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SEPTEMBER 1993  
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# MODEL BUILDER

WORLD'S MOST COMPLETE MODEL AIRCRAFT MAGAZINE

## Rose Bowl Spring Soaring Festival Report

**Costa Rica Photo Album**



**reviews:**

**SIG'S  
1/4-SCALE  
SPACEWALKER II**

**MM  
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**construction:**

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**90107 / VS8SP FOR SAILPLANES**



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**90101 / VS8P FOR PATTERN/SCALE**



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**ON THE COVER**  
Marie Lehman, whose husband, Robin, is a leading U.S. proponent of large scale RC sailplanes, makes a pretty complement to that massive 1/3-scale Club Libelle. Robin will be doing some articles on these huge soaring machines in upcoming issues of MB. Inset: Sig's 1/4-scale Spacewalker II makes a great first-time project for those just-getting into Giant Scale. Bruce Edwards reviews the kit on page 24.

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# AIR MAIL

Have a comment? Question? Suggestion? Gripe? Direct your correspondence to Air Mail, c/o Model Builder, P.O. Box 669, Capistrano Beach, CA 92629.

## WHITE-HOT BUILDER

My Grandson, William Jost, is 12 years old and burning at the "white-hot" stage building models. He's going to be a good competitor and a fine model builder.

At his first summer contest, he caught a thermal while flying a hand-launched glider. For about half an hour, Will chased that glider over the fields. On the trip home, he comes back to life and says, "Grandpa, this was the most awesome weekend I've ever had. It was just totally awesome!"

I think he's hooked. Competitors, look out!

Leo Smothers  
Klamath Falls, Oregon

## THEY LIKE THE MAG

*Model Builder* is "my" magazine because it covers the grassroots of this hobby. If it goes to high bucks RC and the dangerous and expensive quarter-scales, I will stop reading it. Until then, here's my renewal.

James J. Bocckinfuso  
Moneta, Virginia

Add my congratulations to all those already on hand for reprinting Walt Mooney's Peanut plans. Also, why not rerun all of the Free Flight Scale articles by Fernando Ramos? Better yet, why not put them all together in a book? I'm sure scale modelers from everywhere would purchase a copy.

George Peach  
La Mesa, California

*(Thanks for the suggestion, George. Actually, Fernando has had a standing invitation to resume the column for quite a while now, but between his full-size homebuilt aircraft projects and the Old Timer modeling he's been doing lately, there's apparently little time left to sit down and crank out a column each month.)*

## CONFESSIONS OF A MODEL BUILDER

Strange things happen when you wear your new *Model Builder* custom T-shirt and fly models that have been pictured in the magazine (December and January). You risk O.O.S. flights—indoors!—and being beaten with your own model by a proxy flier!

At McDill AFB in April, my Pistachio Pacific Ace was on its way to another minute-plus flight. It climbed up to the 65-foot arched roof of the hangar, then landed on the flange of an I-beam. It was out of sight except from one end of the hangar.

Efforts to bump it off with a balloon failed—the flange was too wide!

Doc Martin had no Coconut to fly in the monthly Coconut Mass Launch, so he asked if I had any backup models he could proxy fly. I was flying my Martin MO-1, so I gave him my Messerschmitt M.18 that appeared as a construction feature in the May *MB*. He tweaked it a bit—he can get a brick to max—and then beat my best MO-1 time with a 1:20 in the mass launch. Further, he won the mass launch when I broke my motor in the MO-1 in the second round. Is it fun or pain to be beat by your own M.18?

Dave Linstrom  
Tampa, Florida

## LOOKING FOR TON

*In the March '93 "Air Mail" column, Dutch modeler Ton van Munsteren mentioned that he is looking for information on the Gee Bee R-1 and R-2 racers for an upcoming scale project. We no longer have Ton's full address on hand, and we've just received a note from Bill Meixner, a member of the Cleveland chapter of the Society of Air Racing Historians, graciously offering to supply Ton with the sort of info he needs.*

*So, Ton, if you're out there, Bill Meixner is willing to lend a hand. You can write to him at 14978 Fayette Blvd., Brook Park, OH 44142-2413.*

## HANDY HINTS

We've asked for tips from readers, and what follows are just a few of those received. This is *our* hobby, and we need to help each other. So send in those ideas! If we select yours, we'll send you a custom *Model Builder* T-shirt. Be sure to include your shirt size—L, XL or XXL. Send to Model Builder Tips, P.O. Box 669, Capistrano Beach, CA 92629.

## FIBERGLASSING MADE PAINLESS

When applying fiberglass cloth to, say, a wing joint, the fiberglass is usually difficult to handle due to static electricity. It wants to cling to everything except the piece you are trying to apply it to. It is also almost impossible to cut without unraveling.

I find that if I lay the fiberglass on a piece of waxed paper first, then use a rotary cutter to cut both the fiberglass and the waxed paper, I will have nice, convenient pieces to work with. I then put CA glue on the work, place the fiberglass/waxed paper on the glue, then remove the waxed paper.

There's much less mess when finished and the waxed paper can be used to smooth out the fiberglass without snagging it. *Keith Love, P.O. Box 361891, Milpitas, CA 95036.*

## FOR "OLD GUYS"

Here's a tip for dyed-in-the-wool free flighters, commonly referred to as "The Old Guys" who still light their dethermalizer fuse with a prepared length of cotton clothesline or sash cord that's been soaked in saltpeter water and then dried to make a slow-burning punk.

The problem now is that sash cord and clothesline is being made of plastic and melts instead of burning. And the 100 percent cotton is almost impossible to find.

Not to fret—100 percent cotton mop refills are available in any grocery store. My mop had 65 strands, each 24 inches long. That figures out to 128 feet of cotton mop strands to treat in saltpeter water. I made a small dispenser bottle and burn a strand at a time. It takes just seconds to change to a new strand when the first is used up. A 24-inch strand will last most of a day's flying. *John Epley, 4260 S. Tucson Estates Parkway, Tucson, AZ 85746.*

## TISSUE NUMBERS

Most free flight modelers use colored tissue for numbers, control surface outlines, etc. I use a spray adhesive applied to a taped-down sheet of pre-shrunk or ironed piece of tissue, then untape the tissue and flip it over onto a piece of waxed paper. I then put the pattern that I wish to make on top of the tissue and then tape down all three sheets together. Cut with a sharp new blade through your pattern or around it, or use a metal straight-edge for long, thin lines. Pick up your tissue pieces that you have cut, peel off the waxed paper and apply them to your model. Don't let them sit around too long, as the glue will dry out and they won't stick. Several sheets of tissue can be cut at the same time by putting a sheet of waxed paper between each one. *Charles R. Rodriguez, 9959 Godin Circle, Cheboygan, MI 49721.*

## WINGING IT

Here's a tip for securing covering materials to the undercamber of a wing. Mix a little water into Franklin Home, Shop & Craft Glue to make a brushable mixture that can be brushed onto the undercamber of the ribs. Let it dry.

Now apply your wet or dry covering using a heated iron, which will reactivate the dried glue and secure the tissue to the model. This method will also apply balsa sheeting up to 1/16-inch thick without leaving pinholes in the sheeting. *Tom Lucas, 19 Burke Rd., Rockville, CT 06066. MB*



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# PLANE TALK

## WE WANT YOU IN MODEL BUILDER!

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The Minimax 700, produced by Ron Parcels of Minimax Enterprise in Chelan, Washington, has been advertised in *Model Builder* on occasion and Leo Smothers found it to be "a very nice kit with all of the parts cut and sanded to perfection." The Klamath Falls, Oregon builder says the kit "comes with a 32-page instruction booklet and went together just as it was supposed to. It took very little adjusting to give a flat, slow glide. It is a slow, majestic flier and is a real pleasure to fly." *Leo Smothers, 5312 Eastwood Dr., Klamath Falls, OR 97603.*

Lakes, Arizona. "It is covered with Sig Koverall and nitrate dope, with Varathane as a fuelproofer. The open structure and plywood front were stained prior to fuelproofing," reports the builder, who completed the model about six years ago but just got around to putting a radio in it. The biplane is powered by an O.S. Surpass .40 four-stroke and is controlled with a JR Century 7 RC system. Jack reports, "It's really fun to fly—slow and predictable. I use coupled ailerons and rudder." *Jack Finn, 9247 E. Lakeside Dr., Sun Lakes, AZ 85248.*



"Somewhere in the Persian Gulf, a high-powered flash freezes the F-14 Tomcat in a high-G turn... or is it the Great Planes F-14 caught by the flash of Wagner Studios?" That's the caption supplied by George Voss of Oklahoma City. He came up with the concept and design for the photo, which was taken by Les Wagner. George built the Great Planes kit for a *Model Builder* product review article, scheduled to appear next month. *George A. Voss, 1403 Lincolnshire Rd., Oklahoma City, OK 73159-7709.*

Of the accompanying photo, Tony Peters states: "This was originally going to be a Fiat CR 32. I had a great deal of scale information, including the Peter Westburg drawings that *Model Builder* published some time ago. I had already enlarged the drawings on a copier and was looking for a color scheme when I came across a small color three-view of this Fiat CR 20. Lots of 32s have been built, but not the CR 20." Tony liked the airplane's racy look and the nice color scheme. "The colors on the model are colored tissue. The louvers and lettering under the tail were Xeroxed onto the tissue, and the insignia on the tail and under the cockpit are color copies cut out and pasted on. Wingspan is 16 inches." Bernie Gallagher took the photo and so receives a free *Model Builder* custom T-shirt. Tony gets the fame and glory! *Antony Peters, 303 West 66th St., #12C-W, New York, NY 10023.*



This attractive Proctor Mini Antic Biplane is the handiwork of Jack Finn of Sun





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	Apollo Type	# of Servos	Size in Inches H x W x L	Wt. Oz.	Stall Torque	60 DEG 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	\$ 55.95
"PRO-PACK"	10	4	1.48 x 0.79 x 1.6	1.55	42 oz."	0.24 Sec	1/3 DEG.	IRON/OILITE	\$ 66.95
"ELECTRO-GLIDE"	20	3	1.25 x 0.55 x 1.2	0.95	28 oz."	0.22 Sec	1/2 DEG.	SUPER TIGHT	\$ 78.95
"GIANT PACK"	15	3	1.97 x 1.14 x 2.3	3.50	130 oz."	0.23 Sec	1/2 DEG.	B.Brg./OILITE	\$105.95
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	
"SUB-MICRO PACK"	24	3	1.14 x 0.55 x 1.1	0.60	32 oz."	0.15 Sec	1/3 DEG.	SUPER FAST	\$ 99.95

### RECEIVERS (All are RCD "Platinum-Grade", Bullet-Proof)

RECEIVER MODEL	PART NBR	AM/FM MODE	3 OF CH.	RCD # THAT IS PLUG COMPATIBLE WITH:								Size in Inches H x W x L	Wt. Oz.	SUGG. LIST
				AIRT.	FUT. G	FUT. J	JR	HITEC	CIRRUS					
PGP	21	AM	7	300	100	150	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	\$ 81.95		

\*Plus \$5.95 shipping and handling per order, & CA sales tax for CA residents. (Allow 2 - 4 weeks for delivery.)

# DEAR JAKE

## Advice For The Propworn

### DEAR JAKE:

I am a private detective who happens to fly model airplanes as a hobby.

In the course of following a crooked politician around because his girlfriend suspected him of cheating on her with his ex-wife, I unearthed some information on one of his City Council cronies, a Mr. Jake Elliott of Red Bank, New Jersey. A routine background check disclosed that Mr. Elliott: 1) is a model aviation enthusiast; 2) has a journalism degree from the Jacksonville Correspondence Institute of Literature and Air Conditioner Repair; 3) mails an envelope to California every month; and 4) has a criminal record for check forgery using the alias "Jake Doe."

As a regular reader of *Model Builder*, I immediately made the connection when I saw that last piece of information. The evidence is clear that Jake Doe, model magazine columnist and Dear Abby wanna-be, is in reality Jake Elliott, bad check artist and Red Bank City Council member.

What do you have to say for yourself? Are you ready to admit it?

Gumshoe in Garden State

Dear Gumshoe:

*That's preposterous! You said yourself that Mr. Elliott was a modeler. If he used the name "Jake Doe" to commit a crime, it's probably because he saw it in this magazine. Who knows, he might even be a fan.*

*I am not Jake Elliott. Never have been, never will be. So please don't spread this nonsense any further. This kind of irresponsible accusation can cause irreparable damage to an innocent victim such as myself. Can you imagine the trouble I would have getting reelected if the good citizens of Red Bank heard about this?*

Jake

### DEAR JAKE:

As you know, the Wright brothers are credited with the first flight of an airplane. They are also credited with the first flight of a canard. A fact not commonly known is that the Wright Flyer was not a canard, but a conventional tractor biplane.

It is an accepted fact that the brothers were extremely thrifty. At the time, there were a number of well-made engines avail-

able. The Stanley and White, used in the steam cars, although heavy, were reliable and popular. The frugal brothers, however, chose to build an engine of their own design. After much tinkering and cussing, several fires and a couple of small explosions, the bicycle makers eventually fabricated a four-cylinder clunker that made the Model T seem like a Lamborghini.

The morning of the famous flight at Kitty Hawk saw the Flyer engine being cranky and cantankerous, not the least bit interested in toil. Finally, after much propping, flipping and profaning by Wilbur, the contraption roared to life, belching flame and backfiring. It was, however, running in reverse! (We modelers sometimes have this problem.) Happy that the motor was running at all, Orville said, "The heck with it! Let's try her backwards!" And of course, the rest is history.

The famous aircraft was flown successfully in the conventional direction in later attempts, but this was never recorded on film.

Roger (The Re-Kitter) Caron  
Fremont, California

Dear Roger:

*Thank you for the compliment at the beginning of your letter, which I chose not to print in order to protect you from the declining property values and increased insurance rates you would face should word get out that you liked my column. Besides, nobody would believe I didn't write it my-*

*self and stick it in the front of your letter just to look good.*

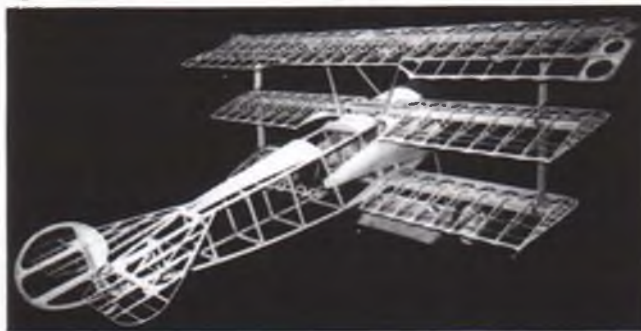
*Having expressed my gratitude for your kind words, I must now sadly inform you that you are at the least deluded, if not thoroughly folded and spindled. You clearly know nothing about the brothers Wright. You twice accused them of cussing, which they never did. Their sister would simply not have allowed it. They were frugal, but they built their own engine from weight considerations, not penny pinching. And they certainly weren't cavalier zanies who would attempt to fly a painstakingly designed aircraft backwards.*

*Anyone who has studied the Wrights is well aware of the real reason their Flyer made its initial flight in the wrong direction. Contrary to your misguided account, their engine ran flawlessly and powerfully. In fact, they were concerned that its thrust might be excessive, so they built a derrick and hung a weight from a pulley and cable system which they attached to the Flyer's launch cradle to oppose its acceleration down the takeoff rail. Unfortunately, they erred slightly in their calculations and we have all seen the famous film in which the weight pulls the airplane instead of vice versa.*

*At least they were smart enough to tell everyone, "It was meant to do that!", and never, as you erroneously suggest, flew the aircraft in its intended direction at a later date.*

Jake **MB**

## "QUALITY WITHOUT QUESTION"



### 1/4 scale FOKKER DR1 TRIPLANE

71" wing span	14-16 pounds	2 plan sets
1.60 4-stroke true scale	color chips	5 view dwgs
	H/W included	Cost - \$438

### GLENN TORRANCE MODELS

1919-93 Woodhaven Cir, Rockledge, Fl 32955  
(407) 631-2519 Catalog \$1

# 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. This 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.



## THE BIG MYSTIC

Last month's *Model Builder* included Art Steinberg's review on the EZ Sports Aviation "Mystic 30" distributed by Global Hobby Distributors. EZ also produces a much larger, 62-inch span version, the Mystic 90, for .60 two-stroke or .90 four-stroke power. Like its little brother, the Mystic 90 was designed by Hanno Prettnner and comes completely factory built and covered in a multi-colored EZ-type skin. A full hardware package is included. Retracts are optional.

The Mystic 90 is available in hobby shops throughout the U.S. and is distributed by Global Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728-8610; (714) 963-0133.

## PUNCH 'EM OUT!

Eastern Tool and Supply Co. offers a set of square stainless steel



punches that come in handy for making square holes or rectangular slots in thin balsa or other materials. We received a sample set to try out and went to work on some pieces of scrap balsa. Our findings: 1) The punches work best when using the *end grain* of a piece of pine or a 2x4 as a backing surface to punch against; 2) On balsa, we got clean cuts on pieces up to 1/16-inch thick. On anything thicker, the wood on the edges of the hole perpendicular to the grain would invariably break out on the backside; 3) The very best cuts were made by first using one of the smaller punches to remove most of the wood, then following up with the final size. We also tried the punches on thin ABS plastic and made very clean cuts

here as well.

Eastern Tool's SPS5 square punch set consists of five pieces, in 1/8, 3/16, 1/4, 5/16 and 3/8-inch sizes, packaged in a clear plastic box. The set

sells for \$12 plus \$3 S&H. Ask for a free catalog with your order, or order the catalog by itself for \$3 from Eastern Tool and Supply Co., 149 Grand St., New York, NY 10013; (212) 925-1006.



## SAY "SIR-OO-GEE"

Altech Marketing is going to be handling the new "Tsurugi" RC helicopter produced in Japan by Hirobo. It's priced at a very reasonable \$825 retail, yet is loaded with top-of-the-line features that Altech estimates would run around \$400 in upgrades for the "market standard" .60-size machine. James Wang has more to say about the Tsurugi in his "Chopper Chatter" column this month and will no doubt be saying a lot more about it in months to come. In the meantime, you can get a free brochure on the Tsurugi by writing to Altech Marketing, P.O.

Box 391, Edison, NJ 08818-0391, or call (908) 248-8738.

## MAT'S SUPER SERVO

Model Aviation Technology is importing its German-made "Super



Servo," a ball-bearing, all-metal-gear unit that falls into the "standard" servo size category. The servo is priced at \$45 and boasts a waterproof case, a torque of 55.5 ounce-inches, a transit time of .24 second for 60 degrees, and a weight of 2.04 ounces. It's offered with your choice of JR or Futaba J connectors and comes with a special "Super Servo Mount." For full details, send an SASE to Model Aviation Technology, 12848

Touchstone Pl., Palm Beach Gardens, FL 33418; or call (407) 626-6955.

## ROBBE'S "SOFT" MOTORGLIDER

MB Soaring columnist

Bill Forrey is presently

putting the finishing touches on a Robbe "Calibra," a high-performance electric motorglider that will appear shortly as a review article. For those for whom the Calibra



might be a bit too much, Robbe offers the new "Calibra Soft," a rudder/elevator/polyhedral-wing version better suited to low-time fliers. The model spans 72-1/2 inches and comes with one of Robbe's exclusive molded "Plura" plastic fuselages, foam core wings pre-sheated with obechi, pre-cut tail parts and hardware, all of which makes for very quick assembly.

The Calibra Soft, as well as the standard Calibra and a host of other great modeling goodies, is described in Robbe's thick 1993 catalog; contact Robbe at 170 Township Line Rd., Belle Mead, NJ 08502, or call (908) 359-2115 for catalog ordering info.

## INSIDE THE PIEZO GYRO

By now, everyone involved in RC helicopters has heard about the revolutionary new non-mechanical Piezoelectric gyro being produced by JR. Now here's a look inside the



gyro unit itself. (Keep in mind that this is one of three individual components that make up the complete gyro system.) On the left is the Piezo sensing unit, which contains the three crystals that sense the model's motion and send the electrical feedback to the tail rotor servo. The sensing unit fits inside a housing made up of inner and outer shells joined by vibration isolation dampers at both ends.

The NEJ-1000 gyro is now in full production and available at hobby shops that handle JR equipment, which is distributed exclusively by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-0022.

### HERE'S ONE FOR THE KIDS

One of many modeling items that Dan Rutherford is importing into the U.S. from Russia is the "Junior" CO<sub>2</sub>-powered, molded foam ARF free flight. We had a chance to see one up close and were very impressed with both the quality and the engineering that has gone into this good-looking little ship. Span is 27-1/2 inches, weight complete is 3 ounces, and it comes virtually complete, lacking only glue and the CO<sub>2</sub> cartridges—both readily available.

Performance is surprisingly good.



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

says Dan. He reports that neighborhood kids pressed into "testing" duties were able to get 45 to 55 seconds right out of the box; tuning the motor for less power and a longer run consistently brought flights of around 1-1/2 minutes in calm air. Better have your name and address attached if any thermals are around!

National distribution of the Junior and its CO<sub>2</sub> powerplant (which is available separately for scratch builders) is being handled by Sig Mfg. Co., 401-7 S. Front St., Montezuma, IA 50171. Suggested retail for the complete model is only \$35. If not yet available at your local dealer, call Sig at (800) 247-5008.

