal use here in the MB office. The boards measure one inch thick by 14 inches wide by four feet long (a three-footer is also offered) and are very nicely made, with one-inch square balsa strips on all four edges and a two-inch-wide balsa plank in the middle,

perpendicular to the long dimension, to prevent the board from bowing across its width. Lightweight and portable, these boards are just the ticket for those with limited workspace available, or who have to do their building on the dining room table.

If you were to put

together your own balsa workboard like these, it would cost you a small fortune. A pleasant surprise with the Guillow boards is the price: \$20.98 for the 36-inch (stock #WB 36) and \$23.98 for the four-foot board (stock #WB 48)... about the cost for a couple of Peanut Scale models these days. Shipping and handling runs \$4.75, and Massachusetts residents have to cough up an extra 5% for Uncle Sam. Write to Paul K. Guillow, Inc., Dept. WB, P.O. Box 229, Wakefield, MA 01880-0329. And please be sure to mention *Model Builder* when placing your order!

## TWO NEW ARFS

The selection of RC ARFs produced by EZ Sports Aviation now includes a CAP 231, the famous French-made aerobatic machine; and



yet another P-51 (their fourth!), this one a B model. Both are designed for .40 two-stroke or up to .90 four-stroke powerplants, and four-channel radios (five in the Mustang if you spring for the optional retracts). There's also an optional armament kit available for the P-51 if you want the utmost in realism. Both models can typically be found discounted to around the \$250 range.

EZ Sports Aviation models are distributed exclusively by Global



Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728-8610.

## MILLER YF-22 DUCTED FAN

The USAF's latest combat jet, the General Dynamics YF-22 Advanced Tactical Fighter, is now offered as a precision scale RC model kit from George Miller, 1140 Civic Center Drive, Rohnert Park, CA 94928; (707) 584-9446. It's a well-tested model that has been demonstrated very impressively at several of the more recent U.S. fan-fly, often by well-known jet model pilots.



The Miller kit consists of a one-piece fiberglass fuselage, foam cores, sheeting, pre-cut fuselage formers, clear canopy, pre-built stabilizer mechanism, and full-size plans and instructions, all for a going price of \$400 plus \$30 for freight charges. The aircraft is engineered for a Byron fan unit and Spring Air retracts, is 75 inches long and spans 52 inches. All-up

flying weight is around 11-1/2 pounds. And despite the fact that the YF-22 platform is the very latest in design technology, the model is claimed to be very docile in flight, with absolutely no tendency to tip-stall if you find yourself getting too slow on landing approach.

Write to George Miller at the address above for more information on the YF-22 and the other quality models in his product line.

## WINCH LINE RETRIEVER

Something new and interesting in the way of RC sailplane winch line retrievers is being marketed by Innovative Product Design. The "E-Z Retriever" is unusual in that it operates much like a large open-face spinning reel, the advantage of which is that it winds the

line back onto the face of the spool just as it comes off, completely eliminating the problem of line



twists and tangles common to most other retrievers that feed the line off the front of the spool and then wind

it back on from the side. This non-twisting feature makes possible the use of monofilament fishing line for very low payout drag.

The E-Z

Retriever is sold both as a kit for \$250 (you build the cabinet and mount the pre-assembled mechanics) and complete and ready to go for \$325. Options, such as a foot-operated switch, are also offered. Contact Innovative Product Design, 1911 Wolcott Dr., Columbia, MO 65202; (314) 443-6708 for full particulars, and when you do, be sure to mention that you read about their products in *Model Builder*!

continued on page 12

## SUPER BUILDING BOARDS

Without a doubt, one of the best-kept secrets in the hobby is the solid balsa building boards sold by Guillow's... that's right, the outfit that has been producing an extensive line of stick-and-tissue scale models for just about forever, it seems. We found out about these boards purely by chance and



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## counter continued from page 9

### TWO VOLUMES OF SCALE DRAWINGS

There isn't a Scale Modeler worthy of the title who isn't familiar with the late Paul Matt's great *Historical Aviation Albums* and the equally great aircraft line drawings contained in each one. Unfortunately, the older editions of HAA are out of print, and not many modelers are aware that the individual Matt scale drawings are currently available from another source. That source, Aviation Heritage Books, has recently come out with two 8-1/2x11-inch softbound volumes, each with over 150 pages, which together contain all of the 122 scale aircraft drawings (some comprising up to six sheets) originally published in HAA. These are a treasure trove of documentation drawings that all scale modelers, be they RC, FF or CL oriented, will want to have in their collections.

Paul Matt's *Scale Airplane Drawings*, volumes 1 and 2, sell for \$24.95 each. All of the drawings they contain are also available as 11x17-inch enlargements; complete pricing and ordering information is included with the books. To order your copies, write to Aviation Heritage Books, P.O. Box 2065, Terre Haute, IN 47802, or call them toll free at 1-800-999-0141.

### NEW CUB LANDING GEAR ASSEMBLIES

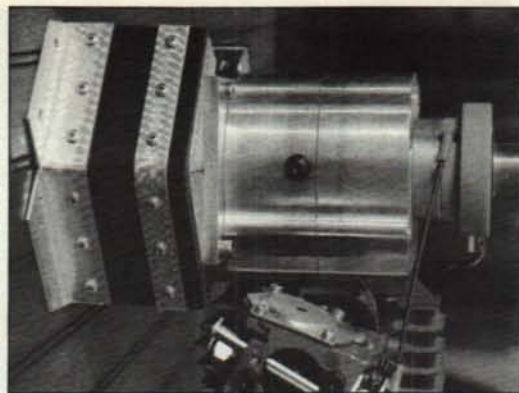
Michigan's Bob Shattleroe runs a small business specializing in aftermarket scale model landing gear assemblies. His latest two are for J-3 Cubs; the huge 1/3-scale Cub from Balsa USA, and a slightly scaled down version for Wendell Hostetler's 30% Cub. Both are spring loaded for proper shock absorbing action and are made from 1/4-inch wire-welded, reheated piano wire. Coming up in the near future will be scale-looking bungee covers that will hide the springs and make for a 100% scale looking landing gear.

Bob has a catalog available for a buck and advises that if it doesn't list what you need, don't fret, he also does custom work. Catalogs are available from Bob Shattleroe Custom Gear, Dept. #8, 31985 John Hawk, Garden City, MI 48135.

### SOFT MOUNTS

Another entry in the line of "soft" engine mounts being made for model aircraft are the new ones by Art Designs, P.O. Box 2606, Page, AZ 86040. Two sizes are offered: small (\$17 plus \$3 S&H), for .40 to 1.20 cu. in. engines; and large (\$22 plus \$3 S&H), for 2 to 6 cu. in. powerplants. The photo shows the mount supporting an A&M Sachs-Dolmer 5.8, one of the biggest engines currently being used.

Simply described, the Art Designs Soft Mount is



in two halves, each half consisting of fore and aft V-bent aluminum brackets joined by stiff, reinforced neoprene; the neoprene is what does the vibration damping between the engine and airframe. Extra neoprene inserts are included so that you can tailor the stiffness of the mount to suit your particular installation. A few hand tools are needed for assembly, which takes about half an hour.

If needed, more information can be obtained by contacting Art Designs at the above address.

### FUEL-PROOF RUBBER BAND

Need some good quality rubber bands to hold the wing on your model? Try the new ones marketed by Midwest Products Co. They are claimed to be 100% fuel-proof and feature a special ultraviolet treatment that retards deterioration from sunlight, smog and acid in the air. They're packaged in #62 and #64 sizes, at \$2.49 per box. They should be available at your local hobby shop by the time you read this. From Midwest Products Co., 400 S. Indiana St., P.O. Box 564, Hobart, IN 46342.

### BOB VIOLETT T-33 DUCTED FAN

A notice from Bob Violett Models carries the announcement that the long-awaited BVM T-33 Shooting Star is now in full production and ready



for shipment. This model sounds like the way to go for prospective jet fliers looking for a model that's looking model can be turned out with only

*continued on page 86*



## Tools

TAO001A	Taig Lathe	269.00
HLAE801	Solingen Balsa Planer	7.40
HLH625	Balsa Stripper	12.60
HLMO0002	Modelers pins, 50	3.40
HLPS111	Permanent sanders set	33.40

## Building Boards

GR503	Laminated balsa 50 x 13"	43.50
GR645	Unitized balsa 39 x 10"	26.60

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HLKE300	Workbench set	22.90
HLKE200	Storage unit set	39.90

## RC airplanes, glow powered

HLA121	1:4 Scale Cub	228.00
HLA128	DH82A Tiger Moth	209.00
HLA3731	Golden Eagle Biplane	226.00
HLRM1480	Romeo	139.00
HLSC232	Taurus Plus	309.00

## Telemasters, Funster

HLA105	Telemaster 70 ARF	174.00
HLA107	Senior Telemaster	135.00
HLA111	Telemaster 40	79.50
HLA112	12"6" Telemaster	339.00
HLA108	RCM Funster	79.80

## RC electric sailplanes

HLA130	Freshman	39.00
HLA131	Graduate	59.00
HLA10204	Excel WS 10	148.00
GR4207	Elektro-UHU (1.9M)	88.00
GR4208	Pink	105.00
GR4264	ASW 22 B270	279.00
GR4266	ET 200 RTF	127.00
GR4270	Elektro Junior ARF	179.00
GR4271	Cherry ARF	238.00
GR4274	Solar-UHU	128.00
HLAN1324	Sinus	284.00
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## RC Electric fast boats

GR2175	Taifun hydroplane	99.00
GR2118	Systems	89.00
GR2166	Cobra	52.00
GR2171	Key West	49.00
GR2173	Eco-Speed	59.00
GR2174	Key Biscayne	99.00

## Electric RC airplanes

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GR4678	Fokker E.III	99.00

GR4681	Zoff	97.00
GR4684	Partenavia P.68	118.00
HLAN1329	Aerofly	138.00

## RC Sailboats

GR2116	Miramare	326.00
GR2169	Collie	119.00
HLKK1423	Tina	138.00

## RC Steamboats

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GR2126S	Glasgow (steam)	569.00
HLKK2026	Victoria steam	587.00
HLKK2028	Alexandra steam	568.00

## RC scale boats

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GR2160	Pegasus	276.00
GR2163	Sea Commander	167.00

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HLH721	for under 2 meter	85.00
HLH722	for 2-3 meter	97.10
HLH723	for 3-4 meter	125.20

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HLA401	Sport 500 with collective	285.00
HLA404	Sport 500, assembled	412.00

## Snow skis for RC airplanes

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HLBB180	7" single	12.75
HLBB200	8" single	13.75
HLBB240	9-1/2" pair	35.70
HLBB270	10-1/2" pair	38.25
HLBB300	11-1/2" pair	40.80

## Kavan starter

HLFK111	Kavan starter	25.90
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## "PFM" adhesive

HLIMP001	"P.F.M." adhesive-seal	9.95
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## CO<sup>2</sup> Motor

HLMO3700	CO <sup>2</sup> Motor	36.30
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## Morco Engines

MER30D	30 RC Diesel	99.00
MER30RC	30 RC Engine	65.00
MER35RC	35 RC Engine	67.00
MER40RC	40 RC Engine	69.00
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VIDEO6	Taifun, Key Biscayne	9.00
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VIDEO8	Sailboats, Tina, Miramare	9.00
VIDEO9	ASW 22 B270, Excel	9.00

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## Hobby Lobby's FEMO Onboard Starters:

(specify engine name & size, all styles not listed)

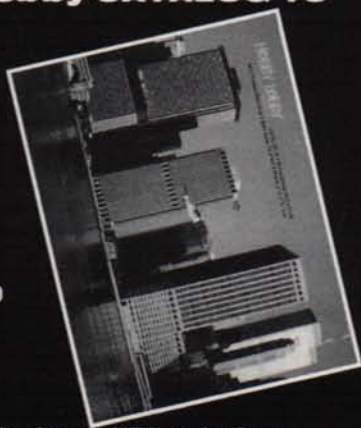
HLFE00	for 60-80 RC	225.00
HLFE05	for 40-50 RC	210.00
HLFE10M	for 90 Marine	235.00
HLFE12	for 90-120 RC	225.00
HLFE13	for ST2000-3000	220.00
HLFE15	for Q30-40 pre-'89	220.00
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## ELBERT J. (JOE) WEATHERS' **WX-48R** EARLY 30'S RUBBER POWERED SPEED MODEL

BY KEN HAMILTON



Many of you, no doubt, are familiar with Joe Weathers' scale-like free flight gas powered model airplane designs, the controversial "Mystery Man" being perhaps best known. While the late Joe Weathers steadfastly maintained that this model simply left its takeoff dolly on the ground, landing on a partially-exposed single wheel in the fuselage, there were others who insisted the model was illegal in that it "dropped parts in flight." Other well-known original free flight gas model designs by Joe are the "Westerner," "PacifiCoaster," "Miss San Diego," "Winged Victory," "Tubby," etc.

But before becoming San Diego's first gas modeler, a distributor for the ELF gas engines, and participating in the founding of the still very active San Diego Aeroneers model airplane club, Joe produced a number of glider and rubber-powered model designs, several of which were published. Jim Alaback, a member of the Aeroneers club, compiled a history of Joe's model career, finding over a hundred

designs, both gas and rubber powered as well as gliders, originated by Joe. A few were scale flying models, but most were beautiful and original designs.

Through the nominating efforts of Jim Alaback, Joe has become posthumously a member of both the AMA and NFFS Halls of Fame.

The April 1935 issue of *Model Airplane News* had a photo and description of a rubber-powered speed model, the "WX-48R," one of Joe's designs. The writer immediately obtained a print of the plans for this racy looking model from Joe, and built the model. It flew well, but was totalled in January '36, in a flight intended to show Joe how well it flew. A few extra turns than ever before were cranked in, and you know the rest! These early contacts led to visits back and forth, attending contests together, and eventually to Joe's older sister and the writer marrying!

Joe's original drawing, and the writer's print of it, have long vanished. Having a special in-



Previously unpublished photo of Joe Weathers' original model. Don't let those big fuselage/wing fillets scare you off; they're easier to do than you might think. Winding was done from the rear, hence the opening under the stab. Hatch just behind the nose block was for access to ballast. Joe had a knack for designing models that look good from any angle, and his sexy WX-48R is certainly no exception! Ken Hamilton has done an outstanding job of recreating this early-30s rubber job from memory and a few existing photos.



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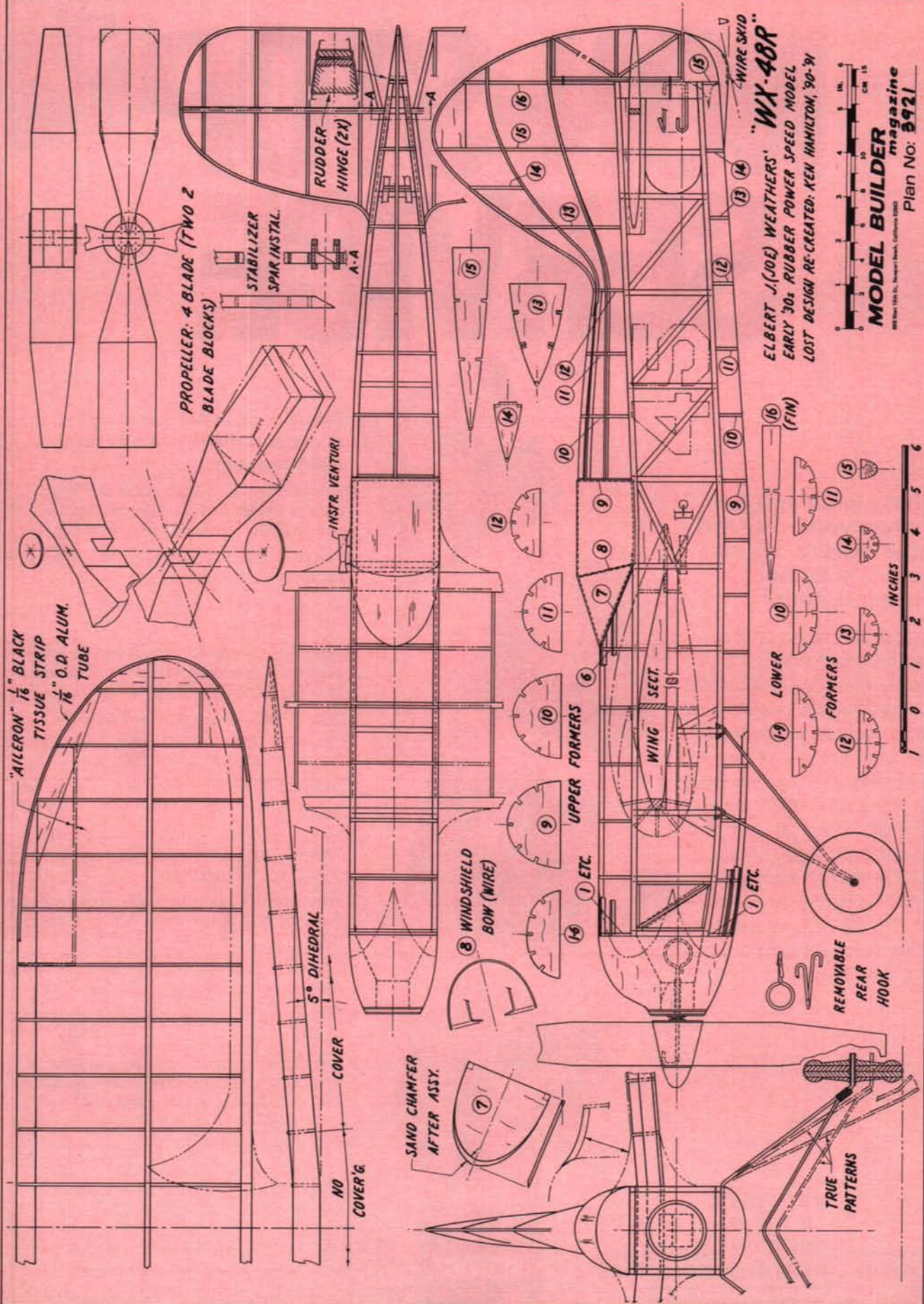
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terest in the design, and five photos of Joe's and his models, and knowing the span, the writer has re-created the design, presented here. A replica of Joe's model was built by the writer, soon to be on display by the San Diego Aerospace Museum as part of its new History of Model Aviation Museum. The model is being displayed in two capacities: typical of the then popular rubber-powered speed model type, and as an example of Joe's early modeling.

The plan presented here exactly duplicates Joe's original structure, and very closely duplicates his model's configuration and finish. Construction is standard in many ways, thus in the interest of brevity, only the unique aspects will be touched on in the following paragraphs.

Structure is all balsa, and sizes may be scaled from the drawing. For reference, the stringers are 1/16x1/8-inch strips, formers are 1/16-inch sheet, as are wing and stabilizer ribs, and the basic fuselage box structure is of 1/8-inch square strip.

The four-bladed propeller is actually two two-bladed propellers assembled as shown, the blocks carved and the propeller balanced after assembly. Small blocks of balsa fitted between the blades are shaped to form part of the spinner.

The fin, fairing into the top fuselage deck cockpit fairing, originally utilized 1/16-inch aluminum wire for its outline and two sharply bent short pieces, one each side of center, between formers 12 and 13. Soaking the stringers (ammonia works well) will permit them to follow the curves shown on the fin.

The writer substituted readily available 1/16-inch O.D. aluminum tubing for the once easily obtained aluminum wire Joe used for wing tips, the horizontal stabilizer and vertical fin outlines. It is easily formed to match the drawing, looks the same, and is lighter!

The landing gear is of 1/16-inch diameter music wire joined by wrapping with fine wire and soldering as shown. Wire struts

are secured to the lower long-erons with strong thread and cement. If the 2-1/4 inch diameter wheels are made, it is suggested they be laminated with grains crossed, then carved and sanded to the indicated cross section. Bushings of 1/16-inch I.D. aluminum tubing can be installed, with the ends flared and flattened. Soaking thin cyanoacrylate cement into the laminations at the axle hole will strengthen the wheels. Similarly, allowing thin cyanoacrylate to soak into the 1/16-inch balsa sheet formers before notching

had ever heard of a winding tube, or stretching a braided long rubber motor out the front to crank in many turns at minimum risk to the fuselage in the event of motor breakage. While the drawing shows the original setup, you may wish to modernize the rubber motor installation to permit front winding, and use a winding tube inserted through the nose block opening. While this rugged model was never intended to achieve much duration, the performance of the replica can be extended beyond that possible with the original

black tissue "45" on each side of the fuselage, and strips to simulate aileron and elevator outlines.

Small areas of opaque color dope (believed to have been bright red) were applied to the fuselage nose and tail, and to the wing leading edge, extending partially around the tips and on the inboard end onto the fillet area. The wing root fillet, incidentally, is easily made by cementing formers from the already covered fuselage upper deck across the uncovered wing section to the inboard side of

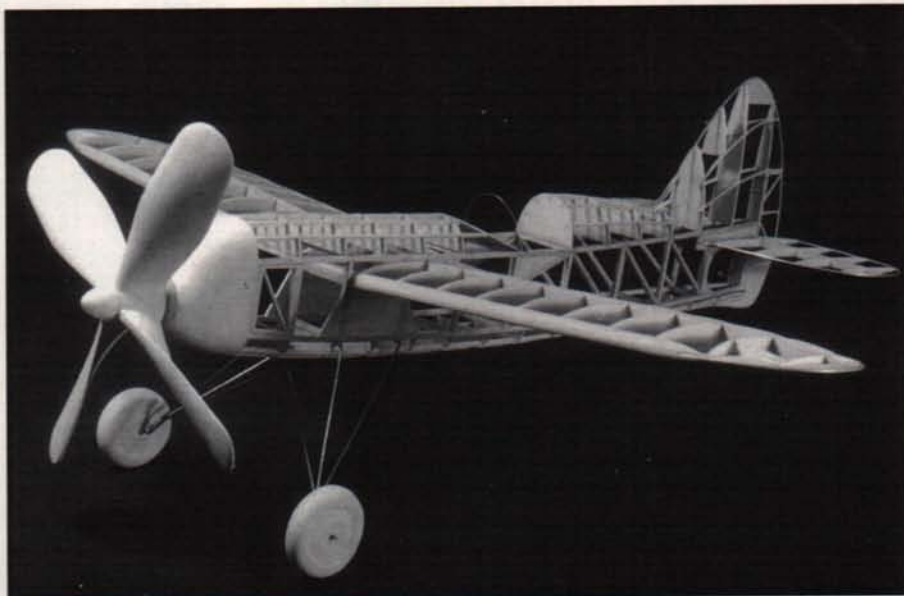
the first rib outboard of the fuselage. A typical former is shown. These formers are best fitted on the assembled model. As in the case of the fine the fillet is easily covered smoothly by fitting individual small pieces of tissue to each opening, water shrinking, and clear dopping when dry. If a tissue piece dries with a wrinkle on either the fin or fillet, do not hesitate to remove it and try another with a different grain direction until a smooth, wrinkle-free area is obtained. The results are worth it.

Both Joe's original and the writer's first model flew well without side or downthrust.

Here in Southern California the traditional tall grass field for first flights is a legendary thing. In fact, any field is becoming scarce. But at least this model does not create a noise problem, thus being flyable in nearby built-up areas. Following the initial glide trimming, power flights should start with low power and winds, gradually increasing these until the desired performance is obtained.

One last suggestion: Joe's original model did not have a freewheeling propeller, as the plan shows. The writer's replica model has a simple freewheeler hidden inside a vacuum-formed spinner nose. You may wish to make the same change.

As I did, have fun building this model from an earlier era. You will be rewarded by having an attention getting racy model, and by its being a tribute to the modeling skills of the late Joe Weathers. **MB**



Pre-covering shot reveals a fairly basic structure. It took the author three attempts at a three-view and a half-size card stock model before he felt he had it right. Model spans 26 inches.

them for the stringers, will help eliminate breakage.

Note the strong wing spar, full depth, cut from a straight strip of 1/8-inch balsa sheets, the dihedral break being made by slicing the strip at a long five degree cut, then cementing the resulting two pieces to the center section of the spar.

Two identical horizontal stabilizer halves are made, the ribs being sanded to a streamlined shape after assembly. The spar is left long; bevel the ends as shown. The spars are inserted into the fuselage so that the bevel cut surfaces meet and are cemented in place.

Joe used a removable rear hook, attaching an extended winder hook to it and stretching the rubber motor out the rear to wind. As the wound motor was brought in, the removable rear hook was secured to the small fixed hook in the rear fuselage. You must remember that no one

configuration by using a long, braided motor.

While Joe used a cellulose type model cement to attach the windshield and canopy, I suggest you use Wilhold RC-56 glue, which dries transparent, stays flexible and does a neat job. This is what I used on the replica model, a very thin bead of the glue being laid along the joint between the windshield and canopy. Paper templates should be developed on the model and the transparencies then cut from these.

Joe covered the model with medium weight tissues, water shrunk. I applied the tissue damp, permitting the tissue to adapt to gentle compound curves without wrinkling. The severe compound curves of the fin may be covered wrinkle-free by fitting separate pieces of tissue to each opening bounded by formers and stringers. Joe clear doped his model, applied



# RC Soaring A VISIT TO THE SEVENTH ANNUAL CHICAGO MODEL HOBBY SHOW

BY BILL FORREY

It hardly seems possible that this show is actually seven years old! Within this brief time frame, the Chicago Show has grown to a such a size that its co-sponsors, the Radio Control Hobby and Trade Association (RCHTA) and Model Railroad Industry Association (MRIA) feel bold enough to claim that it is the "World's Largest."

Located very conveniently only five minutes away from O'Hare International Airport,

scores of booths containing RC aircraft displays, but also those of RC cars, boats, and related RC accessories. You also find model railroading stuff, plastic models, rockets, kites, modeling tools and accessories, and several "organization" booths. There is even a hobby shop area if you want to buy something you've seen at the show. Literally, there is something for every model enthusiast... including RC sailplane types!

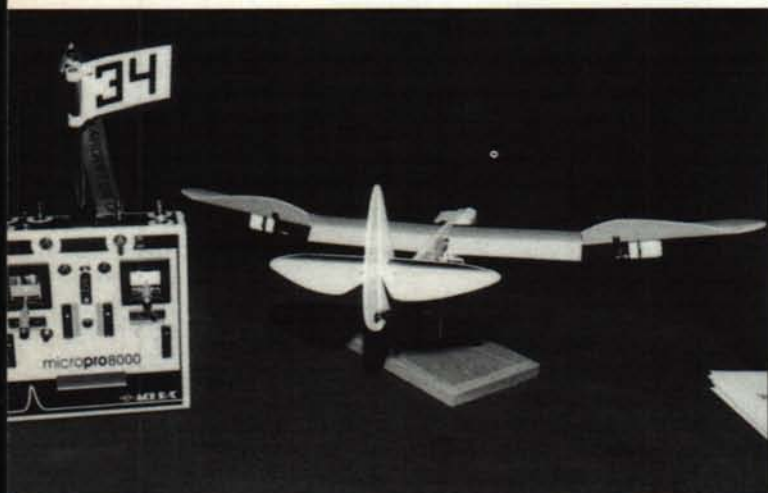
As I have done in the past, this month I will take you on a tour of the show from A to Z, relaying to you the core of what was "new" for glider guiders and builders at Chicago.

**ACE R/C, INC.**  
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Although Ace R/C's Micropro 8000 computer radio is not new, it has recently been significantly improved. It now has a new software package, new EPROM chip, a new RAM



Aerotech has now released the new Phoenix rocket powered RC aerobatic glider. A fascinating combination of two separate hobbies.



Ace R/C, Inc., now has an improved version of their successful Micropro 8000 computer radio which (among other things) makes "crow" mixing a simpler task.

the Chicago Show takes place inside the O'Hare Expo Center. This center is linked to four large, comfortable hotels by a fully enclosed, heated pedestrian bridge that crosses a busy boulevard and allows conventioners to stay warm and dry on their way to or from the show. Officially called the "Skyway," most folks preferred the pet store moniker, "Habitrail," because it often resembled a crowded hamster tube! Seriously, no matter how far they've traveled (and many come from around the world), exhibitors and visitors have it made once their planes touch down in the windy city.

Inside the show, not only does one find

chip, and a new communications port (All can be retro fitted to older Micropro radios as an upgrade). The new "Version 4.00" program allows the sailplane user to select crow mixing as a menu option, among other things.

With the RS232 Interface Option (the



George Sparr of Aerospace Composite Products demonstrates his new E-Z VAC I vacuum bag setup. Always drew a crowd of interested model builders.





Bob Renaud is all smiles over the recently arrived Airtronics Infinity 1000A computer radio. This is the best of the best in high-tech radios. TV monitor made the transmitter display screen easy for all to see. Also, Airtronics is offering new mods for the Infinity 600A ... see text.

appropriate "smart" cable) you can upload, modify, and download parameters to any IBM compatible personal computer. You can then print out your data for permanent record keeping, or save it on a disk.

Of course, there is much more that could be told about this U.S.-made, sophisticated yet easy-to-use computer radio, but space doesn't allow it. Contact Ace for all the facts.

#### AEROSPACE COMPOSITE PRODUCTS P.O. Box 16621 Irvine, CA 92714 (714) 250-1107

If you could see over—or through—the crowd of fascinated modelers who always seemed to be huddling around the small, round table in this booth, you would see George Sparr of ACP demonstrating his new E-Z VAC vacuum bagging kit. This is the neatest, simplest, easiest, and least expensive complete system I have yet seen for bonding wood veneers to

Estes is also getting into the RC rocket boost glider biz; witness the new Astro-Blaster aerobatic canard designed by former *MB* columnist, Larry Renger.

foam cores with epoxy resin. Judging from the onlookers, this was a belief held by many others at the show. The E-Z VAC kit has brought vacuum bag technology to the masses!

Selling for a very affordable 75 bucks, the E-Z VAC kit comes with a truly remarkable, factory preset, electric powered, mini vacuum pump that can be run continuously; nine feet of nylon vacuum bagging "tube" that is 18 inches wide; new, easy-to-install, aerospace quality vacuum fitting/valve; nine feet of 15-inch wide "breather felt;" and a totally-unique-to-ACP pair of reusable Quick-Seal clips for the ends of the vacuum bag tube. An additional four bucks for shipping and handling, plus 6.5% California (residents only) sales tax, gets the E-Z VAC system on its way to you pronto!

George also has a more heavy duty vacuum pump system that should interest the serious composite model builder. Called the E-Z VAC II, it is capable of much greater vacuum and thus greater compaction on your laminate. It too is available as a com-

*As I have done in the past,  
this month I will take you  
on a tour of the show from  
A to Z, relaying to you the  
core of what was "new"...*

plete kit or as a pump system alone. It has a vacuum reservoir to smooth out the vacuum and give the pump a long rest between

draw-downs. It has a vacuum gauge for visually checking and adjusting inches of mercury (vacuum). And finally, it has an industrial grade AC motor to drive the separate vacuum pump unit. The pump system alone goes for \$98 and the bagging kit goes



Mark Smith and Lindy Bailey of Dynalite show off the new prototype ARF Freedom slope glider. Goes together in one hour, according to Mark.

for \$135.

ACP sells literally everything you need (and a lot more things you didn't know you needed, but can definitely use) in composite products, plus related tools and accessories. The price and info sheet George has is 10 pages long! Send a large size self-addressed, stamped envelope and you'll receive one ASAP.

Personally, I am going to be using the new mini E-Z VAC in my own model building and design work. Years ago, I once made my own Rube Goldberg vacuum bagging system from surplus industrial parts, K&S brass tubing, automotive rubber hoses, springs, micro switches, glue syringes, and a bunch of strapping taped glass water bottles. It was a hassle to put together, and it worked only so-so. What's available in the E-Z VAC systems from ACP is a vast improvement! I'm excited (does it show?).

#### AEROTECH, INC. 1955 S. Palm St., Suite #15 Las Vegas, NV 89104 (702) 641-2301

Although not strictly new (it has been shown before), the AeroTech "Phoenix" rocket-boosted aerobatic RC glider is now available in kit form after its show debut about a year ago.

Having actually seen this RC rocketeer flown by Don Edberg one time last fall, I can testify that on this particular flight it climbed to about winch launch height (350 to 400 feet) at a 45 to 60-degree angle in about five to eight seconds. It trailed a hissing streamer of white smoke as it climbed, then the motor petered out and left the Phoenix in the pure glide mode. At this time Don had a lightweight, sleek little aerobatic sailplane with all kinds of potential energy (altitude plus mass). After performing some basic maneuvers (loop, quick roll, four-point roll, speed run, inverted flight), approximately 60 to 70







Great Planes introduced the new Spirit 100 multi-purpose RC sailplane. Comes with two airfoils: S3010 and SD-7037. Look for a review in *MB* early this summer.

seconds later it was ground bound again.

Not a bad way to combine two hobbies into one! Model rocketry and RC model soaring technology can be successfully merged into a single vehicle; the Phoenix is ample proof.

#### AIRTRONICS

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

Airtronics unveiled its newest Infinity radios, the 1000A and 1000H. Quoting from the new 1992 Airtronics catalog, "IN-FIN-I-TY, n: boundlessness; without limit or end. That's INFINITY according to Webster's. INFINITY according to Airtronics? Computerized radio control technology in a sleek, sculptured housing that knows no bounds in providing the performance, flexibility and technology that serious, competitive American RC fliers have longed for, but until now, have never been able to enjoy." Yes, in a nutshell, that's it!

Never before have I seen so many features in a radio system. In a very small typestyle, it takes Airtronics two full pages to put into



Perhaps not really "new" (except to our columnist), the Hitec Focus 4 FM is available in a micro (sailplane) version too.

words all the things that these two versions of the Infinity 1000 radio can do. For sailplanes in particular... well, if you can think of it, the Infinity 1000A can do it, from changing channels to programming up to seven different gliders (with names) from a choice of 16 different aircraft templates (for



Hobby Dynamics distributes the JR Propo x-347 computer radio nationwide. New mods done at JR Service America will permit three position camber presets on flap/aileron sailplanes.

both power and sail). Assignable switches, crow mixing, elevon, V-tail, taileron, spoileron, flaperon, flap-elevator mixing, assignable receiver channel output, and much more! About the only way you are going to be able to know more about this new rig is to get the catalog...and even then I don't believe you'll know it all. This is the last radio you will ever need. It is the top of the line.

The Infinity 600A is now upgraded to become more user-friendly for sailplane users. All new Infinity 600As are now available with a small pair of connectors hidden near the concealed NiCds which allow the throttle stick (power version) to be used as a flap stick (sailplane version). Before, the side lever was the flap control tab and achieving crow mixing was a confusing task. Now it is much simpler. Owners of original shipment Infinity 600As may send in their systems for upgrade to the new setup.

If the Vision 8SP was too rich for your budget, try an Infinity 600A for about \$150 less. No, it can't do everything the VS-8SP can do (for example, on a flap/aileron model, the flaps can only be flaps, not flaperons), but it does enough to be a great value. You can have user-assignable transmitter switches (e.g. three dual rates on a single switch), bi-

*continued on page 84*

The Thunder Tiger 95% RTF Explorer 2M made its debut at Chicago. Distributed by Global Hobby Distributors to dealers nationwide, it should be available by early summer 1992.



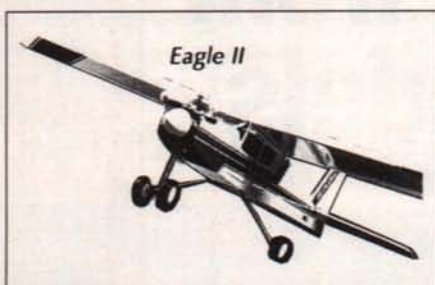




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BY ART STEINBERG & ROGER JAFFE

# ME-109 Warbird from Dickey Bird Models

It's not often that we review an electric powered ARF in these pages, and there are two distinct reasons for this. First, there just doesn't seem to be a great many worthwhile electric ARFs coming on the market these days (though that situation is rapidly improving). The second obstacle is my personal lack of extensive experience with electric flight, which sometimes lends an air of negativity to my attitude towards electric powered RC airplanes. In order to be totally fair and objective, the next opportunity I had to review an electric ARF, I decided that I would enlist the assistance of an accomplished electric RC enthusiast.

The expert I chose is a well-known modeler from the San Diego area, Roger Jaffe. Roger's main interests are Ham radio operation and electric RC models. He is secretary of the Silent Electric Flyers of San Diego, and serves our hobby well in many other capacities, including field acquisition activities. Roger came to my assistance when I recently received a really innovative electric ARF from Dicky Bird Models of Westminster, California. So without further ado, let's see what Roger had to say about the model:

### DICKY BIRD ME-109 WARBIRO

I was very pleased when Art Steinberg asked me to review the Messerschmitt ME-109 kit manufactured by Dicky Bird Models. This plane is marketed as an 05 electric powered model featuring a vacuum-formed plastic fuselage, machine-



(Above) Roger Jaffe holds the Dicky Bird ME-109, an unusual "stretched scale" electric powered warbird. (Left) Hand launching the ME-109 is mandatory, as no landing gear is provided.



cut balsa and plywood parts, and a complete set of hardware. All that is required to complete the kit are the covering materials, radio, speed control, and motor. The plane can also be built without the motor and speed control as a conventional slope soaring sailplane.

### CONSTRUCTION

Two unique features struck me at once when I opened the box. First, the fuselage uses a beautifully prefabricated full-length crutch built by laminating two pieces of 1/8-inch plywood on both sides of a 1/4-inch balsa center frame. The crutch has holes cut out of the left and right sides in various places to accommodate the ser-



receiver, motor batteries, and wiring. The servos are attached using double-sided tape with a little CA glue for reinforcement. The receiver is held in place by Velcro and the motor battery is attached with a rubber band. The fuselage is assembled by cutting and trimming the vacuum-formed plastic fuselage sides and cowl. Although it takes quite a bit of time to trim and sand the plastic, the fit that can be achieved is worth the effort. The two forward halves are removable for access to the radio and power system. A plastic tube is inserted through the crutch with each end of the tube passing through the plastic fuselage sides. Two small cotter pins through the tube retain the fuselage sides. Two small screws secure the cowl. A hardwood landing skid is attached on the underside of the crutch, keeping landing damage to a minimum. I also added some small socket head screws to secure the fuselage where the removable plastic sides meet on the top and bottom of the crutch.

The second unusual feature of this kit is the undercambered Jedelsky type airfoil and the method of wing construction. Each wing panel comes pre-assembled and is built from three balsa planks. The ailerons are already cut from the wing and come pre-hinged. The wing panels are joined simply by butt-cementing them together and reinforcing the center joint with the fiberglass fabric supplied. At first I had my doubts about the structural integrity of the wing, but after it was built I found it to be quite strong and durable. No doubt the "hi-lift" characteristic advertised in the instruction booklet is due to the airfoil's undercamber.

The stab is a sheet of 1/8-inch balsa pre-notched for the elevator joiner wire. A generous section of "gapless" hinge material is provided to mount the elevator halves to the stab. The fin is part of the plastic fuselage; there is no movable rudder. The motor mount is made from two pre-shaped pieces of aluminum that clamp the motor and secure it to the crutch.

During construction I ran into only a couple of minor snags. For instance, one of the aileron pushrods was too short, so another had to be made. Also, the motor mount was too big and did not clamp the motor tightly. This was solved by wrapping the motor with three layers of 1/32-inch balsa. Otherwise, the kit went together extremely well.

## FINISHING

The entire model was painted with two coats of medium green Testor's Model Master paint. The plastic took the paint extremely well. The cockpit window areas were masked off and a coat of black paint was applied. After some sanding and smoothing, the paint was sprayed on the wing. In the interest of keeping the weight down, I did not do a significant amount of the filling, sealing and priming normally done when painting balsa. The green color hides most of the grain in the balsa wing, and from a distance of more than three feet, any

imperfections in the balsa are invisible. Decals were applied from the generous assortment provided in the kit. (A drawing showing where the decals were to be located would have been very helpful, but was not supplied.)

## RADIO, MOTOR AND BATTERY

I installed an Astro Flight direct drive cobalt 05 electric motor, a seven-cell 900mAh battery pack, and a Futaba Attack radio with a built-in speed control and battery eliminator circuit. After positioning the motor batteries slightly forward of the location shown in the instructions, the plane balanced in the desired CG range.

## FLYING

Art took me to his club's magnificent flying field, located in a beautiful industrial park. We had about 40 acres of land in which to play and a large, flat runway. There was a forty-foot downhill slope suitable for slope soaring at the west end of the runway. Since the ME-109 has no landing gear, hand launching the plane is a necessity. With the Astro Flight 05 motor spinning a 7x5.5 prop, the first hand launch went well but the plane wanted to pitch down due to a lack of airspeed. Pointing the nose at the ground and letting the speed build up proved to do the trick as the Messerschmitt slowly climbed out of ground effect and toward the 40-foot slope at the end of the runway. Once the plane entered the slope lift provided by the 10-knot wind, it had no problem maintaining altitude. Trim adjustments at this point were minimal as the aircraft only required some up elevator.

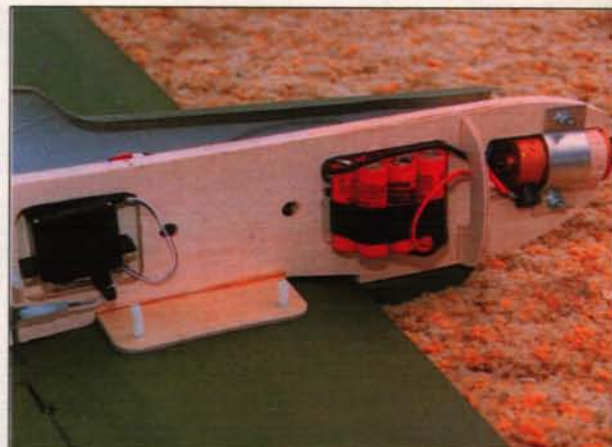
After a minute and a half into the flight I elected to land. When the plane turned on final it became unstable and tippy as the airspeed had dropped too low and there was not enough altitude or power left to speed it up. The plane stalled and fell about 10 feet into the soft dirt, suffering no damage, but the prop wasn't so lucky!

Art and I agreed that while the direct drive motor was enough power to get into the air when the batteries were freshly charged, there was not enough power to sustain the flight for any appreciable length of time. Our solution was to add a gearbox to increase the motor torque and swing a bigger prop.

The gearbox was added, the motor timing was adjusted, and we put on an 11x7 prop. The second and third flights proved much more rewarding. The plane showed a decided increase in power, the flight duration was far longer, and we had time to play with the plane in the slope lift as well as normal flying under power. The per-



Removing the right side of the fuselage allows servicing the motor battery pack and the aileron servo.



Notice the strong fuselage crutch, which is the basis for this durable model. Clever clamp arrangement holds the motor in place.



With the left side of the fuselage removed, the elevator servo and receiver are easily accessed. Aileron and elevator servos are Futaba S148s.

Roger pauses between test flights to charge the battery pack and make a few adjustments.





formance leaves no doubt in my mind that the ME-109 would make a superb slope soarer without the motor and batteries. As an electric/slope combination, it is quite a challenge to fly, but a lot of fun, too.

A word of caution: This plane is not for beginners. While you don't have to be a champion pattern pilot to fly it, it would be to your advantage to have previous experience with fast aileron models. Please remember that this plane is not really an ARF in the traditional sense, but it is not a true stick-and-plank kit either.

Intermediate building skills are required to put the ME-109 together. I would recommend this model as a standoff scale electric plane. It was a lot of fun to build and is even more fun to fly.

#### SPECS

Wingspan:	60 inches.
Length:	34 inches.
Wing area:	420 square inches.
Weight:	44 oz. advertised, 45 oz. as built.
Wing loading:	15.1 oz./sq. ft.
Radio:	Three channels (ailerons, elevator, motor).

#### COMMENTS

Time to build: Approximately 20 hours.

Pros: Extensive prefabrication of the wing and fuselage crutch helped speed construc-

tion. The iron-on gapless hinges provided are a joy to use. When built carefully, the plane is very sharp and clean looking.

Cons: Motor mount was too big, and some holes in the fuselage crutch had to be enlarged to get the servos and pushrods to work properly.

Other comments: The plastic fuselage takes much care to trim and fit correctly. I thought this was the hardest part of building the airplane. Be sure you have plenty of very sharp hobby blades on hand, you'll use them! Other than the fuselage fit, the rest of the plane was fairly easy to build. The extensive prefabrication makes the project enjoyable. Use a good quality cobalt motor; most 05 ferrite motors will not supply sufficient power to fly the plane well.

#### STEINBERG COMMENTS

Now that we've had a detailed report on the Dicky Bird ME-109 from our guest test pilot Roger Jaffe, I'd like to add a few of my own observations. I felt the conception of this model was outstanding for its innovations. Most of the ARF electrics I've seen are built of flimsy plastic with little reinforcement, but this model is tough as nails due to the strong balsa-and-ply fuselage crutch. The solid balsa wing can also take a beating without breaking. If anything, I felt the model was somewhat overbuilt for electric power. But if built as a slope soarer, that's an entirely different story. Without the motor and its

accessories, the flying weight will run about 27 oz., and performance on the slopes should be great.

I found it interesting that the manufacturer offers the builder only two options: constructing the ME-109 as an electric or as a slope soarer. It occurred to me that this attractive warbird has great potential as a glow engine powered sport model. It would be simple to mount a .15 or a .20 engine in the nose, as the sturdy crutch is notched to receive any type of powerplant. Furthermore, there is a perfect place to mount the fuel tank using the compartment provided for batteries. The only thing I would add would be a landing gear.

The overall quality of the kit was top notch and it was obviously the result of a great deal of care and attention to detail. The hardware was excellent and complete. One of these days I'll be able to pry the airplane away from Roger and find out how it performs when converted to engine power.

The ME-109 is available from Dicky Bird Models, Post Office Box J, Westminster, CA 92684-000J, telephone (714) 775-4153.

Thus far, I've been able to keep up with personal answers to all the reader correspondence, but if you wish a reply to your questions, please remember to enclose a SASE. Write me at 2267 Alta Vista Drive, Vista, CA 92084. You can phone me at (619) 726-6636, or send me a FAX at (619) 726-6907. **MB**

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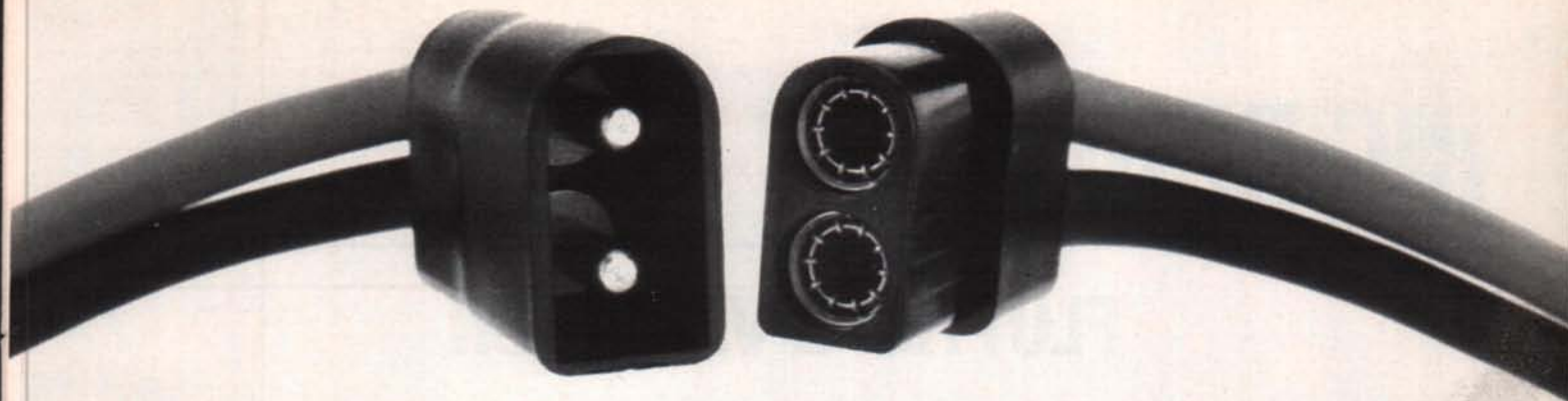
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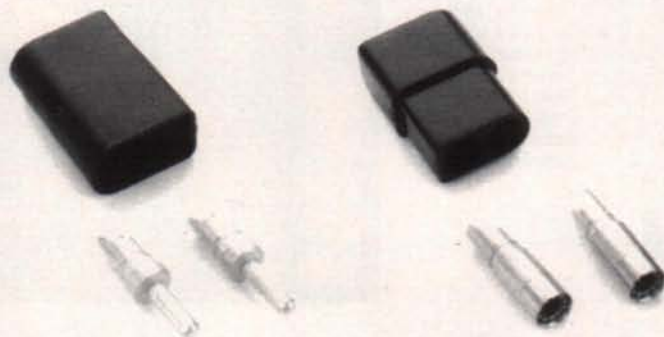
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# BIG BIRDS

BY BRUCE EDWARDS

## FLUTTER & VIBRATION

**T**his month presents a good opportunity to discuss a phenomenon that sometimes occurs in flight control surfaces, because many of us are using the winter months to build our next Big Bird. I have experienced flutter of flight controls on two of my planes and was able to land safely and correct the problem both times. It would have been much better to



build in the cure than to try to eliminate the flutter after the plane was finished. Both planes were extremely difficult to land without aileron control!

(Left) An example of control surface static balancing to prevent flutter. In this case, the weighted arm totally balances the aileron; with the control rod disconnected, the aileron stays at neutral deflection. (Right) Joe Forbes did a fine job constructing this I'kon Gee Bee Super Sportster. A&M Sachs 3.2 c.c. engine, J.R. radio with big RCD servos. (Below) Walt Clark (left) showing off his Nosen Champ, all decked out in California Highway Patrol colors.



If your flight controls are not rigid enough, aerodynamic forces may cause them to oscillate or flutter. Control rods and actuating arms should be of sufficient size and strength

to accommodate any loads placed on them by your plane or style of flying. In my case, the control arms on my Big Bee aileron servos were not of sufficient strength to do





the job. Insufficient hinges, either too small or not in adequate numbers, will also allow the aerodynamic load and engine harmonics to cause excessive oscillations to build up in the flight controls.

A large, heavy, overbuilt control surface with a big gap at the hinge line is also conducive to flutter. When building any part of an airframe remember, that we are not building a bridge. We want our airframe and flight controls strong but light.

Soft engine mounts have been covered in past columns. One of the reasons they are so

***If your flight controls are not rigid enough, aerodynamic forces may cause them to oscillate or flutter.***

beneficial is that they help reduce the harmonic vibrations that try to tear our planes apart and induce oscillations in flight controls.

Lightweight, rigid control surfaces are a must. Extra ribs and appropriately placed gussets are a good way to keep the controls light and stiff, and at the same time, will help avoid weight at the trailing edge of the control surface. Big strip ailerons are difficult to keep from oscillating and may require all the cures we will mention here.

If you are using 2-56 threaded rod in your Big Bird control system, you should consider replacing them with 4-40 size threaded rod. Control rods should have plenty of supports along their length. Fiberglass control rods need guides to prevent them from bowing when in compression. If you are using a control rod directly from the servo to the control surface with no supports or guides, the rod must be short and thick.

The control arms or levers on your servos should also be sufficiently strong to prevent any flexing of the arm. If the arms flex under load they will eventually break. Heavy-duty arms should always be used on Big Bird servos.

It was discussed in a previous column that a substantial number of hinges are necessary for many reasons, not the least of which was to prevent flutter. Securely installed hinges in adequate numbers will help keep your flight controls from fluttering.

Once you have your hinges installed there will no doubt be a gap of some size between the control surface and the structure to which it is attached. It is desirable to seal this gap to increase the effectiveness of the control, and it will also assist in keeping the control from fluttering.

Just about any of the modern iron-on coverings may be used to seal control surface hinge lines. I like to use clear MonoKote for the seal, or the same color covering as the wing or stabilizer may be used to good



(Above) Bob Boyce's Morrisey Bravo was built from the Sig kit, weighs 20 pounds and has an 86-inch wingspan. It is powered by an O.S. 300 twin four-stroke. (Left) Gordon Parr did a nice job building and covering this Balsa U.S.A. Phaeton biplane. It has a lot of zip with an S.T. 2500 powerplant and a 14-pound weight. (Below) Fred McPherson puts on a good aerobic show with his Air Tech Eagle; 86-inch wingspan. Plane weighs 17 pounds and is powered by a Quadra 42.





effect.

The biggest culprit that causes flight control oscillation is the static imbalance of the control surface. There sits the control surface, its full weight behind the hinge line. The cure is to install a counterweight that balances the flight control. In full-size aircraft the leading edge of the control surface often has a formed weight that counterbalances the weight of the surface; naturally, the hinge line is behind the weighted portion of the surface.

The formed leading edge method is not too practical for model use; a good alternative is to use a weighted arm. This method uses an arm that is attached to the control surface and extends forward of the hinge line, with a weight on the end. Sometimes the arm is U-shaped and the weight disappears inside the wing for about half of its travel.

Another good method is to attach a weighted arm at the end of the control surface so that the weight extends forward of the hinge line. Bob Heitkamp used this method on his Sea Fury's ailerons at the recent Unlimited Pylon Race at Madera.

On my Cessna 180, the U-shaped counterweight works well on the ailerons; the elevators and rudder have weights in their offset tips. My Aero Fly original design has weights in the aileron tips forward of the hinge line, and my Big Bee uses the weighted arm balance system on the ailerons. The Big Bee ailerons are the only surfaces that are neutrally balanced; that is, the weights hold

the ailerons at neutral with the control rods disconnected. The other surfaces are not 100% neutrally balanced. I try to use a counterweight that is at least 25% as heavy as the flight control, and this seems to work very well.

If your plane is a slow mover that does not do much in the way of aerobatics, flutter may be no problem. If, on the other hand,

you are flying a high performance plane, balanced control surfaces are absolutely necessary.

The extra time you spend building balanced flight controls will often seem wasted until you see a Big Bird destroyed by fluttering flight controls, so take a little more time and save yourself a lot of grief.

• • •



(Left) Bonnie Phillips poses with his Cessna Scarab racer. Futaba radio guides it, and a Saito 270 gives it the go. (Below) Jack Barron's Big Bee flies very well with a 1.2 cu. in. O.S. twin four-stroke. Sixteen-pound plane has a McDaniel on-board starter and uses a Futaba FM radio.





One of the pleasures of attending the RC Unlimited Pylon Races in October 1991 was visiting with a lot of friends I had not seen for some time, such as Walt Clark, who furnished me with a picture of his latest project, a Nosen Champ. Walt painted it to look like a California Highway Patrol aircraft. After completing his plane and test hopping it, Walt visited the Highway Patrol airfield to get some shots of his plane next to the real thing. The Pilot Patrolmen were very friendly and Walt had no trouble getting them to pose with the model and their planes.

It was also fun visiting with Bill Northrop, our Editor, and Al Tuttle, "Strictly Scale" columnist. These two gentlemen both come from warm climates, so the hundred degree weather did not bother them much. I was about to melt.

It was nice to get home and find a letter from Joe Forbes, of Butte, Montana, who is a member of the Butte Plane Nutz Model Plane Club. In a recent column I commented on the Gee Bee story and I'kon Northwest's kit of the Super Sportster. Joe really liked building the kit and recommends it as a good Big Bird project.

Our friend Art Gross has come up with another brainstorm. We often need a small access hatch to gain entry to the wing or fuselage, and they are tedious little rascals to build. It is also tough to put a nice finish on

them.

Art is using the plastic tops off of spice cans to make small hatches. They are easily painted and offer a neat, compact hatch that opens easily and snaps shut. No screws are required to hold the hatch closed.

• • •



Tom Richards has had a lot of different engines in his Tiger Moth. Tom is a great experimenter and often shows up with unusual planes of his own design.

Big Bird Book of the Month is *The Battle for the Falklands*. This is a rather sad tale, but has a lot of flying experiences in it. Available from W.W. Norton Co., Inc., 500 Fifth Ave., New York, NY 10110.

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# FREE FLIGHT

BY BOB STALICK

## Early 1/2A Nostalgia Gas Event

Harry Murphy, well-known gas flier and CIA (Central Indiana Aeromodellers) member proposes a means by which Nostalgia fliers can get away from the hassle of expensive Holland Hornets or Cox Space Hoppers. Here is Harry's idea:

"From time to time we get feedback about the apparent runaway of the 1/2A NosGas event by the Holland Hornet and Cox engines. At the outset some feared that we would be into a Ramrod/Spacer event by now, and it did sort of appear that way in the beginning, but soon dissipated. The current

optimum airframe selection—or both.

"My mailbox gets a letter now and then which generally asks how can a fellow be competitive with his beloved old Wasp, Spitzzy, Baby Spitfire, OK Cub or similar relic. The obvious an-

conceived at this point either—so we knew no better. Fifteen to 20 second engine runs helped in the altitude department with relatively slow, spiraling climbs most enjoyable to watch.

"Some of those early domestic designs which come to mind



Bob Stalick poses with his 1/2A Vee F1J concept model at Harts Lake Prairie. Model was test flown for the first time during this meet. This design, featured as a three-view in the March-April 1989 *Model Builder*, flew well even with a stuck engine timer. Photo by Jack Shafer.

concern is now aimed at the advanced British designs of that era.

"At any rate, problems of this type will continue to arise and should be expected, for when you hold closed events for any length of time, the best competitors will seek out the best advantages, whether they lie in the realm of engine selection or



After 15 years in construction, it's the moment of truth for author Bob Stalick, as he launches his Megow Flying Quaker on its maiden flight. With the Brown Jr. engine chugging away, the model just slowly and majestically climbed into the air at Harts Lake Prairie, Washington. Photo by Jack Shafer.

swer is that it would be most difficult against the later Hornets and Coxes of the era.

"That set me to thinking that maybe we have let this portion of the NosGas era get away, which brought us the early production 1/2A glow engine ventures and the relatively small size of the models designed around them. For the most part, these designs were less than 200 sq. in.

and basically very simple in construction, with most capable of being dumped out of the kit box on Friday evening after school or work and being ready to fly by Sunday afternoon.

"Flight characteristics were not often the greatest, with the weight-to-wing-area ratio on the high portion of the curve and the available power compared to a Hornet embarrassing, but then the Hornet was not yet

were the kitted Civy Boys, Smarty, El-En-Gone, Comet Pacemaker, Baby Phoenix, Fubar 36, early Jascos and of course, the 1/2A Zeek at 176 sq.

*...how can a fellow be competitive with his beloved old Wasp, Spitzzy, Baby Spitfire, OK Cub or similar relic.*

in. In addition, the model mags put out a steady stream of these diminutive birds, offering full-sized plans for less than a dollar. Some of those early kits get passed up at current swap meets, as do many of the early power-

plants. Maybe it's time to put these relics back into service.

"With the foregoing in mind, a special Early 1/2A Nostalgia Gas event will be held at the 1992 CIA O.T. and NosGas contest the last weekend in July. Build one in your lap while you watch those three-hour long football games and get prepared for the fun next summer.

"The rules are as simple as you can get: 1) Any qualified



1/2A NosGas design. 2) Scaling is prohibited. 3) Eligible .045-.049 engines are: Wasp, Spitzy, Spitfire, Baby Spitfire, OK Cub and K&B Torpedo. 4) Other rules shall be the same as the conventional 1/2A NosGas event.

"For the 'millions' of you who will immediately respond with the question, 'How come not the Atwood .049?', well, they have three bypass ports in comparison to its counterpart Wasp, which has only two, so we shall leave them off the eligibility list for awhile and see what happens.

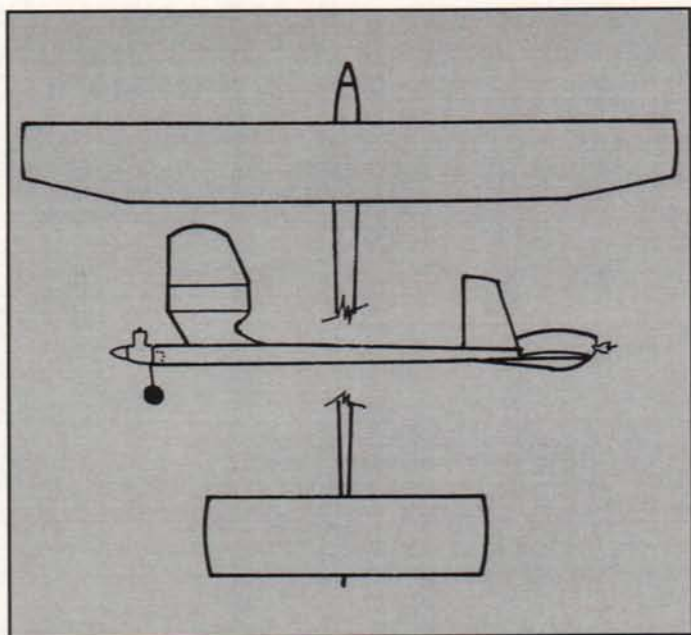
"Comments are welcome and requested."

So, Murph, there you go again! I like the concept. The only addition I would make would be to limit the model designs in some fashion, i.e.: maximum wing areas or no models allowed if designed after 1953 or some such arrangement.

## MARCH MYSTERY MODEL

Back in the good old days of free flight, a number of names consistently appeared in the magazines as winners. Sal Taibi, of course. Bob Cherny and Bob Sifleet. Bill Dunwoody was another. The model presented this month is one of Dunwoody's designs. Bill was one of those guys who seemed to have a construction article in a magazine every month. This month's design is a fairly typical Dunwoody model. It features a Torp 15 and could be flown in either A Gas or FAI Power.

If you know the name of the Mystery Model, send it in on a post card to Bill Northrop at



MARCH MYSTERY MODEL

*Model Builder.* Bill tosses all of the cards into a symbolic hat and picks out a card. The first card that has the correct model identification, that lucky contestant receives a free one-year subscription to *Model Builder*. Neat deal, huh?