### "USER-CUSTOMIZABLE" SPEED CONTROL

Hobby Lobby's new catalog 22 is, as usual, chock full of interesting new items. An example is the FX35 electronic speed control, an



inexpensive (\$87.70) unit but one that will handle from 6 to 20 cells, up to 35 amps, and gives you the option of turning the prop brake on or off, motor cutoff on or off, and the BEC feature (6 to 10 cells only) on or off. It also has a soft start feature and will automatically shut down if it overheats or if the current limits are exceeded.

Further details on the FX35 speed control are listed in Hobby Lobby's catalog 22, which you can get free of charge merely by writing to Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027, or call (615) 373-1444.

### A CATALOG YOU GOTTA HAVE

Ken Sykora favored us with a copy of his new 1993 Oldtimer Model Supply catalog—as usual, a fun-to-read publication heavily

illustrated with artist Otto Kuhni's delightful sketches. What's listed in the catalog is strictly free flight stuff, much of it difficult or impossible to find anywhere else. You'll find all sorts of building and



covering materials, nitrate dope (clear and colored), lots of parts and accessories for rubber models, books (the Zaic Yearbooks and others), and something over 400 model plans—mostly scale rubber, but there are also several O.T. competition and sport rubber models and even a few O.T. gas model plans as well. The 15-page catalog goes for \$2.00; order your copy from Oldtimer Model Supply, P.O. Box 7334, Van Nuys, CA 91409.

### NEWS FROM TRU-TURN

We were impressed at Toledo by the line of prop nuts and hubs being added to Romco Mfg.'s line of Tru-Turn spinners. Like the spinners, the nuts and hubs are machined from aluminum bar stock, but sit flat on the front face of the prop. The prop nuts (far left in the photo) are one piece, from 5/8 to 7/8-inch diameter, in a bunch of different thread sizes, including metrics. Prop hubs range in size from 1 to 2 inches in 1/4-inch increments, are bored out to a fairly thick wall, and have a thick aluminum prop washer to center the hub on the prop. Hubs are offered in A (flanged at the base) and B (straight) styles—center and right in the photo respectively. All of the hubs require one of Romco's separate Tru-Turn Adaptor Kits to



mount to an engine. A complete listing of all of the Tru-Turn spinners, nuts and hubs is available from Romco Mfg. Inc., P.O. Box 836, South Houston, TX 77587; (713) 943-1867.

### THE WELL-DRESSED AIRPLANE

To complement its big Four-Star 120 kit, Sig has come out with a set of optional wheel pants that can be used on any big model with 4 to 4-1/2 inch main wheels. The pants measure 10-3/4 inches long by 2 inches

wide by 2-9/16 inches tall and are molded from ABS plastic. They retail for \$9.95 per pair; the star decal seen in the photo is also available at \$1.95 per pair. From Sig



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



### ABOUT FACE!

Most all modern radios have servo reversing switches, but often when ganging up two or more servos on one channel, one of them has to be modified to run in the opposite direction. Jomar's Servo Reverser does just that, simply by soldering the tiny circuit in the servo lead (or use connectors to make it removable). It weighs only 1/4 ounce, draws no extra power, and will work with all modern servos. Priced at \$19.95, at hobby shops or direct from Jomar, 3440 Riverhills Dr., Cincinnati, OH 45244; (513) 271-3903. **MB**

# THE PURSUIT OF PERFECTION • PART 2

**Rick concludes his treatise with discussions on downthrust, trimming for knife-edge flight and loop trimming.**

Last month I ran out of space and bailed out just as we were about to tackle trimming that new airplane for a straight vertical upline. We had done our radio setup and incidence checks, the correct thrust and balance point adjustments were fairly well dialed in, and the airplane was behaving itself on vertical downlines without pulling out or tucking under. Most reasonably straight, well-de-

signed and constructed aircraft will fly a good power-on vertical at this point without further adjustment. If you have one that doesn't, the place to look is engine downthrust.

The purpose of downthrust is to counter the overall nose-up pitching moment shown

*Today, with a modern computer radio, it is possible to mix everything but a drink.*

by most aircraft when thrust is increased. This power-on pitching moment is usually considered by most modelers to be simply the consequence of an increase in velocity causing an increase in lift, but it is actually the end result of all the different aerodynamic reactions taking place during flight, and is due to many factors acting in concert, of which lift is only one. "In-line" or mid-wing designs simply have smaller force vectors for all of these reactions due to less design asymmetry. Center of Gravity location is another factor, but in the vertical sense, rather than in the usual longitudinal one. While thrust, lift and drag act through the AC, the fourth component of the basic flight equation, weight, acts through the CG. If the thrustline passes above the CG, there is a nose-down pitch under power, and if it passes below the CG, the reverse is true. Again, a mid-wing design is likely to have less vertical CG displacement, simply because of the physical layout.

All of this sounds complicated, but in practice, this is what you do. Check the aircraft in trimmed level flight by cutting power suddenly. The airplane should continue in level flight for some distance and then gradually require increasing amounts of up elevator to hold altitude. If it climbs or dives suddenly, you aren't ready to trim for verticals, because your previous incidence/balance adjustments are grossly out of whack, and you need to go back to square

one and start over. This should not be the case if your vertical downlines were good.

Providing the airplane behaves itself, proceed by pulling a power-on vertical line directly in front of yourself. This really should be done on a fairly calm day. A slight drift to the canopy means more downthrust; a tendency to "pull down" or pitch to the belly means you already have too much, and some should come out. Do



NSRCA District 8 VP John Noster of Eugene, Oregon, and his new Zeus design for FAI. About 925 square inches, 10 pounds, YS 1.20AC and Futaba 92AP radio. A fine flier, and John isn't bad either.

signed and constructed aircraft will fly a good power-on vertical at this point without further adjustment. If you have one that doesn't, the place to look is engine downthrust.

Force arrangements on modern pattern planes vary, but most dynamically stable arrangements incorporate some slight amount of downthrust. As a general rule, those designs which are more "in line," i.e., the wing, tailplane and engine all mounted near or on a datum line passing through the aerodynamic center (AC) of the aircraft, will use less downthrust; sometimes even none. The equations of flight assume that the summed drag of the aircraft acts through



Sportsman pilot Greg Roth of Marysville, Washington and his Boxer .60. Uses an O.S. .61RF, JR x-347 radio. Greg built the all-wood design very light, at 7-1/4 pounds.

this repeatedly, until you are satisfied that you have identified a real tendency, and that what you are seeing isn't the result of wind or your own inability to pull to an accurate vertical.

If you need an adjustment, it will be fairly small, and normally shouldn't affect level flight trim under power. If it does, the drill is to start over with the elevator trim, then



■ LEFT: Novice flier Scott Evans of Snohomish, Washington, with his Goldberg Ultimate O.S. 1.20, JR x-347 radio. ■ RIGHT: Masters competitor Mike Lance of Seattle looks happy with his recently trimmed Cursor, designed by MB's pattern columnist. O.S. Hanno, JR PCM 10, about 7.75 pounds.

check the downlines, move the BP, etc., as necessary. Thrustline adjustments should be thought of as a method of "fine tuning," because the available adjustment range is just too small to overcome large incidence or balance problems.

At this point, if we look back to those thrilling bygone days of smoking, screaming, 9-pound Rossi-powered cruise missiles flying the old AMA style pattern, the fun would only be beginning, because it would be time for the extended agony of Knife-Edge Trimming. Fortunate we! Such is no longer the case.

The reasons are multiple. The pattern has changed, and knife-edge trim is now less important than it was, because the new patterns require only a few knife-edge maneuvers of relatively brief duration. In the old days, horizon-to-horizon knife-edge perfection was a practical necessity, 5-second slow rolls were the rule (7 seconds was better), and the average 8-point roll used up acreage like a California land developer.

Nowadays, vertical lines are just as important as horizontal ones, and most of the rolls go up or down rather than sideways.

Back then, radio mixing was first nonexistent, and then primitive and very crude (screwdriver adjustments on actual real tiny potentiometers. Can you imagine?). Snap roll buttons were considered to be on the cutting edge of high tech. Roll coupling was routinely dealt with by sawing the wing in half, and cutting out the stab to reposition it was a common practice.

Today, with a modern computer radio, it is possible to mix everything but a drink. Mention cutting someone's airplane to pieces, and the likely result will be a very defensive attitude and the removal of all sharp objects from your immediate vicinity until your mental stability improves.

Much has changed, but the basics really haven't. True, we don't need to knife-edge as long, but straight knife-edge trim still helps. We still need to be able to correct a line with the rudder without rolling or pitching the

airplane in the process. The physics of the matter haven't changed. And while a modern radio offers us some new choices, it will not cure everything. We can mix only the little things. Surgery is still the only cure for a certified barking AKC registered special.

The theory is not tough. For pattern purposes, we want all of the aircraft control axes decoupled from each other. We especially need pure yaw; a rudder input should neither pitch nor roll the airplane. Too much dihedral will cause the airplane to roll in the direction of rudder application (proverse roll couple). Too little will cause the opposite effect (adverse roll couple). Since we can't really trim for pitching in knife-edge until the roll couple is zeroed out, this is the place to start. Check the dihedral by rolling to knife-edge position and applying top rudder to hold level flight (not climb!). Do this both ways and note the effect. Because of spiral slipstream, the effect will usually differ a little from side to

*continued on page 80*



The author's new Python from Pioron Models on its maiden voyage to the field. The 950 square inch, 10.5-pound bird is a super flying machine. Rick is using a JR PCM-10S rig. Plug-in wings, stab, and two-piece fuselage fit in a 43x28x14-inch carrying case!

# WHICH WAY DO THE GRAIN GO?

More on the ongoing controversy over whether shear webs should be installed with the grain vertical or horizontal.

I will never know whether most readers agree with what I write or not, because I hear from only a small percentage of you. Occasionally some of you tell me you disagree with me. Sometimes you are wrong, sometimes I am wrong, and sometimes I can't tell who is wrong. One of the latter cases started over something I wrote nearly two years ago.

In December 1991, my subject was wing structural design. Among other things, I wrote that "The shear webs should be installed with the grain vertical, because the shear web usually has to carry some com-

pression loads in addition to pure shear loads. Dihedral will also add a sizeable compression force in the shear web near the center of a wing in flight."

pression loads in addition to pure shear loads. Dihedral will also add a sizeable compression force in the shear web near the center of a wing in flight."

the column because it was too technical and too lengthy to interest most of you.

I'm not going to identify who said what, as it might cause embarrassment, but I especially wish to thank S. Cole of Jackson, Wyoming; Jack Fletcher of Lexington, Massachusetts; Bill Gray of Seattle; my engineer son, Greg Reynolds of San Francisco; and Jim Stevens of British Columbia, Canada, for their opinions, proofs, hard work and interest.

This has been an argument among knowledgeable people. Most, if not all of them are graduate engineers, and at least three of them were stress or structural design spe-

This result was consistent with other tests he ran, and supports the theory advocated by the vertical-grain proponents.

## ABOUT ENGINE STARTERS. . .

I had a "heavy duty" starter of a popular brand. It started .60s fine most of the time, but on a cold engine with exceptional compression the starter wouldn't hack it.

Awhile back, a fellow flier's starter battery went dead while he was trying to start a helicopter. I loaned him my starter with a freshly charged battery. The engine on the chopper was a .60 ABC. As you know, ABC



■ FAR LEFT: Dissatisfied with the performance he was getting out of his commercial direct-drive electric starter, our columnist made up this all-metal 2:1 gearbox to double the available torque. Output shaft appears to be riding in an oilite bushing, with possibly some sort of thrust bearing setup directly behind the starter cap. Works great!  
 ■ LEFT: Gearbox is held in place by means of the two long bolts that hold the front and rear starter covers in place. No-load output rpm is 2,800, which is close to the idle speed on most common .60s.

cialists! Most of those concerned have had their say at least twice. As the result of recent letters, I am finally putting the subject to bed. In the opinion of this judge, *vertical-grain shear webs are best*. If you disagree, I don't want to hear about it. Believe what I originally wrote.

There were more experts on the vertical-grain side, but the strongest reasons for my favoring vertical-grain shear webs are test results. Jim Stevens originated and carefully conducted a very nice test program which compared beams (spars) with vertical-grain webs to beams with horizontal-grain webs. I hope to publish more of Jim's results later, but for now, suffice to say that the horizontal shear web beam failed at only 60 percent of the bending load of that of the otherwise identical vertical shear web beam.

engines are very tight at the top of the stroke when cold—squeaky tight. My starter would only start it with great difficulty. My friend was using the old trick of revving up the starter first and then jamming it onto the engine, but even that questionable technique took time and barely worked. (I say "questionable technique" because it is hard on starter and engine bearings, wears out starter inserts faster, and may even be dangerous to model or modeler.)

Of course, this spin-it-then-ram-it-home technique helps a marginal starter because of the kinetic energy built up due to the inertia of the starter motor armature and the adapter assembly. When I am trying to use a marginal starter I turn the prop back against compression before engaging the starter. This gives the system a fraction of a

fraction of a



revolution to build up kinetic energy before the starter motor has to overcome engine compression. It helps.

There is a much better way to get the required torque, however. Most electric motors are high-speed, low-torque devices. We don't need a lot of speed in starting model engines, but we do need torque. There is a well-known technology for increasing torque at the expense of speed or vice versa; it is called gearing. Kavan puts out a small planetary-gear starter with a 5:1 ratio, which they claim will start a .60. It has half the weight of a conventional starter, about the same cost, and less starter battery drain. I'm told Hirobo also puts out a powerful starter for large model helicopters, which is either geared or has a belt reduction.

The great majority of model engine starters are direct drive, however. Most of these starters use automobile window motors or roof motors. They are available, reliable and inexpensive, but for their size, weight and power consumption we could get much more torque and much better performance by adding gears.

Since I like to build things, I didn't junk my old marginal "heavy duty" direct-drive starter, I put a homemade gearbox on it. Boy, what a difference! I no longer have a marginal starter for any .60 or .90. A 2:1 gear ratio was chosen. A higher ratio would

reduction ratio. It was geared that way to have enough torque for drilling a large hole or driving a wood screw, with a fairly small motor and battery.

The problem with the driver as a starter is its low speed; only 500 rpm unloaded. Model diesel engines and some glow engines require a fairly brisk compression stroke in order to fire. I suspect this 500 rpm driver could start some glow engines under optimum conditions, but it certainly isn't practical. One can get more speed than the driver provides, on that critical compression stroke, by hand flipping.

The no-load output speed of my homemade geared starter is 2,800 rpm. It puts out as much or more torque with 2:1 gears as the driver does with 6:1, because the starter motor and the 12-volt lead-acid battery that powers it are much larger.

Most of the companies selling model starters are taking the easy way out and using available motors direct drive. I hope that in the future, more of them will add some sort of reduction drive to give us better model starting for the weight and power consumption. Meanwhile, a cottage industry might find a good market for gearboxes to be added to some popular brands of starters. If anyone is interested, contact me.

#### SILICON AND SILICONE

I hate to see misinformation published. Many thousands of readers who know what is correct think less of the publication when they see errors, and thousands of ignorant readers are misled and uneducated. I try hard to keep errors out of this column... and sometimes still fail; but let's talk about the errors of other people.

One common error in the model airplane literature bothers me a lot. Most of you already know the following, but let me

educate a few, especially some guilty writers and editors.

The words "silicon" and "silicone" are *not* interchangeable. Neither are the materials! We use a lot of both of them in RC modeling, but we could never substitute one for the other.

Next to oxygen, silicon is the most abundant element on earth. In compounds such as quartz (silica or silicon dioxide), it is the major ingredient of most rocks and soil. Most sands are largely quartz, because it is harder than other common rock minerals and doesn't weather or wear down as fast.

Elemental silicon doesn't occur naturally on earth, but it can be reduced to the pure

*continued on page 79*

### A SUPER STAND CAN...



**BE USED FOR—FIELD  
MAINTENANCE • CARRIER •  
BUILDING/ALIGNMENT JIG •  
PAINTING JIG • STORAGE  
STAND •**

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have given still more torque, but I didn't want to go too low on rpm.

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As an experiment, I also fitted a starter attachment to a cordless drill/screwdriver and tried to start an engine with it. I didn't think it would work, but it was worth a shot. It didn't work. If torque was the only requirement, the cordless driver would work fine for engine starting, because it has a 6:1

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# PYLON RACING: WHAT'S IN STORE FOR '94

**Our resident racer takes a look at the rules changes adopted by the Racing Contest Board and predicts their impact on the pylon events as they are currently being flown.**

**T**he 1994 rules cycle has just been completed. There are some changes that will affect the sport of pylon racing and some that are nothing more than bringing the rulebook up to what has been common practice for years. These changes, adopted by the Racing Contest Board, will be in the new '94 rule book and have no effect on the current '93 season.

I'm going to run through all of the proposals that were still up for consideration after the initial vote so that you can prepare for next year without any sudden surprises and comments of "nobody told me!"

The first, RCR-1, eliminates the word *throttle* under the Controls section of the Quickie rules, resulting in fuel shutoffs, as in Form I, now being legal. The new line in paragraph 6 will read: "The airplane must be equipped with four separate controls to independently operate the engine, rudder, ailerons and elevator." To elaborate, a control is no longer needed to operate the engine throttle, meaning a flier could lock his carb wide open and utilize a shutoff for

engine kill.

RCR-3 deals with .15-size Quarter Midget, but becomes a moot proposal with the passage of the proposal to change QM to a .40-size event. (Discussed later as RCR- 40.)

RCR-8 will no longer allow a Contest Director of any race of two or more days to fly in that event. This will undoubtedly cause some consternation because many argue that if the CD can't fly, we will have a shortage of CDs. The proposer argued that most two-day events are large in nature and require a CD's constant attention to detail from a management standpoint, and flying curtails that attention.

RCR-10, 11 and 12 are nothing more than a language change, where the word *flagmen* is changed to *judges*. The effect on racing is nothing, since flags are being used less and less these days and many of the girls who work pylon cannot really be called "flagmen". . . at least grammatically. "Flagpersons?" Whatever, the change to *judges* made more sense and was accepted by the Contest Board as a logical solution.

RCR-13 changes the language in the Operation of the Race section of the Form I rules; the current language has the number 1 judges out on the course with the planes flying directly at them or over their heads. The change puts them inside the turn radius zone, which is common practice in most areas except the west coast.

RCR-14 is nothing more than a language change and has no effect on current practices. The words *gets the* and *gets his* were exchanged for other phraseology.

RCR-15 is another language change clarifying a confusing statement in the Form I section dealing with how much of the engine has to be covered with the cowl. This change also has no effect on current practices.

RCR-16 changes Form I in that a pilot's registration number is no longer needed on the lower wing panel. This change will also cause some consternation, especially with those pilots who still follow this long-standing rule. However, the proposer argued, the rule is not enforced or followed by a majority of fliers, and if no penalty is going to be administered for lack of numbers, the requirement should be eliminated.

RCR-17 changes the Form I rules dealing with the required height of the pylons. These rules are utilized by all racing events and will therefore affect them all.

The current rule requires the number 1 pylon to be the same height as the number 2 and 3 pylons. The proposer argued that a higher number 1 pylon, if wanted, is easier to find by both caller and pilot during a race, meaning a rule change was needed to allow it.

RCR-18 merely makes the "availability" statement utilized in most events a universal statement, which was missing from the Quickie 500 section. It has no effect on current practices and brings Quickie into line with the other events.

RCR-19 adds a maximum carburetor bore size to Quickie 500. This is something that was missed on the original rule submission for the event. Up until now, any carb could be utilized as long as it was a stock carb from the engine manufacturer cataloged for the engine being used. The new maximum dimension will be 0.011 (0.013 in.)

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RCR-20 very simply eliminates any wing fairing/radius between the wing and fuselage in Quickie 500. All radii of any size will be illegal in '94.

RCR-21 adds language to the Form I rules that clearly allows rechroming of piston liners, a practice that has been followed for many years. The current rule indicates that this practice is illegal.

RCR-22 is nothing more than a rulebook shuffle which basically takes the "no drinking" statement from each individual set of rules and inserts it into a General section.

RCR-23 will affect Form I and the use of backup models. The current practice does not allow a flier to utilize his/her backup unless it is deemed unflyable, and after making this switch, a flier is not allowed to use the original plane under any circumstances.

The rule change removes the language, "He can only use his alternate model if the first model is not flyable." Any registered model will be legal to use at any time during a meet, which will allow minimally damaged planes to be repaired either during a race or overnight, and if a flier damages the backup plane he or she is currently flying, the original can then be utilized, keeping the flier in competition.

RCR-26 simply notes that the Form I scoring procedure is to be used for 1/2A racing, as no procedure was indicated in the 1/2A rule section.

RCR-27 affects Quickie 500 and removes the requirement for having a removable

hatch or a window to inspect the fuel system. This will be well accepted, I would guess, by those people building Quickies with fiberglass fuselages.

The proposer argued that most races pump the fuel systems dry and refill and hardly ever look inside the hatch or window to see if the tank has really been emptied. If the window requirement is not being enforced, he argued, let's remove the requirement.

RCR-29 has no effect on current practices and only changes the language in the Quickie rules, in which the Controls section will state, "... throttle, plus the roll, pitch and yaw attitudes of the aircraft," instead of the current language, "... throttle, rudder, ailerons and elevator."

RCR-31 is moot because it deals with .15-size Quarter Midget, which will no longer exist (see RCR-40).

RCR-32 is only a language change for Quarter Midget; the word *fiberglass* was removed from the Propeller section and replaced with *plastic*, the reason being that most plastic props being utilized are not fiberglass but rather carbon fiber.