## DARNED GOOD AIRFOIL—TILKA 6406B

This is the airfoil used on Bror Eimar's successful Wakefield, "Tilka." This model is produced as a kit and is currently available from FAI Model Supply. The airfoil is a derivative of a Benedek section and is a good selection for rubber powered models. It is especially suited to Wakefield and Coupe designs due to their weight requirements. However, it would be a

good choice for any rubber model design. It is a middle-of-the-road section, favoring neither power nor glide phases of the flight.

Try it on your next rubber model design.

## MARCH THREE-VIEW—SPACER PAYLOAD

In 1991, the Strat-O-Bats, of Kent, WA, issued a challenge to anyone who could enter a Payload model to bring it to the Annual Misery Meet at Harts Lake Prairie. I got myself in gear quickly, since the lead time on the event was less than a month. Since I have a strong attachment to Taibi's Spacer, I decided that it would be a good starting point for a Payloader. In fact, I toyed with the idea of naming it the

"Spacer," to show that it was a Payload model. Fortunately, good sense prevailed.

Anyhow, Taibi's classic design was scaled down to 36-inches, and the fuselage was skinned down and stretched out. The fin was moved to the rear, due to my excellent experience with this layout on my Pee Wee Spacer. And, of course, the pylon was changed to accept the required pilot.

As you look over the three-view, you will see that the wing and stabilizer are conventional in construction. The fuselage is simply a 1-1/4 inch square box that tapers down toward the tail.

The only slightly tricky part of the construction is the pylon, which is teardrop-shaped (looking from the top) and has 1/16-inch balsa sides. The windshield area is cut out after the pylon is sheeted, and is covered with thin acetate using RC-56 glue.

The pilot (or dummy) is made from sheet balsa with 1/32-inch plywood front and back. Since it must weigh at least an ounce, I hollowed mine out and filled it with lead shot. It is installed into the fuselage from the bottom. I hold it in place by gluing a piece of 1/16-inch plywood on the bottom of the dummy; this plywood extends beyond the sides of the dummy and meets the fuselage side at the slot in the bottom. The dummy is held in place by a rubber band.

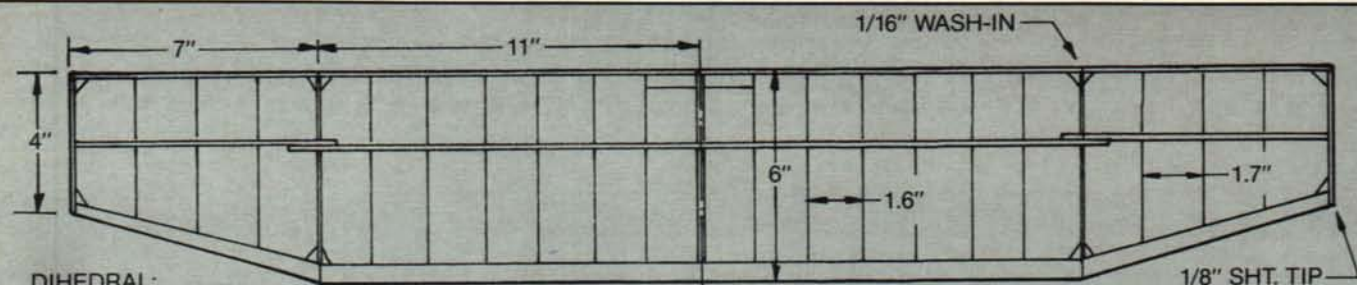
The original model needed a slight bit of right thrust to set the takeoff direction. I used one thin washer behind the tankmount. I also added a very small bit of right rudder tab to keep the right spiral in place during the latter parts of the climb.

## DARNED GOOD AIRFOIL — TILKA 6406B



STA	0.00	1.25	2.50	5.00	7.50	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100.
UPR	0.65	2.50	3.50	5.00	6.10	6.90	7.95	8.60	-	9.20	9.20	8.65	7.90	6.60	5.00	3.10	-	0.80
LWR	0.65	0.00	0.00	0.10	0.20	0.55	1.20	1.65	-	2.65	3.35	3.55	3.35	2.90	2.10	1.10	-	0.00

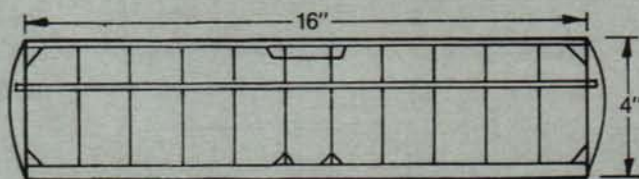




DIHEDRAL:  
2" EACH TIP,  
1-1/4" EACH MAIN PANEL

ENTIRE MODEL COVERED WITH  
JAPANESE TISSUE, FUSELAGE  
SEALED WITH K&B SUPERPOXY

1/16" SHT. TIPS



#### AREAS:

WING—200 SQ. IN.  
STAB—68 SQ. IN.

#### WEIGHT:

4 OZ. WITHOUT DUMMY

#### PROP:

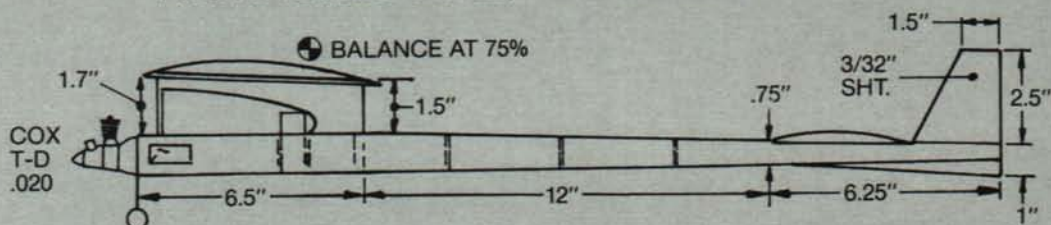
COX 4.5x2 TRIMMED  
TO 4.25x2

#### TRIM:

2° RIGHT TRIM  
1/16" RT. WASH-IN  
RT. STAB TILT  
1/16" RT. RUDDER TAB

FLIGHT PATTERN:  
RIGHT/RIGHT

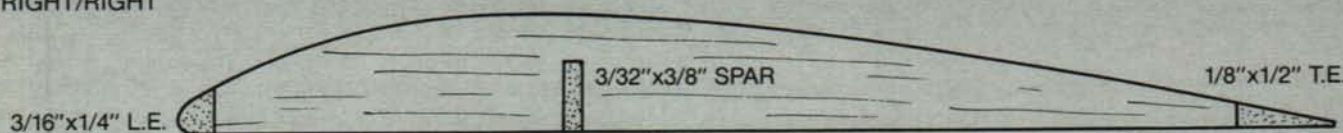
PYLON IS TEARDROP SHAPED, 1" MAX. THICKNESS



1-1/4" DIA. WHEELS, 3" TREAD

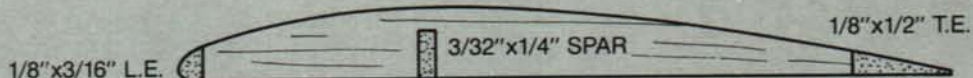
1/16" BALSA SIDES, TOP & BOTTOM

FUSELAGE IS 1.25" WIDE @ PYLON REAR, TAPERING TO .5" @ STAB L.E.



FULL SIZE WING & STAB RIBS — ALL RIBS 1/16" BALSA

Designed by Bob Stalick  
(with thanks to Sal Taibi)



## SPACER PAYLOADER

Williams Brothers wheels are used on the original. I used 5/64-inch wire to stiffen up the landing gear and improve take-offs. At the Misery Meet, takeoffs were conducted on a piece of canvas that was placed on the grass field. My Spacer could not get off the ground. At the Willamette Modelers Club Fall Annual, all takeoffs from the plywood surface were without incident—taking about four to six feet in low wind before becoming airborne. I won Payload at the Fall Annual against two other contestants, one of whom had won the Misery Meet earlier in the year.

If you want to build a payload model, you will be pleased with the results if it's a Spacer Payloader.

### THE SKYSCRAPER WAKEFIELD

Several months ago, I reported on some of my favorite models of all time. One of them was the Skyscraper Wakefield by Bob Hatschek. Lo and behold, within a few weeks after the column appeared, I received a nice letter from Bob. In it, he filled me in on some of the details about how this model came about. I thought you would find it interesting, so here goes:

"Back in 1959, the U.S. team was selected by a local elimination contest and a regional semifinal—with one team member selected in the east, the midwest, and the west. The finals were considered to be the World Championships. I quali-

fied for the Semi okay, but the model I used just wasn't a world beater (see 1954-1955 Wakefield in the Zaic 1955-56 Yearbook, p. 121).

There were only three weeks between the elimination meet and the eastern semifinal, but I decided to build a completely new ship for the semi. I had been thinking about a new design for some time but hadn't yet put a razor into balsa. I put the new design—the Skyscraper Wakefield—on paper and into reality in exactly eight days (during which I did not take any time off work!), and did the trimming on the last weekend before the semis. I was remarkably lucky in that the weather that weekend was great, I didn't run into any snags, and the

model trimmed out in very few flights—less than a dozen, as I recall.

"At the semis—five flights per day for two days—the following weekend at Frederick, Maryland, we had bright sunshine, moderate drift, and temperatures both days several degrees over 100. I was very fortunate to have Bill Dunwoody picking air and retrieving for me. The model dropped about 20 seconds in the last round of the first day, leaving me in second place behind Cliff Montplaisir after five flights. It maxed the first four times on Sunday and was well enough ahead so that I could D.T. early on the tenth flight—in consideration of Bill's dragging fanny after all those retrieves in the extreme heat.



## FREE FLIGHT

"The rest has been reported elsewhere, but little of that has been in the USA.

"Matveev's (Russian Wakefield flier) second place in 1965, along with my own second in 1959, always led me to call the design 'second rate.' But it's always been flattering to see other people using it. Besides Matveev, Canada's Paul Roberts has flown a Skyscraper (original version) in the World Championships, and at the 1975 Plovdiv, Bulgaria W.C., the entire Turkish team was equipped with Skyscrapers. The Turks are not a world power in F1B, but I found it interesting and flattering. Perhaps even more flattering was learning that in the early 1970s the Swedes were using the Skyscraper in a formal Wakefield training program because of the model's basic construction simplicity and tameness in flight."

Bob's letter fills in some of the details of the Skyscraper story. As some of us older free fliers may recall, Bob's Skyscraper was traded for Vladimir Matveev's Wakefield, called the Dragonfly, and became the subject of much scrutiny and more than one magazine article here in the U.S. and overseas. Obviously, Bob's Skyscraper also became the object of much scrutiny in the USSR, as subsequent designs by Matveev and other Russian fliers had distinct similarities to the Skyscraper.

### STARLINE MK II ENGINE CUT-OFF TIMERS

I recently received a box of prototype timers from Sal Fruciano, proprietor of Starline International, 6146 E. Cactus Wren Rd., Scottsdale, AZ 85253. These timers are the Mk. II version of the single function pinch-off timer that Sal has been selling for the past year or so. As with the original timer, the Mk. I version, these timers are made in Poland and are of extremely high quality. The new timers, however, will have a wire bale type switch instead of the lever arrangement now used. This wire bale is very similar to the

original Tatone timers sold in the 1960s. The advantage to using a wire bale is that the switch is positive. Once you release the wire, it cannot slip back into the slot and stop the timer, and you can also see that the switch is out of the slot and that the timer is running.

The remainder of the Mk. II timer is unchanged, and except for the snap-off function, it is identical to the Mk. I. Sal tells me that the Mk. I will have the snap-off discontinued as it puts quite a strain on the timer works and has caused some to wear out prematurely. I will keep you posted on the new timer's release date. When it becomes available, you will read about it here in *Model Builder* first.

By the way, Starline has a substantial inventory of exotic and useful free flight parts. If you don't have a catalog, order one today. Send Sal a buck to cover postage.

### NFFS WORLD WIDE FREE FLIGHT DIRECTORY

In the most recent issue of the *NFFS Digest* comes word that the NFFS is constructing a directory of all free fliers worldwide. This directory is the work of Bob Beecroft, 1014 Daisy Ct., Carlsbad, CA 92009-4846. If you are a free flight club secretary or have a club mailing list, consider mailing a copy to Bob at the above address. Even better, Bob can accept lists on an IBM formatted disk in ASCII. At the present time, over 1700 names, addresses and a few phone numbers are on the list. Your additions will be most helpful.

The goal is to have the directory completed in the near future and to make it available at an inexpensive cost. Here's your chance to help the free flight movement!

### 1991 SYMPOSIUM EDITOR ANNOUNCED

NFFS President, Anthony Italiano, has just announced that Les Garber, 2324 E. 5th St., Duluth, MN 55812, is the newly



Mel Chafin shows his 1936 Copeland rubber model during a meet at Harts Lake Prairie. Model is covered in deep yellow and brown art tissue. Photo by Bob Stalick.

appointed editor for the 1991 *Symposium*. As you may recall from reading this column, the publication has been editorless for several months, consequently the next issue is late. The intent is to have the new publication out for members and others in the very near future. Watch this space for announcements.

### U.S. FREE FLIGHT CHAMPIONSHIPS CHANGES DATES

According to recent information from SoCal, the U.S. Free Flight Championships, which has been the dominant event over Memorial Day weekend for well over two decades, will be moving to Labor Day weekend for 1992. In conjunction with the USFFC this year, the NFFS Nostalgia Gas Championships will also be held. Nostalgia events scheduled are as follows: 1/4A, 1/2A, A, B, C, Small Ignition, Large Ignition, Small Payload, and Large Payload.

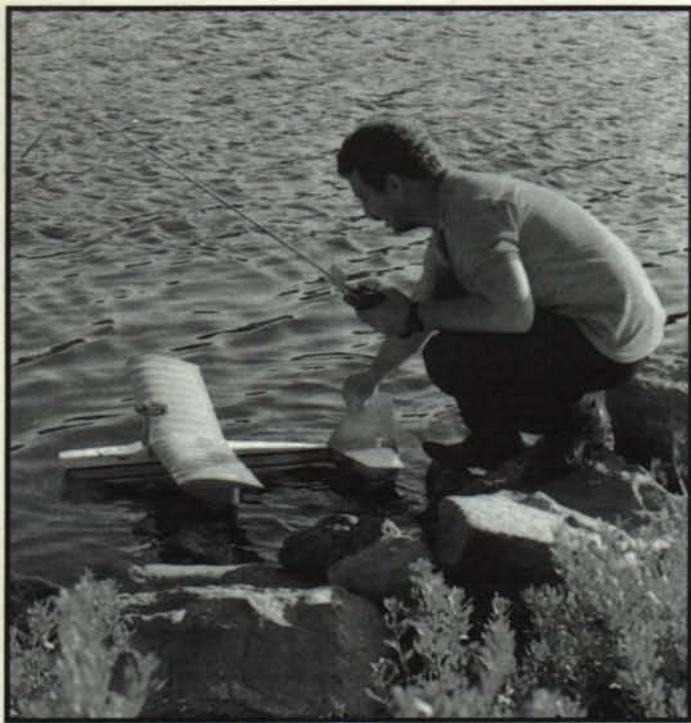
Rules will be per NFFS Rules Book #4, published last Summer. If you are not an NFFS member or did not read the September column of *Free Flight*, wherein the complete NFFS Nostalgia rules were included, you can get ahold your very own complete copy of the NFFS rules by contacting Bob Larsh, 45 S. Whitcomb Ave., Indianapolis, IN 46241. Send \$2 to cover costs of printing and postage.

Well, thanks for staying with me for another month. I really do appreciate the cards and letters I receive. When you ask for some information, please be patient and please enclose an SASE. I am in need of some good photographs of modeling activity in your area. If you have some, please drop a couple in the mail for me. Identify the fliers, the models and the location. No pay, but plenty of notoriety. Send to Bob Stalick, 5066 NW Picadilly Circle, Albany, OR 97321. **MB**



## THE POND SIDE RC ELECTRIC SEAPLANE

BY SCOTT HARTMAN



(Above) The author about to put up a flight with his four-foot flying boat. Quiet electric power opens up a number of potential flying sites that would otherwise be off limits to gas models. (Right) Two of the author's earlier electric seaplanes are the Seagull (a Mitch Poling design) and his original, Lakeside. Pondsides is similar to the latter, but has thinner wing floats, lower thrust line, and a wider hull.



You say you've learned to fly electric trainer and sport pattern models and now you're ready for a change of pace—an electric seaplane? The Pondsides is just that model. The Pondsides is a simple electric flying boat designed for 05-size electric motors, such as Great Planes' Gold Fire or Astro Flight's Cobalt 05. It's a 48-inch wing span model intended to be flown on small lakes and ponds. Its performance is impressive. It goes up on the step almost instantly after the power is applied and comes off the water very easily. The version shown is the largest of the prototypes and is a relatively slow flying model.

The design is based upon two model seaplanes, the Seagull and the Laker. The wing and hull are borrowed from Mitch Poling's Seagull. The wing is a very simple design that builds very light and works well. The hull has a wide base which provides for good flotation and comes off the water very easily. The traditional tail design and wing floats were influenced by Laddie Mikulasko's Laker. The traditional tail works well without adding the complexity or weight associated with the T-tail as seen on most seaplanes. The wing floats build very light and install very easily to the wing with silicone glue.

Pondsides can be powered with either six or seven cells, but if your flying site is more than 3000 feet above sea level, or if your model is a little heavy, seven cells is the better choice. Prototypes have been powered with Gold Fire and Astro Cobalt 05 motors. Both motors work well. The Astro Cobalt 05 is more powerful, lighter and will take more abuse than the Gold Fire, but the Gold Fire offers very good performance and is much less expensive. Several good propellers are now on the market for electric models, but the one that I prefer is the APC 7x5. It gives good thrust and the blade design reduces the propeller noise.

Electric power for model seaplanes has many advantages over gas. The lack of noise as-

sociated with electric power allows the modeler the opportunity to fly in areas not welcome to the noisier gas powered models. Areas such as large ponds and small lakes now become a flying reality. Several times during my flying, others have commented on how quiet the model is and how well it performs. My favorite place to fly is on a large pond. A large gas powered model would not be welcome there!

### CONSTRUCTION

Proceed by first cutting out the sheet balsa pieces to make a kit. Use either light or contest 3/32-inch sheet balsa unless noted. Pay particular attention to the grain when cutting out the balsa parts, especially the wing floats. If the grain is going the wrong way the sides won't bend to form the leading and trailing edges. All glue joints should be made with medium viscosity CA glue and accelerator.

### FUSELAGE

Lay one of the fuselage sides over the plans and mark the location of the formers. Mark the location of the formers on the other fuselage side, making sure you have both a left and a right. Mark the location of the 1/4x1/2-inch spruce motor mounts on former F3. Tack glue the formers on one of the fuselage sides. The angle that the formers join the fuselage side should be estimated based on the angle shown on the plans. Tack glue the rear of the fuselage together. Tack glue the former F3 to the unglued fuselage side, then do the same with former F1. At this point, lay the fuselage over the top view on the plans and adjust the formers until the fuselage is straight. Glue the formers to the fuselage. Add the 3/16-inch square sticks to the battery area on the bottom of the fuselage. Sheet the area below the motor battery with medium 3/32-inch balsa sheet. Add the remaining 3/16-inch square sticks to the fuselage. Sheet the bottom rear of the fuselage with light 3/32-inch balsa.

Install the flexible pushrods



# WORLD CHAMPS NEWS



Wayne Mann

Curtis Youngblood

**X-CELL HELIS DOMINATE  
WORLD CHAMPS  
TROPHIES!**

## THE RESULTS SPEAK FOR THEMSELVES...

USA Team—1st Place  
Wayne Mann—2nd Place  
Curtis Youngblood—3rd Place

M.A. / U.S.A. Congratulates  
the USA Team  
for their outstanding results.

### 1991 USA FAI Team Trials

1st—Curtis Youngblood—X-Cell .60  
2nd—Wayne Mann—X Cell .60

### 1991 USA Nationals

FAI— 1st—Curtis Youngblood—X-Cell .60  
2nd—Wayne Mann—X-Cell.60

Int.— 1st—Robert Akers—X-Cell .60  
2nd—Eulace Mallory—X-Cell .60  
3rd—Kent Officer—X-Cell

### 1991 Kyosho .30 Challenge

FAI— 1st—Wayne Mann—X-Cell .30  
Int.— 1st—Kent Officer—X-Cell .30  
Novice—2nd—Jim Robertson—X-Cell .30  
4th—Mark Ghebelian—X-Cell .30  
Scale— 1st—Ted Schoodnard—X-Cell Hughes

### 1991 Michigan Champs

FAI— 1st—Wayne Mann—X-Cell .60

### 1991 N.J. "Nats Tune-Up" Contest

FAI— 1st—Lance Murphy—X-Cell .60

### Curtis' Choice of Winning Equipment:

#1002 X-Cell .60 Custom  
#3680 Rotosports Kevlar Blades  
#3694 M.A./USA N.H.P Tail Blades  
#0561 M.A./USA Pro-Paddles  
#0802 M.S./USA Torque Tube Drive  
#0552 M.A./USA Constant Drive

Available soon...

Curtis' H.P.F. FAI fuselage (not shown)

### Wayne's Choice of Winning Equipment:

#1003 X-Cell .60 Custom  
#3692 M.A./USA Washout Blades  
#3694 M.A./USA N.H.P. Tail Blades  
#0232 M.A./USA Tail Speed-Up Gear  
#0561 M.A./USA Pro-Paddles  
#3951 M.A./USA Magna-Pipe  
#4327 M.A./USA Magna-Fuel 30%  
#4231M M.A./USA Power Concepts  
#3817 M.A./USA JMW Expert Gyro  
#0803 M.A./USA Torque Tube Drive







(Sullivan #503) and servos at this time. Sheet the bottom area forward of F3 with medium 3/32-inch balsa. Sheet the top rear half of the fuselage with light 1/16-inch balsa. Glue the two 1/4x1/2-inch spruce sticks to the 3/32-inch plywood motor mount, then glue this assembly to the front of former F3. Tack glue a 3/32-inch balsa hatch on the front of the fuselage. Glue on the remaining 3/32-inch sheet balsa. Sand the fuselage joints to sharp edges. The model will not plane on the water properly if the edges are not sharp!

## TAIL SECTION

The horizontal and vertical tail pieces are built out of light 3/32-inch sheet balsa. Join the two halves of the elevator with a 1/8x1/4-inch spruce stick. Sand the tail pieces to prepare for covering with MonoKote.

## WING

Cover the plans with waxed paper. Join the two halves of the spruce wing spar with the plywood dihedral braces. Slightly feather one side of the 1/16-inch balsa trailing edge to allow for a good fit. Pin the trailing edge sheeting to the plans. Use a rib to spot the spar over the plans, then pin the spar in place. Use 1/16-inch thick balsa spacers at the location of the R3 and R2 ribs. Install all of the ribs but the center ones and glue them in their respective locations. Fit the center rib, angle it for the proper dihedral, and glue it in place. Glue on the 1/4-inch square balsa leading edge. Glue on the top 1/16-inch trailing edge sheeting. Glue on the wing tip.

Remove the left wing panel and slide it over to make the right hand side. When finished, glue on the 1/16-inch thick balsa sheeting at the center of the wing and at the locations of the wing floats. Contour the leading edge and sand the remainder of the wing in preparation for covering.

## WING FLOATS

Lay two sides of the floats over the plans and mark the location of the formers. On one of the sides glue parts P1 through P5 in place as shown. Glue the opposite side onto the float. Glue the leading and trailing edges together to form the curved

sections, then install the 1/16-inch thick balsa sheeting on the bottom and final sand both assemblies.

## COVERING

MonoKote has worked well on the Pondsider. Make sure all seams overlap about 1/4-inch to be sure that they will be waterproof. Cover the tail pieces with MonoKote, making sure that no wood will be exposed to water after they are glued to the fuselage. Cover the fuselage with MonoKote. Glue the tail surfaces onto the fuselage with CA glue. Apply a layer of waterproof tape in front of the step on the fuselage and to any seams on the bottom of the fuselage that have not been sealed. MonoKote the wing. Be sure to remove any warps prior to installing the floats. Cover the wing floats. Locate the proper spot to glue the floats on the wing, glue the floats to the wing using silicone glue, and allow to dry overnight.

## MOTOR INSTALLATION

Make a wiring harness as per the plans. Heavy duty 14-gauge wire and a 15 amp micro switch are recommended for best performance. Sermos connectors are the best that I have used and they do offer a power advantage when compared to other connectors. I normally use two capacitors on the motor for noise suppression. Solder one capacitor to the positive motor lug and to the motor case; install the second capacitor to the negative motor lug and to the motor case. Most range problems are avoided by using this installation.

I break in the Gold Fire motor by running it without a propeller for about two hours at about one to two amps from my Astro Flight 112 charger. The motor won't be totally broken in, but it will have plenty of power to fly the model. With this motor, I have found that the more it is run, the faster it gets. If you choose to use an Astro Cobalt 05, motor break-in is not required. Both motors work well in this model.

A flying boat requires that the thrust line be correct. The motor must be installed without any side thrust; minor adjustments in up thrust may be required for best performance. If it stalls under power, decrease up thrust. If the model dives when power

is applied, increase up thrust. To adjust the thrust line, install thin plywood shims between the motor and the 3/32-inch plywood motor mount.

## RADIO INSTALLATION

Only lightweight airborne systems of less than six ounces should be used in this airplane. Larger radios are not recommended. They will fit, but the extra weight will increase the wing loading and reduce flight times. The majority of the radio is mounted forward of the wing in a watertight compartment similar to what is done with model boats. After the radio is installed, the front hatch is sealed with clear waterproof tape. With this installation the model has successfully floated inverted on the wing and nose for over 1/2 hour with no water reaching the radio. The battery area under the wing can collect some water, but this can be minimized by using sealing tape between the fuselage and wing to reduce the potential for water leakage into the body. Also, coat the battery compartment with polyurethane varnish to keep the water that does leak from soaking in.

## CHARGING

The motor battery is held in place with Velcro for easy removal. I charge up to four packs of cells in series outside the fuselage on an Astro Flight 112 charger. This is done very easily when using Sermos connectors, as these connectors come apart and will connect to each other. Charging in series allows up to four flights with only twenty minutes of charging. Please note that charging this way requires that all cells be of the same capacity and that all packs be dead before you begin charging.

## CHECKOUT

Verify that the control surface throws are as specified on the plan and in the correct direction. Check the balance and double check the wing for warps. If there are any warps in the wing, remove them by having a helper twist the warp out while using a heat gun to reshrink the covering.

## FLYING

Pick a calm day for the test flights. Charge the motor battery, install the battery in the fuse-

lage, and attach the wing with rubber bands. Place the model on the water, turn the motor on, and steer into the wind. Adjust the direction of takeoff so that the wing floats don't touch the



Pondsider on step and ready to lift off. It's important that the lower edges of the hull be left sharp for good planing characteristics. Don't round 'em off!



Even though there's plenty of room inside the hull, the author strongly advises using a lightweight micro radio system to keep the flying weight to a minimum. He recommends going to a seven-cell pack if the model weighs over 40 ounces.



Two capacitors are used on the motor to prevent radio interference. Gold Fire motor offers a good compromise between cost and performance.

water. After the model gets up to speed, apply a small amount of up elevator and she'll lift right off. Climb slowly until the model is up to altitude. Mild aerobatics can be done by first diving the model to increase speed and then looping or rolling. When the battery starts to run down, turn off the motor and glide back to the water. Before touching down, apply just enough up elevator to skim across the top of the water. After landing, turn the motor back on and steer the model back to shore. I hope you enjoy the Pondsider as much as I have. **MB**



## THE UPCOMING FLYING SEASON

**S**pring is just about upon us and I trust that all of you had a prolific building season and are ready to hit the campaign trail or just show off your new creations.

If you are competing or planning to compete in upcoming events this year, I hope you have the new AMA 1992-93 rulebook in hand. I guess the biggest change in the scale contest rules is that Giant Scale no longer exists. The specifications pertaining to this category were shifted to Sport Scale. There were no changes to the Giant Scale rules. Now, Sport Scale models may go up to the 55 pound limit (with fuel) and engines of up to 6.0 cubic inches for a two-stroke or 9.6 cubic inches for a four-stroke.

RC Sport Scale has many minor changes. One of these changes is that spinners used for flying are to be presented at the time of static judging for comparison. Also, the static judges are to note the droppable stores that are in place at the time of static judging. Maneuvers or scale operations not capable of being performed by the full-scale aircraft are not eligible options and scoring is to the nearest half point. An official flight is *finally* defined. Fun Scale has the same changes as in Sport Scale. In addition, with advance notice it may be conducted in different classes based on age or skill levels. The words "entry level" have been deleted from the opening sentence.

World War II Combat, involving 1/12-scale models powered by engines up to .20 cu. in., weighing up to 2.5 pounds and towing streamers, has been added. I wrote about this event in my January '92 column. Since that writing, Tom Stryker has added a P-51 and a Japanese Zero to his stable of kits. In talking with Tom recently, he stated that the rules for the new event are very complicated, especially the scoring. Rather than being scored for the kill, a pilot is to be scored on his aggressiveness, flying style, etc. Since this is a new event, I'm sure the scoring will sort itself out.

The Wild Thing combat event is proving to be very popular here in Central Florida. I believe one of the reasons it is so popular is because of the simplicity of the scoring. You get points for each kill. You are allowed one minute to get your plane in the air. When all planes are airborne, the C.D. yells "Combat!"—and everyone has at it. Combat lasts for so many minutes. When a pilot has his streamer cut, the plane is landed immedi-

ately. Several heats are flown. The person with the most cuts during the day is the winner. In case of a tie, there is a flyoff. I had envisioned the 1/12-scale WWII Combat event to be scored along the same lines.

• • •

Cooler weather has arrived here in Florida and IMAA fly-ins and scale contests are in full swing. There are some new models

but to fly as a fun airplane. The plane weighs thirteen pounds and is powered by an O.S. 120 twin four-stroke. Prop is a Zinger 15x6-10. It is covered with Sig Coverall and has eleven coats of paint: two of primer, two of color and seven of clear nitrate.

• • •

Do you have perfectly good servos that are not interchangeable with the radio sys-



Pat Rogers with his beautiful Ace R/C 1/4-scale clipped-wing Taylorcraft. (Inset) Cockpit of Pat Rogers' Taylorcraft. Nice!

showing up on the scene. One of these is an Ace R/C 1/4-scale clipped-wing Taylorcraft built and flown by Pat Rogers of Apopka, Florida. The photos were taken at an IMAA fly-in at Fruitland Park, Florida, October 12-13. The model took Best of Show award. This was the second outing for the plane, and it has won Best of Show both times. The photos do not do it justice.

Pat made a few modifications to the kit. He changed the cowl by adding a flange at the front, the landing gear is spring loaded via compression springs, and he fabricated his own wheel pants. The landing gear is flared into the wheel pants. The top window was also modified to be more scale. He said he didn't build it to be a scale masterpiece,

tem you are presently using? Cal Orr of Custom Electronics has come up with a unit called the CEU universal radio connector. The CEU connector is a four-pin, three-wire female radio connector that will mate with Airtronics, Futaba J, or JR servos and Rx battery packs. Hitec and the new World Engines connectors are pin compatible with JR. The connectors are available assembled with eight inches of wire for \$3.00 each, or unassembled, less wire, for \$2.50 each. If your hobby shop doesn't carry them, you can order them from Custom Electronics, P.O. Box 1332, Alta Loma, CA 91701; telephone (714) 980-4244.

Another handy gadget I ran across is a sanding block made by Warner Manufac-



turing Co., Minneapolis, MN 55441. The unit is all-wood construction and use a quarter sheet of sandpaper. The thing that caught my eye was the fact that one edge is radiused and the other edge is an angle, which makes it easy to sand close to vertical



Handy dandy sanding block, as mentioned in text.

surfaces, etc. I found mine at a Wal-Mart store for two bucks and change.

### MODELER OF THE MONTH

Meet Bernie Fields, from Interlochen, Florida. Those of you who have been around awhile have either met or competed against Bernie in the scale wars at one time or another. Bernie has been modeling since 1933 or 1934...he really can't remember that far back. He has been in RC about thirty-eight years. He and his wife Dorothy owned and ran a hobby shop in Jacksonville for twenty-one years. Bernie has designed many fine scale models, one of which was a Ryan ST that was a construction article in a model magazine several years ago. Bernie's latest effort is a 1/4-scale 1946 Cessna 140. It is all balsa and ply, has operating flaps, doors and scale latches. The landing gear is a modified Sig Morrissey Bravo unit. The corrugated skin is from Sig. Most everything in it was fabricated by Bernie, or modified by him from existing parts. It is covered with Sig Coverall, finished with Sig dope and weighs fifteen pounds.

Bernie says it is a delight to fly and that he has been flying it for about two years. The cowl is all balsa and only weighs a couple of ounces, it has formers and is sheeted and planked and was constructed on a jig to hold everything square in the process. The only compound curve on the model is around the underside of the cowl. The front of the cowl is a hollowed-out balsa block.

Visiting Bernie at his home is akin to taking a guided tour through the history of modeling, from the early thirties to the present. He showed me one radio that was

flown in the 1936 or 1937 Nats. He has everything from single channel, "Kickin' Duck," multi-channel relay and reed rigs, to early propo gear. You name it, he has it.

When Bernie builds a scale model, it is just that: scale. He has a 1/4-scale J-3 built from a Sig kit. He added a baggage compartment; the front seat is all metal and bolted to the floor as in the full-size plane; even the windows open and close. Since they work like the full-size ones, he had to fix the side window so that it is down with a piece of the window showing. The door is unlatched by reaching in through the side window as per the full-size Cub. It has a Fox 78 in it and he says it flies just like the full-size airplane. Bernie should know; he owned a J-3 for 4-1/2 years, only recently selling it and purchasing a Piper Pacer.

He has a scale Der Jaeger that he built and flew at a U.S. Scale Team selection a few years ago. It is fabric covered with 730 hand-tied stitches in the fabric. The gas cap is the on-off switch for the radio. He built it from plans, but modified the plane to comply with a full-size one located in California. The prop is a scale Sensenich and is laminated and hand-carved. Bernie says the prop was expensive to make. The wood cost twenty to thirty bucks and most ended up on the floor.

One model that caught my eye was an FW-190 hanging upside down from the ceiling. Bernie didn't build it, but acquired it from the builder af-

did fly, but was tail heavy and met its demise when it whistled and went straight in.

Bernie's latest project is a 1/4-scale Sopwith Camel. He has been researching it for several years and is in the process of drawing it up. He has many photographs of a full-size replica and photos of the factory drawings. In addition to this, he has a book that shows the breakdown, with drawings and photos of the original parts. Bernie says it is to be a museum scale model and will probably be a bear to fly, especially in the wind, due to its light weight. Having seen the plans, I can't wait to see the finished product.

Bernie attends most of the IMAA fly-ins, as well as spending time at the Sig organization in Montezuma during the early summer. Bernie's wife is a builder also, and you won't see one without the other. If you see Bernie, go right up and introduce yourself. He's a real southern gentleman and one heck of an interesting person.



(Above) Bernie Fields, featured Modeler of the Month, and his 1/4-scale 1946 Cessna 140. O.S. 108 power. (Far left) Bernie Fields shows us his Sopwith Camel project, still on the drawing board. (Left) Bernie and only part of his collection. Awesome!

ter it had crashed. It was built by a modeler in Jacksonville, and Bernie thinks it was the fellow's first effort at designing and building a scale model. It is covered with thin aluminum sheeting. The individual panels are the same shape as on the full-size plane. It was weathered and scarred. There are patched bullet holes in the tail, fuselage and ailerons, and the model is scaled to a particular day in 1945! When the plane was photographed you couldn't tell it from the full-size one. It

Thanks to all of you for the letters, and if you haven't heard from me, be patient as I will get to them eventually. In the meantime, I am in desperate need of a formula that will result in black or gray smoke instead of a white smoke for my smoke system. Anybody got any ideas out there?

Al Tuttle, 4223 New Haven Court, Port Orange, FL 32127; telephone (904) 760-4246. **MB**



## KEEPING IT "STRAIGHT"

In this pattern business, one of our favorite words is "straight." It is constantly tossed around in conversation, appears in every set of building instructions devised for pattern aircraft from the beginning of the world to date, and has been voted "Most Favorite Word" by the Pattern Intelligentsia Magazine Prose Society (P.I.M.P.S.) more often than any other adjective, adverb, or noun, narrowly edging out such perennial stalwarts as "light" and "horsepower." All in all, a wonderful word, and we could scarcely get along without it, even if we don't always agree on what it means.

With such an overwhelming volume of usage, one would think that agreement on a standard definition for the term would be widespread. Such is not the case. I have been shown "straight" airplanes whose major components were joined at angles normally seen only in a game of Pick Up Sticks, and "crooked" ones whose only visible lack of alignment was in the thumbs of their owners.

Language is a fluid medium, and words are slippery, abstract little suckers, darting about and daring you to catch and fillet them properly. I often get quizzed as to specifics when I say "straight," and not all (or even most) of the questions are coming from beginners. In fact, one such question was the impetus for this column. So how straight is straight?

Webster's says: "...free from curves, bends, angles or irregularities; generated by a point moving continuously in the same direction and expressed by a linear equation," among other things. Not a lot of help there, right? What we need is something concrete, absolute, and not subject to interpretation, and it needs to be expressed in inches, meters, and degrees, or

(hopefully) small fractions thereof. All of this serves to bring us back to the same question: "How straight is straight?"

Of course, what is really being asked is, "How much deviation is aerodynamically significant?" or more to the point, "How much slop can I get away with?" The standard answer is, "Not a heckuva lot," which is correct, safe, and at least as informative as

It is time to crawl out on the proverbial long branch with a tape measure, a word processor, and a saw for the return trip.

Given a mil spec standard pattern plane size of 800 sq. in. and 8 pounds, the paired measurements made during the trammeling process (see Figure 1) should be equal to within 1/16-inch to 1/32-inch; 1/64-inch is better. Anything over 1/8-inch is a gross error and a major cause for concern.

Perhaps this is a good time to explain "trammeling." The term dates back to the dawn of the machine age and refers to the various gauges and jigs used to align machine parts. For our use it means any device, such as a measuring string or rod (or even a tape measure) which pivots on a reference point for the purpose of aligning airframe components. Trammeling is used when setting the wing planform alignment relative to the fuselage, and again when setting the stabilizer planform alignment.

Incidence angles should be accurate within 1/4 of a degree; 1/10 of a degree is even better. One-half degree or more deviation from design specifications is a gross error which will result in major hair loss during the trimming process.

Stabilizer tilt relative to the wing should be less than 1/64-inch, measured tip to table; that is to say, it shouldn't exist, period.

Engine thrust offset angles should be within 1/4 of a degree to start with. This is less critical because thrust offset is normally the first trim adjustment made after the initial flight.

Surface trueness should be as good and as equal as you can make it. I don't want to bore anybody with a lot of technicalese, but

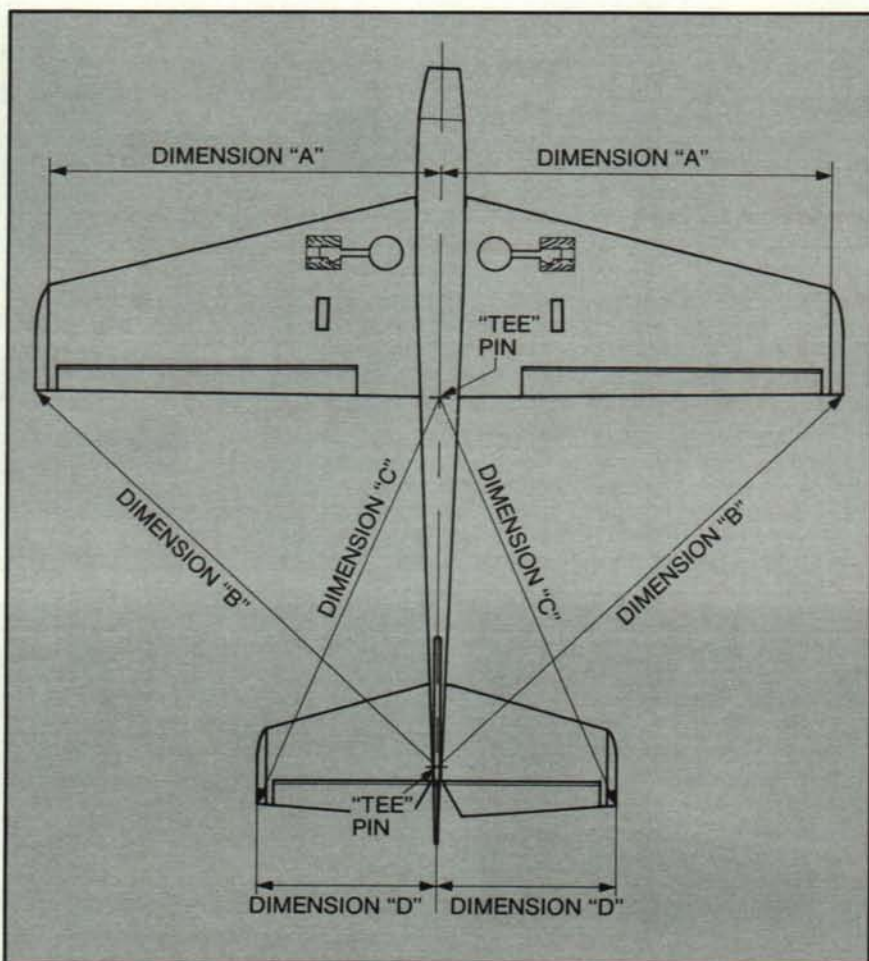


Fig. 1. Trammeling diagram for a typical pattern model. All dimensions with the same letter designation are equal and should only be made after the wing and stab are aligned with each other—i.e., zero stab tilt.

Webster's. The difficulty is that the answer is very much size dependent. A 1/16-inch misalignment that might not be significant in a 1/3-scale Laser would represent gross misrigging in a Peanut Scale free flight model.

Actually, the size issue doesn't apply if we only consider pattern planes, because most pattern planes are very nearly the same size.



at low Reynolds numbers such as our pattern models see, there is a natural tendency for laminar flow to persist to a much greater degree than with full-size aircraft, due to the relatively higher viscosity of the boundary layer (scale effect). The accurate profiles provided by balsa covered foam surfaces encourage this tendency, and to add to it, many modern pattern airfoils are laminar flow types. My Cursor design uses an NACA Series 6 foil, for instance.

The advantages/disadvantages of laminar flow vs. turbulent flow with associated airfoils and planform shapes, etc. in pattern aircraft could (and probably will be) the subject of an entire future column. For our purpose today, please accept that even with this viscous, sticky boundary layer, an irregularity measuring 1/64-inch or less (raised wing skin seam, hollow or bump in the surface, different leading edge radius, paint ridge, control surface hinged off center, etc.) can still mean the difference between maintaining laminar flow well aft (past the designed minimum pressure point of the airfoil) or a forced early transition to turbulent flow with associated separation bubbles and an accompanying healthy increase in total drag.

This still isn't much of a problem unless the irregularity occurs asymmetrically (only on one wing, perhaps). Then drag and lift (and stalling) differences will occur asymmetrically, and the resulting trimming headache may or may not be symmetrical, depending on the surface trueness of the wall on which you choose to beat your skull. This explanation is both partial and simplistic in the extreme, and there is a lot more to the whole deal, but the idea is to make both sides of the airplane match very closely. If they don't, you won't like it, I promise!

As an example, I'll relate to you a story about an "untrimmable" Cursor belonging to a young flier I know. The airplane flew perfectly at slow speeds, but had a very disconcerting habit of suddenly pitching down and to one side as speed was gained in level flight or on a 45-degree down line. We changed elevator servos (twice), inspected the control system for slop and possible flutter, checked for loose covering, looked at the hinge gap seals, checked the balance point, and just generally tore our hair out until I spotted a slight depression in the upper right surface of the stab, probably caused by over-enthusiastic use of a heat gun during the covering process. I sent the kid home to fix it, and behold, an entirely new airplane. The depression was causing separation of the flow over the stab at speed, and the resulting high speed stall of the surface was causing the pitching problem.

From the above, it's easy to see that big pains from small mistakes do grow, and details do matter. The standards outlined above, if adhered to, will produce a trainable airplane. However, there will be those purists, I'm certain, who will say that these

standards are not stringent enough; that no deviation at all is acceptable, and that only perfection is good enough. I admire their incorruptible stance, but most of us are modelers, not machinists, and we work in soft woods and foam, not steel and titanium.

On the other side of the fence, I imagine that most of the sport pilots who have wandered into this column will read the above paragraphs and think pattern pilots are crazed, masochistic, squinty-eyed measurement freaks with pockets full of rulers, protractors, and meters. From a sport pilot's point of view, they are undoubtedly right, but everything is relative to the task at hand. The task in pattern is precision flight. The task in sport flying is schlepping around the pea patch all afternoon without breaking a prop.

How is such admirable straightness achieved? Well, achieving straightness is like making money. Making a lot of money isn't hard as long as you start with a lot of

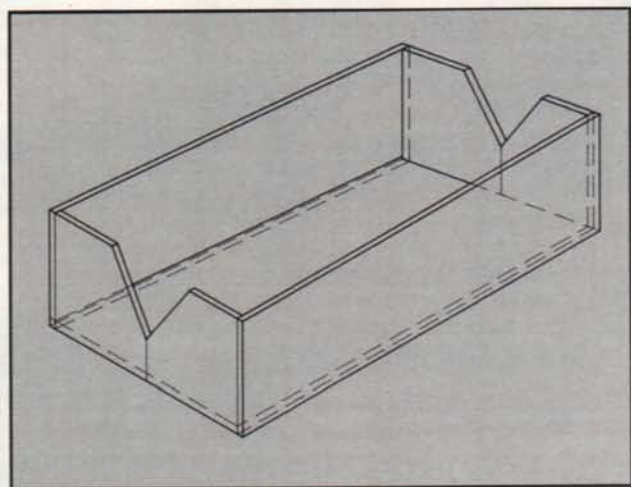


Fig. 2. A setup box, easily made from inexpensive particle board shelving, is especially handy for getting the wing/stab alignment correct; text explains how it's used. A couple of hours spent making a simple fixture like this can save you many hours and much grief trying to trim a crooked airplane!

money, and the same thing works with aircraft construction. You merely start with as much straightness as you can find and afford, and proceed from there. At a minimum, you need a straight, flat table at least 60 inches long and 30 inches wide. Builders I know use hollow-core doors, old drafting tables, old pool tables with the cushions knocked off, benches they have custom built for themselves, or anything with sufficient size and trueness.

The surface you use must not deform under pressure, especially the surface that you use to sheet wing cores. The best stuff I have found for this purpose is slate or natural marble or granite at least one inch thick. Look up a stone cutting shop in the yellow pages; you can often pick up slab ends and pre-cut remnants relatively cheaply, especially if you don't mind a ragged edge.

Whatever surface you decide on, check the trueness with string or fishing line stretched diagonally, corner to corner, or use a long straight-edge stood on edge the

same way. Use shims if you have to, but get it flat and level. Several hours and a few bucks spent here will save a lot of pain downstream.

Buy good quality metal straightedges in both short and long lengths, with increments marked down to at least 1/16-inch, and a good quality metal tape measure. Build or buy an accurate incidence meter. I use a meter made from a commercially available digital inclinometer which is accurate and repeatable to 1/10 of a degree. I wrote the thing up in *Model Builder* some time ago, so check your back issues.

Another very handy item is a setup box (Figure 2) for installing the stab and setting the incidence on same. This is easy to make from the pre-cut shelving available at your local hardware store. The "V" cutouts centered in the end pieces are there to accommodate the fuselage. My box is 48 inches long by 24 inches wide by 12 inches high, and stands neatly on end, tucked away in a corner of the shop, when I'm not using it.

To use it, I set it up on a flat surface (like my bench top), bolt the wing on the fuselage, slide the stab into the cutout in the fuselage, and set the aircraft on top of the box, aligning the centerline of the fuselage with the centers of the "V" cutouts. The box then automatically holds the stab square to the wing (zero tilt) while its planform alignment is adjusted during the trammeling process. Once the trammeling is done to my satisfaction, I check the wing incidence reading and then shim the stab to the identical reading. Nothing remains but to double and triple check all the measurements, and proceed to find the glue. Simple, accurate, and neat, and much less high pressure than the old routine of endless squinting and resquinting fore and aft.

Another building step to watch is the joining of flight surfaces—gluing the wing and stab halves together. Any twist (centerline misalignment) is too much twist. Draw accurate leading and trailing edge centerlines, and make sure they line up. Dry fit everything before you reach for the glue. If you are building something with plug-in wings, either make the wing halves individually adjustable for incidence, or be very, very careful when you set the wing pins.

The basic idea of pattern is contained in the shape of every pattern plane. Our maneuvers are meant to be precisely aligned, straight, graceful, and symmetrical, and our airplanes are a microcosmic representation of this ideal. You don't see much sloppy work wearing the numbers of our top fliers, and for good reason. Dry fit, measure everything at least twice, and then measure it again before you glue. Take your time. It takes less time to build a straight airplane than it does to trim a crooked one, and the differential usually works out to minutes against hours. Be a detail person. Sweat the small stuff, because the payoff is big. **MB**



# FASTER THAN A SPEEDING...

"Jet Trails" Visits the Superman Fan-Fly at Metropolis, Illinois

BY SCOTT STAUFFER



Dennis Strege (left) and a friend show off their creation, the Enforcer DF-2.



Can you believe that Bee McNeil had this pretty Aggressor up for sale? Features Robo struts, aluminum wheels and custom air-brushed paint job.



**T**he 3rd Annual Superman Fan-Fly, held each year at the airport in Metropolis, Illinois, was staged October 5-6, 1991, by Jerry Caudle, who owns J.C. Hobbies and runs the airport, which is shut down each year for this event. And what an event it was, attracting 66 entries and more than 100 aircraft!

The competition saw speed runs approaching 200 mph, a fierce scale show, and some museum quality aircraft along with a host of sport aircraft. After a 9:30 a.m.

pilot's meeting Saturday morning, the field was open for general flying and qualifying speed runs. All day long the announcer called out speed runs. Only the top five would compete on Sunday for the top speed awards.

There were several debut aircraft present, one of which was Bob Violett's new T-33. This is a big one; with an 80-inch span, it will be able to compete in giant scale competition. Sporting a classic silver-and-red paint scheme, it weighed in at 14-1/2 pounds. When the top hatch was removed, the first thing I noticed was how small the fan looks in the big fuselage. This provides plenty of room for radio gear and access for



Bob Violet with his new T-33.



Charlie Trivits with his JMP F-4 and Yellow Aircraft F-14 Tomcat—both beautiful pieces of work.



Another view of Charlie Trivits' F-14 Tomcat, this time with the wings swung back.

maintenance.

The center section of the wing is molded into the fuselage; the two wing panels plug into this. The main gear is mounted in the center section for greater strength. The gear is a beefed-up version of the Sabre gear, to better handle the extra weight. The fuselage is extensively prefabricated with molded-in panel lines and hatches. Other features include speed brakes, a BVM 91 engine and gyro stabilized rudder. A snap-on hatch in the nose provides easy access to the radio

and engine.

Now, you may ask, how does it fly? Well, it won Best Scale performance, with flying characteristics rivaling Bob's Sabre: Smooth with good speed and plenty of vertical climb, plus very scale-looking landings with the speed brakes deployed.

Another new model was Bob Parkinson's Cheetah, the final product of several prototypes. A few months ago I reported on Bob's first prototype of a 60-size Barracuda. This had a nifty purple camouflage paint job. Bob

redesigned it, gave it a silver paint job and called it the Barracuda. Still not satisfied, he refined it further, added a Dynamax fan and a sharp red, white and black paint scheme, and dubbed it the Cheetah. Weight is 7-1/2 pounds, with a Rossi 65 DF engine for power. It features foam core wings and a vinyl plastic fuselage with wooden formers. It's quick, aerobatic and grass field capable. I've obtained one of these kits from Bob, as well as a Dynamax fan and engine.

Bob has also released a new 11-blade



impeller that he says better absorbs the power of the new 90-size engines. They are designed so they can be retrofitted into existing nine-blade fan shrouds. The new impeller slows the engine down to a safer speed, about 20,000 rpm, without sacrificing performance. This will also help your engine last longer. I have a couple of these new impellers but have not had a chance to try one.

One plane that got a lot of attention at the show was the F-14 Tomcat owned by Charlie Trivits and Don Kanak. This glossy black Playboy bunny version of Yellow Aircraft's kit has numerous features, starting with twin O.S. 91 Dynamax fans, Aeroloft graphics and over 40,000 rivets, plus functioning tail arrester hook, lights, spoilers, full cockpit detail and swing wings, all controlled by a Multiplex Royal radio. It features fully articulated landing gear, with 11 air-operated gear doors, three on each main and five on the nose, all tied together with 85 feet of air lines. The complete model weighs in at 28 pounds.

Ron Snyder, of Johnson City, Tennessee, flew his JMP F-4 Phantom. Using two Rossi 65 Dynamax fans and MK retracts, this 21-pound twin had a fancy red, white and blue paint job. The flight I saw was its third and it flew with distinction. *continued*

There were also museum quality aircraft at the meet. Dick Rotkosky of Austin, Texas, won Best Scale Finish with his Violett F-86F. This precision scale aircraft was patterned after an aircraft stationed at Hahn Air Base in Germany. It has speed brakes, oleo struts, main gear friction brakes, drop tanks and Aeroloft graphics. In addition to the graphics, Dick added panel lines and hatches with countless rivets. K&B paint and automotive clear finished off this 14-1/2 pound masterpiece.

Bill Harns also built a Violett F-86, but he modified his into an Mk 6 RCAF Air Sabre, which involved changing the wing and molding air scoops into the bottom of the fuselage. Bill chose the Golden Hawks Show Team colors for his paint scheme. He contacted the Sheffield bronze powder company in Canada, which originally mixed the colors for this plane. They FAXed him a documentation letter stating that this was the true original color, plus they put him in touch with the pilot who actually flew the plane! Bill also used a unique way of applying the rivets to his plane: A sharpened brass tube attached to a soldering iron to melt them into the clear paint. This gave the plane a realistic feel as well as visual effect. Several changes were made by Aeroloft to be sure they had the graphics exactly right. Bill plans to compete with this 12-pound plane at the Scalemasters Tournament later this year.

A group from Marysville, Tennessee, brought three Top Gun Ultimate Eagles. This is a new fiberglass sport F-15 Eagle kit, which uses a single Byron fan and O.S. 91 engine. Two of them had identical red, white and blue lacquer paint jobs. They weighed 12 pounds and had fixed gear. The

planes come with a nice gelcoat finish with optional plug-in wings. The guys sure looked like they were having a good time flying them.

There were eight Violett F-16s present (seven were ready to fly), plus more Vipers and Aggressors than you can shake a stick at. BVM aircraft clearly dominated this event. In fact, all but two of the awards went to Violett planes. But they were not the only planes there. In addition to the planes I mentioned earlier, there were a couple of Starfires, several Byron powered planes and a Cobra, plus some scratch-built aircraft. Dennis Strege modified a delta-winged Enforcer kit with a Byron fan on top. He called it the Enforcer DF. It flew quite well, and I think it would make an interesting kit.

Bill Hiller of Manon, Indiana gets my vote for busiest flier. It seemed like every time you turned around he was flying his Byron Blue Angel A-4 Skyhawk. What this plane lacked in raw speed, Hiller more than made up in aerobatic prowess. Some of his favor-

*The competition saw speed runs approaching 200 mph, a fierce scale show, and some museum quality aircraft.*

ite maneuvers were long, low-level passes, usually less than three feet, and low-level four-point rolls and loops. He also likes to suck up his landing gear just as the plane becomes airborne. One second the plane is rolling down the runway, the next the gear disappears and it's flying. When it comes time to land, he waits until the last possible moment to drop the gear. On his last flight he must have hit the switch a little too late, because he wound up belly-sliding down the runway. When it stopped, an assistant went over and picked it up. As he did, the gear snapped down. He released the plane, and Hiller taxied it back to the pits.

Late Saturday, after qualifying fifth in the speed runs, Vern Smith was sport flying his Aggressor. He was performing a low four-point roll when he made a slight mistake. The plane suddenly veered toward the pits. Rather than trying to save the plane and possibly having it go into the pits, Vern pushed full down elevator and piled into the paved runway, which totally destroyed the plane. This all happened within a split second. Vern did not hesitate to make this decision. To me, this represents the highest caliber of professionalism. Planes can be replaced, people cannot. While we were all saddened by the loss of the plane, I salute Vern for his courage and quick thinking.

The first order of business on Sunday was the finals of the top speed competition. The rules stated that fliers were allowed to make as many runs through the traps as they could on one tank of fuel. Only one flight was

allowed, and that flight started when the wheels left the ground. If the engine flamed out shortly after takeoff, that was considered a flight. Pilots were allowed to dive to pick up speed, but had to pass through the traps straight and level. In order for the top speed to be official, it had to be backed up by another run within five mph.

The event started with the number five qualifier, Vernon Smith, and worked up to Terry Nitsch, the number one qualifier. As the runs progressed, the speeds grew, until Dave Ribbe hit 191, then 193. Only one pilot remained. Soon after Ribbe had landed, Nitsch was in the air and the race was on! Now the pressure was on Terry. On his second pass, he hit 197.2 mph. But he had to back it up to win. Two more runs passed just short of the mark...but his final run hit 196.2 to take the win! The crowd cheered as Terry made his victory rolls.

The top five speed winners were: First, Terry Nitsch, 197; second, Dave Ribbe, 193; third, Roger Shipley, 183; fourth, Joe Rafoloski, 179; and fifth, Vern Smith, 159. Later Terry did an aerial demo set to music. Starting with Lee Greenwood's "I'm Proud To Be An American" and ending with Kenny Loggins' "Danger Zone," it was an inspiring performance. About three o'clock, contest director Jerry Caudle gathered everybody around the impound tent and presented the awards. Best Finish Sport went to Bill Harns for his black Aggressor. Best Finish Scale was won by Dick Rotkosky with his outstanding BVM F-86 Sabre. Charlie Trivits won both the Long Distance and the Aeroloft awards. The Aeroloft award was for his F-14 Tomcat. Best Sport Performance and Top Speed went to Terry Nitsch's Viper. Bob Violett received the Best Scale Performance award for his new T-33.

Barry Cohen of R/C Video Review Magazine packed up his cameras and headed to Texas for the 1991 Southwest Texas Jet Rally. Just two weeks after the event, he released the completed video which features an interesting look at the largest jet rally in the country, with lively interviews and lots of interesting aircraft...like George Miller's new YF-22 and Tom Cook's T-33...plus the F-117 Stealth fighter and some of the fastest aircraft anywhere. If you like jets, this is a tape to add to your collection. It's now available at your local hobby store. Check it out!

Dave Latsha calls it pipe fungus. I refer to it as the creeping crud, scourge of the skies. This all refers to a condition that is causing a host of engine problems. The development of the new, quiet pipes has led to this condition. The pipes contain baffles and tubes over time become clogged with exhaust carbons and oils, which restrict the exhaust flow and cause engine problems. Dave found this problem by accident, when in desperation he changed his pipe and his engine trouble stopped. The cure for this problem is periodic cleaning of the pipe. So check your pipes guys. **MB**





Bob Parkinson and his wife, Aurora, prep their new Cheetah for flight. More on this one in text.



Jerry Caudle's BVM F-16 with sport paint job, BVM 81 engine, scale struts and missiles. Weighs 12-3/4 pounds. Inlet and exhaust covers are a nice touch.



Bill Harns plans to compete in the Scalemasters Tournament with this BVM F-86 Golden Hawks Sabre.



Rick Schaeffer of Custom Model Products with his tried and true BVM Aggressor, "The Texan."



Tom Sierocuk of Mason, Ohio, built this Yellow Aircraft F-4 and painted it identical to the wing commander's plane in the 3rd TAC Squadron, in Okinawa. Features O.S. 91 Dynamax fan, fixed wing tanks and Violet quiet pipe.



This is one of three Top Gun Ultimate Eagles brought to the rally.



## Chopper Chatter

BY JAMES M. WANG

**T**he 4th F3C World Helicopter Championships were held at Wangaretta, Australia in October 1991. At the previous three World Championships, the Japanese team placed first, but this time the U.S. team won, fielding a very good team, including the ex-World Champ, Curtis Youngblood, who placed third individually. Wayne Mann, who has placed in the top three positions in almost every contest he has entered in the



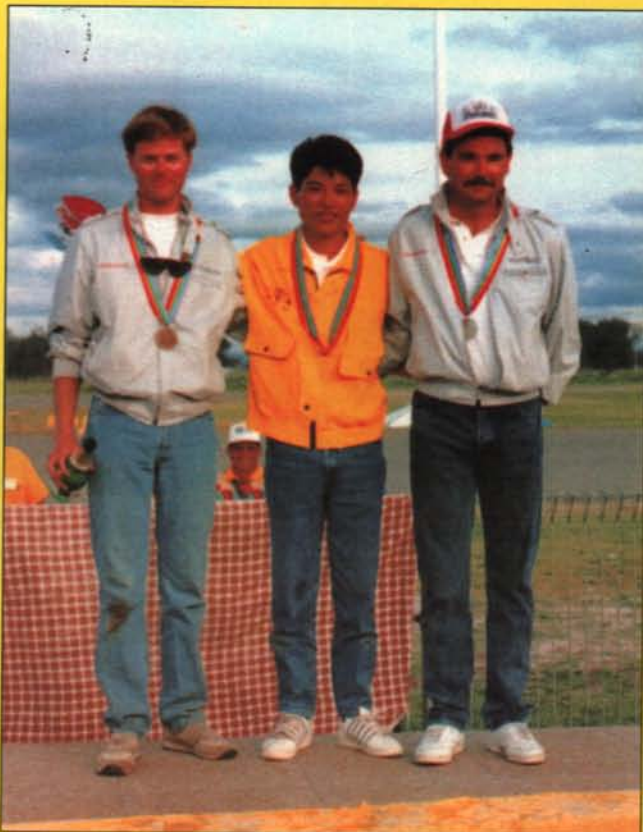
Wayne Mann practices at sunrise.

last two years, was second. Robert Gorham, the third member and the only American who has won a place on all four U.S. teams, placed sixth. With a strong team like this, it's no wonder the U.S. captured the team championship. (These pilots and their machines were featured in the U.S. Team Trial report in the October 1991 Model Builder.)