RCR-34 establishes a new "entry level" racing event utilizing rules very similar to what was originally used for Quickie 500. It follows many of the current Quickie rules, but limits engines to non-Schnuerle, non-ABC/ACC types. The Purpose section of the rules states, "Any engine may be declared illegal if it can turn a standard 9x6 commercially available, unaltered propeller faster

than 16,500 rpm."

The rules require that the muffler be stock, with no rpm increase of more than 300 rpm when in the 11-17,000 rpm range. This, of course, eliminates many of the tuned type mufflers available these days. Also specified are stock, fiber-filled nylon propellers only. No wood, carbon fiber, Kevlar, fiberglass or any resin materials allowed.

RCR-38 is a Form I change wherein a takeoff order of 1-2-3-4 can be utilized as an alternate to the current rule book order of 1-3, 2-4. This will allow a CD to choose whichever method he/she prefers.

Finally, RCR-40. This change affects Quarter Midget only, but the effect will be substantial because the engine size has been raised from .15 to .40 cubic inch and the size of the airplane has been made larger accordingly. The engine now must be muffled, with a max displacement of .403 cubic inch. Mufflers are limited to an outlet diameter of 312 inch.

The airplane requirements are: width, 3 inches; height, 6 inches; wing area, 400 square inches; and a minimum wing thickness of 1 inch at the centerline.

There are a few other changes that affect this event and you can read them in the rule book when it is published, but those items that have the most dramatic effect are those listed above.

That's basically it for the next rules cycle. All other proposals not listed above were rejected. **MB**

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# OFF THE BOARD

When was the last time you built a model that *truly* flew “off the board,” needing no trim adjustments to perform its best? Probably never. Here’s a basic primer in the fine art of trimming a control line model aircraft.

**T**he proud builder beams over his creation at the club meeting, as members gather round to take a first look.

“It flew great right off the board,” the builder proclaims proudly. If he’s telling the truth, our builder is an expert builder—and undoubtedly a lucky one at that.

“Right off the board” is a model building cliché that means the plane was in perfect trim on its maiden flight, with no adjustments necessary. Skeptics have proclaimed this statement a myth, maintaining that the performance of *any* plane can be improved upon after its first flight.

others, just getting the plane to fly more or less straight and stable is an elusive goal.

Modern control line precision aerobatics planes are built with many adjustable features. In fact, many planes intended for casual “sport” flying—as well as planes for other types of competition—now are being designed with some of these features, including adjustable tip weight compartments, movable leadout guides, etc.

Let’s take a look at some control line model airplane trim problems from a basic level, as they are encountered by the novice or sport flier.

adjustments should be *temporary* and *reversible*. Don’t do anything you can’t reverse until you’re sure you know what’s causing the problem. And only try one trim adjustment at a time, so you can determine the effect of each change.

- Was the plane stable in level flight? You should be able to fly the plane level without effort, but it should respond when you ask it to. The issue here is balance.

If the plane is difficult to fly level—it wants to go up and down without your input, or is simply too sensitive (experienced fliers refer to it as “nervous” or “twitchy”)—then the plane probably is a bit tail-heavy. Try adding some nose weight, such as a heavy prop hub, and fly again.

On the other hand, the plane may be *too* stable; it labors to turn, even with plenty of control surface travel. This suggests nose-heaviness, and a little tail weight should be tried. It takes much less weight in the tail to move the CG aft than in the nose to move it forward—don’t overdo it, or you’ll risk an unflyable plane that may crash. Add a little weight, fly, and adjust further if necessary.

- Did the plane respond appropriately to control inputs? This question is related to the issue of stability, but is not identical; you may have to consider both issues simultaneously. We’ll assume that the plane is stable in level flight and appears willing to respond to control inputs.

The plane should react immediately, positively and smoothly to control inputs, without unwanted movements. If it seems to react too quickly, to turn more sharply than you want or turn farther than you want—bobbing at the end of a loop, for example, rather than leveling out at the bottom—you have oversensitive controls. The problem could be at the airplane end or at the handle end. The appropriate solution could be a matter of choice, depending on the degree of the problem.

Narrowing the spacing between the handle’s leadouts reduces control response to arm movement. However, if you have a favorite handle that you want to continue using, the best solution is to solve the problem at the airplane end. Many novice fliers start out with too big a handle. I recommend starting with a line spacing of no more than 4 inches at the handle; this seems to be about right for the common sport/stunt plane. Bigger handles can result in overcontrol. The best solution to handle questions is one of



Gerald Schamp's Big Oriental is based on Ted Fancher's Imitation design, adding a full fuselage in the Oriental shape. It has 640 square inches and uses a Tom Lay Super Tigre .60 and a Bolly 11-1/4x6-1/2 three-blade prop. Gerald Schamp photo.

Trimming a control line model is the equivalent of fine-tuning the TV, or focusing a camera, or editing a manuscript. We’re going to take a plane that flies and make it fly better. We’re going to strive for optimum performance, though the more demanding fliers will never be satisfied—that’s what keeps us building!

We can go as far with trimming as our own demands for performance take us. Expert precision aerobatics fliers will continue making minute adjustments to airplanes that appear, to a casual observer outside the circle, to be absolutely perfect. Atmospheric and seasonal conditions, the alignment of the planets and the current prime interest rate all seem to have effects on performance that these experts can perceive. For many

We’ll assume that the plane has no obvious major problems and in fact makes a successful maiden flight—successful at least in the sense that it takes off, stays aloft until the tank is empty and lands safely. Now let’s assess that first flight and begin considering adjustments. It may take several flights to begin to approach acceptable flight characteristics.

We need to answer several basic questions. Was the plane stable in level flight? Did it respond appropriately to control inputs? Did it fly with one wing higher than the other? Was there enough line tension? The answers will tell us whether we need to make adjustments.

Many trim problems can be caused by more than one thing. Therefore, your first

the several excellent adjustable handles now on the market.

At the airplane end, oversensitive control response is likely to be a result of some combination of the settings of the bellcrank or the pushrod setting in the bellcrank, flap horn and/or elevator horn. Ideally, all of these settings can be changed; the bellcrank could pose a problem if it is hidden inside the plane.

Oversensitive response is often the result of an improper selection or setting of the bellcrank. As a general rule, I always arrange the controls so that a fairly large arm movement is needed to move the controls through their entire range. This usually means a relatively large bellcrank, with the pushrod in the hole nearest the pivot. A smaller bellcrank and the pushrod farther out from the pivot results in a control system that requires much less arm movement and therefore a much finer touch by the pilot. There is also less margin for error.

Assuming you can't change the bellcrank situation, you can reduce control response by moving the pushrod to holes in the elevator and flap horns that are farther away from the control surfaces, reducing the amount of

very well but maintains its speed and lift.

One of the most common control response problems is unequal turning; the plane turns tightly in one direction and too widely in the other. This is a simple adjustment that can be made at the elevator and/or flap horns if you have built the plane with adjustable control features such as Kwik-Links. Simply turn the link in the direction needed to adjust elevator travel in the desired direction. Some planes will need more deflection in one direction for equal turning in flight. If the adjustment appears to be ineffective, examine the pushrod setup; it may need a guide to prevent flexing, which can cause lack of response in one direction.

•Did the plane fly with one wing higher than the other? There are two possible problems here, and it's fairly easy to tell which one is the culprit. It's either a matter of wingtip weight or a wing warp.

Unless the problem is so extreme that there's a risk of a crash in making the maneuver, fly the plane inverted and examine the alignment of the wings. If the wing that was low when upright is now high when inverted, you have a warp. This is fairly easy to correct if you used an iron-on covering; just

corrected and line tension seems to be a continuing problem, you need to examine what is referred to as "line rake." Simply put, this is the point at which the leadouts exit the inboard wingtip.

An exit too far forward in relation to the center of gravity causes a lack of tension; an exit too far back can cause excessive tension or other problems, such as a yawing of the plane to the outside of the circle. If the plane has adjustable leadouts, move them forward or aft as needed to correct the problem. Search for the minimum effective line tension—enough to keep the plane tight enough to respond to the controls while not so tight as to cause other performance problems.

Some fliers try to enhance tension with rudder or engine offset. These are both poor methods of providing line tension. A properly trimmed plane, with proper line rake, should have good tension with little or no engine or rudder offset. Both of these—particularly rudder offset—are most effective when least needed.

Unless the line tension problem is extreme, it will be most noticed in maneuvers. There is no substitute for building a plane straight and light. An overly heavy or under-



■ ABOVE: Osprey Mfg. is producing this excellent adjustable handle in right-handed and left-handed versions—details in text. Jim Cameron photo.

■ RIGHT: Frequent photo contributor Jim Cameron, of Portland, Oregon, shares this look at his Super Firecat, a Jim Walker design resurrected in recent years by Frank Macy's American Junior company. The Firecat decal was originally designed for Jim Walker by none other than Walt Disney.



elevator and flap travel. This should tame the airplane. If necessary, you may also be able to substitute larger horns.

If you have the opposite problem—the plane, while not nose-heavy, does not turn quickly or tightly enough—you need to make the opposite adjustments, increasing elevator travel and possibly widening handle spacing.

Another common control-related problem is stalling. This can be caused by an excess of control surface travel, a common construction mistake of novices. Any elevator deflection above 45 degrees is excessive and likely to cause stalling. Many planes will perform just right with much less travel; racing and combat planes often are set up with only a few degrees of travel in each direction. If the plane is slowing or stalling in turns, reduce the control surface travel and try again. You may find that the plane turns

twist the wing in the desired direction and reshink the covering to hold the new shape. A silkspan/dope wing may require steaming, or trim tabs for alignment. Flapped planes can be trimmed with adjustment—"tweaking"—of the flaps to correct the warp.

If the wing that was low when upright remains low when the plane is inverted, it's more likely a tip weight problem. If the outboard wing is low in both attitudes, there's too much weight; if it's high, there's not enough. You want to use the minimum weight necessary—remember that tip weight is mostly an aid in takeoff and has limited value once the plane is flying. Too much weight can cause the outboard tip to drop in maneuvers.

•Was there appropriate line tension?

Some of the problems discussed above can affect line tension, particularly the warp and tip weight situations. If those have been

powered plane will have line tension problems in maneuvers no matter what trimming measures you take. Same goes for a plane with a serious warp or alignment problem.

Speaking of alignment, there is one trim difficulty that may defy all of the above adjustments; it's what modelers refer to as "hunting." This means that the plane oscillates up and down without any control input. It's not nose-heavy or tail-heavy, but it won't fly level.

This can be caused by an alignment problem of the wing, elevator, stabilizer and flaps that may be hard to chase down and correct. Another possible cause can be a too-precise control system, one in which there is no play whatsoever. One easy thing to try with a hunting plane is to simply loosen up the pushrod connection to the elevator horn—enlarge the hole in the horn

*continued on page 82*

BY BRUCE EDWARDS

## The Sig 1/4-Scale Spacewalker II

**Sig has another winner on its hands with this replica of the full-size two-seater homebuilt. It's big enough to qualify for IMAA events without being difficult to manage or transport.**

**T**he Sig Spacewalker II review project for *Model Builder* was a joint effort of myself and my good friend, Ken Rowe. The plane was largely constructed by Ken with my assistance and interpretation of the drawings. I did the paint job and equipment installation.

Harold Hester, designer of the kit, has worked diligently to supply a very comprehensive step-by-step building guide, which is accompanied by three sheets of rolled full-size plans. The kit box is as fully packed as you can imagine. The hardware package includes just about everything but the glue, covering, engine, wheels, fuel tank, fuel tubing and radio. Once you start taking things out of the box, you are committed to build, as there is little chance you will be able to return all the parts to the box!

Ken and I followed the building guide with few deviations, doing things Sig's way instead of our own way. Sig's step-by-step building guide worked very well with good logical steps that speeded construction.

I usually build the tail feathers first but the instruction book started with the wing, so that's where Ken and I started. The wing is a conventional D-tube type with barndoor-style ailerons, just like those on the full-size plane. We used Sig CA Medium glue for construction except on the spar joiner, where Sig epoxy was used.

There are several features in the Spacewalker II's wing construction that help speed up the building process. I especially liked the alignment tabs on the bottom of the ribs. They allow the builder to speedily assemble the wing without a wing jig or any other special fixtures. Other useful gauges in the kit help the builder achieve correct wing dihedral, wing saddle fit for the wing, and shape the wing's leading edge.

The kit is also furnished with a lightweight

*MB's Spacewalker II review team, "Big Birds" columnist Bruce Edwards (left) and his buddy Ken Rowe, think Sig's 1/4-scale Spacewalker II kit will put a smile on your face too.*





paper tube material large enough to accommodate both the aileron servo leads and their connectors. This is a handy feature because it lets you use standard servo extensions without the necessity of soldering on a connector after the aileron servo wire is pulled through the wing tube.

The plastic wingtips are also a big help, but don't use really coarse sandpaper on them. I'd say 220 grit is the roughest paper you should use on any of the plastic parts supplied in the kit.

The only problem we encountered when building the wing was the leading edge sheeting. It was cut to exact size and had curved to the extent that it had to be replaced. We contacted Sig and recommended that they supply the leading edge sheeting oversize so that it can be trimmed by the builder to actual size. Our recommendation was well received.

The fuselage has a rather unusual shape; a look at the top view shows that the fuselage widens until it reaches the rear cockpit instrument panel, then tapers to the tail post. When completed, our fuselage came out light and true. Sig epoxy was used to assemble the firewall and Sig CA Slow and CA Medium was used for the rest of the fuselage construction.

We followed the construction manual carefully to ensure that our engine exited the cowl correctly and that the fuselage was aligned properly. The wing and the fuselage are finished in alternating fashion so that the construction of one complements the construction sequence of the other.

With the wing and fuselage completed, we decided to build the tailfeathers next. They are conventional balsa stick construction and went together easily. Our only deviation from the plans was to use dowels at the hard points for the tail bracing. Thin CA in the holes would probably have worked okay.

The landing gear is pre-formed from 3/16-inch music wire. The landing gear pieces were put in their appropriate slots in the wing and then wrapped and soldered. Ken used



■ LEFT: Here the basic framework has been framed up and covered with Sig Koverall, a heat-shrink polyester material popular with the Giant Scale crowd because of its easy handling and extreme puncture resistance. Covering is adhered with "Stix-It," a heat-activated adhesive also produced by Sig. ■ RIGHT: To provide an opaque base for the color coats, the model was first given two brushed coats of Sig clear nitrate dope, followed by three sprayed coats of Sig butyrate dope with aluminum paste added. Bruce described the Spacewalker's finishing process in considerable detail in his March '93 "Big Birds" column.



■ LEFT: The dummy Continental engine is molded from ABS plastic and is included in the Spacewalker II kit. Bruce spent some extra time getting the cylinder cooling shrouds to look just right—time well spent, as the finished product adds greatly to the model's appearance. Bruce recommends painting the engine parts before gluing them to the cowl, which would have saved him a lot of masking work. ■ RIGHT: Du-Bro rigging pins and clevises make excellent rudder controls and tail guy wire attachments. Tail wheel assembly is part of the large hardware package that comes with the kit. It's also available separately for scratch builders; see "Over The Counter," July '93 MB.

muriatic acid as a flux and we had the gear assembled in no time. The gear was sanded clean and the balsa and fiberglass-covered strut fillers were added.

The cowl and wheel pants are fairly easy to assemble, but the simulated Continental engine is more difficult and takes a great deal of care during assembly. I would advise trimming off all of the flashing before gluing the heads and shroud on the cowl. Consult the three-views and plans closely to make sure these are properly positioned. The fuel cap and compass help add scale detail to your plane and are not difficult to assemble

and install.

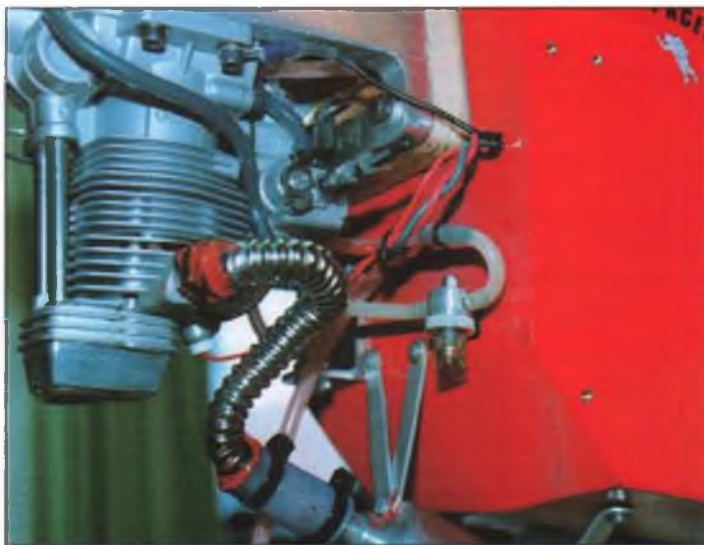
Servo hookup is done in the standard manner, with several pictures in the manual to help with the installation.

I used Sig Koverall fabric and Stix-It adhesive for covering. The model was painted with Sig nitrate clear dope, followed by Sig Supercoat butyrate clear with aluminum paste added. Sig white butyrate dope was the undercoat for the Sig Supercoat light red. The white trim was cut from a trim sheet and positioned over the painted surface; 1/32-inch striping tape was applied around the trim. This put a fair finish on the Spacewalker

## SIG'S SPACEWALKER II

SCALE ..... 3'-1".  
 WINGSPAN ..... 84 inches.  
 WING AREA ..... 1100 square inches.  
 OVERALL LENGTH ..... 60-1/2 inches.  
 FLYING WEIGHT ..... 11-13 pounds.  
 WING LOADING ..... 23-27 ounces per square foot.  
 POWER ..... 90-1.20 two-stroke,  
 1.20-1.60 four-stroke  
 (O.S. 1.20 Surpass with fuel pump  
 used for review model).  
 CONSTRUCTION ..... Balsa, plywood, spruce,  
 ABS plastic cowl, scale engine,  
 wingtips and wheel pants.  
 RADIO ..... Four channels with four  
 heavy-duty 60-ounce thrust servos,  
 and one standard servo.  
 SUGGESTED RETAIL ..... \$209.95.

Produced by Sig Mfg. Co., 481-7 S. Front St.,  
 Montezuma, IA 50171; (515) 623-5154.



It took some planning, but our author managed to plumb the Davis SM-4 muffler so that it's impossible to remove the glow plug without using a special homemade tool! Wiring is for the McDaniel On-Board Glow Plug Battery System, which comes highly recommended by the author for keeping glow engines (especially inverted four-strokes) running reliably at idle or low throttle.



Author took this shot of the D.S. 1.2 Surpass four-stroke with pump on a newspaper because the engine was good news. It is an ideal powerplant for the Spacewalker II, although at the bottom end of the recommended four-stroke engine size spectrum.

An O.S. 1.20 Surpass four-stroke engine with fuel pump was chosen for the Spacewalker II project. It has been some time since I owned an O.S. 1.20, and I found the Surpass with pump to be quite different from the older 1.20 FS I was using several years ago.

I had not operated an engine on glow ignition for some time and had no battery to use for starting. Because the engine was to be mounted inverted, a quick call to Bob

McDaniel solved my problem. A McDaniel Model 176 On-Board Glow Plug Battery System arrived at the Big Bird hangar and the Surpass was soon running happily. I set up the system to supply current at 1/3 throttle and below, which worked well for initial start and in-flight use.

I bench ran the engine for an hour, then for another 20 minutes with it mounted inverted, as it would be in the plane. At the end of the break-in period the engine would turn a 16x8 at 7,300 rpm and a 15x6 at 8,000. Idle was 1,900-2,000. I was a little apprehensive at first about setting up the pump-equipped Surpass but did not experience any difficulties, perhaps because I read the instructions through several times and hooked up the pump exactly as described in the instruction booklet.

I found the O.S. Surpass 1.20 pumper to be a fine performer. A geared Miller starter was used for starting and just a touch would bring the engine to life. Our only problem with the engine was fuel leaking out of the valve cover. We fabricated a gasket from a file card and the problem was solved.

II. (For full details on spray painting with Sig butyrate dope see the March 1993 "Big Birds" column.)

In the past, good quality wheels have been fairly heavy, but Sullivan has recently solved that problem with their new Sky Lite wheels. A 4-inch pair was installed on our model and are holding up well under the 13-pound load.

That weight gives a wing loading of 27 ounces per square foot, which is very good with the semi-symmetrical airfoil used. The

plane could have come out a pound lighter by leaving off the on-board glow ignition system and the D.G.A. pilot, but the McDaniel system enhances the plane's performance, and I do not like to see a scale aircraft—or any Big Bird—without a pilot in at least one cockpit.

In addition to the pilot, the Spacewalker II cries out for instrument panels. J-Tec's instrument sets look good and are very easy to install. To speed things up, I used a black-felt-tipped pen to color the bezels. Give J-Tec's

instruments a try even on a sport Big Bird. They really make it look sharp.

## FLYING

Our review model balanced between the fore and aft extremes shown on the plans. I built in two degrees of toe-in on the landing gear and the Spacewalker II hugged the center of the runway on the first flight.

After climbout and a 360-degree turn we did a fly-by and then tried some loops and rolls. The model tracked well through the loops and had a very nice roll rate for a plane with a scale dihedral. The bright red paint with white trim showed up well against the dark gray clouds present on test hop day.