The first place individual trophy, however, went to Kazuyuki Sensui, of Japan, who finished second at the last World Championships (1989). The 21-year-old Sensui works for his father, who has a small model product manufacturing firm that makes special aftermarket products geared toward improving model helicopter performance. Sensui also writes a helicopter clinic column in the Japanese *Radio Technique* magazine. At the World Champs, he flew a Kalt Omega with many custom parts. The rotorhead is a Kalt 10-SII of all-metal construction. It is an underslung teetering design, similar to Hirobo rotorheads and GMP Elite and Proheads. A rubber damper is used to provide the flapping spring stiffness.

Sensui uses an O.S. 61 RF Long Stroke ringed motor. It is a rear exhaust design

(Right) Wayne Mann, second place winner at the 1991 F3C World Championships flew an X-Cell 60 Custom with a Triumph fuselage. It has Zig-Saw 680mm blades, an O.S. 61 SFN motor, and optional 9.4:1:5.5 gear ratio. (Far right) Third place winner, Curtis Youngblood, used X-Cell 60 Custom mechanics inside his own fuselage design, which may soon be kitted by Miniature Aircraft USA.



Top three winners at the 1991 F3C World Championships, from left: Curtiss Youngblood, 3rd; Kazuyuki Sensui, 1st; and Wayne Mann, 2nd.

with the header coming from below and going up the side of the frame and into a special muffler made by his father's company. The fiberglass fuselage used by Sensui is very different from the one he used at the last World Championships. His 1989 model resembled a Jet Ranger but this time the fuselage looked more like a Lockheed 286, with a bullet nose and an intake scoop on







Kazuyuki Sensui's winning machines featured Kalt mechanics and his own body design. The streamlined fuselage has large vertical and horizontal fins. The design is quite different from the ones he used at the World Championships in 1989.



(Left) Efraim Kastier of Israel should qualify as the most promising young pilot. With only four years of modeling experience, he demonstrated competition skills approaching those of Curtis Youngblood. Kastier is currently an Israeli soldier, operating remotely piloted vehicles (RPVs) for military surveillance.

(Below) This pair of gorgeous Jet Rangers with TSK Blackstar mechanics belongs to Robert Gorham of the U.S. team. Both use TSK hingeless rotorheads, single flexbeam for flapping, YS 61 motor, and Hatori 666 muffler.



## F3C TEAM RESULTS

Place	Country	Score
1.	USA	1978.0
2.	Japan	1969.0
3.	Switzerland	1789.0
4.	Germany	1708.0
5.	France	1661.5
6.	Gr. Britain	1502.0
7.	Australia	1473.0
8.	New Zealand	1340.0
9.	Austria	1092.5
10.	Korea	1065.5
11.	Netherlands	1014.5
12.	Belgium	957.5
13.	Israel	499.5
14.	Norway	493.0
15.	Finland	437.5
16.	China	287.0

each side. It has huge vertical and horizontal fins to improve the forward flight stability. The model weighs 9.2 pounds. The main rotor blades are K&S GC-660s which are 660mm long. The main rotor diameter is 60.63 inches. The tail rotor blades are K&S carbon fiber blades, 10.24 inches in diameter.

Sensui's teammate, Yoshiro Dobashi, placed fourth, flying a machine similar to the one he used when he became the World Champion in 1989. It uses Hirobo Eagle mechanics in a Blackshark fuselage. It has a Hirobo SSR II rotorhead. The main rotor diameter is 61.4 inches. The complete model weighs 9.3 pounds. Dobashi uses a Y.S. 61

## F3C INDIVIDUAL RESULTS

Place, Name, Country	Rnd 1	Rnd 2	Rnd 3	Rnd 4	Total
1. K. Sensui, Japan	225.0	238.5	226.5	217.5	690.0
2. W. Mann, USA	224.5	224.5	209.5	226.0	675.0
3. C. Youngblood, USA	212.5	220.0	222.0	225.5	667.5
4. Y. Dobashi, Japan	210.5	237.0	213.5	217.0	667.5
5. S. Suwabe, Japan	219.5	223.0	221.0	213.5	663.5
6. R. Gorham, USA	213.0	199.5	204.5	218.0	635.5
7. D. Graber, Switzerland	207.5	221.5	205.5	201.5	634.5
8. J. Brennstetter, Austria	204.5	214.0	181.0	199.5	618.0
9. T. Ikeda, Japan	202.0	122.0	202.0	211.5	615.5
10. R. Parizot, France	196.5	201.0	197.5	172.5	595.0
11. V. Heine, Germany	191.5	199.5	186.5	200.0	591.0
12. J. Roessner, Germany	193.5	197.5	191.5	198.5	589.5
13. H. Gasser, Switzerland	204.5	188.5	167.0	189.5	582.5
14. U. VonNiederhausen, Swt.	203.5	189.5	148.5	179.0	572.0
15. G. Weil, France	181.5	193.5	172.0	166.5	547.0
16. O. Graf, Germany	180.0	189.0	145.0	158.5	527.5
17. R. Barbuto, Australia	146.0	179.5	171.5	173.5	524.5
18. J. Verhagen, Netherlands	154.5	180.5	180.0	160.5	521.0
19. P. Rose, France	176.5	180.0	159.5	163.0	519.5
20. J. Knox, New Zealand	181.0	105.0	164.0	172.0	517.0
21. L. Mount, Great Britain	169.0	174.5	169.0	158.0	512.5
22. E. Kastiel, Israel	165.0	185.0	130.0	149.5	499.5
23. C. Bliss, Great Britain	170.0	165.0	121.5	161.5	496.5
24. K. Verplanke, Netherlands	144.0	0.0	160.0	189.5	493.5
25. R. Nessen, Norway	173.5	120.5	147.5	172.0	493.0
26. A. Newman, Great Britain	128.5	177.5	159.5	156.0	493.0
27. J. Wessel, Australia	153.0	166.5	155.0	163.0	484.5
28. T. Verbrugge, Belgium	172.5	161.0	145.5	130.5	479.0
29. G. Vanderschelden, Belg.	136.5	170.5	151.0	157.0	478.5
30. H. Bingel, Austria	160.0	165.0	149.5	126.0	474.5
31. H. Park, Korea	137.5	0.0	168.0	161.0	466.5
32. F. Proos, Australia	53.5	159.0	172.0	133.0	464.0
33. A. Campbell, New Zealand	157.5	101.0	132.5	151.5	441.5
34. J. Porokka, Finland	107.0	153.5	129.5	154.5	437.5
35. B. McKay, New Zealand	131.0	144.0	24.0	106.5	381.5
36. Y. Kim, Korea	116.0	62.5	107.0	128.5	351.5
37. X. Zhang, China	91.0	98.5	91.5	97.0	287.0
38. S. Kim, Korea	82.0	91.5	71.0	74.0	247.5

Long Stroke, rear exhaust ringed motor exhausting through a very special muffler system with two chambers; it looks like two canister mufflers connected by a tube. Dobashi is an engineer with Futaba Corporation, so of course he uses a Futaba radio and gyro.

All of the Japanese contestants used long stroke, rear exhaust engines. In the early eighties, many of the top U.S. pattern pilots also favored rear exhaust engines, which

*continued on page 80*

The best finished models at the World Champs, according to our columnist, belonged to S. Suwabe, who works for Hirobo in Japan. Naturally, he flew Hirobo mechanics with a fuselage similar to the Hirobo Nova. The models are extremely fast, close to 100 mph.





## DEEP-STALL LIFT COEFFICIENT

In our October 1991 column I showed a photo of Paul Weston's "Sea Stealth," and discussed its ability to descend vertically and flat, at idle and with hands off the transmitter. I commented that it seemed to descend so slowly that it had to be operating at a much higher lift (or drag) coefficient than for a theoretical flat plate. I said I couldn't understand it, and asked you readers for help. You came through, as usual.

I received a telephone call from Robert Randall, of El Segundo, California, and letters from Dave Gilbert, of Houston, Texas; Dick Hawes, of Omaha, Nebraska; Eliot Kimble of Putney, Vermont; Nat Penton, of DeQuincy, Louisiana; Jim McCulley, of Warrenton, Virginia; and fellow model-engineering writer, George Abbott. Dave submitted some calculations, and referred me to an aerodynamics text I didn't have. Robert, Dick, Eliot, Nat, Jim, and George referred me to articles in *Sport Aviation* magazine for July and September 1991. Some of these kind fellows even sent me copies of the articles. Thanks, guys.

It looks like flat plate drag is twice what I quoted in the column. I made a mistake in interpreting one of my texts. But if Paul Weston and I were close in estimating the vertical descent velocity of the Sea Stealth, it was still operating at several times higher coefficient than the books could explain.

The *Sport Aviation* articles were very revealing. This vertical descent mode has been observed in several different full-scale airplanes; again the descent was much slower than the texts account for, and no less an expert than Burt Rutan doesn't understand it either!

I quote bits and pieces from the articles: "We detailed two very unusual instances in which 'Velocities' (a full-scale airplane. fr) have been flown into deep stall conditions from which they could not recover, but during which the aircraft descended to water landings at such abnormally slow rates of descent that the pilots suffered minor or no injuries.... Recently a similar accident occurred in Utah involving a Long-EZ.... descending much slower than the flat plate drag coefficient of the Long-EZ would

normally dictate, according to Burt Rutan.

"This suggests that very high lift coefficients are somehow being generated in the deep stall condition. Burt intends to investigate the phenomenon, and will be aided by a report (Paper 77-672) presented during an AIAA conference in 1977 by Vernon Rossow of NASA Ames, entitled *Lift Enhancement by an Externally Trapped Vortex*... that predicts section lift coefficients up to around 10.... The paper theoretically confirms

separated rolling wave of air from the fully stalled wing.... The canard case has also been discovered.... The aircraft rotates many degrees beyond the stall into a new stability bucket.... If you have a low enough wing loading, such as free flight model airplanes... the parachute mode can be used to safely lower the aircraft to the ground. If you have a high wing loading, forget it!.... The infamous flat spin is a close relative of the deep stall, wherein the spin itself provides

the stability for the parachute mode. The flat spin and the deep stall both result in non-recoverable rapid descents and should be avoided at all costs.

"Keep your airplane nose heavy so the center of gravity cannot be surrounded with fully-stalled wings and tails acting as parachutes.... Hinge your horizontal tail so it will flip up and most any (especially high wing) airplane becomes a parachute.... In the parachute mode of stability all normal aerodynamic forces and moments are thrown out the window. You are not flying, you are falling.... Changing the power only makes you a powered parachute and moves your crash site over a bit."

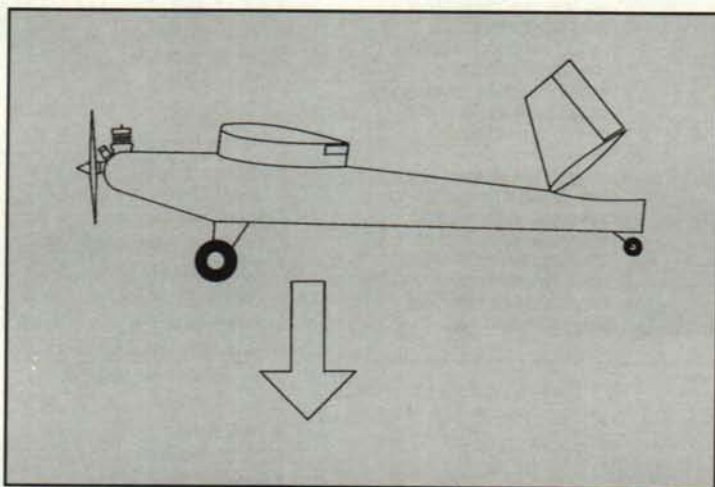
Thank you, *Sport Aviation* and its authors, for shedding a lot of light on our vertical-descent mystery.

## PARACHUTE-MODE RECOVERY OF RC MODELS

In his letter to me, Jim McCulley suggested, "How about designing this into our models as a radio system failure recovery mode?" Interesting thought, Jim.

On a free flight model we install a dethermalizer to increase the sink rate and get it out of any thermals which threaten to kidnap the plane. We do this by rigging a mechanism which, after a predetermined time, puts the horizontal stab at an incidence angle of roughly -45 degrees. With the horizontal tail out of commission for normal flight, the model goes into the deep-stall parachute mode we have been discussing and comes nearly straight down. However, this increased sink rate is still so slow that the resulting pancake landing normally does not damage the model.

continued on page 82



Deep-stall-mode recovery of RC models? See text.

Witold Kasper's long held contention that devices can be built into wings to induce and control vortex lift."

And quoting, in part, from another *Sport Aviation* article, by Barry Jones, a former Douglas aerodynamicist: "Deep Stall was first discovered by British Aircraft Corp., as a result of the crash of one of the first BAC 111s during certification testing.... The BAC 111 had rotated into a second mode of stability at approximately 30,000 ft. altitude and descended to the ground in a 'belly-first' attitude. All attempts to cycle engine thrust, change aircraft configuration, and move controls failed to return the aircraft to forward flight so it could recover from its plunge. The saga was radioed to the ground as it took place, by the unfortunate crew....

"The DC-9 was cured of similar 'parachute mode' tendencies by making the horizontal tail approximately 1/3 the area of the wing! For obvious reasons this story was given little publicity. The deep stall phenomenon [may occur in] T-tailed aircraft where the horizontal tail is rendered ineffective by the



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GENERAL DAVE  
JIMMY DOOLITTLE

I COULD NEVER BE SO LUCKY AGAIN

P-61  
WIDOW

DELTA

DELTA

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P-61 BLACK WIDOW

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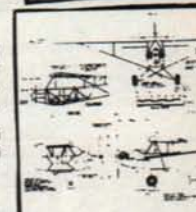
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# HANNAN'S HANGAR

BY BILL HANNAN

## "Me, put lead in my aircraft? Never!"

Our "heavy" quotation this month is by pioneer aircraft manufacturer Louis Bleriot. Adding ballast to overcome balance deficiencies may be philosophically painful, however, it is often the simplest solution, especially in scale models with very short noses...such as Bleriot's!

### SPEAKING OF BALLAST

Floral clay employed in flower arrangements appears to be a better solution than the traditional modeling clay for shifting

flight, because in the February 29, 1908, *Scientific American* he wrote: "In ballooning, a few glorious hours in the air are usually followed by a tiresome walk to some village, an uncomfortable night at a poor hotel, and a return home on a slow local train." From a talk presented by the late Pearl Young, shared with us by Hewitt Phillips.

### THOSE AGGRAVATING AUTOGYROS

Autogyros (Cierva-licensed

are aerodynamically complex, and are seldom seen in successful model form. Many if not most modelers who have tried them, gave up in favor of less vexing projects.

A notable exception is Georges Chaulet, of France, who has devoted many years to experimenting with rotorcraft in almost every imaginable configuration, in both free flight and radio controlled form. His 99th(!) example appears in one of our photos, however, in spite of his vast accumulated knowledge, Georges freely admits to not

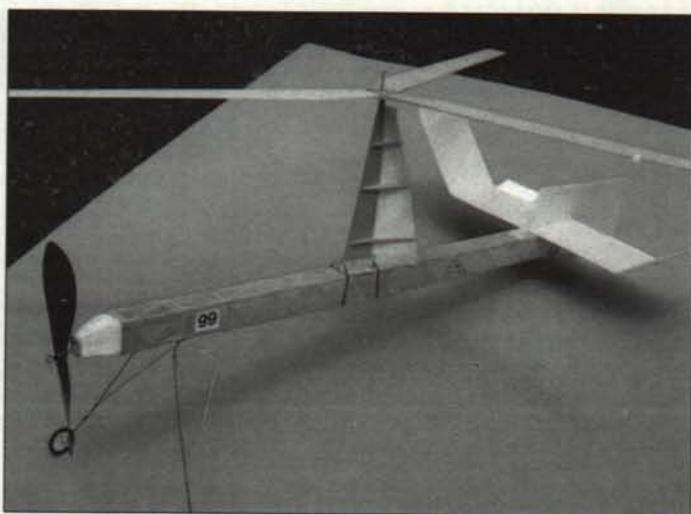


Tony and Addie display their magnificent 105-inch span, electric-powered Hill Pterodactyl flying wing. Model was inspired by Otto Kuhn's Pistachio version!

the center of gravity on small models. While it has similar characteristics, it is claimed not to stain, and will stick to most clean surfaces. In local craft stores, a 5-ounce package costs about \$1.69, and should supply enough ballast for dozens of models.

### LEAD BALLOON?

Wilbur Wright evidently took a dim view of lighter-than-air



Milestone model! This simple-appearing autogyro is the 99th in a series by Georges Chaulet, of France, who considers them the most challenging of any model type.

designs) and autogyros (other brands) are strange flying machines—somewhere between airplanes and helicopters, but combining the frustrations of both. Mechanically simple, compared to helicopters, they

having all the answers. His motto remains: "Let us go forth and break blades together!"

John Walker is also interested in wingless gyros, and achieved good results with a Louis Garami design from an old issue of *Air*



Rolls-Royce test pilot Andy Sephton with his fine A.B.C. Robin indoor flying scale model. Photo by Tonda Alfery.





Doug McHard poses with his awesome Antonov "Pchelka" compressed-air powered twin. Initially troublesome, patient problem-solving resulted in a fabulous flier.

*Trails* magazine. Subsequently, however, he tried a scale Auto-giro and found the challenge much more difficult: "The only way I could get it to fly was when the rotor blades locked, with two of them in the forward position. Then it flew great!"

### INVERTED BIRDS?

According to a New York Times item sent by Ed Whitten, hummingbirds are the only ones capable of flying upside-down. On the other hand, some larger birds, such as crows and hawks, are briefly inverted while performing evasive maneuvers, and slow-motion films of such antics have appeared on television. And long ago it was well documented that certain insects can either half-roll or half-loop in order to land on ceilings. So now you know...

Thanks to Frank Scott, we received a copy of *Flying Wires*, newsletter of the Michigan Ultra Light Association, in which Editor Dennis Demeter wrote these lyrical lines: "Once, one summer day I found a thermal. I shut off my motor and started circling. To my amazement, not

a hundred feet below was a red-tailed hawk. I watched him, and mirrored his flight path. Anyone who tells you that hawks and eagles only soar because they are looking for food has never shared a thermal with one. They soar because they are masters of flight. They soar because they can. They appreciate their gift as much as we humans appreciate our freedom. I am convinced that in a hawk's heart, there is a soul, and he is cognizant of a greater power that gave him his wings and the rising air beneath them. He revels in it, and is truly alive...just like me. And so it was that two minds of two different species merged in a communion of flight, high above an un-knowing world, absorbed in a moment of time."

### JOHNNY REMEMBERED

John McElroy, of Mineola, Texas, wrote to say: "I was especially grateful for your comments on my old friend, the late Johnny Clemens. I was in his wonderful Hobby Counter store only a couple of weeks before he went O.O.S. I can tell you he

was preaching and teaching model aircraft with his last ounce of strength...and being funny!"

### GB CO<sub>2</sub> ENGINES

Or motors, if you prefer. Bill Brown, of Brown Junior Motors, has announced an agreement reached with Stefan Gasparin, of Czechoslovakia, to produce a new line of CO<sub>2</sub> powerplants to be known as GBs (Gasparin/

Browns). Both single-cylinder and twin-cylinder types are under development with displacements of 12 cubic millimeters per cylinder.

Stock in the firm may soon be offered, and inquiries from prospective investors are invited. For additional information, contact Brown Junior Motors, Inc., P.O. Box 77, Pine Grove Mills, PA 16868.

### FORTHCOMING FREE FLIGHT FARE

According to Bob Beecroft, the 1992 National Free Flight Society U.S. Free Flight Championships, to be held at Lost Hills, near Taft, California, on Labor Day weekend, will include the Nostalgia Gas Model Championships. For more details, contact Bob at 1014 Daisy Court, Carlsbad, CA 92009-4846.

### VALUE FOR THE MONEY

Al Lidberg points out that a typical model plan is quite a bargain, even in today's economy. He compares the cost of a small cheese pizza (at about \$7.30), which is consumed in a matter of minutes, with a similarly-priced model plan, which can provide hours of good thoughts, even if the model is never constructed. If the model is built, more hours of involvement are possible.

Clive Wienker looks pleased with his rubber-powered Corben Super Ace, during a Washington state scale meet. Photo by Carl Stokes.





# HANNAN'S HANGAR

Lidberg is marketing a new plan for the little-known Romanian I.A.R. 80A WWII fighter, which has ideal proportions for a rubber-powered model. Crisply drawn, the design spans 34-1/2 inches, and is supplied with detailed building instructions, proof-of-scale drawings, and a color sheet of insignia.

*Model Builder, Flying Aces/Flying Models, Air Trails, Model Aviation, Model Airplane News* and more. Most of the classifications are priced at \$6.50 each, postpaid, and a complete listing of available categories may be obtained by sending a stamped, pre-addressed return envelope to: James W. Patten, 5646 So. R.

minimum minimum qualifications for a potential builder, which include: 1) At least ten years of age; 2) A desire to build, without prodding; 3) A stable, moderate, patient and persevering nature; 4) An enjoyment of craft work and evidence of hand-skills; 5) Availability of a reasonably experienced modeler

The very complete kit includes construction drawings by Lynn Fehr, quality balsa print and strip wood, decals, lightweight tissue, formed canopy, plastic propeller, rubber, fittings and instruction sheet. The price is \$23 postpaid, from: Diels Engineering, Inc., Box 101, Woodville, OH 43469. Dave also offers the brochure giving descriptions and prices of his other kits and plans, for \$1. Please mention *Model Builder* when writing to him!

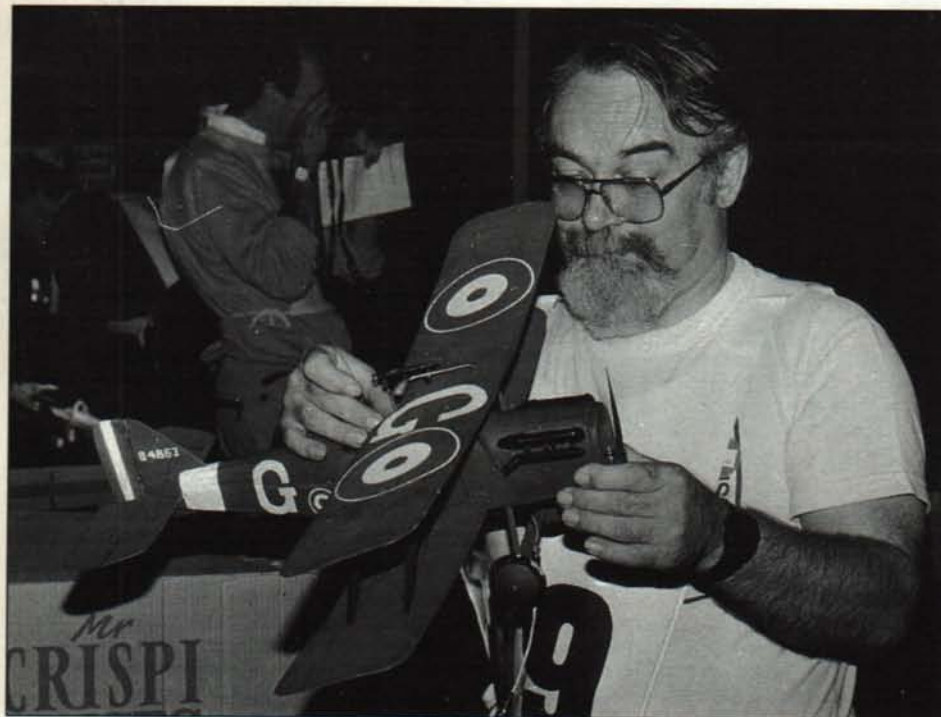
## MULTI-ENGINE PISTACHIOS?

Both George Benson, of Mill Valley, California, and Stuyve Pell, of Princeton, New Jersey, alerted us to the tiny new electric motors developed by Toshiba of Japan. With an outside diameter of only one-tenth of an inch, they can operate on from two to three volts. Think of the possibilities; how about four-engined indoor models? How about *truly* tiny RC servos, practical for even Peanut-size models? The mind boggles.

Speaking of small things, Benson also sent us samples of the doll-size clothespins he found at his local toy store. Resembling regular household clothespins scaled down to 1-1/4 inches long, their spring-loaded jaws open to about 1/4-inch. Best of all, they are priced at less than ten cents each, and would seem to be quite useful in model building.

## LET'S TRY THAT SIGN-OFF AGAIN

The sign-off for our December Hangar column contained a monumental typographical error, which reversed its intended meaning by 180 degrees! Here's what it should have said: "The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore, all progress depends upon the unreasonable man." Adapted from the *Journal of Irreproducible Results* via Bill Kincheloe. (Apparently even the quotation was irreproducible!) Apologies all around. **MB**



Bob Harwood's indoor free flight S.E.5a is powered by a KP-01 electric system. Photo taken by Tonda Alfery at the English Interscale '91 contest.

The complete package sells for \$8 (about like that aforementioned pizza!) plus 15% domestic postage or 25% overseas postage, from: A.A. Lidberg, 614 E. Fordham, Tempe, AZ 85283.

## HUNTING FOR A PARTICULAR PLAN?

We receive numerous letters from readers seeking some fondly-remembered magazine plan. Sometimes they have only a hazy recollection of the publication involved, such as, "One of the major model mags of the 1940s..." which makes the searching a bit complicated. But now, thanks to Jim Patten, the hunting may be considerably easier, via his extensive compilation of magazine plans and articles.

Separate lists are offered for

68 #107, Urbana, OH 43078. While perusing the *Flying Aces* item, we were delighted to see the fiction articles also listed (particularly Phineas Pinkham!), a nice bonus.

## THE ISLAND FLYER

Sometime ago, Clive Wienker designed an exceptionally fine-flying 22-inch span rubber-powered sport model called the Island Flyer (Clive lives on an island). The craft is the result of many years' experience in teaching model building classes, and lessons learned from inept students.

Although its flight performance cannot be totally guaranteed, it has "a very high likelihood of flying acceptably even for the lesser-experienced modeler." Clive suggests the opti-

as a coach; 6) Previous experience with building and flying a simple stick-and-tissue R.O.G. (and preferably having a parent who understands what R.O.G. means).

Admittedly a rather tall order for today's beginners, however, a much more realistic appraisal than most designers seem to acknowledge. Island Flyers are available through hobby shops at \$13.95, or by mail for \$15.95 from: R/N Models, 15421 Redhill, Suite A, Tustin, CA 92680.

## RUBBER POWERED JET

The latest deal from Diels Engineering is a North American F-100 Super Sabre model kit, which may be flown either as a glider or with a conventional rubber-driven propeller.



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**\$79.95**



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Redesigned for the 1990's. A Little Larger - Sport Scale throughout - Open Cockpits & Tail Dragger - Looks like a famous Fairchild. Tapered wing. Mod. Clark-Y Weight 6 Lbs, Eng. 46-Up 63" Span, 633 sq.in. Easy to build. List \$109.95

**MARK IV**



**\$59.95**

An easily transported, smooth flying, low landing speeds. Responsive but not touchy. Good roll rate. Looks like an airplane, not a box. Balsa & ply. Molded Canopy & Cowl, Span 54", Area 540 sq.in. Length 44" Power 40-60 2/4 strokes, 4-1/2-5 lbs. List Price \$84.95



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# PLUG SPARKS

BY JOHN POND

## Catching Up on the News

This month we have a chance to catch up on some of the contests and resulting action that we were unable to cover in previous columns. To say that SAM has grown immensely is an understatement as it was noted that 268 contestants were registered for the 1991 SAM Champs; of those, 116 were RC oriented. Signs of the times men! One day we'll all be too old to chase those errant free flights!

Some of the photos may be a little dated, but the model subjects are not! Photo No. 1 shows Al Richardson of Fullerton, California, with an Ed Lidgard Eugene II. Shot was taken at the



No. 2. Ray Chalker with Morril Hornet powered Brooklyn Dodger, at the 1989 SAM Champs in Jean, Nevada. Johnson photo.



No. 1. An Ed Lidgard "Eugene II" as built and flown by SCAMPS member Al Richardson. Photo by Harold Johnson.

Jean, Nevada Champs. For those who are not acquainted with Ed Lidgard's designs, Ed always adjusted them to accept the maximum power he could cram

into the fuselage. Needless to say, the climb of all of his designs was sensational!

Matter of fact, in watching Ed fly, his models flew excellently in the climb, being practically a dot in the sky when the propeller folded. Great stuff, huh? Unfortunately, the models got so high they often drifted out of sight while the low powered clunkers hung around for twice the time.

Regardless, all of Lidgard's designs; Eugene (I & II), Sparky (even the Comet kit version flew well) and numerous unnamed rubber designs, were adjusted under the Lidgard formula: fast steep climb and flat glide. A

sure way to lose them!

Al Richardson, himself, is no slouch in rubber power flying as he won the English 50th Anniversary Wakefield gathering two years ago. We like his models,

always yellow with blue or black trim.

### SAM CHAMPS (AGAIN)

We also like to see the neat models built and flown by Ray Chalker of Tacoma, Washington. Seen in photo

*To say that SAM has grown immensely is an understatement...  
...268 contestants registered for the 1991 SAM Champs.*

No. 2 is Ray cranking a Morril Hornet 19 in his Brooklyn Dodger. This engine may seem a bit small for the Taibi design, but those Hornet engines produced by John Morril are real goers. If you didn't get yours when he produced them, you are going to have to scrounge around to find one of these goodies.

Chalker is a consulting engineer and as such, makes his engineering offices available to SAM 8 to hold their meetings. Ray is one of those guys who makes the local area SAM Chapters tick.

If you don't know Jim Adams, SAM president, by sight, no more excuses as Jim is shown in photo No. 3 with an Ohlsson 60 powered Playboy Cabin. Johnson photo.

The cabin version of the



No. 3. SAM President, Jim Adams, with excellent flying Ohlsson 60 powered Playboy Cabin. Johnson photo.

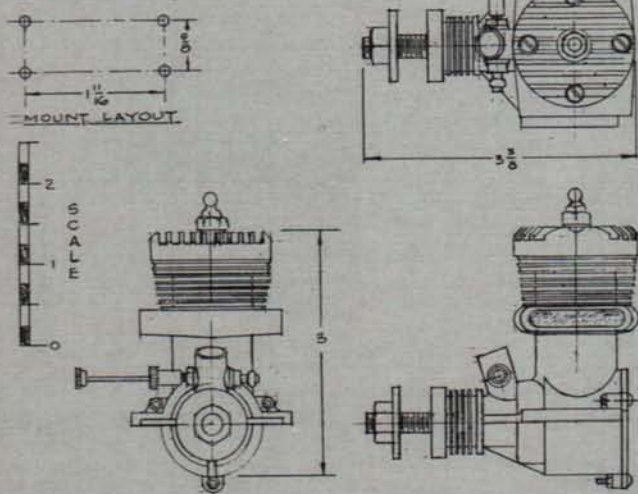


Playboy Senior has turned out to be a very successful competitor, whether it be free flight or RC. Most evident in RC work is the ability of the cabin version to penetrate into the wind much better than the pylon version. Regardless, Joe Elgin came up with a dandy idea in sketching a cabin structure on the plans!

left something to be desired but the engines did run smoothly and started easily. The engine, designed in 1951, was in prototype form early in 1952. Inasmuch as Tyrrell was working on the first Australian rules book with Bob Rose, VMAA Secretary, and Alan King (of Wakefield World Championship fame),

## DELTA 490

DRAWN BY ALLEN POND



### ENGINE OF THE MONTH

#### ENGINE OF THE MONTH

This month's engine is a little-known Australian engine known as the Delta 490. This writer is greatly indebted to Monty Tyrrell for his most informative history and background (which are too extensive to include in this short writeup). In addition, we were greatly pleased to be able to borrow Brian Potter's Delta engine to present the engine correctly.