The muffler we used for flying was a Bob Davis SM-4, which worked very well along with Davis Nitrothane 10 percent nitro fuel. Nitrothane has more castor oil than most fuels.

The wheel pants held up very well on our bumpy grass strip. They also filled up with mud and grass in short order and had to be cleaned out.

The radio system we used was a potpourri of good products. The transmitter was my seven-channel Multiplex Commander. The receiver was a seven-channel R.C.D. Platinum FM. We used two of Multiplex's new Profi coreless motor servos on the ailerons and Hitec HS 500 servos for rudder, elevator and throttle. The battery was a 1250 mAH SR Magnum pack with a Hitec switch.

If you are ready to break away from slab-sided sport planes and trainers and move up to a scale flying machine, then the Spacewalker II is going to be a rewarding experience for you. If scale building is already your forte, consider building two—one to fly and gain experience with and the other to detail to the max for taking home the gold.

The Spacewalker II project has been a pleasure from beginning to end. I would not hesitate to build another or recommend the Spacewalker II to my friends. **MB**

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# PIPER CUBS

by Peter M. Bowers

This book is a must-buy for every American aviation buff. It traces the evolution of the legendary Piper Cub from the classic 1930 Taylor E-2 Cub to the contemporary Super Cubs. Through its 60 years, this remarkable aircraft has changed very little, but its life has been an interesting and important one. . . and Bowers captures the spirit of the "Cub" scene with clarity and color!

Bowers traces the Cub's contributions to aviation, from its prewar growth in popularity and role as a primary training aircraft in WWII, to its postwar service as a classic trainer for private pilots, its subsequent death and rebirth as the #1 civilian aircraft collector's jewel. The Cub's simple but efficient design was copied by many foreign and domestic competitors, establishing the Cub as the most influential lightplane of its era, and remains to this day the single most famous household word in civilian aircraft.

Between them, the Taylor Aircraft Company and its successor, the Piper Aircraft Company, introduced separately designated and certificated models of Cubs between 1930 and 1949. Altogether, Taylor and Piper built nearly 40,000 production airplanes that qualify as Cubs. Of these, some 11,000 are still on the U.S. civil register.

No modern entry-level airplane built since 1950 can approach the operating economy and easy maintenance of the J-3 Cub. The late-model Super Cub, on the other hand, is an entirely different bird and shares only the basic construction and appearance of the lower-powered model. It is a thoroughly modern airplane with a full complement of electrical and electronic gear plus the high horsepower needed to operate in modern high-density air traffic.

Pete Bowers' book describes each of the designated Cub models in sufficient detail to enable you to visually distinguish between such J-3 models as the J-3C-40 and the J-3C-65, the prewar and postwar J-3, and the PA-18-125, PA-18-135, PA-18-150 and PA-18-180. Separate chapters describe some of the unique activities of the aircraft and the modifications that ingenious owners have made to the basic tandem two-seater Cub to make it the world's most versatile puddle-jumper.

*Piper Cubs* includes 10 full pages of outstanding three-view scale drawings by Paul Matt, including the Taylor E-2, Taylor J-2, Piper J-3, and Piper J-4E models. The softbound book is 7-1/2x9-1/2 inches, contains 240 pages, 227 photos and illustrations, eight full-color pages, specifications and index. Only \$17.95 plus \$3.50 shipping, ordered from Aviation Heritage Books, Box 665, Destin, FL 32540; or phone 1-800-999-0141. You'll be glad you did! **MB**

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# SERVO ROUND-UP•PART 2

Bruce takes a look at nine more powerful servos that are well suited to the rigors of flying Big Birds.

Since our first Big Bird Servo Round-Up in the May *Model Builder*, several more large, powerful servos have come to my attention. I want to review these for you this month so that you will have as complete a picture as possible of all the applicable servos currently available.

As before, all of the servos were measured for thrust at a point 3/4 of an inch from the center of the shaft. My numbers will be higher than the ounce-inch torque figures

current draw using a four-cell NiCd pack. With a five-cell pack it developed 180 ounces at 930 mA. It weighs 1.85 ounces and has heavy-duty arms. Mounting lugs are a hefty 0.10-inch thick. It comes with a good hardware package that includes grommets, screws and ferrules. The current price from Multiplex is \$81.

•The second servo tested was a Multiplex Royal M.C. Using a four-cell battery pack the servo developed 109 ounces of thrust and drew 630 mA; a five-cell battery pack gave

ounces of thrust and drew 1020 mA from a five-cell pack. At 0.80-inch thick, the case lugs are thinner than the other Multiplex servos tested. Heavy-duty arms must be purchased separately, but the servo does come with a complete hardware package. Current price of the servo is \$62. This servo has been around awhile and has a square drive. I used two of them with a C.B. servo doubler on my Big Bee with good results.

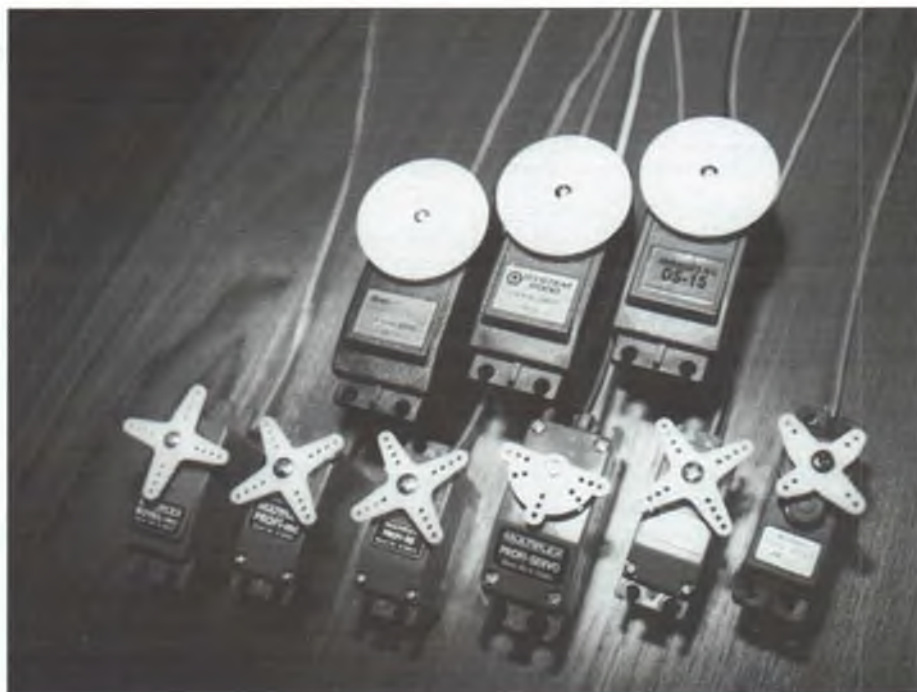
•At \$90, the Multiplex Profi B.B. coreless servo was the second most expensive servo tested this time around, but it's a real powerhouse. It gave 192 ounces of thrust and drew 830 mA on a four-cell battery pack; on a five-cell pack the figures were 229 ounces and 900 mA. It weighs 1.75 ounces, is supplied with heavy-duty servo arms and has strong case lugs, 0.10-inch thick. A full hardware package is included.

•Horizon Hobby Distributors supplied a JR NES-4721 servo. This is the one you've seen pictured lifting a bowling ball. Using our standard test, it gave 176 ounces of thrust on a four-cell pack and drew 1220 mA; a five-cell pack gave 202 ounces of thrust and drew 1400 mA. The complete hardware package includes formed grommets. Case mounting lugs were 0.11-inch thick, but unfortunately there were no matching heavy-duty servo arms; the ones supplied were 0.75-inch thick. The current price is \$99.95.

•Danielle's R/C supplied one of their DS-15 servos along with a copy of their catalog. Danielle's is one of the finest hobby shops in the south. You can visit their well-equipped store or shop by mail.

Danielle's DS-15 is a robust servo weighing in at 2.75 ounces. It delivered 226 ounces of thrust and drew 1280 mA on a four-cell battery pack. A five-cell pack delivered 273 ounces of thrust and drew 1550 mA. The case has 0.10-inch thick lugs, and an excellent hardware package is included. Sale price is only \$28.95 each. The servo may be ordered with any of the popular servo plugs.

•Tower Hobbies is one of the biggest mail order houses in the business. You would expect them to have a good big servo for their customers, and indeed they do. Their TS-72 delivered 218 ounces of thrust from a four-cell battery and drew 1150 mA; the five-cell pack gave 260 ounces and 1920 mA. The case lugs are 0.10-inch thick. The excellent hardware package includes heavy-duty arms and wheels. Tower's TS-72 servos are priced



Our second in a series of servo tests takes in nine different units. Top row, from left: Hobbico CS-72, Tower Hobbies TS-72, and Danielle's R/C DS-15. Bottom row, from left: Multiplex's Royal MC, Profi MC, Profi BB, Profi, and Micro BB; and JR's NES-4721.

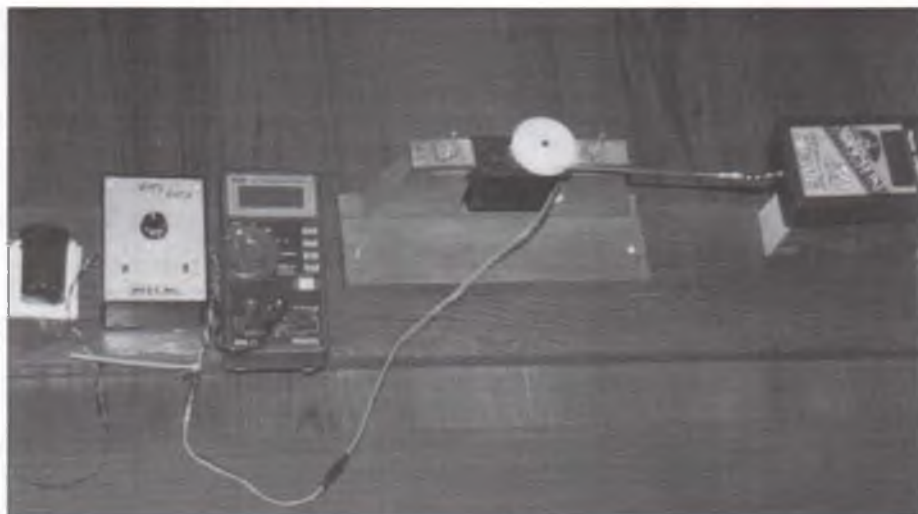
specified by the manufacturers because they make those measurements with the pushrod attached 1 inch out on the servo arm. However, because not all servo arms are long enough to duplicate that test, I instead went with 3/4-inch on all of them to provide a common basis for comparison. All of the servos tested are quite fast, transit times ranging from 0.18 second to 0.25 second for 60 degrees of travel. Rest assured, they all move quickly, even for the most demanding Tournament of Champions contender.

•Our first servo in this second series of tests was the Multiplex Profi 6-5053. It gave 141 ounces of thrust at 780 milliamps (mA)

135 ounces of thrust at 810 mA. The case mounting lugs are again 0.10-inch thick, and the servo weighs approximately 2 ounces. It has heavy-duty arms and a good hardware package with formed grommets, ferrules and screws. Current price is \$73.

•The Multiplex Micro BB servo gave 174 ounces of thrust at 830 mA from a four-cell battery; a five-cell pack delivered 221 ounces at 970 mA. The Micro BB has a spline drive, a full hardware package and heavy-duty servo arms. Case mounting lugs are 0.10-inch thick. Current price is \$72.

•The Multiplex Standard Profi BB servo developed 114 ounces of thrust using a four-cell pack and drew 900 mA. It gave 137



This was Bruce's servo test setup. It held up well under all conditions.

at \$24.99 each and are available with any of the popular servo plugs.

• We'll wrap up by looking at Hobbico's CS-72 servo. I found it gave 220 ounces of

Nashville, TN 37207.

Hobbico, P.O. Box 9021, Champaign, IL 61826-9021.

Horizon Hobby Distributors (JR radios),



Bill Pottage built this gorgeous Waco 10 from an Ikon N'wst kit. It's powered by an O.S. .91 four-stroke. Bill says it's a great flying model, something you can shoot touch-and-go's with all day long and never get bored.

thrust at 1260 mA using a four-cell pack; a five-cell pack delivered 268 ounces of thrust at 1550 mA. The arms and wheels are all heavy-duty, and the case lugs are 0.10-inch thick. The servos are priced at \$24.99 each, and are available with any of the popular servo plugs.

All of the servos tested in these two series are from very good to excellent in quality. I would not hesitate to use any of them. Some servos will fill specific needs better than others, so it's up to you to determine which servo is best for a particular application.

Many thanks to the following distributors who sent servos to be reviewed in our second Big Bird Servo Round-Up:

Beemer R/C West Dist. Inc. (Multiplex radio distributor), 17252 E. Falcon Dr. #3, Fountain Hills, AZ 85268.

Danielle's Hobbies, 3141 Ambrose Ave.,

4105 Fieldstone Rd., Champaign, IL 61821.

Tower Hobbies, P.O. Box 9078, Champaign, IL 61826-9078.

• • •

One of the characteristics I noticed while testing all these servos was that those with a ball bearing on the output shaft performed more efficiently than an equivalent servo with a composite bearing. The ball bearing servo put out more thrust for the same amperage.

While attending the Northwest Model Expo in February, I visited the L.D.M. booth and got a close look at their ball bearing upgrade kits for a number of various servos. I happen to have a JR radio, and by adding the L.D.M. bearings, the standard NES-507 servo is upgraded to the equivalent of a 517. L.D.M.'s instructions are easy to follow and in less than 30 minutes I had replaced the white

composite shaft bearing with a high-quality ball bearing in all four servos.

The JR servos and radio will be used in our up-and-coming review of the Great Planes Ultra Sport 1000. I am using one servo on each elevator half and one on each aileron. A JR 4721 servo will be used for the rudder and nose wheel. **MB**



### AL ALMAN

It is with a great deal of sadness that I must report that my friend and mentor, Al Alman, former Big Bird columnist for *Model Builder*, died in May after a lengthy illness that finally brought the big fellow to his end.

Ken Rowe and I assisted Al's sons, Mark and Adam, and two daughters, Dawn and Jill, in carrying out Al's last wishes to have his ashes spread at the local Big Bird flying site. It will please Al's friends to know he now rests peacefully near the Bald Hills, in Washington, in a place of quiet beauty just made for Big Birds to spread their wings.

Al did much to further the cause of Big Birds. He was a founding member of the International Miniature Aircraft Association and served as District XI Director for several years. Al worked with the E.W.H. Company that sold the equipment and engines used in the early years of the Big Bird movement. I'm sure he influenced many developments now common in our hobby.

Big Birds led Al to his column in *Model Builder*; he was the magazine's first Big Bird columnist. Many of you cut your teeth on Big Birds by following Al's expertise, which he freely shared in his column.

Al moved to the Great Northwest about 11 years ago and I was pleased to see a Big Bird man of his stature come to our area. Al and I hit it off right away and became good friends—his son Adam still calls me "Uncle Bruce."

Al was a founding member of the Puget Sound Rocs, IMAA Chapter 108. The Rocs are sending a donation to the Kidney Fund in Al's memory, at the family's request, in lieu of flowers.

I wish to extend my condolences, as I am sure all Big Bird enthusiasts do, to the Alman family and say farewell to a good friend. He will be missed!

# ELECTRONICS CORNER

BY ELOY MAREZ

## • BECs Revisited

For opensers this month we have an old subject, new letter; this one from Frank Hamilton in Reno, Nevada:

"I have enjoyed your articles on the Cox Failsafe radios. I must admit, however, that I enjoy using mine in the stock form. I have two questions: 1) How can I run a 30-watt HiLine motor pulling about 12 amps and use the Cox B.E.C.? And 2) If I use a regular model aircraft [internal combustion engine], how large an aircraft can I build?

applied voltage is the key to the *output* power that the motor will produce; the current that will flow is determined by the resistance of the motor, which was determined by its designer.

This matter of applied voltage is important to understand. You can take even a small motor like this one and apply 100 volts to it. It will run like hell, but not for very long before it self-destructs. You *must* keep within the specified limits!

Watts are the product of volt-

nothing more than an electrically operated switch, the simplest thing to do, were weight and size not a consideration, would be to leave the Failsafe's original small relay in place and use it to operate a huskier relay capable of handling the motor current. However, size and weight *are* a consideration, so let's take out the little relay and put in a larger one.

By yet another coincidence, I recently learned about a relay that is only slightly longer than the one originally used on the Cox receiver, yet is rated at 5 amps at 30VDC. At the lower voltage required by Frank's 30-watter, a couple of amps more or less should not make any difference.

Installation is relatively simple. Refer to the partial drawings of the receiver PC board. Note the original connections and the two jumpers that have to be added to accommodate the slightly larger relay. To add a bit more mechanical integrity, I would suggest a small piece of thin double-sided tape be placed between the relay and the PC board.

The relay is available as part of a channel expander; a very clever device suitable for scale RC boats and/or cars but having no application for aircraft. It is priced at 95¢ plus \$1 shipping (and sales tax if in California) from: High Sky, 3929 Kansas St. #9, San Diego, CA 92104. Ask for the 5A OMRON relay for the 7-Channel Multiswitch.

Now for Frank's second question! As it turns out, this question is no easier to answer than the first one, as the necessary control surface power is not determined solely by wingspan or engine size. The model's weight and flying speed are actually greater considerations. One of my other readers reports he has measured the torque of the Cox servo at about 16 inch-ounces, which is not bad for a little guy like that. In any case, one is not normally going to fly really high-performance models with only one channel. For a powered glider "floaters" I would not hesitate to go to 36 inches or so. The servo should also handle an .049



Testing a servo completely removed from the parent RC system is the only way to isolate any real or suspected problems. The inexpensive (\$19.95 kit; \$24.95 assembled and tested) "Servo Mate" from KMI (115 E. Main, Northville, MI 48167) handles all such test chores correctly and rapidly.

"I had forgotten how much fun single-channel flying can be, and I would like to build some of the S/C aircraft, either full-scale or reduced scale (electric)."

By coincidence, I covered BECs in detail in the June column, and would like to refer Frank and all of you who might have interest in the subject to that issue. To review: the BEC provides power to the receiver and servo(s) *only*. The motor cut-off circuitry, which is what Frank is really referring to, is something else entirely. You can have one or the other, or both, but they are as different as your transmitter and receiver.

Thus the question is really how to use a higher power motor with the Cox Failsafe receiver. Bear with me, I'll get to it, but there are other facts we need to clarify first. The "30-watt" value referred to in the case of the HiLine motor—and let's hope for all motors—is the maximum electrical energy it is capable of handling; its *input* power. There are other specifications that must be considered, such as the maximum voltage that will result in an acceptable motor life. The

age times current (in amps). A 30-watt motor drawing 12 amps has to be running on only two cells (30W divided by 12A = 2.5V). This is not the gospel on electric motors according to Eloy; this is Ohm's Law, which applies in all cases and which is completely inflexible.

Let's apply a more realistic figure: 6 volts (five cells). In this case, 30 divided by 6 gives us 5 amperes. To further confuse the issue, the size of the propeller and the weight of the airplane are going to load the motor and increase the current drain.

So what's the answer? Not having access to all the facts, I can only make some educated guesses, the first one being that a normally loaded 30-watt motor running on four or five cells is going to be pulling little more than 5 amps. Educated guesses or not, one thing is certain: the motor current, whatever its exact value may be, is being carried only by the relay contacts, and nothing else. So all we have to do is replace the relay with one with heavier points, right? Right!

Keeping in mind that a relay is

engine-powered scale type airplane like Frank describes up to 18 inches, however, it would be a handful without an elevator. Anyway, Frank, good luck—send pictures!

## STILL MORE FROM COX

Cox Products has just released a two-channel failsafe system. The transmitter contains a video game type of control mechanism; the receiver unit is slightly shorter and the system uses two individual servos.

I have one of the units, but have not had time to really dig into it, except to confirm that there is not enough room in the case to install a normal stick assembly to convert it to full proportional, as I did with the single-channel unit. However, all is not lost; the transmitter electronics can be put into a slightly larger case with little effort and for little money. Don't write for more information; I'll publish it as soon as I have time to work out the details.

## ITEMS OF INTEREST

High Sky was mentioned earlier as the source for the relay to be used for converting the Cox receiver. In addition to the boat-oriented item mentioned, High Sky also has a number of electronic goodies of interest to us airplane buffs. . . such things as a small, lightweight (1.2-ounce) on-off electric motor control for 1 to 50 cells, available both with and without a BEC.

An interesting device, appropriately called a "Thermal Navigator," is available for sailplane fliers. It connects between the receiver and rudder servo, and signals that you are losing altitude with a slight touch of left trim; altitude gain causes a slight right turn. Obviously, this is a great help in locating lift and sink, and will eliminate confusion when your model is already at high altitude without visual reference points.

There are other products, some available now and some under development. Drop an SASE to the address previously

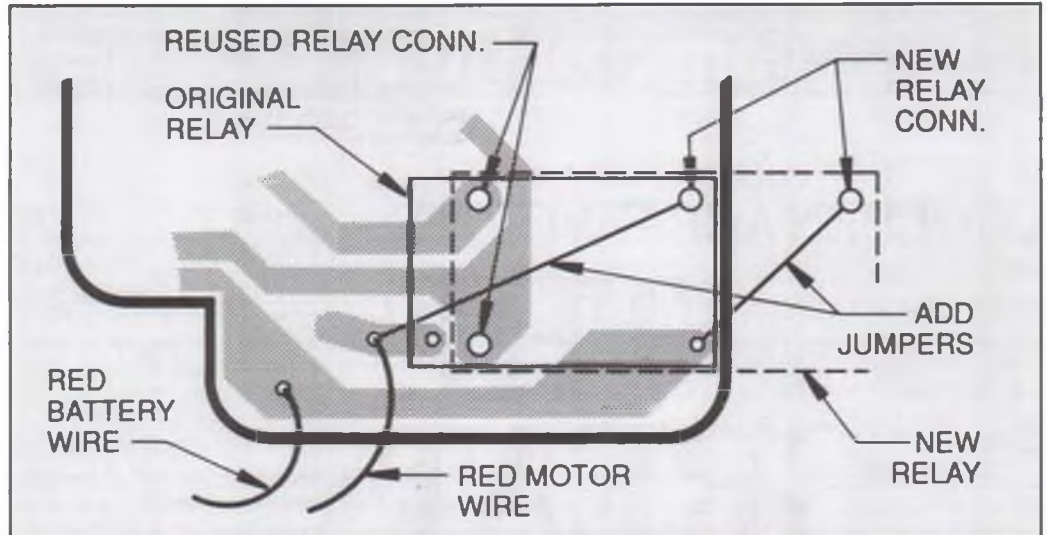


Diagram showing the installation of a beeper relay in the Cox Failsafe receiver, making it able to handle the higher currents of motors larger than those supplied with the Cox RTF models. Details in text.

given for the latest descriptive catalog and price information.

*F.Y.I.—Model Flight* is the name of the latest addition to my RC library. This 212-page compendium of all things of interest to the RC enthusiast is edited and published by Don Edberg, himself an immensely successful builder/flier.

*F.Y.I.* is divided into special-

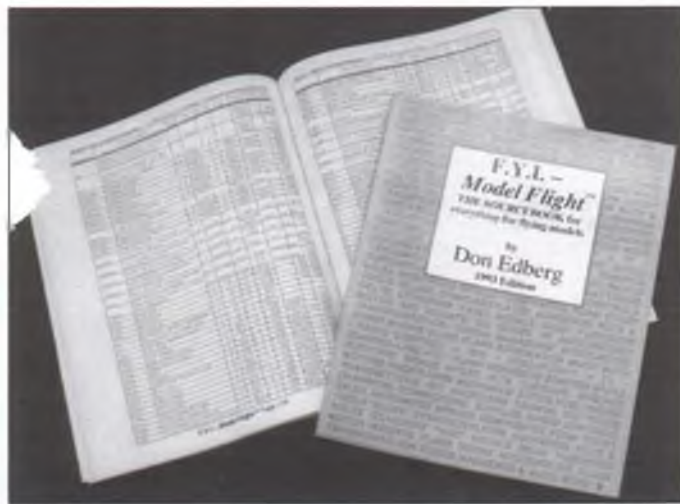
roundup, again with sizes, weights, type, frequency, channels, etc. Even some not-often-seen but interesting data is readily available here: the least expensive receiver listed is a two-channel Airtronics unit at \$50, the most expensive is Futaba's R309 at \$630.

The same type of information is furnished for RC systems, from Ace to VL. The "Servo Survey"

factor with a claim for warranty service because "it never worked from new"! Still, such things go on all the time, and maybe having the proper information will save a few servos from being barbecued.

Last but not least, there is a listing of 150 electronic speed controls, some of which I had never heard of. Again, all pertinent information is here to help you make the right selection.

Don's book is a recommended reference for all active modelers. It is available from Dynamic Modeling, 4922 Rochelle, Irvine, CA 92714-2941, and is priced at \$19.95. First-class postage is \$1.40 extra, as is \$1.55 tax for California residents. The RC system comparison and servo conversion charts are available separately at \$2 and \$1 respectively.



Edited and published by the well-known Don Edberg, this recently released book, entitled *F.Y.I.—Model Flight*, contains a wealth of information for the active model builder and flier, including data on all important RC electronic products.

ized sections: companies by product and/or by name, descriptive listings of models from control line to RC helicopters, engines and motors, etc., etc. Every item is fully described with sizes, weights, etc.—all the info you will need to pick the one best suited to your specific application.

Of special interest here are the lists of purely electronic items, starting with a receiver

includes weights, sizes, torques, speeds, bearing types and prices for all popular and some not-so-well-known servos. Included also are directions for interchanging servos from one manufacturer to another by modifying the plugs and the wiring sequence. I cannot give my complete blessings to these procedures, having seen too many servos damaged by reversed connections sent back to the manu-

Multiplex RC, one of Europe's most popular brands of radio control equipment, is represented in this country by Beemer R/C in the Phoenix, Arizona area. For those of you who already own one of these fine radios, or for those who may want to know more about them, I wish to inform you of their new address: 13827 N. Wendover Dr., Fountain Hills, AZ 85268; (602) 837-0311, FAX (602) 837-0155.

Sometime last year, Multiplex introduced a new servo with some rather advanced technology, incorporating parameter programming such as we have seen in transmitters for some time. I expect to have one of these servos soon, and will be telling you all about it in a future column. **MB**

## A GOLDEN AGE FAVORITE:

# THE GREAT LAKES

BY AL WHEELER

**One of the more popular Golden Age aircraft was the Great Lakes, unique in that its production, although spotted, spanned more than 50 years. Al's EEE-Z-FLI version spans 40 inches and is designed for .25 power.**

For his in-line engine model, Al duplicated the black-and-yellow color scheme and N705K registration numbers from the full-size Great Lakes 2T-1 he owned back in the 1950s. Bet he wishes he owned it now!



In March of 1929, the Great Lakes Aircraft Company, of Cleveland, Ohio, introduced a two-place open biplane that was to become a legend. Powered by a 90-horsepower four-cylinder upright Cirrus engine, it had a span of 28 feet 6 inches, was 20 feet in length, and weighed 910 pounds empty—not a large aircraft. Although initially conceived as a trainer, later appreciation of its excellent aerobatic capabilities saw the little biplane become the favorite mount of many airshow stars.

Engine changes in the quest for more power were many, with the Menasco B-4 Pirate being a favorite. One of the best known was a “big tail” 2T-1A powered by a 150-horsepower Menasco C4-S and campaigned around the airshow circuit by the very capable Tex Rankin. Further engine changes saw the use of 175- and 200-horsepower inverted Rangers, several Kinners and the 185-horsepower Warner radial. Airshow greats Hal Krier and Bob Nance used the 185 Warner, as did the much-modified Hunt Special. The 200 Ranger was the choice of Clyde Parsons in his Gold Coast Air Show presentations. Two interesting Ranger-powered examples are currently

being flown from the Sonoma County (Schellville) airport in California by Bill and Jan Ewerts—real “his and hers” aircraft popular throughout the West Coast fly-in circuit.

For our trip back to the Golden Age we have elected to model the original 2T-1 and the 2T-1A powered with the original upright Cirrus and, as a companion effort, a “round engine” special, typical of the higher powered airshow performers.

### GENERAL

Prior to cutting wood, get familiar with the drawing and the building instructions. Both the inline and radial versions are the same from the cockpit back, and the tail surfaces and wings are the same. Differences are noted in the instructions. If unable to resolve any problems, don't hesitate to contact me in care of the magazine.

Construction is not difficult (an EEE-Z-FLI feature) and no exotic, hard-to-find materials are used. Flight characteristics of both versions are quite pleasing. They are very aerobatic and have no bad low-speed traits. Ground handling is typical narrow gear taildragger: quick but with positive rudder control.

### STAB AND FIN

Tail surfaces are 3/16 medium balsa. Join the elevators with a dowel and round all edges. Mark and slot the stabilizer, elevators, fin and rudder for hinges, and install hinges in the stabilizer and fin only.

### LOWER WING

Edge-join the bottom skins; note that they extend full chord and from the root to the tip. Mark the locations of the ribs and spar directly on the bottom skin so that the entire wing may be built on top of the skins.

The 1-3/4 inch trailing edge stock will later become both the ailerons and the trailing edge strip at the hinge line when the ailerons are cut loose. The R1 ribs are flush with the top of the spar and 1/16 inch below the



top of the trailing edge; the R2s are 1/16 inch above the top of the spar and flush with the top of the trailing edge. The strips between the R1 ribs at the front face of the trailing edge, flush with the top of the ribs, provide support for the rear edge of the center section skin. The R3 ribs are all the same and are notched for the leading edge dowel only after they are installed. Use a 5/16-inch rattail file to do this, keeping the file in contact with the bottom skin so the dowel will seat on its top surface.

The wingtip and the filler between the leading edge of the two outboard ribs are 3/16 balsa. The upper center section skin is fitted from the face of the trailing edge to the *centerline* of the spar. The leading edge sheeting is one piece from the root to the tip rib and fits from the rear face of the spar to the leading edge dowel. You will need to cut a notch to fit the center section skin, which extends to the spar midpoint. When dry, the top and bottom



The plans show both the in-line (90-horsepower Cirrus) fuselage and a latter "round engine" fuselage typical of the higher-powered radial engine aircraft. The rest of the airplane is the same.

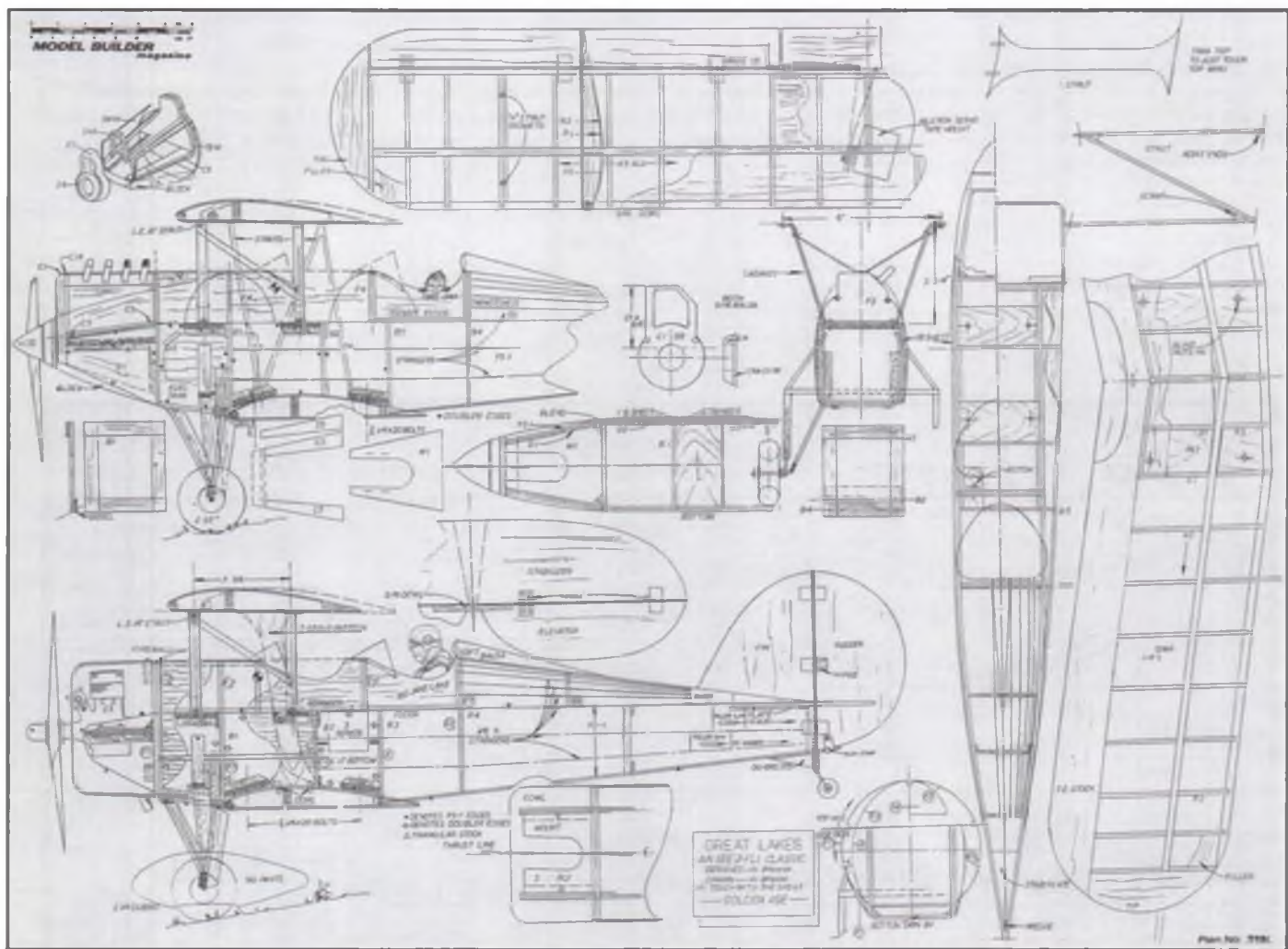
skins can be blended smoothly into the leading edge dowel.

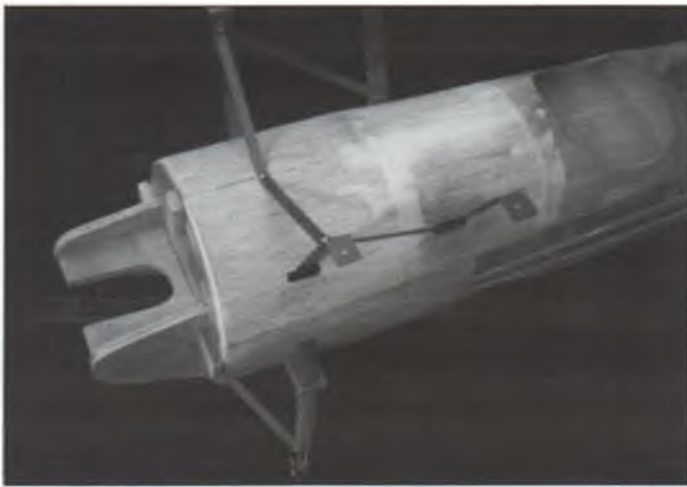
Sand the root ribs to form a good joint with a straight leading edge and with both tips

elevated 1/2 inch. Mark the outboard ends of the ailerons and mark the line for the aileron cutoff 1-1/2 inches in from the trailing edge. Starting at the

root end, cut off the entire aileron section and the inboard aileron ends.

The two wing halves can now be joined with both tips el-





■ LEFT: Close-up of the engine mount and cabane strut installation on the Great Lakes fuselage (radial version). Cabanes are bent from regular hobby shop brass stock and are bolted to plywood plates in the fuselage. Top sheeting is put on after the cabanes are in place. ■ RIGHT: Upper wing bolts to the cabane via four bolts. Blind mounting nuts are set into plywood plates glued to the top of the bottom sheeting.

evated 1/2 inch. Also join the center trailing edge so that it has the same dihedral angle as the wing, but *do not* attach it to the wing at this time; it must first be grooved to accept the housing for the aileron control rods, which I bent out of coathanger wire. With the finished aileron controls in place, carefully align the trailing edge section with the wing and cement in place. Make sure the bottom is parallel with the bottom wing skin. Install a 2-inch band of glass tape around the wing at the center section.

#### UPPER WING

Construction of the top wing is the same as the lower, with the exceptions that there are no ailerons and the wing can be built in one piece flat on the

board, as there is no dihedral. Prior to skinning the center section and the leading edges, install 4-40 blind nuts in the cabane strut attachment holes on the bottom surface. For extra strength, skin the center section with one piece of wood between the outboard R1 ribs.

#### FUSELAGE

The basic "box" is the same for both versions with the exception that the sides (FS1) extend farther forward on the Cirrus version and are scored and bent inward at the firewall to form the "pointy" nose, this to be done prior to installing doubler D1. Doublers D1 through D4 (D2 through D4 on the Cirrus version) are glued to one FS1 with spaces in between to accommodate the bulkheads.

Install the firewall and bulkheads B1 through B4 on one FS1, then place the remaining FS1 on the building table (doublers up) and cement the bulkheads into the slots. On the Cirrus version, score and bend the front ends of FS1 as shown and install D1 now.

Glue the fuselage sides together at the tail post and install the verticals and cross members in the aft fuselage. Install the upper formers (note the differences between the two versions) as well as the plywood cabane strut supports and the triangular reinforcements. Install 4-40 blind nuts on the bottom side.

Bend the cabane struts from 1/16x1/2-inch brass or aluminum according to the drawing. Note that the round engine

model has side formers, is sheeted with 1/16 balsa back to B2 and has stringers from there aft. It's better to install the stringers later, as handling may crack them. There are no side formers on the Cirrus version, just 1/8 sheet back to B1 and stringers, flat on FS1, from there back. The aft bottom of the fuselage is skinned with 1/16 cross grain balsa.

Install the cabanes with 4-40 hex socket screws. Install them *tight*, as this is your last shot shot at it! It might be wise to put a drop of CA on the bottom where the screw comes through.

Because the upper fuselage skin is done in two pieces, joined at the top stringer, getting it on with the cabanes in place is no problem. Make the slots a little longer than the strut

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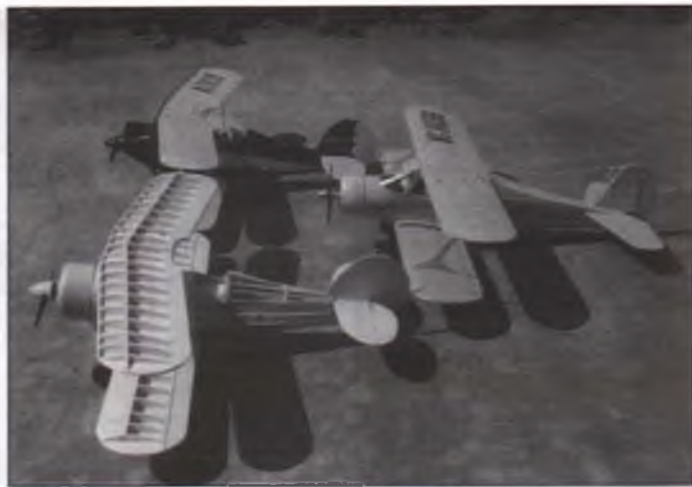
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■ LEFT: Here the powerful Great Lakes is almost ready to cover. Note the wing construction—fully sheeted on the bottom, sheeted from the spar forward on the top. This is typical of all of AJ's EEE-Z-FLJ efforts. ■ RIGHT: Three EEE-Z-FLJ oldies but goodies: the two versions of the Great Lakes being followed in close formation by AJ's Staggerwing Beech (MB plan #2921, \$14). AJ has still more semi-scale projects coming—watch for 'em!

width and about 1/4 inch wide with rounded ends. Assure a good bond on all edges. On the Cirrus version, note that the top skin breaks at B1 and tapers forward to F2.

The engine support and triangle braces are installed with epoxy. On the Cirrus version, install the C1 nose block assembly, assuring that the hole centers around the shaft of your engine. Install the side blocks

and the bottom block. Trial fit the engine so the rear prop flange protrudes far enough ahead of C4 to leave room for a spinner. Install both lower wing supports with epoxy.

### LANDING GEAR

The main gear legs fit side by side in the slotted cross support in the fuselage. With them in place, check the axles for toe-in or toe-out and bend them as


required. The front brace and the bend for the solder joint is a trial-and-error job, best done with soft wire to establish a pattern.

Measure from the firewall back and the bottom of FS1 to establish the location of the 3/16 dowel that goes through the fuselage. Start with a small drill and drill each side carefully. Gradually open up the holes to accommodate the

dowel. Recheck alignment and install the dowel. Add a soft balsa fairing to the rear side and sand to shape. The upper brace is of medium hardwood sanded to an oval shape.