As Monty Tyrrell points out, he was heavily involved in the production and refinement of the engine developed by Bill Evans and Alan McCulloch. Several options were offered; i.e., disc valve or crankshaft valve, ball race or plain crankshaft bearing.

The general design followed the early O.S. 29 glow and the AMCO 3.5 diesel of that era. The power of the Delta engine



No. 4. The late Phil McCarty with a 60-inch Curtiss Robin for FF gas scale. A real beauty!

Tyrrell immediately signed up Bill for an advertisement on the Delta.

In the Spring issue of *Australian Model Hobbies*, page 11, under "New Motor Preview," a writeup on the engine appeared. This engine couldn't have made a more auspicious entrance, considering the very severe restrictions on imports. At that time, Australia was attempting to build up its own industries; hence, the excessive import duties and restrictions on goods being imported.

The advertisement for the

Delta 490 (rear induction version) noted that the designer, Bill Evans, was responsible for other engines such as the Gee Bee Red Special and various Gee Bee motors. Specifications of the Delta engine were 18.5cm bore; 18mm stroke; 4.886cc displacement (approx. .29 cu. in.); and 9.5 to 1 compression ratio. The engine featured eight bypass ports and four exhaust ports which exited through twin exhausts. The piston crown was conical. Most engines were ball bearing equipped.

Monty Tyrrell was a member of Bill Evans' staff, where his duties were assembling Deltas and test running them. He held the viewpoint that if the engine could not be started easily by hand, it would not be sent out for sale. Monty points out the engine was about as powerful as a hot .20 cu. in. motor. To be used in the same model as powered by a Fox 29 was not practical although the Delta was reliable and ran well.

Actually, the engine did fill that terrible gap when very few engines were available. It was not until the Deltas, the Burford engines, and the English FROG 500 engines made their appearance that control line flying in Australia was practical from a competition standpoint.

#### LAS VEGAS

One of the prettiest Curtiss



No. 5. Dick Everett seen with a Thermic type glider. He was extremely active, attending contests both as a reporter and competitor.



## PLUG SPARKS

Robins we have ever seen is the free flight version, photo No. 3, produced by the late Phil McCary of the Las Vegas VAMPS (SAM 25).

The Robin was scaled to 60-inch span from the 48-inch Comet rubber model plans. Needless to say, Phil was a master craftsman and was not afraid to fly his beauties at a meet.

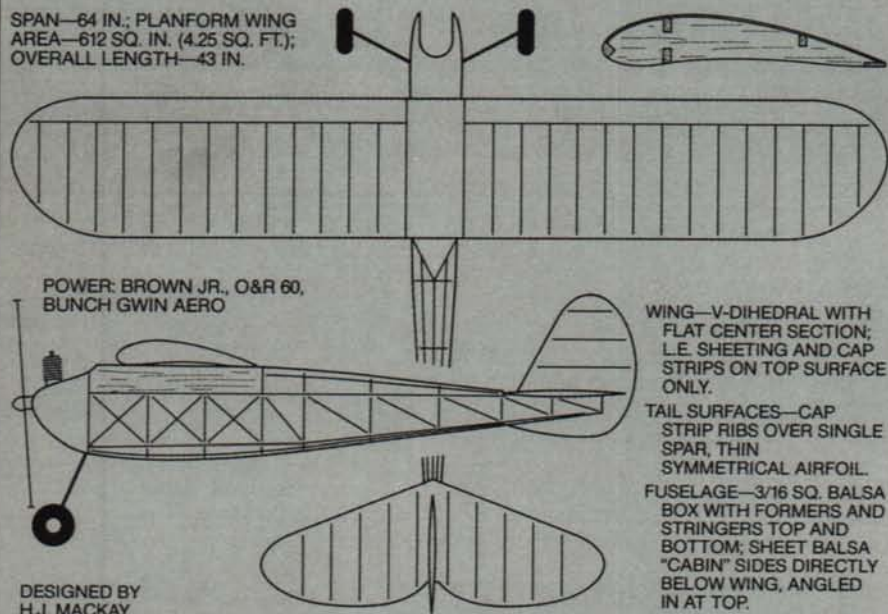
It might be noted that a con-

Jasco type wing while the balance of the model is quite reminiscent of Frank Ehling's approach to simple construction. Everett was not only an avid modeler, flying all forms of free flight, but he also wrote a column known variously as "Western Roundup," "Out West," and a few other titles for *Air Trails* and *American Modeler* magazines.



No. 7. Vic Cunningham with most unusual twin pusher hydro model...about 1929 vintage.

SPAN—64 IN.; PLANFORM WING AREA—612 SQ. IN. (4.25 SQ. FT.); OVERALL LENGTH—43 IN.



WING—V-DIHEDRAL WITH FLAT CENTER SECTION; L.E. SHEETING AND CAP STRIPS ON TOP SURFACE ONLY.

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DESIGNED BY H.J. MACKAY

### 1939 Australian Petrol Driven Champion

#### MODEL OF THE MONTH

siderable amount of detail was added. These items can be found on the 72-inch gas version also marketed by Comet Model Airplane Supply in those days. Those looking for a good 1/2A Texaco Scale subject could do worse than to use the 48-inch rubber-powered version. Don't say we didn't tell you!

#### NOSTALGIA CORNER

We have been showing quite a few photos taken by Dick Everett in the post WWII days. Seen in photo No. 7 is Everett himself, holding a glider design he calls the "Ehling Thermic." One can readily recognize the

#### MODEL OF THE MONTH

In keeping with the idea of presenting little-known models, we present the Australian 1939 Champion as designed and

flown by H.J. Mackay at the Sydney Model Airplane Champs, sometimes referred to as a "Nationals." (This is erroneous as this was only a state-wide meet.)

Note the similarity to the Simmons "Gas Champ" fuselage. The lack of the small pylon seems to have little effect on the flying qualities of this model, as it won handily flying in heavy winds. As a side-light, this author's Gas Champ also exhibited good flying characteristics in stiff winds.

The only version this writer has seen is the one flown by old timer Jim Fullerton's son. Matter of fact, better than eight years ago, a photo of his model was run here in the "Plug Sparks" column. Although the model

flew well, it has not aroused much interest. Hopefully, this presentation will convince modelers that this particular design is a darn good flying model.

#### FORSTER 99 CONVERSION

While there have been throttle conversions made for Forster 99 engines, it remained for the Rocky Mountain SAM vice president, Art Groscheider, to come up with a simple conversion to suit RC operation.

As can be seen in photo No. 6, the Forster 99 has been fitted with an O.S. FP 35 carburetor attached to a homemade brass intake. This appears to be about right, as bigger carburetors do not seem to work as well. The Forster 99 is one of those few engines that can be modified without any remachining of the engine. Because the Forster 99 has a detachable intake manifold, it is no great problem to make up a new attachment.

Art reports this carburetor works great, throttling down to 2,000 rpm where it flies very realistically while putt-putting around. The transition from idle to full power is as clean as any modern glow engine so equipped.

#### READERS WRITE

Every so often, we receive a most interesting letter from an old timer (in this case, Vic Cunningham) reporting on the performance of his O.T. twin pusher. As seen in photo No. 7, what makes this one so interesting is the conversion to a hydro type model. This columnist must admit he hasn't seen a twin pusher hydro since he built one,



No. 6. The Forster 99 RC throttle conversion in Art Groscheider's Super Buccaneer.



a Virgil Rassner twin, back in 1935. Surprisingly, they do take off well and fly very stably. Of course, with all that drag, the glide is something else! You need a real boomer to keep this one up!

Vic goes on to say that this model is sort of an amalgamation of various ideas. The basic A-frame is a Don Burnham 1929 type that won the 1930 AMLA Champs at Detroit. The floats were designed by Bert Pond and

used on the Tudor Morris model, which set a 1929 record. Quite a successful combo! Vic also says he put skis on the model and successfully flew it off snow!

### ITALY

Cesare De Robertes, Via F. M. Poccioni, 24, 00139 Roma, Italy, sends the latest notice from AIAS-SAM Italia announcing the first *Italia Annual*—a 96-page black-and-white, 8-1/2x11-1/2-inch book full of articles, pho-

tos, plans, you name it! Here is your chance to learn something about Italian vintage engines, models, and history. There is also a portion on Russian old timers!

Several unpublished plans (from the thirties) are included. Worried about being able to read the material? Cesare states the *Italia Annual* will be bilingual. You can read it in good old English!

To order your copy, send an international money order or international check, in the amount of 25,000 Italian lire, to: Franco Pianigiani, Via P. Nenni, 15, 53100 Siena, Italy.

### SWEDEN

Despite the rather cold weather during the winter months, Swedish modelers are very active in the spring and summer. Sven-Olov Linden of Orebro, Sweden, sent in a group of photos taken at the Swedish Old Timer Champs.

From this, we have selected photo No. 10 showing the action at the "Classic Wakefield" event. This is an event for well-documented models. Seen is Einar Hakansson with a Bob Copland "GB-3" and his helper, Ove Larsson.

It must be noted that most

events are rubber or glider oriented. This is a result of too few gasoline engines being available. The entries in the Power event reflect this, as generally five constitutes a fair showing.

### AUSTRALIA

A note was received from Monty Tyrrell, 13A Irving Road, Dandessong North 3175, Victoria, Australia.

Monty writes, "We were chugging along in a Piper Cherokee with a friend about 95 miles north of Melbourne, gradually descending after crossing the Great Dividing Range. The main cloud layer was several hundred feet below us. At ten o'clock high we spotted what we assumed was an eagle. But on closer inspection, I identified it as a Red Zephyr flying loose as a goose."

"I regard this as a superb reason for cutting back Limited Engine Duration and Texaco fuel allowance. We don't know if the model was free flight or radio controlled but it is for certain the owner didn't know where the model was. We were just lucky to spot the model and avoid a collision. It will be interesting to see if the owner ever gets his model back."

Food for thought, eh? **MB**

No. 8. Swedish O.T. Champs: Einar Hakansson and helper Ove Larsson get ready to fly Einar's Classic Wakefield entry, a Copland GB-3. Photo by Sven-Olov Linden.



#### JEKYLL

Wing Span: 66" Weight: 8.0-8.5 Lbs.  
Wing Area: 770" Engine: .60



#### CONQUEST VI

Wing Span: 66" Weight: 8.0-8.5 Lbs.  
Wing Area: 840" Engine: .60

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Vortex



#### DESIRE

Wing Span: 66" Weight: 8.5-9.0 Lbs.  
Wing Area: 920" Engine: 1.20



#### TYPHOON

Wing Span: 73" Weight: 8.5-9.5 Lbs.  
Wing Area: 1000/900" Engine: 1.20



#### SKYBOLT

Wing Span: 77" B/66" Weight: 20-25 Lbs.  
Wing Area: 1625" Engine: QUADRA



# ELECTRONICS CORNER

BY ELOY MAREZ

## How Big is Big?

(Below) Harry Apoian, builder of probably the only full-size electric RC model in the world, caught during his preflight. One might say that Harry really gets "into" his RC projects. (Inset) Harry's Pensuti-Caproni in full flight. The slow speed and large size make it an easy photo subject. See text for details, and don't ask, plans are NOT available.

Twelve inches to the foot scale. That means full-size, friend! Meet Harry Apoian, of Rolling Hills, California, and his full-size RC 1919 Pensuti-Caproni Triplane. As you can see from the photograph, the darned thing flies! And it is electric motor powered.

The way Harry tells it, it all started off as one of those conversations that we are prone to get into: "I could build a full-size RC airplane if I wanted to." His friends, of course, as firmly saying, "No way." Not one to ignore a thrown gauntlet, Harry went home to his drawing board, and you now see the results.

I had never heard of the Pensuti-Caproni either. Actually it sounds to me like something they'd serve in a New York pseudo-Italian restaurant, smothered in catsup which you are supposed to believe is some

kind of exotic sauce. But I have seen the drawings from Janes, and such an airplane did exist. Harry's creation, a well-engi-



The new Novak "Digi-Peak Plus" (left) and "Digi-Peak" chargers for packs up to eight cells. Described in text.

neered, challenging piece of model aircraft achievement, is actually a replica of this old oldtimer with the following specs: span 13 feet, chord 39 inches, length 12.35 feet and weight 45 pounds.

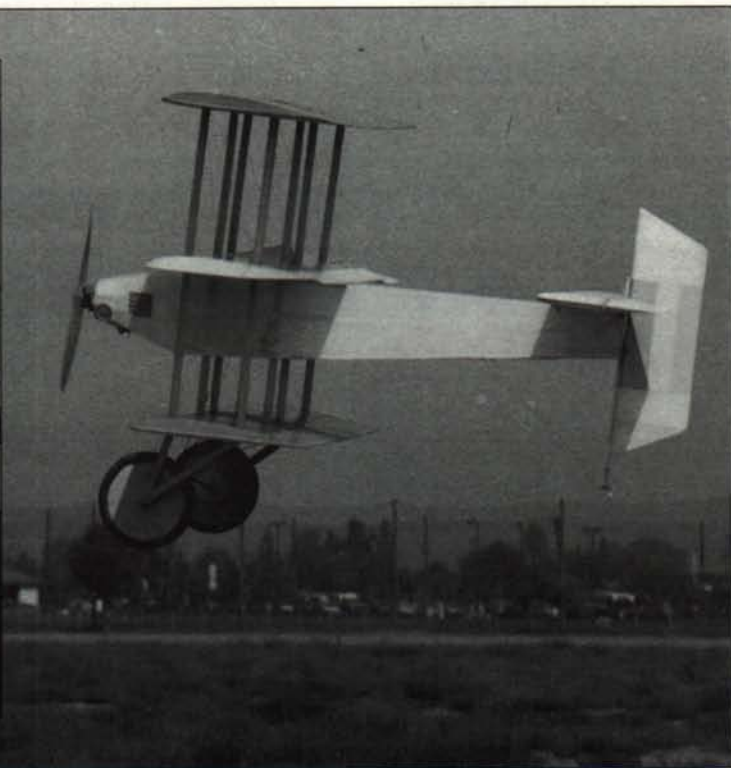
To replace the 35-hp Anzani engine used in the original, this one uses two Astro Flight cobalt

40s running on 28 cells per motor, at an input of 5.7 horsepower. These motors are coupled through a 12:1 belt driven reduction to a 48-inch diameter, 27-inch pitch, hand-carved balsa propeller, also of Harry's design. Throttle control is via two Novak Electronics 828-HV (8 to 28 cells) high frequency speed controllers. The entire powerplant amounts to 12.5 pounds of the ready-to-fly weight, and is based on a 20 mph airspeed and 800 propeller rpm.

According to my calculations, with allowances for the fuselage width, the effective wing area comes to 90.4 square feet, for a wing loading of around eight ounces per square foot. In the air, it appears to handle as you might expect such a lightly loaded model would; the takeoff roll is about 36 inches! The rest of the control functions are handled with an Airtronics system and some of the MS747 servos I told you about in my November column. And before you ask, it is mostly balsa and lite-ply, the former from Superior Aircraft Materials in Hawaiian Gardens, California, which I know as a source that can be depended on, not only for excellent wood but also for that special piece you need if you are carving a 48-inch propeller!

In answer to my question about whether he would do it again, Harry admitted to not being too sure; but in this case, he definitely did himself proud. Good on you, buddy!

**Some words of wisdom** from Harry Apoian: Beware the possibility of motor-generated RF getting into the radio system of your electric powered RC airplane. Use the capacitors recommended by the motor and/or speed control manufacturer, and leave as much space as possible between *all* components of the



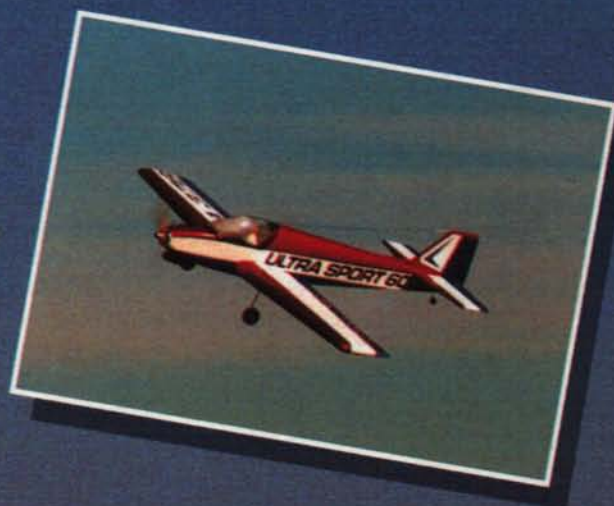


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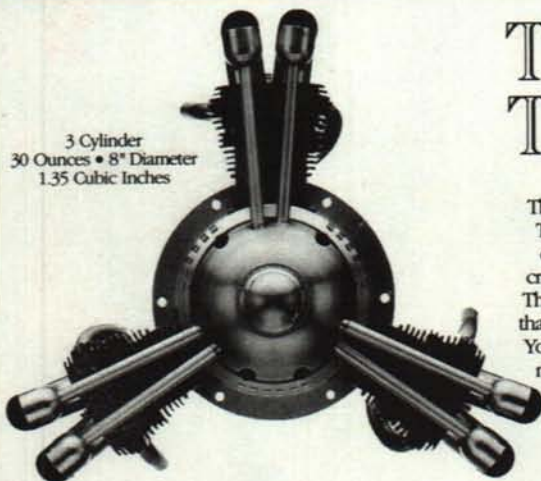
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motor(s) and their electrical system and the RC equipment. Before attempting the first flight, check the RC system's ground range with and without the motor(s) running. Any significant reduction may be a problem in the air.

And, always remember that there is a lot of energy packed into modern NiCd batteries; the more cells, the more possibility of a serious accident. Harry advises the use of a removable fuse, which he keeps in his pocket until just before flight.

Still on the subject of electric power, I'd like to tell you about a newly introduced charger, also from Novak Electronics. Named the Digi-Peak (without an integral digital meter) and Digi-Peak Plus (with a meter), this charger is claimed to use a new digital detection circuitry that completely eliminates false peaks or overcharging. It also includes temperature sensing that shuts it down in the event of overheating as well as a clever device called a "Solder Pop" fuse, which offers complete protection from reversed input voltage and which the owner need only resolder in the event it opens.

The LCD meter on the Digi-Peak Plus can be used to monitor charge current, and both battery pack and charging source voltage. Either version will completely and safely revive your four to six-cell packs from a 12-volt source (car battery) and from four to eight cells with a 15-volt source such as one of the many switching power supplies now available. The Digi-Peak (114400) is priced at \$140; the 'Plus' (114450) at \$185. Initially it is best to look for them in the shops that cater more to the RC car gang, though in time you'll also see them at the airplane stores.

• • •

**WEE RC**, even if the size of the subject is small, does not diminish the size of the mistakes. Referring back to my December listing of the wee airplane plans I have on hand, I don't know how I could have, but I actually missed the one that started the whole thing: Ralph Pearson's "Mini Mono," from *American Aircraft Modeler*, August 1970. The MM came to my attention back in early '86, and I shared it with you in the March issue for that year. It is a real cutie, a 21-inch low-winger originally designed for pulse rudder and elevator and a Cox .020 for power. The plans are full-size and I lost track of how many copies I have mailed out. Return mail also brought copies and information of other similar projects, with the list growing to what I have today.

I later had the pleasure of meeting and sharing war stories with Ralph in Toledo; I hope he is well and still gluing sticks together. Anyway, add the MM to your list. It was included with the rest to those of you who asked for the entire set or a large number of the plan; to save you having to write in again now. As of this writing, it is too early to give you a reading on the number of plans that will ultimately be requested, but it will be considerable. They love me down at the

*continued on page 70*



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2. Entries are limited to one model per person, per class. (Also one per show team.)
3. Former first place Toledo winning models are not eligible.
4. Models will not be allowed to be removed until show closing on Sunday afternoon.
5. Deadline for entering models is 6:00 P.M., Saturday, April 4th.

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## THE TRAILING EDGE OF TECHNOLOGY

**T**hat's the tongue-in-cheek motto of the most successful new control line model airplane contest to appear on the scene in the past decade: the Vintage Stunt Championships. VSC-4 will again draw enthusiasts from all over the United States to Tucson, Arizona, on March 21 and 22 for a celebration of the joys of Old Time Stunt and Nostalgia Stunt, two of the fastest-growing types of miniature aviation.



Don McClave, who explains the finer points of Old Time Stunt in this month's column, shows his Smoothie, built from *Air Trails* plans, powered by a 39-year-old Fox .35.

On Saturday, March 21, the events are Old Time Stunt (spark ignition engines) and Old Time Stunt (glow), followed by the annual banquet. On Sunday, it's Nostalgia Stunt, for designs from 1967 and earlier.

Plans call for flying two rounds of each event, leading to the following awards: "Spirit of '52," "Spirit of '64," "Spirit of '46," "Best Appearance" for both OTS and Nostalgia, "Flight Achievement," and other special awards—in addition to the usual trophies and merchandise. There also will be awards for those using the Ringmaster design, in

commemoration of that kit's 40th anniversary. They include "Most Authentic" and "High-Point." One participant will take home the perpetual "Keeper of the Flame" award for a general display of the OTS Nostalgia spirit.

For all of the details of the contest and advanced registration, write Mike and JoAnne Keville, 6109 E. Ivyglen, Mesa, AZ 85205. Because the contest is coming up soon, here's a phone number: (602) 985-3363. For OTS and Nostalgia Stunt rules, send \$1 and a self-addressed, stamped envelope to Tom Morris, 1019 Creek Trail, Anniston, AL 36206.

If you're not quite sure what all this old time and nostalgia stuff is all about, what follows will answer many of your questions. In anticipation of VSC-4 and of the upcoming contest season, one of the most prominent practitioners of OTS and Nostalgia in the past few years has written a primer on the topics for *Model Builder* readers.

Don McClave of Portland, Oregon, an expert modern precision aerobatics pilot, has become one of vintage stunt's most ardent enthusiasts and, more recently, an evangelist for the activity. In addition to the text below, Don provides a list of product suppliers, some diagrams of vintage planes' control systems and some photos of some of the currently active airplanes and fliers.

### FLY VINTAGE STUNT

By Don McClave

Shortly after a recent National Model Airplane Championships, one of our local fliers here in the Portland area, Steve Soloman, asked me to fly his new kit Nobler a couple of times to help him trim it out properly. Having not flown this design for nearly 30 years, I approached the flight with some trepidation. Had my old Nobler of 1958—the favorite plane of my youth—really flown as well as I had imagined, or had the plane's performance improved in my memory with the passage of time?

The answer is that Steve's Nobler flew great, brought back all sorts of pleasant memories of the plane I had flown as a teenager, and it took about eight flights before he could pry my fingers off the control handle to get a flight himself.

Since then, I've been increasingly drawn to the Old Time and Nostalgia Stunt events, which are a bit more low-key than regular AMA stunt events and a heck of a lot of fun.



Galloping Comedian Old Time Stunt plane built by Senior National Champion, Todd Lee. Note cockpit instrumentation and flying scarf on pilot. Photo by Don McClave.



Don McClave's All-American, built from the A-J kit and powered by a Dixon-tuned Merco .35. Finish is multicolored Sig Plyspan and clear dope.

As some readers already may know, Old Time Stunt designs are those kitted or published before January 1, 1953. The 1951-52 AMA stunt pattern is used in competition and bonus points are awarded for use of spark ignition engines and aircraft without the now-standard movable flaps. There are no appearance points in OTS and there is no builder-of-the-model rule.

On the other hand, any design that is at least 25 years old is eligible for Nostalgia Stunt competition. This format ensures a fresh supply of new building projects each year as additional designs become eligible. The present AMA stunt pattern is used in competition, appearance points are awarded and the builder-of-the-model rule applies.

In both events, construction modifications are allowed to strengthen the airframe, but the exterior dimensions of the aircraft must remain unchanged. Models constructed for these two events are referred to as vintage aircraft, denoting their origin in the early,



formative years of the precision aerobatics event.

On March 21-22, the fourth edition of the Vintage Stunt Championships (VSC-4) will be held in Tucson, Arizona. This wonderful event has become the national celebration of stunt's heritage and is well worth attending either as a participant or spectator.

It occurred to me that stunt fliers embarking for the first time on a vintage stunt project in preparation for VSC-4 might appreciate a few simple building, trimming and engine operating tips that will maximize performance without altering the basic design or flight characteristics.

My first suggestion is that you check alignment very carefully as you build, just as you would on a regular AMA competition airplane. This admonishment applies to both scratch-built and kit projects. I'm absolutely convinced that faulty alignment was the reason for more poor-flying airplanes in the early days of stunt than any other single cause.

Check the plans you are using for accuracy, check the fuselage sides in kits to be sure that the wing cutout is properly aligned with the thrust line, etc. The extra time taken here will pay big dividends in the long run.

Second, you'll want to reduce the tip weight called for in most designs, especially if wing asymmetry is more than one inch. Lots of tip weight is great for line tension but hurts performance in the square maneuvers. For much of the 1950s, this wasn't a problem since the modern stunt pattern wasn't adopted until late in the decade. I suggest you use one ounce of tip weight in equal-span designs, 3/4 ounce in designs having up to one inch of asymmetry, and 1/4 ounce in designs having two inches or more.

Next is control sensitivity. Most early designs had extremely sensitive control systems and you'll probably be a lot more comfortable slowing things down a bit. Try

the setups shown in the accompanying diagram in lieu of the plan instructions.

Use the inside hole of a Sig bellcrank and connect the bellcrank-to-flap pushrod to the one-inch hole in the flap horn. For 1:1 flap-to-elevator ratio designs such as the Top Flite Nobler, the elevator-to-flap pushrod should use the 3/4-inch hole on both the flap and elevator horns (Sig Magnum control horns come predrilled to these dimensions).

For Veco kits and other designs that call for more elevator than flap travel, drill a pushrod hole 5/8-inch from the pivot point

in the elevator horn. For airplanes such as the Barnstormer and All-American that don't have flaps, use the one-inch hole in the elevator horn.

Coupled with a four-inch control handle spacing, this will give a reasonable control feel for most people.

The center of gravity shown on most older designs is awfully far back for all but the quickest reflexes. Don't hesitate to move it forward as needed to get a groovy feel. This advice is most applicable on early 1950s designs. By the end of the decade, trimming and design evolution had resulted in generally better balanced setups.

Rudder and engine offset shown on most designs are excessive for best performance. I

don't recommend using more than 3/16-inch to 1/4-inch of rudder offset on any design, and one degree of engine offset is usually adequate. Moving the center of gravity forward is a more desirable means of maintaining good line tension.

Perhaps the most controversial recommendation I'm going to give you is, don't overpower your aircraft. Vintage aircraft generally were designed for 6-1/2- to 7-ounce .35s with modest power output, not 9- or 10-ounce Schnuerle-ported engines with lots of zip.

My Smoothie was much more enjoyable to fly with an ancient Fox .35 than with a more powerful, modern Schnuerle .40. The

pace of the flight was more comfortable and the ship handled better. With a .40 and some lead in the tail to maintain the correct center of gravity, it was a fat 40 ounces and very much victim of the "barbell" problem; i.e., too much weight in the extremities.

My favorite powerplant for most vintage aircraft is the old dependable Fox .35, now entering its 44th year of production. With proper break-in, fuel and prop, its running characteristics are still the standard against which non-piped stunt engines are measured.



Steve Tapp with his Nostalgia Stunt Oriental, from a Control Line Classics kit. Took third place Nostalgia Stunt at the 1991 Nats.



Jo Kubek built his original Fox .35-powered Stardust in 1953 and has been flying it ever since. I-beam wing is typical of Detroit aircraft style of the 1950s.

The Fox breaks into a two-cycle at just the right places to produce extra power, is virtually trouble-free and is ideally suited for smaller, lightweight aircraft.

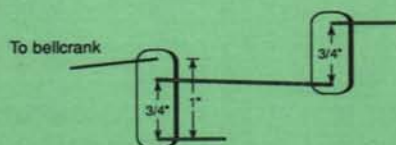
Use either Fox Superfuel, Carolina-Taffinder's Foxfire or Taff's 5-percent PAC with 3-4 ounces of added castor oil. If you mix your own fuel, try a blend of five percent nitromethane, 28 percent castor oil and 67 percent methanol. If you need more power, add more nitromethane; up to 15 percent is fine.

Your Fox will thrive on a Rev-Up 10x6W propeller, which is very similar to the old Top Flite 10x6 props in performance. In windy conditions, try a regular 10x6 Rev-Up, which has slightly less blade area. If you can obtain some Top Flite 10x6 props, or even one of the very rare Y&O 10x5 props, by all means do so as they work very well on the Fox .35 engine.

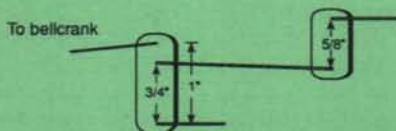
I don't recommend the Fox muffler, however. It's heavy and creates too much back

## Vintage Stunt Control Hook-ups

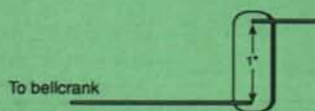
### Example 1: 1-to-1 elevator/flap ratio (Top Flite Nobler)



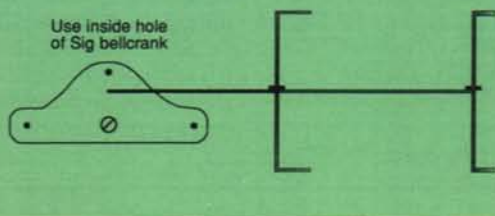
### Example 2: Reduced flap travel (Veco Kits)



### Example 3: No flaps (Barnstormer, All American)



### Example 4: Top view of controls





pressure. Instead, use an SST muffler with either twelve 1/8-inch holes or sixteen 3/32-inch holes. This setup also works well with other older bypass-ported .35s, such as the Veco, McCoy or K&B (the early Johnson engines with angled exhaust stacks had sub-piston induction and should not be muffled). In addition, keep the flying lines short—about 60 feet is plenty. Many pilots who flew on longer lines in the early days were doing so on the then-legal .010 solid lines rather than .015 cables.

If your plane is large (over 600 square inches of wing area) or heavy (over 45 ounces), you may need a little more power since the Fox was designed for smaller aircraft. In this case, you might want to consider the Merco .35 or .40 engines, which, like the Fox, have 1950s roots and are still in production. Mercos need a little special preparation for stunt, and I would highly recommend that you consider having Tom Dixon fit the piston cylinder assembly, adjust the compression, install a properly sized venturi, an SST muffler and a Kustom Kraftsmanship needle valve assembly. The Merco .35 he prepared for me is still humming along like a sewing machine after three contest seasons.