On the round fuselage cut a short slot so the end of the brace fits into the skins and cement in place. On the Cirrus version it attaches to the outside of the 1/8 sheet. Make the shocks from


*continued on page 40*



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6 X 2	1	1.59	9 X 9	1	1.99	12 X 6	2	2.89	13 X 7	4	2.25	15 X 8	10	12.95
6.3 X 4	3	3.95	9 X 10	1	1.99	12 X 7	2	2.89	13 X 8	4	2.25	15 X 10	10	12.95
6.5 X 2.9	2	3.95	9.25 X 5.0	4	3.95	12 X 8	2	2.89	13 X 9	7	7.95	15 X 11	10	12.95
6.5 X 3.7	2	3.95	9.25 X 5.25	4	3.95	11 X 10	7	7.95	13 X 10	7	7.95	15 X 12	10	12.95
6.5 X 5.0	3	3.95	9.25 X 5.5	4	3.95	11 X 11	7	7.95	13 X 11	7	7.95	16 X 8	12	12.95
6.5 X 5.5	3	3.95	9.25 X 5.75	4	3.95	11 X 12	7	7.95	13 X 13N	9	7.95	16 X 10	12	12.95
6.5 X 6.0	3	3.95	9.25 X 6.0	4	3.95	11 X 12W	7	7.95	13 X 13.5N	9	7.95	16 X 12	12	12.95
6.5 X 6.5	3	3.95	9.5 X 6.5N	5	3.95	11 X 13	7	7.95	13.5 X 9	7	12.95	16 X 14	12	12.95
7 X 3	15	1.59	9.5 X 7.0N	5	3.95	11 X 14	7	7.95	13.5 X 10	7	12.95	16 X 16	12	12.95
7 X 4	15	1.59	9.5 X 7.5N	5	3.95	11.5 X 4	8	2.89	13.5 X 11.5N	7	12.95	9 X 6P	Pusher	3.95
7 X 5	15	1.59	9.5 X 8.0N	5	3.95	12.25 X 3.75	8	3.49	13.5 X 12.5	10	12.95	10 X 6P	Pusher	3.95
7 X 6	15	1.59	9.5 X 8.5N	5	3.95	12 X 9	7	7.95	13.5 X 13.3	10	12.95	10 X 7P	Pusher	3.95
7 X 7	15	1.59	9 X 6.5	5	3.95	12 X 9W	7	7.95	13.5 X 13.5	10	12.95	10 X 8P	Pusher	3.95
7 X 8	15	1.59	9 X 7.5	5	3.95	12 X 10	7	7.95	13.5 X 14	10	12.95	11 X 6P	Pusher	3.95
7 X 9	15	1.59	9 X 8.5	5	3.95	12 X 10W	7	7.95	13.5 X 14W	10	12.95	11 X 7P	Pusher	3.95
7 X 10	15	1.59	9.5 X 4.5	11	2.29	12 X 11	7	7.95	14 X 5N	12	12.95	14 X 6P	Pusher	12.95
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7.8 X 7	6	3.95	10 X 5	2	2.29	12 X 12	7	7.95	14 X 10	12	12.95			
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8 X 4	14	1.79	10 X 7	2	2.29	12 X 12W	7	7.95	14 X 12 N	10	12.95			
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8 X 6	17	1.79	10 X 9	2	2.29	12 X 13N	7	7.95	14 X 13N	10	12.95			
8 X 7	17	1.79	10 X 10	2	2.29	12 X 14	7	7.95	14 X 13.5	10	12.95			
8 X 8	17	1.79	10.5 X 4.5	11	3.95	12.5 X 9	7	7.95	14 X 13.5N	10	12.95			
8 X 9	17	1.79	11 X 3	2	2.49	12.5 X 10	7	7.95	14 X 14	10	12.95			
8 X 10	17	1.79	11 X 4	2	2.49	12.5 X 11	7	7.95	14 X 14N	10	12.95			
9 X 4	16	1.99	11 X 5	2	2.49	12.5 X 11.5	7	7.95	14.4 X 10.5	10	12.95			
9 X 5	16	1.99	11 X 6	2	2.49	12.5 X 12	7	7.95	14.4 X 12	10	12.95			
9 X 6	19	1.99	11 X 7	2	2.49	12.5 X 12.5	7	7.95	14.4 X 13	10	12.95			
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■ TOP LEFT: El Gallito Industries is one of Costa Rica's major candy manufacturers and a sponsor of the Tropical Fun-Fly. Karla Granados (left) and Marcia Castro came to learn about RC airplanes, such as Jerry Kitchin's Extra 230, and to pass out sweets to the kiddies and smiles to the rest of us.

■ TOP RIGHT: The Dynamic Duo that made it all happen—on the left is Alberto Estraviz, the CO affectionately known as the "Cuban Director," and Mr. Costa Rica RC himself, founder and organizer of the Tropical Fun-Fly, Julio Pastora. They want to see YOU in '94.

■ ABOVE: The flight line included a little of everything, from giant scale down to 1.2A, RC and control line. A well-controlled flight line and light scheduling, with bilingual announcements, kept something in the air at all times.

■ RIGHT: Jerry Kitchin's "Best of Show" Super Corsair on its takeoff run from the Los Reyes Country Club runway, site of the Aeromodelismo Costa Rica flying field. Though located an hour or so from the heart of San Jose, it does not detract from the large crowd present every year for this international event.



# COSTA RICA PHOTO ALBUM

BY ELOY MAREZ

Eloy again journeys south of the border to attend one of the best known and most popular fun-fly events anywhere in the world.

■ **BELOW:** Luis Sanchez, well-known Florida RC chopper flyer, showing the style of flying that earned him the "Most Aerobatic" award this weekend. ■ **BOTTOM:** Jets were much in evidence and quite successful in spite of the high (3,500 feet) altitude. The F-4 seen here belongs to Javier Fernandez. Also on hand were a Buran F-16 and an F-86 flown by Mr. Jet Hanger Hobbies' Dimas and Larry Wolff.



The Aeromodelismo Costa Rica Tropical Fun-Fly is definitely an established event, with a large number of former attendees returning from 10 countries to attend the 1993 gathering, now in its 11th running. It does seem hard to believe that we've been doing this for 10 years prior to this last one—to paraphrase a common saying, how time flies when you're flying RC!

The 1993 Fun-Fly, witnessed by 4,000-plus spectators, took place May 6-9, with about 75 airplanes awaiting their turn at the airspace. At Sunday's awards dinner, the following persons were honored:

- ◆ **Best of Show—**  
Jerry Kitchin, California.
- ◆ **Best Finish—**  
Frank Reyes, Florida.
- ◆ **Best Crash—**  
Raphael "Pepo" Cano, Panama.
- ◆ **Best Overall Performance—**  
Clark Hopkins, Florida.
- ◆ **Most Aerobatic—**  
Luis Sanchez, Florida.

Special Awards were also made to Mayra Baker, the self-appointed special assistant to the event organizer, who through it all manages to keep her great smile; to Albert Estraviz, U.S./Canada event coordinator; and to Eileen Miller of the Hotel Irazu, who efficiently ar-



■ ABOVE: Denise Alfara, also from the Republic of Panama, with the Sig Matriking Arrow dubbed "Bad to the Bone" by her husband Boris and which he claims to have built especially for the Tropical Fun Fly—in just 10 days!

■ RIGHT: The distaff side is not going to be left behind anymore! Janet Evans is the last "True" lady to fly publicly, seen here playing glider tag with the clouds. Because of their predilection for adding "tica" to a word to make a diminutive, instead of the more common "ito," Costa Ricans are known as "ticans." ■ FAR RIGHT: Control line is alive and well in Costa Rica; here we see two of its main proponents, Sergio and son Jorge Suberle. They are both first-class buidarcwood fliers and are always an active part of the weekend's activities.



ranged for everything from storage of airplane boxes to our dinner menu. My good friend, Panama's "Pepo" Cano, was honored for being one of the prime advocates of model aviation throughout Central and South America, as was his wife Lissie for her support

of him. And we all appreciate the sponsorship, assistance and friendship of the following: LACSA, The Airline of Costa Rica; Fabrica Nacional de Licores (national distillery); Compania General de Telefonos (telephone company); El Gallito Industrial

(candy); Cervecería de Costa Rica (brewery); El Hobby Shop; Hotel Fiesta (beach); Hotel Irazu (city); and Texson Precision Products, Miami.

And of course, all of us wish to thank Julio Pastora, Mr. Radio Control in Costa Rica, for his unselfish volunteering of the time and effort necessary to not only get an event of this magnitude off the ground, but to see it through to a successful landing. Julio is, in true Costa Rican tradition, an ambassador of "Pura Vida"—the good life!

The 1994 Fun-Fly, to take place in early May, is tentatively planned in two parts: a one-design sport airplane contest during one day, and the usual fly-what-you-brung the next day. This is truly a family affair, with

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**▶ FAR LEFT:** The enthusiastic, ambitious and talented Panamanian Air Force, spearheaded by Captain "Pepe" Carré (behind the sign), is always present. There is a 14-hour road trip, with all of these models and all of these people in one van—well, into a small trailer.  
**▶ LEFT:** Multi-Catalaned Kalle Martin, the real/serious behind Bob Martin RC Models, was the first American lady RC pilot to fly here; same—where but there in the wild blue yonder is her ET 40, probably enjoying the view.

special activities for wives and other non-pilots. It's not too early to get your name on the list for information.

Contact either Albert Estraviz, Texson Precision Products, 3615 Northwest 20th Ave., Miami, FL 33142;

(305) 635-3134, or Julio Pastora, Box 44-1017, San Jose, Costa Rica; (506) 32-2681. **MB**

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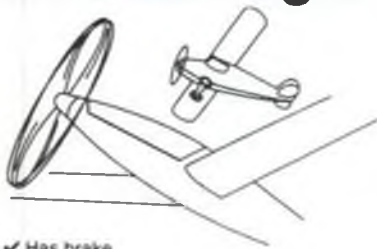
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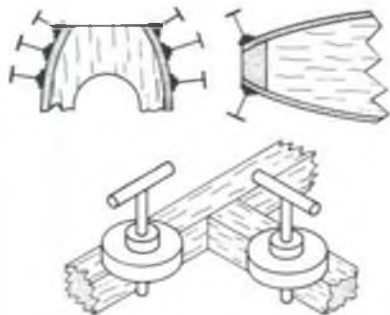


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## GREAT LAKES continued from page 35

soft balsa. Drill them to accommodate the wire guide and make the "wire" strut. The bottom end that fits over the axle is an electrical terminal crimped onto the wire with the upper end free sliding up into the "shock." These will be installed with the rest of the gear after covering.

### COVERING

For ease of application, excellent shrink-ing properties and lasting color, the writer recommends Super MonoKote for all EEE-Z-FLI covering applications. Following covering, trim the MonoKote from any joint areas to assure good wood-to-wood contact.

### ASSEMBLY

Install the stabilizer and fin, assuring they are both level and square with the fuselage centerline. The landing gear may be installed and the wood fairing strips added to the wires. Solder the lower joint. These may be filled and painted the required color. A short piece of fuel tube between the shock strut and the inside of the wheel acts as a good cushion.

Fuel proof the engine compartment and install the engine and throttle control cable. The servos may now be installed, three abreast—rudder, elevator and throttle. Stuff the fuel tank in place and connect the fuel lines.

Drill and tap the holes for the 1/4-20 lower wing mounting bolts and bolt the wing in place. Prior to drilling, check from a common point on each wingtip to the tail post to assure the wing is square with the fuselage centerline. Bend and install the V-brace between the forward cabane struts. It should touch the fuselage top and maintain the 6-inch dimension between the wing mounting holes. Place the top wing upside down on a padded surface and bolt it to the cabanes with 4-40 bolts. Note that the fuselage can be rocked sideways at this point.

Support the model so that the measurement between the top and bottom wings at the tips is the same on both sides. Install a screw through the hole in the V-brace into the fuselage top. Install the diagonal braces between the front and rear cabanes, maintaining the fore and aft dimension of 3-5/8 inches.

Insert servo mounting grommets in the wings at the N-strut locations after making the struts, which are pointed at the four ends and seat in the grommets. The wings may be sprung apart slightly to install them. On the radial engine version the I-struts may be attached to the lower wing with dowels and the top end trimmed to just touch the bottom surface of the upper wing. They are left on for flying and remain attached to the lower wings.

The headrest and rear fuselage fairing blocks between the stab and fin can now

be fitted, covered and installed. Cabane struts and landing gear legs may be painted. Install the tail wheel assembly and connect the control arm to the bottom of the rudder with an aluminum strap and self-tapping #3 screw. The aileron servo on both prototypes was mounted on the top of the lower wing with double-sided servo tape. With the MonoKote cut away, adhesion to the wing surface appears adequate, even for some pretty serious aerobatics.

### RIGGING

Level the airplane so the top of the horizontal tail is at 0 degrees. The lower wing should also be at 0 degrees and the upper wing at 1 to 1-1/2 degrees positive. Inserting washers between the top of the cabane struts and the lower surface of the wing will correct this angle as required.

For starters, control surface movement can be set at 1/4 inch up and down for the ailerons, 1/2 inch up and down for the elevators and 5/8 inch each way on the rudder. Neither of the prototypes have required more than one or two clicks of trim in any direction. The throttle servo should be rigged to give full throttle with both the throttle and the trim forward; throttle closed with full trim back should give engine cutoff. With the rudder at neutral, roll the aircraft and tweak the tailwheel alignment as required to attain a straight track.

### PREFLIGHT AND FLYING

At a point "one finger's width" forward of the rear cabane strut, the model should balance slightly nose down with the fuel tank empty. Minor changes in the battery location have accomplished the proper balance on both prototypes—a little farther forward on the round engine versions due to the shorter nose.

Give a tug on all moving surfaces to make sure the hinges are not going to pull out—it's best to come back with all the surfaces you departed with! Do a range check appropriate to your radio and also a control check.

Either version will accelerate quite rapidly, so line up and add throttle slowly, keeping the tail wheel on the ground until you are tracking straight, easily apply full throttle, keep your rudder finger ready for slight corrections and up you go. You will find the model tracks well and is stable in pitch and roll. Even at the initial setting you will find the ailerons to be quite quick—adjust them as you like. Rudder and elevator alone will produce excellent snap rolls and spins.

Check the glide characteristics prior to landing. A slight nose-down attitude produces a good glide and the flare and landing are routine. The rollout will require a bit of rudder wagging but is easily controlled.

Enjoy your Golden Age creation and send the old modeler a picture! You might win an EEE-Z-FLI T-shirt! **MB**



# MICRO-DUSTER

BY P.A. COLLINS

**We take a break from the Peanuts this month to present something a bit different—an .010-powered version of Sal Taibi's famous Starduster, complete with full-size plans. A real screamer!**

"Suzy" doesn't seem to have much interest in the Microduster, but we bet our readers will. This little ship fits right in with the .010 event that "Free Flight" columnist Bob Stallick has been promoting lately. You'll have a hard time finding a model that delivers more performance for the dollar.

It's easy to see why Cox .010 powered free flight is catching on. These little airplanes are simple, quick to build, relatively cheap, and most of all, they're fun. And with that little engine screaming out front, boy do they perform!

The Microduster is a 65 percent reduction of Sal Taibi's classic 1/2A Starduster. It is "scale" in all but a few details. Wing area is 110 square inches, and the flying weight is 2 ounces or less.

## CONSTRUCTION

Construction follows established methods so I'm not going to get real detailed here. In general, watch the weight and build it straight.

I like to get the wing out of the way first. Lots of ribs to hack out! Use a template and it will go quickly. All ribs are 1/20

balsa except at the joints and at the tips. The end plates are cut out and glued in place slightly oversize, then sanded to shape. Stabilizer construction is similar.

The fuselage is built just like the larger Stardusters. Pin the right-hand side to the building board and glue the longerons and formers into place (1/16 square at the pylon and 1/16x 3/16 aft). Select some fairly stiff 1/16 sheet for the pylon. Once it's glued in place, the remainder of the formers and the left-hand fuselage side can be added.

The wing rest is next. Score it down the middle, crack and glue it to conform to the bottom of the wing. Use a template when you glue the wing rest to the pylon to insure alignment. Carve and hollow the engine mount cheeks and glue them in place. Add the firewall, fin, and stab mount.

## COVERING AND FINISH

Cover the wing and stabilizer with tissue and apply four or five coats of butyrate dope thinned 50 percent. Dope the fuselage until it is well sealed. A coat of epoxy paint (K&B SuperPoxy or similar) on the forward fuselage and wing center section will protect the finish from high-nitro fuel.

As an alternative to the dope-and-tissue route, you can use Model Research Labs' .0015-inch thick clear mylar. This material is adhesive backed, paintable, and is much more puncture resistant than tissue. Write to MRL, 25108 Marguerite #160, Mission Viejo, CA 92692.

## DETAILS

An eyedropper tank is ideal for this type of model. It allows you to monitor the fuel supply and gives better control of the engine run. Rather than use the entire dropper, you can easily cut it in half. With a triangular file, make a small notch where you want to make the break. Carefully snap the eyedropper in two at the notch, then fire-polish the end with a propane torch. Gloves and eye protec-



1/32 SHT.  
GUSSETS

1/16 SQ.

1/16x1/8

.010 FF MINIPOWER

# MICRODUSTER

BY P.A. COLLINS

1-1/16" DIA.,  
1/16 PLYWOOD  
FIREWALL

1/16 SHT. WING  
MOUNT, 1"  
WIDE

3/32x3/8 T.E.

CG

.025 M.W.  
HOOKS

2-7/8"

SOFT BALSA  
BLOCKS

1/16  
SHT.

1/16  
SHT.

1/16 SQ.

1/16x3/16 LONGERON

RUBBER BUMPER

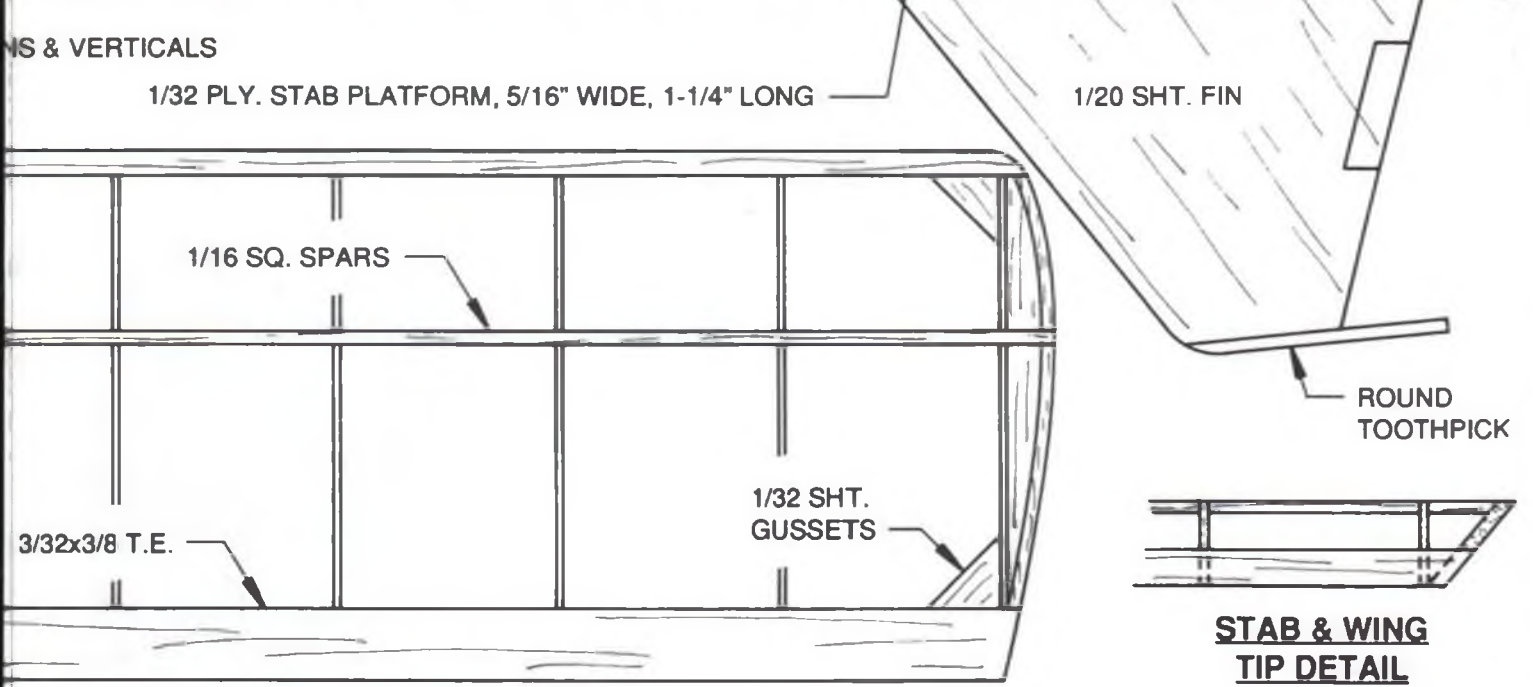
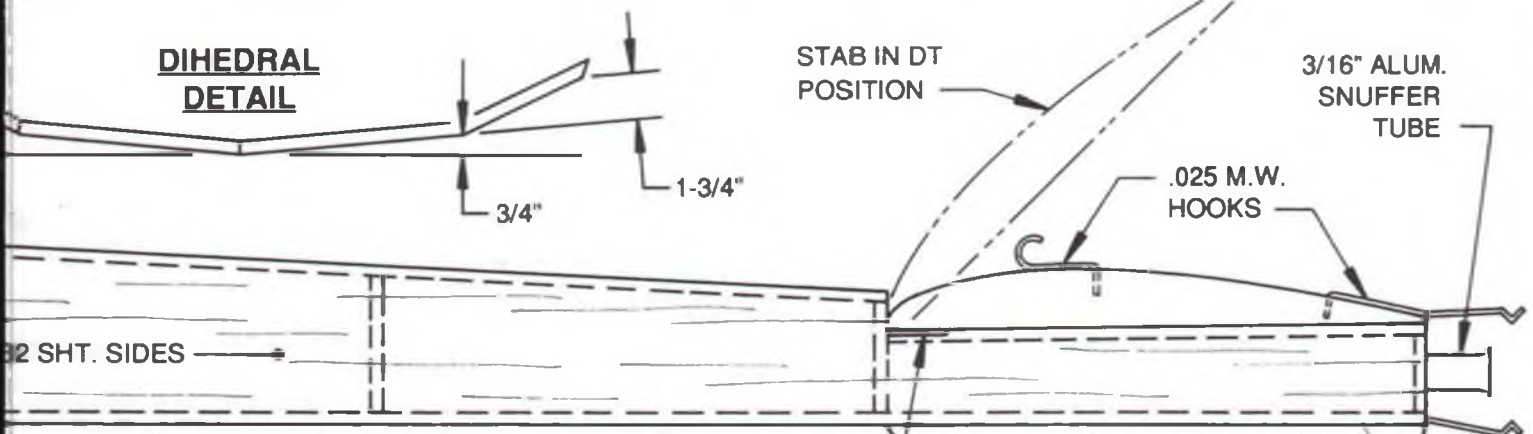
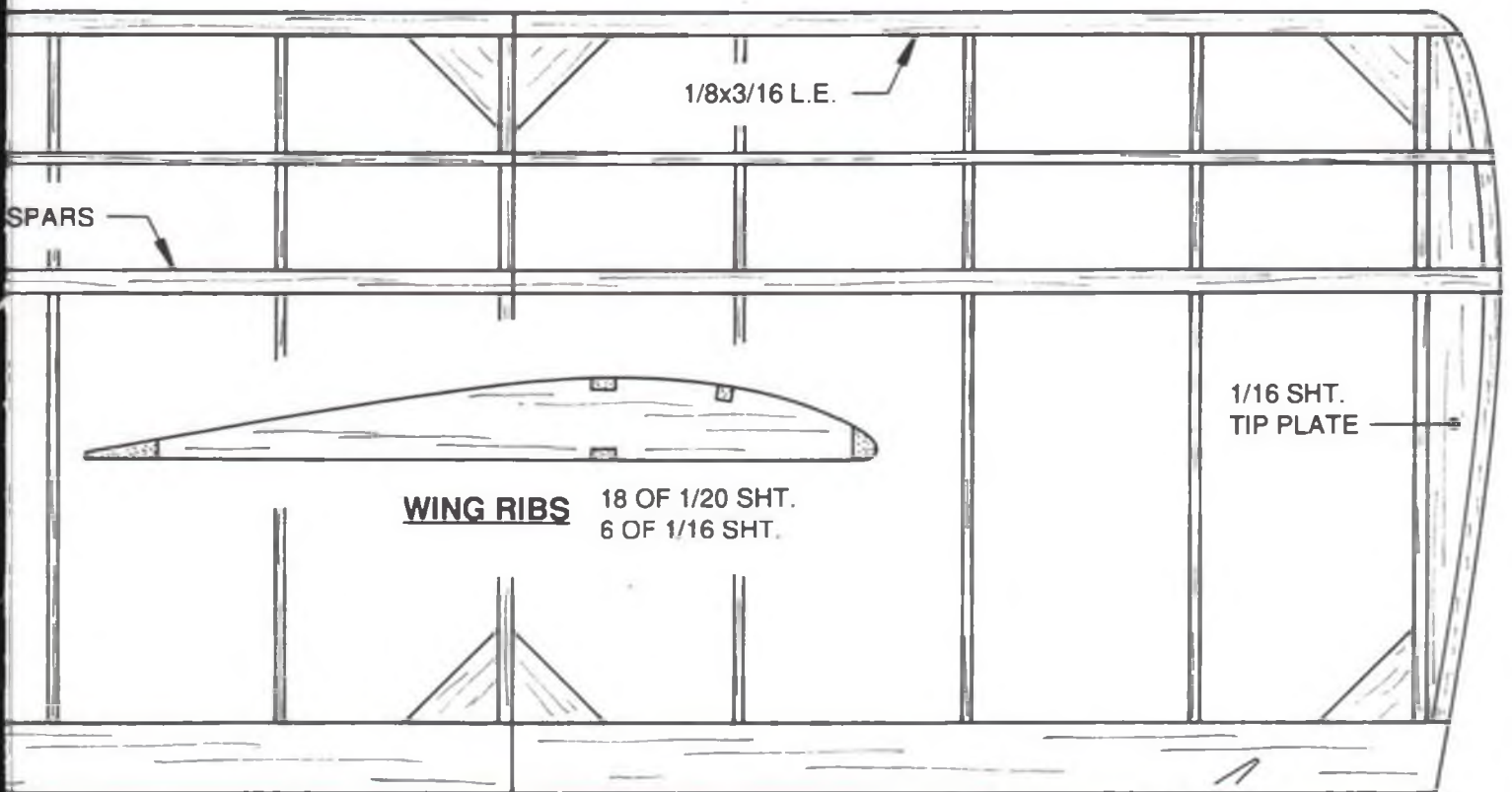
1/8x3/16 L.E.

1/32 SHT. INLAY

**STAB RIBS**

12 OF 1/32 SHT.  
1 OF 1/16 SHT.





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Fuselage construction is as light and simple as possible—1/32 sheet sides with 1/16x3/16 framework. Pylon is 1/16 sheet with 1/16 square sticks on either side. Pick your materials carefully; ship shouldn't weigh over 2 ounces ready to fly.



Close-up of the engine and eyedropper tank installation. Tank holder is a loop of .025 music wire.



Tail assembly with the D.T. deployed. Dark lines on the fin are soft wire embedded into the wood for the trim tab.

tion are mandatory for this operation!

### INITIAL ADJUSTMENTS

Steam out any warps from the flying surfaces and check that the fuselage is true. Balance at the point shown on the plans (approximately 70 percent). Tilt the stabilizer so that it is nearly parallel to the left inboard wing panel as viewed from the rear.

At this point you are ready to test glide. The model should glide in a smooth left turn with no stalling or diving evident. Shim the rear of the stab to correct stalling or diving. Change the stab tilt to adjust the turn rate. The model will turn towards the high side of the stab (left in our case).

### FLYING

The Microduster should be flown to the left under power. The first few flights should have an engine run of 3-4 seconds to observe the flight pattern. Make power pattern adjustments with the rudder tab (small increments only, please). As you work out the bugs, gradually increase the engine run to 10 seconds.

I think you will be surprised at the performance of these tiny models. Don't forget to light the D.T.! **MB**

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# 'MERLIN'

When it comes to getting the most fun for the buck, it's hard to beat an RC hand launch glider. The Merlin is one of the newest and performs equally well in both thermal and slope flying.

**PRODUCTS IN USE BY RICK LAWRENCE**



Rick gives the Merlin an easy toss. Hand launches, despite the light 11-1/2 ounce flying weight, are very steep, quick and high. Temperatures during this photo session were in the 20s—not exactly ideal thermal conditions! ■ INSET: The Merlin on a fly-by. Glide path is shallow and for a polyhedral ship, the model is quite agile. It toops well and does a very respectable rudder roll.

The Merlin is a slick little pod-and-boom RC hand launch glider, the first kit offering from a small but growing company called MM Glider Tech, located in Downey, California. The ship was debuted by proprietors Merrill Farmer and Margaret Newhouse at the Pasadena IMS show early this year.

It has been some time since I have built a balsa rib-and-spar wing, especially one as light as the Merlin's. All of the balsa for

the Selig 3010 airfoil wing is included; leading edges, trailing edges, spars, turbulators, sheeting for the center section, plywood dihedral braces, ribs and shear webs. The machine-cut ribs are nicely cut, clean and neat.

The tail group is 1/8-inch sheet balsa, which is pre-cut and needs only a light sanding. You have to supply the recommended fabric type hinges and control horns.

A 3/16-inch fiberglass arrowshaft con-

nects the tail group to the ABS polystyrene vacuum-formed fuselage pod. The pod's three pieces—main pod, hatch and finger pocket—were free of burrs or flash.

Micro radio gear is required for the Merlin—a 50 to 250-mAH battery, small receiver, and two micro servos for the rudder and elevator. There are no pushrods or clevises included in the kit.

The plans are full-size and well drawn. However, the instructions are limited to only two pages of text, with no diagrams. If you have never built an RC plane, this would probably not be the best kit to start with.

## CONSTRUCTION

The Merlin's wing is standard rib-and-spar construction. I built the inboard and outboard panels at the same time, to assure proper alignment of the leading and trailing edges and spars.

Both the top and bottom spars are 1/4x1/8 balsa. The leading edge stock is 1/4x1/2 balsa. This thick material allows the leading edge to lay flat on the building board while the rib lower leading edge curves up. The excess leading edge material, top and bottom, has to be trimmed away later. This does take some work, but is well worth the effort, resulting in a straight wing panel.

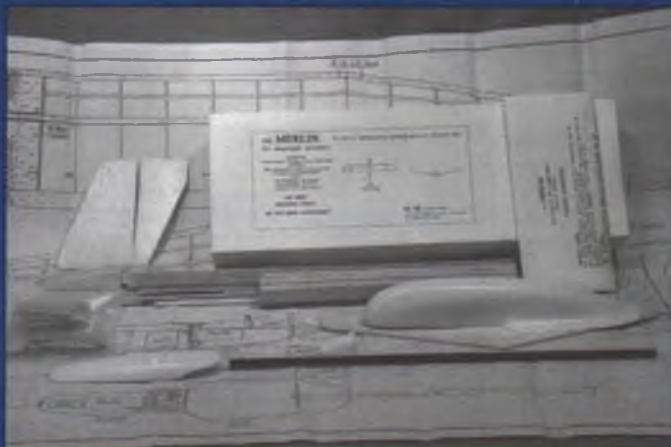
Shear webs are 1/16-inch vertical grain balsa. These come roughly cut to size and need to be individually fit. Good tight fits here are important for wing strength. Turbulators are 1/8-inch square balsa. The shape and fit of all of the wing components was quite good, and the quality of the balsa was equally good. Upon completion of one wing side (inboard and outboard panels), the other side was done in the same manner, resulting in a total of four wing panels.

The inboard panels are joined with 1/16 plywood dihedral braces glued to the front and back of the main spars. The center of the wing is sheeted top and bottom with 1/16 balsa, then a strip of glass cloth is wrapped around the center joint. After gluing the tip panels in place, small pieces of glass cloth are likewise added to the trailing and leading edge and spar joints. The glass cloth is not included in the kit; I used 2-ounce material.

The tail components are all pre-cut and ready for sanding. To reduce tail weight, lightening holes were cut as suggested on the plans. This is highly recommended by the manufacturer. Gussets of 5/16-inch triangle stock are used to brace the vertical stab to the horizontal stab. The same size triangle stock is also used to

*continued on page 54*

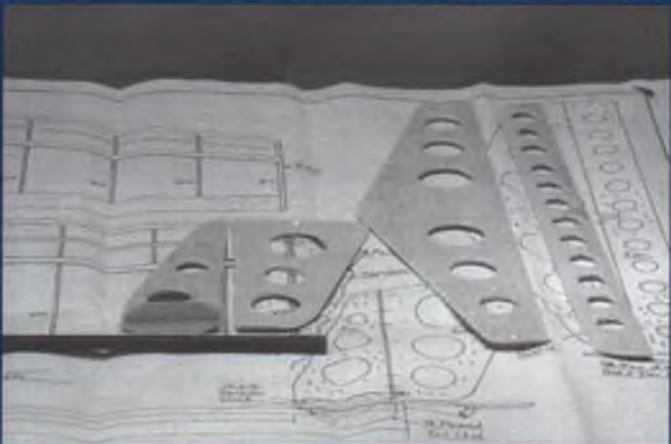
*All of the balsa for the Selig 3010 airfoil wing is included; leading edges, trailing edges, spars, turbulators, sheeting for the center section, plywood dihedral braces, ribs and shear webs.*



The Merlin is a quality kit: vacuum-formed ABS plastic fuselage, fiberglass arrowshaft boom and well-cut balsa parts. You will need to supply all of the hardware—pushrods, control horns, etc.



Standard balsa rib-and-spar construction is used for the Merlin's Selig 3010 airfoil wing. Rick built the inboard and outboard panels side by side to help insure good alignment.



Tail group completed, ready for covering. Lightening holes are optional but are highly recommended to keep nose weight to a bare minimum. Rick initially had to add an ounce to the nose to get the ship to balance as specified, but found it flew best with no nose weight at all.

### MM GLIDER TECH'S 'MERLIN'

TYPE ..... RC hand launch glider.  
WINGSPAN ..... 50 inches.  
FLYING WEIGHT ..... 11-1/2 ounces as tested.  
WING AREA ..... 280 square inches.  
WING LOADING ..... 5.9 ounces per square foot.  
RADIO ..... 2 channels (elevator, rudder).  
SUGGESTED RETAIL ..... \$36.95 plus \$5 S&H.

FEATURES: ABS vacuum-formed fuselage, fiberglass arrowshaft boom, built-up wood wing, Selig 3010 airfoil, sheet balsa tail, and full-size plans.

COMMENTS: Very light, small sailplane, durable fuselage, responds to the lightest lift, builds easily for the experienced builder and looks interesting in the air. Produced by MM Glider Tech, P. O. Box 39098, Downey, CA 90239; (310) 928-3034.



The top ten Unlimited Class fliers, from left: 1st Fred Weaver (FLC Thermal Eagle), 2nd Joe Wurts (Thermal Eagle), 3rd B.J. Weisman (Thermal Eagle), 4th Stephen George (Thermal Eagle), 5th Jason George (O.D. based on Shadow fuselage), 6th Ben Clerx (Clerx Aeronautic Mako), 7th Richard Burns (O.D.), 8th James Hemphill (Team ISS Vector), 9th Daryl Perkins (FLC F3B Eagle), 10th Craig Foxgord (Super V).

RC SOARING BY BILL FORREY

# The 12th Annual Rose Bowl Spring Soaring Festival



*The weather was typical SoCal: early morning low clouds burning off to hazy, humid afternoons.*

■ ABOVE: Ben Clerx finished 6th with his company's new Mako design. Ben is an airline pilot and frequently makes runs to England, where he has been intrigued with F3J (a hand-throw, time-slot thermal duration event). This led to the Mako, 118 inches span, 948 square inches, SD7037 or RG-15 airfoil, 68 ounces, Kevlar/fiberglass fuselage with slip-on nosecone. It's a partial kit from Clerx Aeronautic, 39 Seabrook Cove, Newport Beach, CA 92660. ■ RIGHT: This look across half of Pit Row doesn't really give a fair idea of just how many sailplanes were on hand for this two-day meet. A fair number of "older" designs in the background suggests that balsa butchery is still alive and well in California. Any interest in a pre-1980 or pre-1975 "Nostalgia" class? People are talking about it!



"It just keeps getting bigger and better!" That's what I was told by Contest Director Richard Burns and by more than one participant in California's second-biggest two-day soaring event, held at the famous Rose Bowl on May 1-2. This year's meet was dedicated to the memory of Pasadena Soaring Society's Bob Bukshpan, who passed away in April of 1993.

The Pasadena Soaring Society proved once again that it is more than capable of hosting a professional quality, AMA sanctioned, major soaring meet. This year they succeeded in attracting 106 fliers, 94 of whom recorded flight scores in the Unlimited Class and an additional 51 in the Two-Meter Class. Together, these 145 entries represent the second-biggest two-day meet turnout and the biggest Two-Meter Class meet on the west coast in many years! Only Visalia's Fall Soaring Festival draws more people, but it is strictly a one-class contest.

The Rose Bowl two-day is a very enjoyable contest to fly. Contestants were never pushed to hurry up and fly, yet the three winch/retrievers were constantly busy both days. This was probably due to the fact that the tasks were fun and relatively low pressure. Contestants seemed to want to fly, as opposed to keeping the C.D. off their backs while sandbagging.

Participants came from as far away as Indiana (Jim Thomas) and Central Arizona (a team of six from CASL), however the vast majority came from southern and central California.

The weather was typical SoCal: early morning low clouds burning off to hazy, somewhat humid afternoons with a good dose of smog. The temperature got up to the high 80s—hot enough for the local Boy Scout troop's hamburger stand to run out of all sodas except regular Coke by two o'clock Saturday.

The last flight of the day Saturday landed around four o'clock, and on Sunday this moved up to about noon. This early finish allowed ample time for travel home each day, ample time to browse through the on-field hobby industry "bazaar," and ample time for a big raffle and awards ceremony at the meet's conclusion on Sunday. PSS is to be congratulated on a very relaxed, enjoyable and efficiently run event!

### EVENT TASKS

The tasks flown were basically low-pressure thermal duration types. Saturday featured four rounds of competition, Sunday featured three. Round 1 was a simple three-minute precision duration flight with spot landing. The first flight launched around 8:15 a.m.



The top five Two-Meter Class fliers, from left: 1st Daryl Perkins (Super V 2M), 2nd Fred Weaver (FLC prototype based on Swift T-2000), 3rd Joe Wurts (Airtronics Whisper), 4th Stephen George (Whisper), 5th Craig Foxgord (13-year-old original built for the first Two-Meter World Cup in 1980).



■ LEFT: Keven Anderson had a colorful sailplane that was a real eye-catcher—a Fox Models "Scorpion 100," available from Northeast Sailplane Products. You could probably guess the features: molded fiberglass fuselage with slip-on nosecone, lightweight foam core wings, SD7037 airfoil, and 100-inch wingspan. According to Keven, "It signals lift really well, practically jumping up once inside a thermal. It's pretty stable and docile." ■ RIGHT: PSS had three of these winches (paired with retrievers) with chargers set up to do the launching chores. Very few winch-related problems or slowdowns were encountered throughout the meet.

*The Pasadena Soaring Society proved once again that it is more than capable of hosting a professional quality, AMA sanctioned, major soaring meet. This year they succeeded in attracting 106 fliers.*

■ LEFT: He liked the sailplanes so much, he bought the company! Fred Weaver, new owner of Flite Lite Composites (now sold exclusively through Airtronics Specialty Division), launches one of his new Thermal Eagles on his way to 1st place in Unlimited. The amazing thing is that Fred doesn't fly very often, yet he has the natural talent to beat an entire field of seasoned contest circuit fliers. ■ RIGHT: Ed Holder (left) and Keith Schwemmer really like those V-tails! Ed's is an original design worked up from a Legend fuselage. Keith's is from a Cumic Plus fuselage. The pair of identical two-meters are modified Whispers. Our columnist says there were more V-tails at Pasadena than at any other meet he can remember.





■ **LEFT:** The father-and-son team of Chris (right) and Ryan George give combined body English to try and scoot Ryan's original design Unlimited ship back into the landing zone. Ryan scored a 10-point bonus as a result!  
 ■ **RIGHT:** Geoff Drought of the El Dorado Silent Fliers club launches his FLC Thermal Eagle while controlling both winch and transmitter from his non-motorized wheelchair. He finished 44th out of 94 fliers with a normalized score of 910.8 (91 percent of the winner's score!).



Enthusiasm reigns supreme for "Team Super V." From left: Craig Foxgord, Mark Levoe (Super V designer and manufacturer), and two UFPs (unidentified flying pilots). Watch for this design to catch on! More and more transmitters are featuring electronically mixed V-tail options these days, making these designs easy to execute.

Super V being launched with Mark Levoe timing. Ship spans 110 inches, covers 900 squares, is offered with an SD7037 or RG-15 airfoil, and has the tail servos in the stab. Construction is all glass and carbon fiber. For details, write to Levoe Design, 510 Fairview Ave., Sierra Madre, CA 91024. A two-meter version is also in the works.



Top Scoring Team trophy recipients were, from left: Keith Kindrick (FLC Falcon 880), Fred Weaver (FLC 2M prototype), Stephen George (FLC Thermal Eagle), and Jason George (Stephen's son, flying an Airtronics Whisper), all of the Central Valley RC club in Visalia, California.



The informal "Team Shadow" fliers are extremely pleased with the performance of their sailplanes. From left: Mike Aguirre, Jim Markle, Bill Klatskin, and brothers Don and Art McNamee. High quality and value also contribute to the TEKOA Shadow's popularity. Art was highest placing Shadow flier (14th), but Don wasn't far behind at 21st place.

into thick, low overcast skies; I know, because I was the third pilot to launch!

Rounds 2, 3 and 4 were the first three flights of a four-flight, 22-minute add-'em-up duration. No flight was to exceed 7 minutes. This I found to be a lot of fun and truly relaxing to fly. The only pressure put on the pilot was to land on or near the highly unusual "spot" and to keep from overflying the 7-minute max time. If you did, you'd suffer a 10-point-per-second penalty. Without the precision element to these three rounds, you could concentrate fully on the *toe-igh* landing zone.

Round 5 on Sunday was another 3-minute precision duration. Round 6 was the last one of the four-flight, 22-minute add-'em-up. Finally, Round 7 was an 8-minute precision duration task.

In the tradition of two-day California meets, the landing zones were challenging and unusual. The landing zone was a small rectangle (see photo) sectioned into some strange diamonds and triangles. Overlapping, 180-degree opposed Vs created a bonus diamond in the center worth 30 bonus points; to the right and left of the diamond were two zones worth 10 points; the areas in front of and behind the diamond (the remainder of the two triangles) were worth 20 points. The center of the diamond was a very small (pancake size), painted orange circle worth 50 bonus points. Very few pilots made even one of the 50-point bonuses. In fact, not too many fliers even made the 30-point bonus!

## THE PLANES FLOWN

The sailplanes you find at competitions of this size and in this part of the country tend to be a mixture of state-of-the-art thermal duration, high-tech F3B, and even polyhedral balsa designs. The majority have foam wing cores sheeted with balsa or obechi veneer and mounted to molded fiberglass or Kevlar fuselages, some with carbon fiber reinforcements. Stabs are a mixture of built-up balsa and foam core types.

At this point, I'm going to let the photos do the talking. Space is always limited, and the situation is worse when I have a large selection of pictures to share with you, as I do this time.

See you next month, Good Lord willing, and we'll have more to share from the world of RC Soaring. I welcome phone calls, but I'm ashamed to admit I'm a lousy letter writer, so call me at (909) 245-1702 and we'll talk! **MB**

# BUILDING A CHARGER CASE

Roger shows how to convert a common pistol case into a charging station that will keep all of your battery charging paraphernalia in one place.

Keep a small toolbox filled with things like rubberbands, small screwdrivers, CA glue, a prop wrench, an expanded scale voltmeter and sunglasses. As an electric flier, I also carry a couple of battery chargers, cables with assorted connectors, and a digi-

ter, connectors, etc.) in this one convenient charger case.