Of course, if you have an old McCoy, O.S., Veco, K&B or Johnson in your basement, by all means dust it off and use it in your vintage ship. The fuel, muffler and prop suggestions I made for the Fox .35 also apply to these engines, all of which approximate the Merco .35 in power output. My reason for focusing on the Fox and Merco engines in this article was simply that they are the only remaining bypass-ported engines still in production and available to everyone.

Plans for many intriguing designs for Old Time and Nostalgia Stunt events are available from John Miske, Tom Dixon and others. A growing number of popular vintage designs also are available in kit form, from a variety of suppliers. From personal experience, I can highly recommend those produced by A-J's Free Flight Service and Control Line Classics.

For more information about the Vintage Stunt Championships, contact JoAnne Keville (address in the introduction above). While

you're at it, join the Precision Aerobatics Model Pilots Association (PAMPA) to keep in touch with everything that's going on in the stunt world and establish contact with other fliers in your area.

PAMPA publishes an excellent bimonthly

### VINTAGE STUNT SUPPLIES

- A-J Free Flight Service, 4840 East Leisure, Fresno, CA 93727. (209) 255-2422. Kits.
- Aero Products, 1880 Scenic Highway, Snellville, GA 30278. (404) 979-2035. Custom engines, plans, kits, accessories.
- Aldrich Models, 1822 Tarrytown, San Antonio, TX 78233. (512) 656-2021. Custom engine work.
- Carolina-Taffinder, 8345 Delhi Road, N. Charleston, SC 29148. (803) 553-7169. Fuel, tanks.
- Control Line Classics, P.O. Box 8732, Moreno Valley, CA 92553. (714) 242-5077. Kits.
- Tom Dixon, P.O. Box 671166, Marietta, GA 30066. (404) 973-0004. Custom engines, plans, kits, accessories.
- Fox Manufacturing Co., 5305 Towson Ave., Fort Smith, AR 72901. (501) 646-1656. Engines, fuel.
- John A. Miske Jr., 215 Clifton Blvd., Clifton, NJ 07013. (201) 472-2752. Plans.
- Pro-Stunt Products, 9 Union Ave., Little Ferry, NJ 07643. (201) 440-0905. Plans, kits, engines, accessories.
- Sig Manufacturing Co., Inc., 401 South Front St., Montezuma, IA 50171. (800) 247-5008. Fox engines, accessories, other supplies.
- S.S.T. Products, 28746 Westfield, Livonia, MI 48150. (313) 421-4330. Mufflers and other accessories.

newsletter, *Stunt News* and a membership directory, and can supply you with complete rules for the Old Time and Nostalgia Stunt events. Annual membership is only \$15, one of the best values in modeling. For information about PAMPA, contact Tom Morris, PAMPA secretary-treasurer (address in introduction above).

Finally, don't forget to have fun. Whether

you're a longtime modeler revisiting some great planes and great times from long ago, or a younger flier curious to discover the magic of legendary aircraft from stunt's golden age, I'm confident that you'll enjoy building and flying vintage stunt models. For a relatively small investment of time and effort you can have a lot of enjoyment and get a unique kick out of our great hobby that's hard to beat.

### A CORRECTION AND A PREVIEW

The next two editions of this column will be dedicated to the subject of control line scale airplanes. Specifically, the topic will be electronic control systems for auxiliary functions (beyond the usual flying controls supplied by the lines).

The information will be provided by the Southern California scale fliers who created a sensation at the 1991 Northwest Regional Control Line Championships with their array of fine scale aircraft, some of which performed multiple functions with only two lines.

As a preview, here's some information from Merle Mohring, one of those fliers, who responds to an incorrect reference made in a recent column's photo caption:

"A major error has appeared in your column in the October 1991 issue of *Model Builder*, Page 63, the caption of the photo of my B-17G. None of the accessories or options are operated by radio control, as this is not allowed under AMA rules. However, RC technology is used (i.e.: encoder, decoder and servos).

"The system used is a modified JR four-channel RC system, which is to say that the crystals at both ends have been removed and the RF circuits have been bypassed so the system cannot transmit or receive any signal or interfere with any other RC system ever. This system works the same way as a normal RC system except that it is hard-wired to the control lines which are insulated through wire connectors.

"Now, a little about the model: The plane is a Royal B17F kit that has been modified to a 'G' and is powered by four O.S. .26 Surpass engines (four-stroke) turning Tor-

*continued on page 77*



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# Competition Fierce at T.U.R.N. Quarter Midget Championships

BY WAYNE YEAGER

**T**he T.U.R.N. Quarter Midget Championship race was held once again at Rough River State Park, in Kentucky, and although the attendance was down slightly, the racing was fierce, as always, and as expected.

The Louisville R/C Club has hosted this race for something like 18 years, which makes it one of the longest continuing races in the country. It is held the first weekend after Labor Day at Rough River, an excellent location that breeds closeness. It's in a well-manicured park and most of the racers stay at the lodge or in the cabins; they all eat in the lodge restaurant so they see each other at every turn, and naturally there is tons of gossip after belly-stuffing, plus the park allows the modelers to use the airstrip which is closed for the weekend to the full-size planes.

Many of us arrive a day or two early, so we can kill some snakes on the park's nine-hole golf course; in fact, Friday mornings have been the "Rough River Open" for several years, with several "foursomes" whacking around

the course.

This year saw quite a few new members from the Louisville club working needed

their job and racing went very smooth with absolutely no problems.

We flew a total of 11 rounds, plus the "Doolittle" trophy dash and still were able to let everyone get an early 3 p.m. start for home on Sunday. Any of you guys who have been concerned about the amount of flying in the past should note how much was flown this year.

Seven full rounds were flown on Saturday, with those Columbus, Ohio guys leading the pack. Craig Grunkemeyer, Joe Dodd, and Dave Gohn, all racing buddies from the same area, were tied for first place with 24 points. To indicate how tough things were, this tie was four points down from a perfect score, meaning even the good guys were getting beaten by someone.

Fast Time for the first day belonged to Toledo's Rex Knepper, who turned a very respectable 1:16.98, which held up for most of the meet before finally falling by a few one-hundredths to Dan Kane, Jr.'s 1:16.29. This, incidentally, makes two straight major Quarter Midget contests in which Kane



The top five with their callers, from left: Rex Knepper, 5th; Dave Gohn, 4th; Rick Landers, 3rd; Dan Kane, Jr., 2nd; and Craig Grunkemeyer, 1st. In the back are callers Rick Cromer, Gail Jacobson, Jim Gager, and Joe Dodd.

positions and the problems were really minor, considering. We did have a few re-flies on Saturday, but by Sunday everyone knew

Before the contest, while all the models were still in one piece, every entrant, except one, posed for this group shot. From left, front row, are: Jon Lemmons, Toby Grether, Peter Rourk, Jerry Salisbury, Dave Bowman, Rick Moreland, Jim Gager, Denny Sumner, Rich Van Hulle, Craig Grunkemeyer, Ray Blake, and Kevin Kane. In the rear are Gail Jacobson, Rick Landers, Neal Rehm, Dave Gohn, Bob Hisey, Greg Doe, Bob Petrinc, Cary Strickland, Steve Kovach, Allen Booth, Rex Knepper, Rick Cromer, Joe Dodd, and Donny Weidman.





has gone home with the Fast Time award; this meet and the Silver Cup race.

Although Kane was fast, this race belonged to Craig Grunkemeyer, whom we have written about previously, considering his consistent finishes at or near the top. Craig is smooth, has an excellent caller in Joe Dodd, and these guys just plain kick butt everywhere they go.

Craig's overall fast time was 1:16.86 (second fastest overall) and his consistency is noted with recorded times of four 1:19s, two 1:18s, one 1:17 and a 1:16, out of the eleven rounds flown.

Second in the Championship was the aforementioned Dan Kane, Jr., from Chi-

ago, with 37 points. Third was "Racer Rick" Landers, from Georgia, with 37 points. Fourth was Dave Gohn, from Columbus, Ohio, which must have been a little Deja Vu for him as he had been there before by finishing 4th in 1990. Dave had 36 points. Fifth was Rex Knepper, from Toledo, with 31 points. This is tough racing! I think Rex was a little surprised he finished in the top five, but with this level of competition, everyone there was capable of beating the top guys, and did!

After the regular heat racing is finalized, another race in-a-race is run with the top 12 people by times, regardless of finish position, racing each other for the Doolittle Trophy, which carries an etched photo of Jimmy Doolittle. Several years ago the club requested and received permission to do this from the man himself.

This makes for a very prestigious award, if you

are lucky enough to get your name engraved on it; therefore, the competition level is awfully high. People do like to win this award, and race accordingly!

Again, though, that guy Grunkemeyer won his way into the finals of the Doolittle Trophy Dash by winning his elimination heat, and walked away with the final to be the "all everything" for the 1991 T.U.R.N. Quarter Midget Championships.

Congratulations to all who participated; and to those who didn't, you should consider attending in 1992 if you really like good racing. If you prefer easy races, don't show up here, because these guys will rip you sideways and never blink. No quarter is



Typical racing scene with models being identified for the benefit of the pylon judges. Here we see Craig Grunkemeyer (left) demonstrating his quick-draw while Rex Knepper (second from right) still has his hands on his holsters. In the meantime, the rest are here to race. Next to Craig is his caller, Joe Dodd; next is Denny Sumner with Jim Gager holding, Toby Grether with Peter Rourke holding, and Rick Cromer, holding at right.

#### FINAL STANDINGS

1. Craig Grunkemeyer	1:16.86
2. Dan Kane, Jr.	1:16.29
3. Rick Landers	1:17.48
4. Dave Gohn	1:20.26
5. Rex Knepper	1:16.98
6. Dennis Sumner	1:19.27
7. Peter Rourke	1:19.65
8. Neal Rehm	1:20.34
9. Jerry Salisbury	1:20.81
10. Gail Jacobson	1:18.41
11. Jim Gager	1:20.89
12. Joe Dodd	1:21.29
13. Greg Doe	1:21.51
14. Rick Cromer	1:27.56
15. Bob Hisey	1:29.29
16. Cary Strickland	1:20.89
17. Jon Lemmons	1:25.32
18. Bob Petrinc	1:26.93
19. Steve Kovach	1:25.10
20. Toby Grether	1:20.86
21. Rich Van Hulle	1:33.75
22. Allen Booth	1:28.32
23. Ray Blake	1:33.18
24. Dave Bowman	1:30.84
25. Rick Moreland	1:23.88

spared in Kentucky, and that's the truth.

A few special thanks must be noted. First, to Ritch's Hobbies, of Dallas, Texas, which provided the fuel when 15 percent fuel is very difficult to obtain. Very few suppliers are making any higher nitro fuel at this time, however, Dickie and Randy Ritch did not hesitate when asked and assured us a successful contest with their benevolence. To them, a big pat on the back and a very serious "thanks, guys."

Also, we must thank some special people who worked certain key positions in the contest, to help the Louisville guys get their feet on the ground. These people were Dan Kane, Sr., who spent two days at #1 pylon working as Chief Judge; my other (better) half Karen, who started on Saturday; and to Kathy Waters, who assisted Karen on day one and started everything on the second day. Youse guys also get a big pat. (I give the better half a smooch.) **MB**

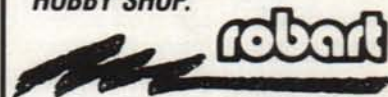
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"Repro Depot" around the corner! And I must tell you about one Waldo Saintsing, of Thomasville, North Carolina, who wrote in for the late additions and also to report that he has built seven of the original thirteen, mostly with rubber power. Super! It must be obvious that I have a lot of respect for those who *build*, as opposed to assembling, their model airplanes. There is a difference!

Anyway, the Mini Mono is available, for the usual SASE. An afterthought: Mono in Spanish means "monkey"...I wonder if Ralph intended some connection and I have missed it all along?

The other thing I forgot to mention is that foreign readers need not concern themselves with not having U.S. stamps or dollars to send with your requests for these or any other material mentioned here in EC. Just ask, it'll be on its way to you courtesy of some generous U.S. modeler who sent in an extra couple of stamps or bucks.

**Spark ignition** is another popular subject here in EC, and I am glad to see that many of you are referring to it in that manner in your letters, as it is indeed *spark* ignition and not simply "ignition" as it is most often referred to. Remember that all internal combustion engines, even those fired by a glow plug and even diesels, operate because the fuel is ultimately ignited in some manner.

Anyway, I have heard from many of you who would like to correspond directly with Mr. Floyd Carter himself. Though his address is on the spark ignition information that I have been sending out, also in large numbers, here is his address, since I know he doesn't mind fan mail, and is, in fact, a most helpful gentleman: Floyd Carter, 11232 Crist Dr., Los Altos, CA 94022.

A glow plug supply is the request of Tucson's Jim Lynch, who writes:

"Would you supply a simple circuit that would permit me to drop my 12-volt truck battery down to 1.5 volts for my glow plugs? Too often, I arrive at the field with a dead NiCd starter for glow plug use. Since I normally run a set of jumper cables from my truck to a small maintenance table on which I start my helicopters, having a source of glow plug voltage there at the table's 12-volt terminals would be very convenient. While I build and troubleshoot circuits, I do not know enough about design—for example, setting up a Zener diode with resistors for the job. I really appreciate any help that you could give me."

Jim's idea of using a Zener diode as a voltage regulator would work, except that they are not made in such low voltage ratings. I don't know why. I never thought about it, as a matter of fact, but it must have to do with the fact that a certain voltage has to be applied before the diode junction will act as desired. Anyway, that leaves us with having to explore alternate methods, but first let's look at the characteristics of the glow plug, and its power requirements.

To the power source—in this case, the battery—the glow plug will appear as a resistor. Furthermore, its resistance will vary greatly from cold to hot, which makes it impossible to simply measure said resistance with an ohmmeter. However, we can

determine it accurately using Ohm's Law. Refer to Figure 1, the equivalent circuit of a 1.5-volt battery with the glow plug (represented as  $R_p$ ) connected across it. I know from experience that the plug will pull from 1 to 2 amperes of current, depending on the make and type; we could confirm this with a series ammeter as shown. For this example, let's take the average of 1.5 amps. Solving for  $R$  (resistance) equals  $E$  (1.5 volts) divided by  $I$  (1.5 amps), we get 1, the resistance (in ohms) of the heated plug. Love these simple calculations, don't you?

In Jim's case though, we have the 12-volt supply to complicate things.

Well, we know that the simplest possible way to reduce the voltage would be to add a series resistor, right? So let's explore that possibility. Figure 2 shows the equivalent circuit, with  $R_x$  now being the big question mark. The solution is almost as simple as the example above. Using another version of Ohm's Law, we first find the total resistance necessary to maintain the 1.5 amp current, with the higher voltage, now 12 volts, applied. Thus:  $R$  equals 12 (volts) divided by 1.5 (amps), for a total resistance of 8 ohms. Since the plug itself has a resistance of 1 ohm, it follows that  $R_x$  must then be 7 ohms, right? Right!

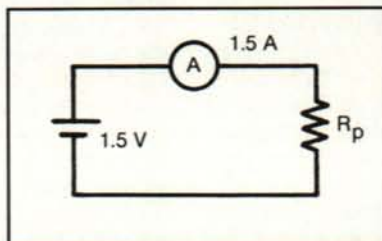


Figure 1. The electrical equivalent of a glow plug circuit, as discussed in the text.

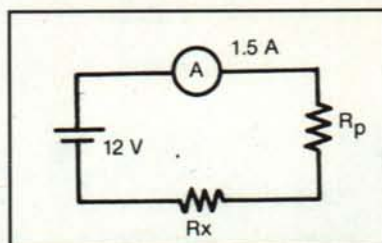
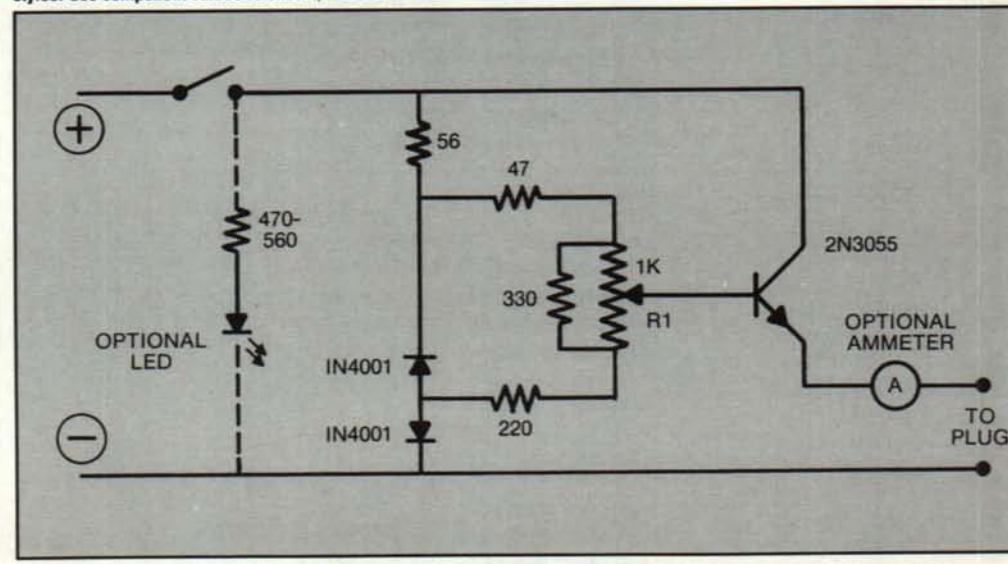


Figure 2. The same glow plug circuit, but now powered directly from a 12-volt battery, with a resistor to reduce the voltage to the required 1.5 volts.

Figure 3. A simple circuit for providing glow plug power directly from a 12-volt battery, adjustable for different plug styles. Use component values as shown; none are critical.



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The next step in any resistance calculation is to determine the required wattage rating—also a simple matter with these small values we are using, all in their basic units. It is important to remember when making similar calculations that basic units have to be used, i.e., you cannot divide 12 volts by 1500 milliamps, though it is the same as 1.5 amps, and get the same results.

Using Ohm's Law for Power, let's first figure out how many watts our plug is using. We can do that by multiplying the 1.5 (volts) by the 1.5 (amps), which gives us 2.25 watts...the basic power requirements of the plug. As for  $R_x$ , we can determine it by multiplying the current through it, which we know to be 1.5 amps, squared, by its resistance, also known to be 7 ohms. That gives us 15.75 watts.

Wasn't so bad, now was it? We know now that we can run our glow plug from 12 volts simply by adding a 7-ohm, 15.75-watt resistor in series. Don't even reach for the nearest catalog, you won't find such an animal. Besides, if you did, you would soon find that it would work best with only one kind of plug, one that draws exactly 1.5 amps. And if left connected too long, the resistor itself would probably get hot enough for its resistance to decrease, increasing the current flow, letting both the plug and resistor get hotter, further decreasing their resistance, ad infinitum.

There has to be a better solution! Well, there is and we can find it. And we'll make it variable to boot, so we can light all types of plugs with it. Now, if we were doing this commercially, we'd probably use a MOSFET, the semiconductor now in vogue for all power handling tasks such as this. However, MOSFET tend to be expensive in numbers of one, plus somewhat difficult to come by in the same quantities, so let's stick with a plain old bipolar transistor, one that has been around for years and which is available everywhere, often for as little as 50 cents. Radio Shack has it available (276-2041) at \$1.99.

Refer now to Figure 3, which shows a venerable old 2N3055 connected in what is called a Common Collector circuit, with the Base bias being also supplied by the 12-volt supply. In this circuit, varying the pot ( $R_1$ ) will vary the voltage applied to the transistor's base, proportionally varying its output through the glow plug. The other resistors in series and in parallel with the pot are there merely to keep it from being overly sensitive as it would be if we used it alone.

Effectively, the 3055 will be doing the exact same job that the resistor we calculated for was to do. And in so doing, it will also be expected to dissipate the same 15 plus watts. In other words, it is going to get hot; and the longer you use it the hotter it will get. Thus it is important that it be mounted

on a metal box, using an insulator kit made for the purpose (Radio Shack 276-1371). If you consistently try to start engines that require a lot of cranking, it would be best to also use a heat sink. Radio Shack no longer catalogs one, but they are available in many shapes and forms, pre-drilled and all.

I must mention that electrically, this is not a very efficient way of accomplishing this particular task. Looking at our wattage figures above, it is obvious that we are wasting power by a factor of 7 to 1 over what we are using. I could not recommend that you build such a device for extended use. On the other hand, you waste tremendous amounts of energy as heat making your morning toast. The saving factor here is that in most cases, you'll be using this device for seconds only.

There is nothing critical about the circuit. The transistor connections are printed on the Radio Shack package header; use the normal precautions for the diode polarity. The switch is optional, and if desired, an ammeter could be inserted as shown.

For testing this or any other glow plug power circuit, don't gamble one of your expensive plugs. Instead use a No. 93 (Radio Shack) or any other high current 12-volt lightbulb. Simply connect it in place of the plug, and you can see the action of your device.

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



# ELECTRIC POWER

BY MITCH POLING

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I had quite an experience recently! Regular readers of this column know that I like to fly electric floatplanes, and I have designed two, the Seagull, which flies on six to seven cells, and the Aqua Sport, which flies on 12 cells.

A few weekends ago, I drove with my

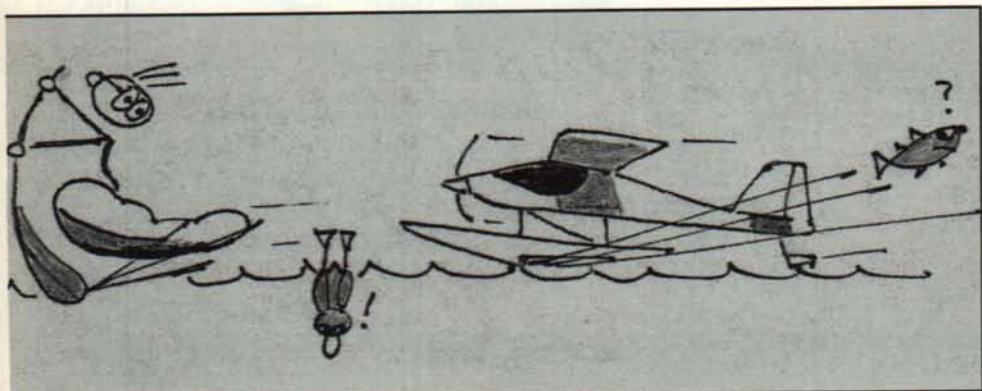
I use landing gear clips to hold the floats onto the landing gear axle. Normally I use masking tape to build up the axle diameter so the clips will hold tightly. When I fly with wheels I remove the tape so the wheels will turn freely. I was in a hurry to get to the Grunstadt meet, so I did not put the tape on

shore, and gave it a blip of full throttle. The front of the right float popped off the landing gear axle and the plane was stuck, nose and wing down in the water.

I use a vinyl two-man inflatable boat for retrieval and inflate it with a little 12-volt car vacuum. I went to the car, got out the boat, inflated it, and then found that I didn't have the right nozzle to blow up the safety chambers on the bottom of the boat. So, I didn't bother. Mistake number three! I put on a life preserver. At last! A glimmer of common sense. I left my \$200 camera in my coat pocket. No common sense. I paddled out to the plane, turned off the receiver and put the plane on the front of the boat. It was dripping water into the boat, so I pushed it farther forward. It tipped nose-first into the water, the motor turned full on, and there was an ugly ripping sound. The prop came off (thank God!) and I was staring at a rip in the boat as wide as my hand! As the air was rushing out, I rolled the edges of the rip together as well as I could, tossed the plane in the back of the boat, and clutching the rip with one hand, paddled single-handed towards the bank.

The bank was about 70 yards away, but it looked like a mile! My progress with the single-handed paddling was a snail's pace,

**Fabulous 13-1/2 foot Lockheed Constellation is the work of German modeler Charlie Binder. Charlie put on an impressive flight demo with the model at the recent Grunstadt meet in Germany.**



Plane bites boat! Jon Svendsen's cartoon commemorates the demise of our columnist's rubber boat—see text.

family to the local boat harbor (just by the Rhine River in Germany) to fly the Seagull. I had been flying the Seagull on wheels, but changed it back to floats the weekend before to show off seaplane flying at the Grunstadt "wine cup" meet. That was fun, and I even made a nice grass landing on floats. However, I had not secured the floats very tightly.

the axles when I put the floats back on.

I had just switched speed controls a few days before, and I forgot to install a safety fuse. I did not use an arming switch either. Mistake number two! Anyhow, off for a beautiful R.O.W. takeoff and flight, with an audience on the bank behind me. Then, a nice smooth landing. I started to turn to





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meanwhile, the boat sank lower and lower, and worse yet, began to fold in the center and wanted to roll over. My wife, Sandra, stood on the shore, but there was nothing she could do. (She was probably doubled over with laughter anyway!-Ed.) I really didn't think I would make it to shore, but just as the boat began to do its final plunge, I got close enough so that Sandra could grab the paddle and pull me out. I stood there, wet up to the ribs, but with the plane and myself intact. The spectators were polite enough not to ask for details, but I could see the thoughts: Americans are craaaazy! Net results: the camera is ruined, but I have learned something about safety. I will never fetch seaplanes in a blow-up boat again, and I will not forget fuses again. I will also not ignore the fact that wet speed controls turn full on. Seaplanes are sure fun!

I recommended the vinyl inflatable boats in an article I did on electric floatplanes in the April and May 1985 issues of *Model Aviation*. If you read those articles, please forget that advice. I do not recommend vinyl inflatable boats anymore! I know I should have inflated those reserve chambers, but even so, I believe vinyl boats are too risky to use for retrieving seaplanes.

The problem of retrieval is generally ignored in seaplane literature—maybe because it is such a pain. Some writers have recommended using a rod and reel. Unfortunately, when I get in trouble my plane is always too far out for that.

I have an idea that I have not tried yet, but it should work. Bring two floatplanes along. If one gets stuck, use the second plane to pull a line out and loop it around the plane, then return. Then you could easily haul the stranded plane in. Has anyone tried this? I think the spool of string should be mounted on the retriever plane, rather than paid out from shore, to avoid line fouls. I would also leave the wing off of the retriever plane to avoid accidental takeoff, weathervaning, and blowovers.

Jon Svendsen shares my enthusiasm for seaplanes, and he flies both the Aqua Sport and the Seagull. He too has encountered the problem of wet speed controls that turn full on, and he sent photos and a description of his solution. He also drew a cartoon commemorating the "plane bites boat" event I just told you about. Thanks, Jon...I guess!

Jon uses a waterproof box to house the receiver, two servos, the speed control, and an on-off switch. The box is made of balsa covered with Coverite or similar fabric covering. The servos are at the back of the box. The waterproof push-pulls are from Du-Bro, designed for boats, with a short swing link as shown in the photo. The swing link allows for the motion of the servo wheel, which is not linear. The speed control goes in the bottom of the box; the heat sink is on the outside of the box, and goes through a hole in the bottom of the plane for cooling air. Jon did not say how the heat sink is sealed underneath to the box to keep out water. I think ordinary aliphatic glue would



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do, or cyanoacrylate. Do not use silicone glue, as it uses acetic acid (vinegar) as part of the glue and is very corrosive.

To install the box, first unclip the pushrods from the tail surfaces, then slide them forward and up so they can be clipped to the control rods coming out of the box. Then slide the box into the plane and reconnect the tail surfaces. Jon uses metal clevises at the box end. This makes it possible to thread the pushrod in and out at the box end by rotating the pushrod at the tail. Jon says his "ACM" (aircraft control module) has cured his problems of water getting into the electronics.

At first glance, it seems like putting the heat sink on the bottom of the plane would be increasing the risk of it getting wet. However, the floats I designed for the Aqua Sport and the Seagull make almost no spray, and the bottom of the plane stays dry. In the usual "dump" that occurs, the plane flips over onto its back, and floats with its nose down. This puts the bottom of the plane and the heat sink high and dry, just the way it ought to be! In the past I have put the heat sink on the windshield. This is a high risk place to put it, because in the flipover that will come sooner or later, the heat sink is almost in the water, and any wave will douse it.

I use a hatch over the top of the cabin, and so does Jon. Jon found the hatch cover was just the place to mount the receiver battery. He has a hatch in the windshield too, and loads the batteries through that. This saves the trouble of removing the wing every time you change packs. Jon uses balsa or thin ply for the hatch; it is easily bowed to pop it on and off. Last, but not least, Jon makes his own fuse holders out of brass, and mounts them on the fuselage bottom with screws. There is a slot in the fuselage, so that the fuse is easily pulled out to act as a safety or arming switch. Neat! I'll have to admit, if I had used Jon's waterproof box idea or his pullout fuse, or both, I would have never met my Waterloo! Thanks, Jon, for the info and photos!

I mentioned Grunstadt at the beginning of the column. This is a wine cup contest, so called because the prizes are bottles of wine! Grunstadt is in the wine country of Germany, so these prizes are very appropriate. It is a two-day contest, in the second week of October. The first day features electric pattern flying and electric pylon. The electric pylon planes are seven-cell, and look much like the planes that were popular for 1/2A racing a few years ago. Most have between 180 to 250 square inches wing area, and weigh about 30 to 36 ounces. They fly fast! The pattern planes are usually shoulder or midwing, no landing gear (hand launched), using fourteen to twenty-four cells. The performance goes up as the cell count goes up.

The second day is for F3E and Jedermann. The Jedermann class is for lower-powered electric gliders and doesn't require quite so

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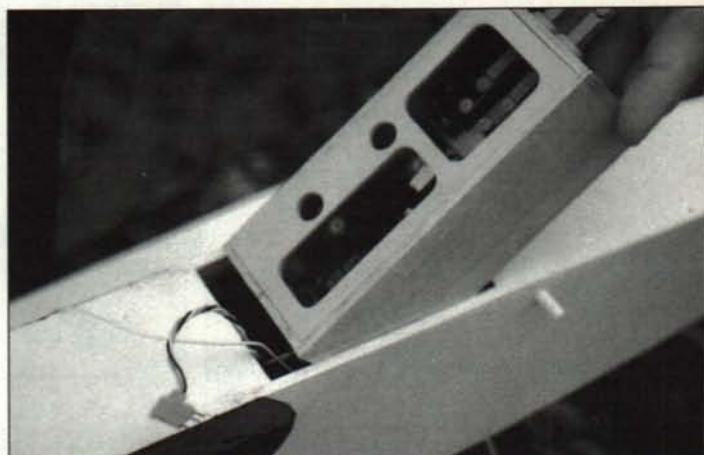
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much intense concentration as F3E. The Grunstadt meet is quite popular; usually there are over a hundred pilots registered. The field is on top of a mountain, and the countryside is beautiful. The only flaw is that the field is very hard to find! It is hidden by vineyards and a country inn. If you decide you want to see it someday, write me first for directions and a map!

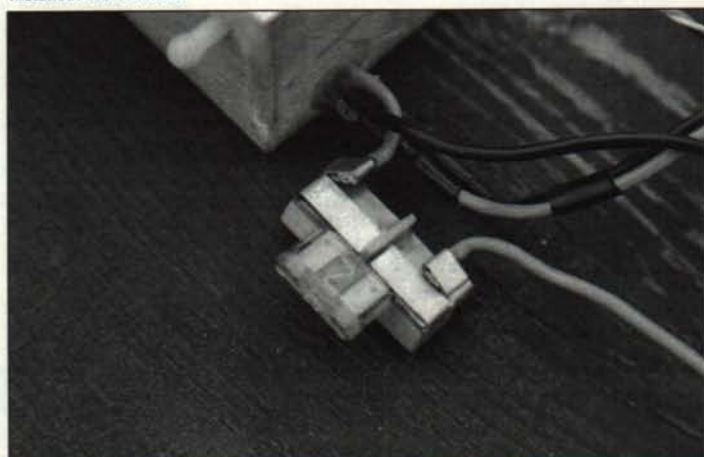
I like the mid-day break, when the fun flying takes place. As mentioned, I flew my float equipped Seagull this year. The Seagull offers a different style of flying compared to most that you see in Germany. It is very slow and leisurely. The strictly sport or old timer type of flying is rarely done here—most of it is high performance contest type flying. Scale electrics are very impressive here, they fly well and are often very large.

Charlie Binder brought a very impressive Lockheed Constellation to the meet this year. Charlie has the proper qualifications for this project; he is a retired flight engineer for Lufthansa, and was flight engineer on the Connies when Lufthansa flew them. The model is of the Connie he worked on. The project took Charlie two years, and the workmanship is beautiful. It is 410cm (13.5 ft.) span, and weighs 14.4 kilograms (32 lbs.) ready to fly. It flies on 48 Sanyo 1400 mAH SCR cells powering four Geist 45-5 cobalt motors, with two Geist speed controls. One speed control is for the inboard two motors, the other is for the outer two. The fuselage is

fiberglass, built by making a styrofoam plug, laying up the fiberglass over it, then dissolving out the core, leaving a light and strong shell. The wings are conventional sheeted balsa construction. There are no retracts installed at this time.



Jon Svendsen puts his radio and speed control in a removable waterproof box, seen here being loaded into his Aqua Sport. Pushrods are connected after the box is installed. More in text.



Detail shot of Jon Svendsen's plug-in fuse setup using homemade brass strip holders. Makes it easy to use the fuse as both an on-off and arming switch.

This was only the fourth flight of the Connie, but it looked very good to me. The wing looks like that of a glider. Charlie lifted the Connie off after a hundred-foot takeoff roll, and it climbed out smoothly to about

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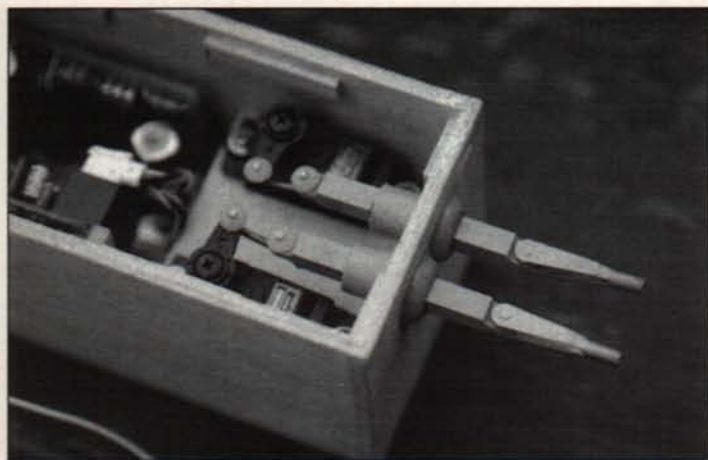
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three hundred feet, while Charlie flew it in circuits around the field. Charlie is a careful pilot, flew the model well away from the pit and crowd area, and kept it at a hundred to three hundred feet altitude most of the time. The Connie looked very realistic in flight, fairly fast and smooth, but not jet type speed. It looked like the real Connies that I used to ride in when I was a kid in Alaska. It sounded like them, too! Charlie flew it for about six minutes, then brought it in for a low

pass and then a circuit for landing. I was very impressed by how cool Charlie was, especially on landing, when several photographers insisted on standing in the landing path to get photos.

Until next time, fly multi-motor, fly electric! My address is: Mitch Poling, 7100 CSW/MC, Box 734 PSC 2, APO NY 09220-5300 for U.S. postage, or Normannenweg 20, D-6200 Wiesbaden-Biebrich, Germany for international postage. **MB**

## CONTROL LINE *continued from page 66*

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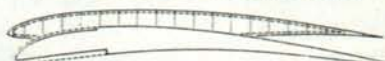
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## helicopter world cont. from page 49

supposedly produce slightly more power than side exhaust. However, if you look at the factory specs, the horsepower ratings are the same for both. I like using rear exhaust engines on my X-Cells simply because it is easier to install the exhaust header, and the engine can be removed without taking the header off. However, some helicopters, like the Concept 60 and Schluter models, require side exhaust motors.

Another common trend among the Japanese models is that the rotorheads are of all-metal construction, with the flybar sitting above the rotorhead. The heads are of either teetering or individual flapping design. The European models, such as those by Heim and Schluter, and the American-made X-Cell, use a floating axle design.

(Readers may wonder why the Japanese team came in second if their countrymen placed first, fourth, fifth and ninth, while the U.S. team members placed second, third and fifth. The reason is that Dobashi was the defending World Champion, so he was automatically invited to compete, and his fourth place win did not contribute towards the Japanese team's score.)

On the U.S. team, both Curtis Youngblood and Wayne Mann flew X-Cell 60s. Curtis flew his model with a special fiberglass fuselage. He designed it and Ted Schoonard of Miniature Aircraft USA made the mold, and will be kitting it soon. Curtis uses the stock MA symmetrical Kevlar Rotorsport blade, which is only 640mm long. These blades are the same length as the stock wood blades and will fit the stock pod-and-boom X-Cell 60; the Zig-Saw GP-9 blades which are popular now do not fit the stock X-Cell because they are 660mm long, and will hit the tail blades. The Rotorsport blades also have very thick airfoil section, which makes them more stable than other blades. The Rotorsport blades look almost identical to the stock wood blades, except they are beautifully pre-finished and balanced, and have a swept tip.

Wayne flew his machine (MA Triumph fuselage with X-Cell 60 mechanics) to second place individually. He uses an O.S. 61 SFN engine and Magna 30% nitro fuel. As shown in the table in the December 1991 *Model Builder*, Wayne hovers his helicopter at around 1200 rpm and kicks it to 1900 rpm in forward flight. He uses the Zig-Saw GP-9 680mm blades, and a tail speed-up pinion gear to increase the tail rotor rpm for more yaw control.

Ted Schoonard accompanied the U.S. team to Australia, and was kind enough to provide photos and the following observations on the contest:

"The Australian organization committee did an outstanding job of handling the needs of the pilots involved, not to mention the countless team supporters visiting from various countries. Everyone throughout Wangaretta was pleasant and eager to ac-



commodate our needs. The flying site was one of the best I have seen, and easily handled the F3A, F3C, and F3D competitions simultaneously. All in all, a better event could not be had.

"Generally, the weather at this time of the year is supposed to be warm, with little or no wind. This was the case only for the first two days. The last two days, the winds were 18 to 20 knots, with very cool temperatures. This situation caused the pilots to really work hard during the last two rounds.

"From a pilot skill perspective, it was quite evident that the U.S. and Japanese pilots are equal in skill. In fact, I think that Wayne and Curtis (who turned in the highest score on the windiest day) were among the smoothest in the wind. Curtis was especially good in strong wind. Of additional note was Mr. Brennstetter of Austria. While his aerobatics were a bit off, his hovering in the wind was very good.

"As usual, the Japanese used special mechanics with some resemblance to production units. All used conventional gear train and engine layouts with fuel tanks mounted aft of the main shaft, with the exception of Sensui, whose tank was under the servo tray in front. In most cases, a Futaba radio with 9201 servos was used. I think most of the Japanese pilots had highly modified O.S. and YS engines. All their blades had similar airfoils (12 percent thick semi-symmetrical shape with or without washout) coming from Zig-Saw, DY, JRC, and K&S. And there were some hand-carved units from Black Hobbies, that looked identical to JRC. Tail blades were all of the carbon graphite variety.

"As for the U.S. team, Curtis and Wayne used stock X-Cell 60 Custom models. Wayne used the new optional gear ratio of 9.4:1:5.5. Curtis used the stock 9.0:1:4.3 ratio. Both used O.S. 61 SFN engines with tuned pipes and modified porting. Robert Gorham used the TSK Blackstar mechanics with a YS 61 motor. Robert and Wayne flew Zig-Saw GP-9 680mm blades.

"The Japanese and U.S. models had similar speeds. They were faster than any of the European models. All used 30% nitro fuel, except Curtis, who ran K&B 500 with 12.5% nitro. Almost all of the European models used low nitro fuel. They all used reflexed airfoils and tuned pipes. Almost all pilots chose to hover at low rpm, except for Youngblood, Len Mount and a couple of others. Forward flight was done at 1650 to 1800 rpm, depending on the rotor disk size.

"Contrary to the warning of Horace Hagen at the team trial, the judging was not strict regarding the 180-degree autorotation, loops, or Tophat. As stated earlier, these maneuvers were abused by all but a few pilots and, in most cases, overlooked by the judges. As usual, the Hovering-M, the Figure Eight, and the Nose-in Circle were tightly judged, since they are so easy to watch. Aerobatic judging was not so exact as evidenced by some "halo" scores given. Oh well, it's always the same." **MB**



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## DESIGN & TECHNICAL cont. from page 50

Our needs in RC are different. An RC glider pilot doesn't need a dethermalizer like a free flighter does. He can dive, or spoil the lift on his sailplane, and fly it out of a thermal, since he has control. The RC power pilot needs something to prevent violent crashes when control is lost, and the "dethermalizer" concept could fill that bill in certain cases.

Some companies offer RC systems that incorporate a failsafe feature, which is supposed to put the model into a glide mode so it can take care of itself if the radio link fails. This is of limited value, since many RC models are not stable enough to glide hands off. Also, even if it does glide, the wing loading on most RC models is so high (compared to free flight models) that an unflared landing is going to cause damage, especially if it occurs out in the brush someplace.

That "someplace" is another problem. A freely gliding model may fly a long way in

random directions before it lands, and could lose itself well, in rough terrain.

A model would be much easier to find if it "parachuted" down as soon as control was lost. Flipping up the stab on an RC model to do this should not be difficult. The higher wing loading of RC models will mean a harder pancake, but not hard enough to do much, if any, damage. It doesn't hurt Paul Weston's "Sea Stealth" at all, as he repeatedly demonstrates.

To release the trailing edge of the stab on an RC model, all we would have to do is use a servo to pull a latch pin of some kind. The use of pull-pull controls on the elevator would help "disconnect" them as the stab pivots up.

Those are the advantages of putting an RC model into the parachute-descent mode when control is lost, as I see them. Let's look at the disadvantages. If we hinge the stab and provide a release mechanism, we will increase the model's weight and/or make the stab more floppy and subject to flutter. By adding another mechanism we also decrease the reliability of the model.

We often fly close to the ground. There the parachute mode wouldn't help us. Like full-scale, we have to have time to decide whether to bail out and altitude enough to do it. Model crashes often occur before the pilot realizes he has a problem. Some RC models may not even have a stable deep-stall descent mode with the stabilizer flipped up, but my guess is that most of them would have.

For the stab flip-up actuating signal, I see many possibilities, but none that would work under all conditions. We could turn off the transmitter to initiate the parachute descent mode, but we would still have to depend on the receiver battery (or use a separate battery), and we would have to add some electronics to actuate the parachute servo when the signal is lost.

Many crashes are due to someone else turning on a transmitter on the same frequency. In that case, turning off our own transmitter would not "deploy the chute."

It would be easy to put the "chute" servo on a spare RC channel, but that, of course, would be of no value when control is lost for



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any of many reasons. Also, with either the extra RC channel or turning off the transmitter, the pilot would have to be trained to evaluate the problem and to immediately actuate the "panic button" or the transmitter-off switch.

It seems to me the most promising way to actuate the parachute mode would be to use an RC system with a good failsafe mode, but to connect the system to trip the stab up instead of setting the controls to neutral. What think you?

Thanks for the "parachute" recovery of RC models idea, Jim.

## GROUND EFFECT SAVED A LIFE

After we talked about ground effect in the November '91 issue, I received the following letter from reader Ed Toner, of Howell, New Jersey:

"I read with interest your dissertation on Ground Effect, and as I did so, I recalled an incident I witnessed many years ago. It was in 1956, and I was a Naval Aviator Lt.jg in a fighter squadron (VF-152), part of Air Group 15, which had just deployed aboard the USS WASP (CVA-18).

"I was flying the F2H-3 Banshee, which required a catapult launch, but with us was VA-155, flying AD-5 Skyraiders, a propeller attack plane that, under most circumstances, could take off from a deck run.

"A friend of mine, Lt.jg Jim Dagdidjian, AKA 'The Crazy Armenian,' an AD-5 driver, had a fortunate encounter with ground effect one night. It was dusk, and I was in the fantail on the port side, watching the first launch. The WASP was wound up tight to her full 32 knots, as the launch was the AD's on their night qualifications.

"Jim was the lead plane, and therefore

had the least deck run for takeoff. (That's the seniority system in action.) The WASP had an angled deck for landing, but of course the full length deck run was required for takeoff. The launch officer signaled 'Takeoff,' Jim saluted, and released the brakes. At this precise second, the Quartermaster on the bridge did his job of lighting the ship for night running, as it was exactly sundown. For some reason, the centerline lights on the flight deck did not illuminate, but the lights on the angled deck, used for landing, did.

"Add the torque of that huge corn cob radial engine, a small swerve to the left, and Jim was lined up with the lights on the angled deck and proceeded to take off, much to the horror of all who witnessed this.

"He left the deck with much less than required flying speed, and rapidly slid down toward the sea, 75 feet below. We all figured he was done for. Jim bent the trottle around the stop, flew needle-ball-air-speed in ground effect, flying inches above the sea, with his prop tips whipping up water, at 12 knots below stall speed.

"He stayed in ground effect until he was almost out of sight, with the rescue helicopter chasing him, and the Destroyer plane guard at flank speed, frantically chasing the both of them. Then, ever so slowly, the AD rose majestically and flew!

"After his uneventful return to the ship a few hours later, he was given a hero's welcome, and a new 'G' suit and skivvies."

## MY APOLOGIES

I usually manage to answer your letters quite promptly, but to use your material in the column promptly is another matter. *Model Builder* requires a four-month lead time, but that is only part of the problem.

When I have good material in mind I tend to write it up "now" before I forget it, and am sometimes months ahead of the four months required.

The unfortunate result is that when one of you sends me something I want to use, it will usually be many months before you will see it in print, even though I will frequently and promptly send you a pre-print of what I intend to say on your subject. Sometimes when you send me something particularly timely, I will juggle columns I've already written to make room for it. Other times it will be awhile. Keep contributions coming, however. My backlog isn't all that great. I can only promise that I will write the best column I can, yet try to do right by those of you who graciously contribute material. Writing the column is a ball. Thanks for reading it and contributing.

## PARTING WORDS

The story goes that a wealthy couple was touring the mountains of Spain in their old Rolls Royce when the transmission went out. They phoned the Rolls factory in England, which promptly flew down a new transmission with a couple of mechanics to install it.

Several months after the couple returned home they had still received no bill from Rolls Royce, so the gentleman wrote to remind them of their kind service. Rolls wrote back curtly, "Sir: We have no record of any Rolls Royce transmission ever having failed."

But back to the subject of the month; our models don't self destruct, they have help.

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A re-creation of Joe Weathers' little-known FF rubber sport model. Sexy looking midwing ship spans 26". By Ken Hamilton.
- No. 3922 POND SIDE \$12.00**  
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Simple 38" shoulder-wing electric RC job for 50-watt power systems and 2-3 channels. By Ron Standley
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- No. 11911 CURTISS SHRIKE \$10.00**  
Rubber scale (0.8 = 1") model YA-8 Attack, span 35.4". By Ted Schreyer.

- No. 10911 ALCO SPORTPLANE \$7.50**  
RC scale homebuilt from 20's, for 50-watt elect., 32" span. By R. Schmitt.
- No. 9911 WHIRLWING \$12.00**  
A 52" span, .25-powered RC flying wing capable of wild aerobatics. By T. Parker.
- No. 8911 MARTIAN SPACESHIP \$15.00**  
Long-awaited RC version of original Roy Clough flying body design. Five feet long. By Skip Ruff.

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## RC SOARING continued from page 20

directional mixing for any two channels, compensation mixing for any two channels, crow landing mix (flaps down, ailerons up), flap-elevator or elevator flap mixing, flaperons, elevons, V-tail, aileron differential, and more.

**DYNAFLITE**  
P.O. Box 1011  
San Marcos, CA 92069  
(619) 744-9605

From the mind of Mark Smith comes yet another RC sailplane, the ARF Freedom. This almost-ready-to-fly version of the classic Freedom aerobatic slope glider features a foam core wing and nearly indestructible plastic fuselage. Assembly time is approximately one hour, and the ARF Freedom can be flown with two or three channels.

The specs read: 71-inch wingspan; 639-square-inch wing area; 43-inch length; and 36-ounce flying weight. Availability is right about the time you are reading this column, so rush on down to your local dealer and order one!

**ESTES INDUSTRIES**  
Penrose, CO 81240

Long-time *Model Builder* readers will no doubt recall the many writings of "Half-A Scene" columnist, Larry Renger. Well, Larry has been instrumental in designing Estes newest product, the "Astro-Blaster" RC boost glider. This little swept-wing canard glider with triplet/vertical stabilizers is coming to your local hobby shop on or about March of 1992. It will go for about \$74.99.

Billed as a "new dimension" in aerial excitement, the rocket-boosted Astro-Blaster glider will perform loops, rolls and other aerobatic maneuvers using only a two-channel radio. The Astro-Blaster should be loads of fun! You can even fly it as a slope glider!

**FUTABA**  
4 Studebaker  
Irvine, CA 92718  
(714) 455-9888

Futaba Corporation of America had one literally "small" new product for the glider guider: a metal geared version of the very popular S133 micro servo. Called the S5102, this new servo can be safely used as a flap or aileron servo installed inside a thin sailplane

*The Chicago Show has grown to a such a size that its co-sponsors feel bold enough to claim that it is the "World's Largest."*

wing without fear of easily stripping gears in the event of a control surface impact. The MSRP is \$79.95.

**GLOBAL HOBBY DISTRIBUTORS**  
10725 Ellis  
Fountain Valley, CA 92827-8610

Through Global, Thunder Tiger Model Co. will soon be offering a 95% ready to fly, all wood, precovered two-meter sailplane called the "Explorer 2M." Featuring a long tail moment for extra stability and upset damping, a D-tube Clark-Y airfoil, polyhedral wing, I-beam spar, and beautiful three-color graphics, this ARF will be a terrific bargain for about 80 bucks. Capable of a broad speed range and extended thermal flight, the Explorer 2M will find favor with beginners and contest fliers alike. Look for it early in 1992.

**GREAT PLANES MODEL MFG.**  
P.O. Box 788  
Urbana, IL 61801

New in the GP booth was the Spirit 100,

the big brother to the Spirit two-meter reviewed in *MB* a few months back. This new sailplane features two complete wing rib sets (Selig 3010 and Selig-Donovan 7037 airfoils) to allow the modeler a choice of trainer or advanced performance levels. The Spirit can be built in either polyhedral or aileron control versions, depending on modeler preference.

As with the Spirit 2M, the Spirit 100 is built with interlocking wood construction. All parts are die-cut or machine-cut from select balsa and light ply. The typical advertised price on the Spirit 100 kit is a very reasonable 70 dollars.

**HOBBY DYNAMICS/JR PROPO**  
JR Service America  
4105 Fieldstone Rd.  
Champaign, IL 61821  
(217) 355-9511

Although the JR x-347 computer radio is not new, the folks at JR Service America have an upgrade for sailplane users (\$30 plus postage). The new modification allows the advanced glider flier the ability to preset the entire trailing edge of his flap/aileron model in three positions (launch/thermal, neutral, or reflex/speed). The amount of flap/aileron movement is fully adjustable (up and down) for each preset and each surface. (Separate aileron servos are required for this trimmable trailing edge function.)

Other features of the x-347 in the "Glider" mode are: crow mixing, four programmable mixes, flap/elevator and elevator/flap mixing, flap-to-aileron mixing, aileron-to-flap mixing, and differential ailerons. Memory for four aircraft is also a feature.

### THAT'S A WRAP!

Unfortunately, time has come to say "thermals" once again! I welcome your input, by phone, FAX or letter (but I prefer the phone), so contact me soon: Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92530, (714) 245-1702. **MB**



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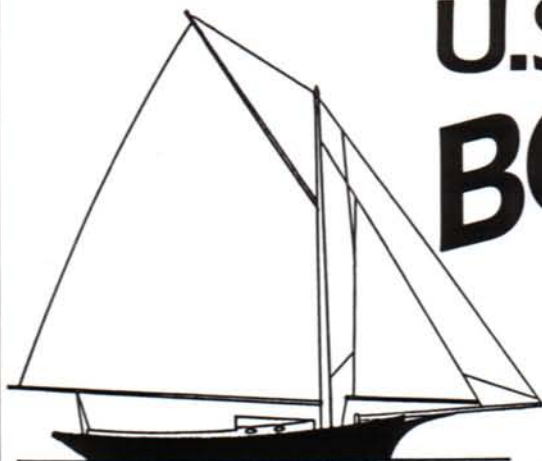
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## CLASSY BUILDING BOARD

Even though this item is covered in this month's "Over The Counter," we couldn't resist putting in our two-cents about it. During the RCHTA show in Chicago, we had a very enjoyable half-hour-long chat with Guillow Models' president, Al Smith, about the past, present, and future of a subject close to both of us; stick-and-tissue model building and the junior modeler. During the conversation, my eyes wandered to a laminated balsa building board leaning against one of the

display tables. My eyes also correctly estimated its measurements as three feet long by 14 inches wide, and one inch thick. Wow, what a perfect building board! Even better than that was the realization that a four-foot long board of the same width is also available, and best of all, in these days of high-priced specialty items, and balsa in any form, the cost is only \$20.98 and \$23.98 respectively!

We have received the ones we ordered, and they arrived unharmed (from Wakefield, Massachusetts to Newport Beach, California) and flat as a slab of heavy plate glass. They accept pins without need of a hammer, and the holes left when the pins are withdrawn close up nicely. You'll build lots of true models on one of these before it has to be retired, and even then, you have yourself a whole bunch of one-inch block material! It's like buying dinnerware that you can eat for desert!

If you're a model builder, you'll want a couple of these boards (hinge two of them and construct your wings with built-in dihedral). If your hobby shop can't help, you can order direct from Paul K. Guillow, Inc., P.O. Box 229, Wakefield, MA 01880-0329.

## HERB CLUKEY

Flyline Models, known for its beautiful kits of Golden Era scale models for free flight and small RC equipment, has lost its owner and proprietor, Herb Clukey. Originally in partnership with AMA's current model museum curator, Hurst Bowers, who designed many of the Flyline models, Herb has kept the company going for many years since. He suffered a stroke on November 17 and died November 20, having just turned 66. This unfortunate news was given to us by his daughter, Glenda. At this time, it is not known what will become of Flyline. We sincerely hope a way is found to continue the production and marketing of these fine kit models.

## REMOTE CONTROL?

Though true in a sense, the term "remote control" is often used instead of "radio control" by those who are not familiar with, or simply have no knowledge of, the normal

method of controlling mechanical objects without visible connection between said object and the "operator." There are many strange misconceptions that have been overheard from spectators, and even more surprisingly, newcomers to RC at the local flying fields. However, we're about to offer some non-radio legitimacy to the term "remote control."

In a near-future issue of *Model Builder* we will be publishing an interesting article on flying a truly lightweight, rubber powered indoor model (an EZ B to be exact) that can be controlled by a "transmitter" and "receiver" that do not communicate by the use of RF signals. It's unusual, it's simple, it's primitive, but could be just the "tip of the iceberg."

Gotcher curiosity? Stay tuned! **MB**

## counter *continued from page 12*

bigger than most, is something less than lightning-fast, is easy to build, and has a straight wing like a conventional propeller-driven aircraft.

The BVM T-33 spans a full 80 inches, which keeps the speed down and also makes the model readily visible in flight. As far as the kit itself goes, the degree of prefabrication is such that a great looking model can be turned out with only minimum effort. Thrust is supplied by a Violett fan unit fitted with either a BVM .81 or the new BVM .91. Retracts and scale actuating struts made by BVM just for this particular model.

No mention was made of the kit price, but you can bet it's *not* inexpensive. None of the BVM jet kits are. On the other hand, the old maxim that "you get what you pay for" certainly applies here. When shelling out the bucks for a BVM kit you can rest assured that you are getting your money's worth—and then some.

If your local hobby shop is a dealer for BVM products, you can check out the new T-33 kit there first-hand. If not, you can learn more about it by writing to Bob Violett Models, 1373 Citrus Road, Winter Springs, FL 32708; or call (407) 365-5869. **MB**

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B-005	1/16 x 3/8	.21	B-177	3/16 x 2	.48	B-065	3/16 x 1/2	.46	B-255	2 x 3	.58	B-337	2 x 3	3.49	B-210	1-1/2 x 2	4.20
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B-013	3/32 x 3/8	.25	B-185	5/32 x 3	.61	B-073	3/8 x 3/4	.96	B-270	1-1/2 x 2	.70				B-218	1/2 x 4	4.75
B-014	3/32 x 1/2	.29	B-186	3/16 x 3	.67	B-074	1/2 x 1/2	.96	B-271	2 x 2	.80	BLOCKS - 24" Lengths			B-219	3/4 x 4	5.35
B-015	3/32 x 3/4	.38	B-187	1/4 x 3	.77	B-075	1/2 x 3/4	1.27	B-272	1/2 x 3	.54	B-354	1 x 1	1.20	B-220	1 x 4	5.95
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B-017	1/8 x 1/8	.12	B-189	3/8 x 3	1.04	48" AAA SHEETS			B-274	1 x 3	.80	B-356	2 x 2	3.20	B-222	2 x 4	9.18
B-018	1/8 x 3/16	.17	B-190	1/32 x 4	.55	B-388	1/32 x 3	.92	B-275	1-1/2 x 3	.94	B-357	1/2 x 3	2.11	B-223	3 x 4	14.53
B-019	1/8 x 1/4	.21	B-191	1/16 x 4	.64	B-389	1/16 x 3	1.06	B-276	2 x 3	1.08	B-358	1 x 3	3.20	B-224	1/2 x 6	7.50
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B-033	1/4 x 1/2	.42	B-141	1/32 x 3	.73	B-403	1/8 x 6	3.86	BLOCKS - 12" Lengths			B-086	3/4 x 5/8	1.30	B-477	1/32 x 3	.83
B-034	1/4 x 3/4	.61	B-142	1/20 x 3	.75	B-404	3/16 x 6	4.50	B-299	1 x 1	.59	B-087	1 x 3/4	1.67	B-478	1/16 x 3	.89
B-035	1/4 x 1	.70	B-143	1/16 x 3	.81	B-405	1/4 x 6	4.94	B-300	1/2 x 2	.80	36" ROUNDED EDGE			B-479	3/32 x 3	1.05
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B-043	3/8 x 3/4	.77	B-151	1/2 x 4	1.03	LAPPED EDGE Balsa SHEETS			B-308	1-1/2 x 3	1.89	B-112	1/4 x 3 x 36	1.72	B-495	1/8 x 3	1.17
B-044	3/8 x 1	.92	B-152	1/16 x 4	1.26	B-610	1/16 x 3-1/4 x 36	1.25	B-309	2 x 3	2.29	B-113	1/4 x 4 x 36	2.54	B-496	3/16 x 3	1.39
B-045	1/2 x 1/2	.72	B-153	3/32 x 4	1.32	B-611	3/32 x 3-1/4 x 36	1.51	B-310	3 x 3	3.49	TAPERED TRAILING EDGE			B-497	1/4 x 3	1.61
B-046	1/2 x 3/4	.95	B-154	1/8 x 4	1.54	BULK Balsa - 3" x 36"			B-311	1/2 x 4	1.59	36" Lengths			B-498	3/8 x 3	2.10
B-047	1/2 x 1	1.16	B-155	3/16 x 4	1.88	Not Stamped or Sorted			B-312	3/4 x 4	1.78	B-097	1/8 x 1/4	.45	CONTEST Balsa - 36"		
B-048	5/8 x 5/8	.86	B-156	1/4 x 4	2.33	B-508	1/32 x 3	.65	B-313	1 x 4	1.94	B-098	3/16 x 3/4	.58	Very Light 4 - 6 Lb. Stock		
B-049	5/8 x 1	1.28	B-157	3/8 x 4	2.89	B-509	1/16 x 3	.70	B-314	1-1/2 x 4	2.50	B-099	1/4 x 1	.78	B-454	1/32 x 3	.99
B-050	3/4 x 3/4	1.20	B-158	1/16 x 6	2.10	B-510	3/32 x 3	.81	B-315	2 x 4	3.04	B-100	5/16 x 1-1/4	.92	B-455	1/16 x 3	1.05
B-051	3/4 x 1	1.40	B-159	3/32 x 6	2.37	B-511	1/8 x 3	.96	B-316	3 x 4	4.82	B-101	3/8 x 1-1/2	1.07	B-456	3/32 x 3	1.15
BAGS OF Balsa			STICKS & MORE			B-512	3/16 x 3	1.17	B-317	1/2 x 6	2.20	MODEL BUILDER'S ASSORTMENT			B-457	1/8 x 3	1.45
B-524	Bags of Balsa	3.75	B-643	Package	3.95	B-513	1/4 x 3	1.33	B-318	3/4 x 6	2.70	B-000	Bales Wood Assort	12.95	B-458	3/16 x 3	1.60
ODDS & ENDS						B-514	3/8 x 3	1.75	B-319	1 x 6	3.22				B-459	1/4 x 3	1.85
PACKAGE OF Balsa									B-320	1-1/2 x 6	4.39				B-460	3/8 x 3	2.10
B-534	Packages	2.85							B-321	2 x 6	4.98						
									B-322	3 x 6	7.92						

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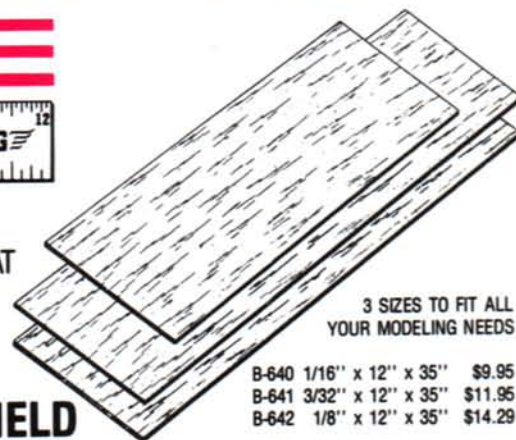
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