The AFI Model 112 charger is capable of charging packs of up to 28 cells; the 115 will handle up to eight. I needed a way to switch the 12-volt input power and the DVM be-

case for yourself, you will need to decide if you want to perform a bit of necessary surgery on your charger(s). Although they are not visible, the wires exiting each charger have been trimmed to just reach the switches. To make the voltmeter connections, you'll



■ LEFT: The author's completed charger case holds two Astro Flight chargers, a digital voltmeter for manual peak charging, and an assortment of adapter cords. The AC power cord from the AFI Model 115 AC/DC charger allows you to charge packs of up to seven cells from house current before leaving for the field. ■ CENTER: The chargers and digital voltmeter as mounted in the pistol case. Adapter cords are stored in an open space in the other half of the case. ■ RIGHT: Close-up of the installed switches. The foam is cut out, the switches are installed and wired, then the foam is stuffed back into the hole to conceal the works.

tal voltmeter. After flying electric for a short time, it was clear that there had to be a better way to organize all this stuff—the gas fliers do it all the time. Disorganization invariably leads to forgetting a crucial piece of equipment and not realizing it until you've driven 50 miles to the fun-fly or contest.

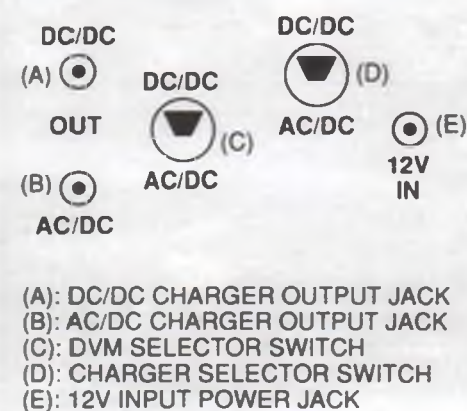
This all came to a head a few months ago. I went out to the flying field to show my neighbor my electric-powered Lacey and to teach him how to fly. We had one successful flight, and then I discovered that in my haste to leave the house, I had forgotten a crucial charger connector. Vowing never to forget chargers and/or connectors again, I came up with a nice charging system package and connector set.

Borrowing an idea from recent advertisements for plastic transmitter cases, I went out and purchased a small and inexpensive pistol case at the local gun shop. I sized it to fit my Astro Flight Model 112 DC/DC and 115 AC/DC chargers and a small Radio Shack digital voltmeter (DVM). My objective was to put all of my equipment (chargers, voltmeter,

tween chargers, and I also wanted to install some jacks on the side of the case so my connecting cables could be plugged into and stored inside the case. The two chargers were laid next to each other, the digital voltmeter sits in one corner, the control switches are on the top of the case next to the handle, and the connector cables are stored in a cutout in the foam in the other half of the case. The AC power cord from the Model 115 AC/DC charger comes out of the top of the case and is not visible in this photo.

Before starting to build such a charger

FIG. 1 — SWITCHES & PLUGS



need to go inside each charger and solder wires to piggyback the positive and negative jacks located on the top of each unit.

## CASE PREPARATION AND WIRING

First, plan the location of your chargers. Neither of my Astro Flight units have internal cooling fans like most of the current models do, so there was no need to provide for cooling air.

If your charger has a fan you will need to locate it so you'll have room to cut a channel in the foam so that cooling air has an unobstructed path to the openings in the side of the charger. *continued*

Once the location of your chargers has been decided, make cutouts in the foam supplied with the pistol case. My voltmeter lays on top of the foam and is held in place with a small strip of Velcro. The case I bought has two layers of foam on the side where the chargers are mounted, so I cut holes for the chargers in the top layer only and hid the connecting wires between the layers.

Drill holes in the pistol case and secure the switches and power jacks—Figure 1 shows their general arrangement and what they do. With the chargers and voltmeter in place, check that the case will close and that there is room to store the connecting cables.

Now wire the switches and chargers according to the schematic diagram in Figure 2. The components include the two chargers, the digital voltmeter, two double-

pole double throw (DPDT) switches, and three coaxial power jacks. The wiring sequence is straightforward and should not pose a problem for the average modeler. All of the switch connections *must* be soldered. Pay close attention that the coaxial jacks are wired in the proper polarity. The center pin of the jack is typically the positive terminal and the outside ring is the negative.

### VOLTMETER WIRING

Now that the switches and chargers are wired, you'll need to open each charger and find where to piggyback the voltmeter connections. Solder one wire to each of the connections and run the wires through the side of the charger case. You may be able to run the wires through an existing hole, or

you may need to drill a new one. Either way, once the wires are passed through, solder them to the appropriate contacts on the voltmeter switch.

### CONNECTOR CABLES

Now that the charger case is built, you'll need to put together a few cables to connect the case to the car battery and to your flight packs. Figure 3 illustrates the connections and the connectors I use in my system.

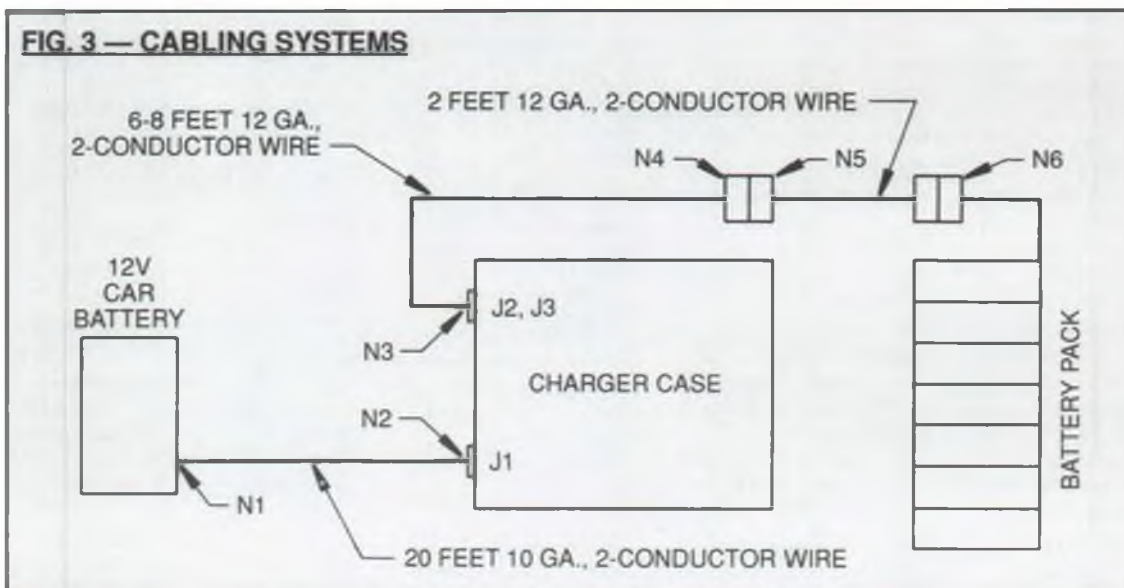
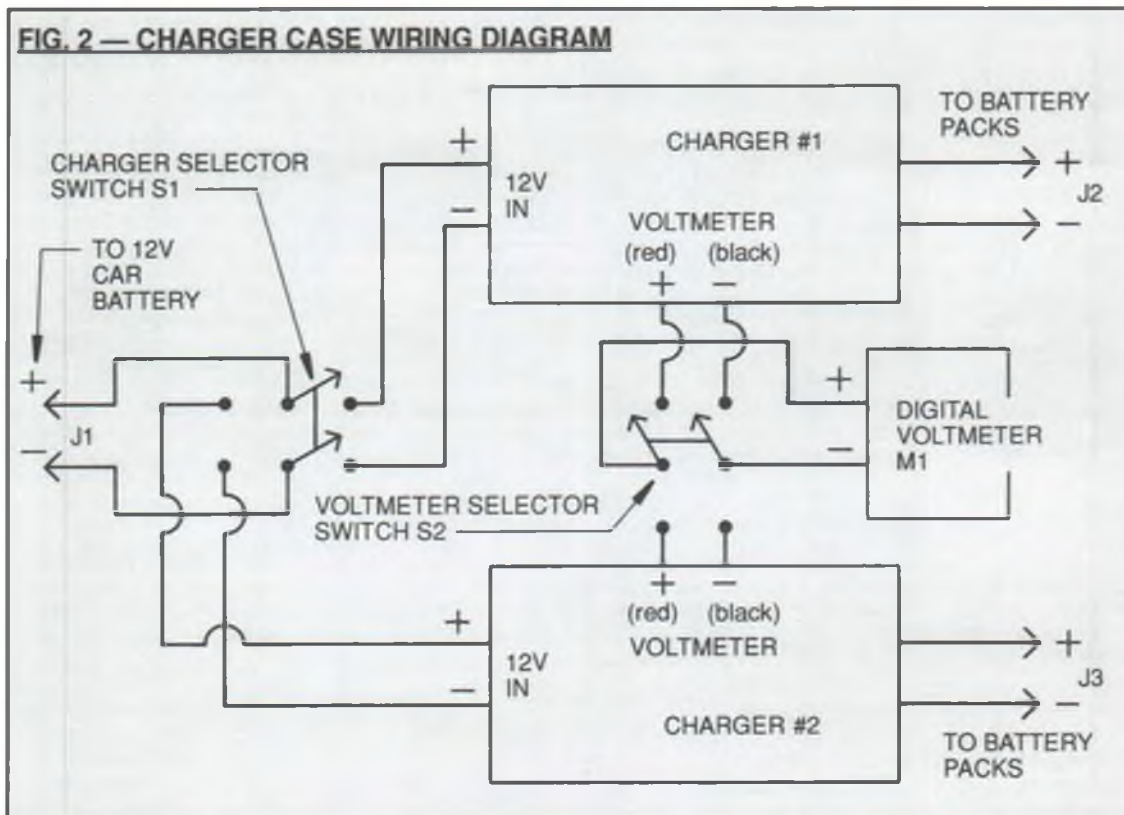
To connect the car battery to the case, make a cable from 10-gauge, two-conductor wire. Get enough wire so that the charger case can rest on the ground or a nearby table; 20 feet should be adequate. The cable connects to the car battery with alligator clips (N1) and to the case with a coaxial power plug (N2). Refer to the parts

list for the Radio Shack catalog numbers.

Pay particular attention to the polarity of all the connectors and cables. You must make absolutely sure that the positives go to positives and negatives go to negatives. Making a careless mistake will probably fry a charger or battery pack.

For my fleet of aircraft, connecting the charger case to the motor battery pack isn't so easy. Over the years I have tried many different types of charging connections. I've never liked dismantling the plane to switch battery packs, so all of my models have had built-in charging jacks and I just wait 15 or 20 minutes while the packs recharge in the model. I prefer to use a coaxial power jack, but they only work in larger planes because of their size. Smaller aircraft demand smaller charging connectors, and I've tried everything from 1/8-inch phono jacks to the standard Kyosho connector.

I made up one cable of 12-gauge, two-conductor wire, 8 feet long, with a coaxial plug (N3 on Figure 3) on one end and a female Molex connector (N4) on the other. Then I made up several cables about 2 feet long, all of which have one male Molex connector (N5) on one end and an assortment of connectors to match those used on my planes on the other end (N6).



## OPERATION

The operation of the charger case is straightforward. The chargers work the same as before—simply decide which one you want to use, set the power selection switch (S1) and the voltmeter selection switch (S2) to work from that charger, connect the leads to the car battery and to the battery pack to be charged, and you're in business.

As I said before, I use an AC/DC and a DC/DC charger in my unit. This lets me charge my seven-cell packs at home using the AC/DC charger without having to take the car apart to get to the battery. I prefer to use the DC/DC charger at the field for most of my models.

## FINAL THOUGHTS

Now that the charger case is done, we've got everything we need, electric-wise, in one nice, neat package—complete with connectors. Connectors are no longer left behind and, if I should build a plane and use a different type of connector, it's an easy matter to build another short adapter cord to satisfy the need.

## PARTS LIST—CHARGER CASE

- Charger #1—I use an Astro Flight #112 DC/DC unit capable of charging packs of up to 28 cells at a variable current rate.
- Charger #2—I use an Astro Flight #115 AC/DC unit for packs of up to seven cells. The AC power cord is not shown in the schematic. I included this unit in my case so I could charge my 05-size airplanes at home before I go to the flying field.
- J1, J2, J3—Coaxial power jack, Radio Shack #274-1563.
- M1—Digital voltmeter, Radio Shack #22-171.
- S1, S2—DPDT (double-pole, double throw) switch, Radio Shack #275-652.
- Miscellaneous—10- or 12-gauge hookup wire (wire used by the RC car modelers is good for this).

## PARTS LIST—CONNECTOR CABLES

- N1—30-amp alligator clips, Radio Shack #270-342.

- N2, N3—Coaxial power plug, Radio Shack #274-1569.
- N4—Female Molex connector, Radio Shack #274-151.
- N5—Male Molex connector, Radio Shack #274-154.
- N6—Connector assortment to match your aircraft charging systems; see text.
- Wire—10- and 12-gauge, two-conductor wire.

## MAILING LIST FOR ELECTRIC MODELERS AND CLUBS

Let me remind you about the electric mailing list. If you want to be put on the list as a contact person for other modelers new to E-power or new to model aviation, please send me your name and address and, at your option, your phone number. If you are a member of an electric flying club please give me the name of one or two contact persons for the club and other information about the club that would be useful

(meeting time and place, club field, etc.). To get a current listing, send me a self-addressed stamped envelope and the area of the country in which you are interested, and I'll get one off to you right away.


## DALLAS FLY-IN

Frank Korman of the Dallas Electric Aircraft Fliers sent an announcement for DEAF's 7th Annual Electric Fly-In, to be held October 2-3. It will be primarily a fun-fly but will include a couple of low-key events such as Limited Motor Run and All Up/Last Down. Every participant will go home with a prize of some sort and trophies will be awarded in several categories. For more information, contact Frank Korman, 5834 Goodwin, Dallas, TX 75206-6106, or call him at (214) 821-0393 after 5 p.m. and weekends.

Please let me hear your ideas. You can write to me at

6462 Sunny Brae Dr., San Diego, CA 92119, or call me during the day at (619) 463-4453. If you write, please include a self-addressed stamped envelope. **MB**

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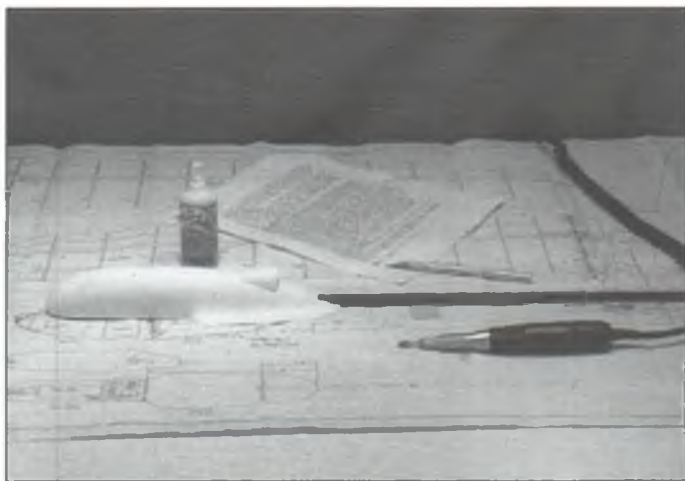
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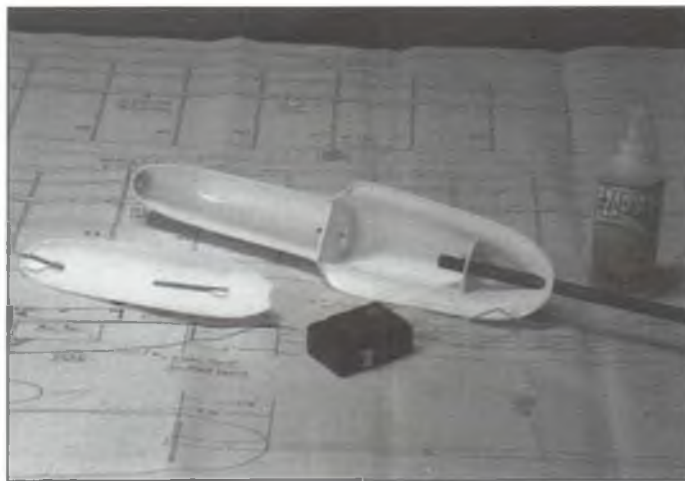
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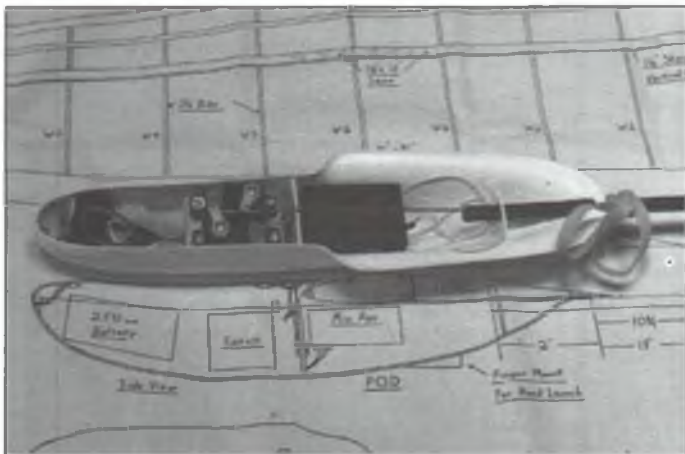
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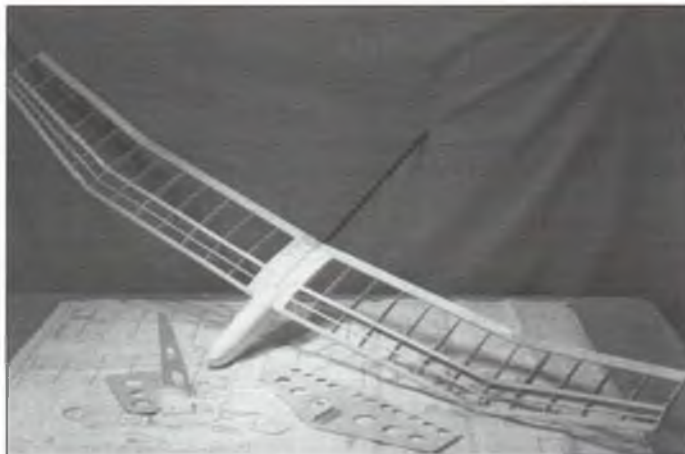
After setting the pod upside-down on the plans, the fiberglass boom is installed level with the building board. Rick used a rotary tool to create the hole in the pod. Note the finger support for hand launching. (You could also cut a hole in the pod for your finger and glue in a chunk of balsa to push against—makes for a cleaner profile.)



Two ABS bulkheads get glued into the fuselage pod; the rear one is for boom support and the other is for wing hold-down. A Futaba FP-R114H receiver fits—barely—under the wing, just behind the forward bulkhead.



Radio installation is tight, but workable. Servos are Tower Hobbies TS-11 micros. Note that the 1/32 piano wire pushrods are right in line with where the wing rubber bands will go. This installation was later changed by butting the servos up against each other in the center and moving the servo arms to the outside, spreading the wires apart.



At this point the Merlin needs only sanding and covering before final assembly. Rick used SolarKote to cover the wing and tail surfaces. Balsa triangle stock is used to attach the fin to the horizontal stab and the completed tail group to the boom.

## MERLIN *continued from page 47*

attach the tail group to the boom. As with the wing parts, the tail group parts were equally well cut.

All ABS fuselage parts are pre-cut and trimmed, and the bulkheads come scratch-

marked on a small sheet of ABS plastic. These marks were not as accurate as I would have liked, but I was able to make them work. It would be better to cut these parts with some excess, then trim for a snug fit. The boom mounts through a hole in the aft section of the pod. There were no marks on the pod for this location; none-

theless, the instructions and plans give ample information. I used a hand-held rotary grinding tool to create this hole, which is actually elongated due to the curve of the pod.

To set the angle of incidence, the pod is placed upside down on the plans. The boom is then inserted through the hole, set

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level with the building board, and glued in place. The rear bulkhead is drilled to fit the boom tube, slid over the tube and glued in place. The forward bulkhead, placed just in front of the wing leading edge, is used for holding down the front of the wing and rear of the canopy. Wire, supplied in the kit, needs to be bent to the plan specifications. I glued these wires to the bulkhead and canopy bottom with CA. Rubber bands fasten the canopy and wing to the fuselage. The small plastic finger pocket that mounts on the bottom of the fuselage is an optional item, depending on your needs.

If you have some previous building experience, building the Merlin kit is relatively easy. Building time for mine was around 20 hours, with an additional hour needed to make pushrod modifications after the first flights.

### COVERING

I covered my model's flying surfaces with SolarKote, supplied by Global Hobby Distributors. The red accent color on the wing was done with leftover pieces from a previous model. For minimum weight, I decided to leave the pod and boom their original colors—white and black respectively.

### RADIO INSTALLATION

Information on the radio installation is covered by one line in the instructions. MM suggests you "refer to the blueprint for details or try something on your own." This process deserves some careful thought and patience.

I used a Futaba Attack 4 radio with its FP-R114H receiver. A 250-mAH battery is probably the biggest that will fit in the Merlin. Not owning any micro servos, I purchased two TS-11s from Tower Hobbies. To help keep the plane light, a radio switch was not used.

Servo rails are not included in the kit, so 1/4-inch square basswood stock was cut and CA glued to the fuselage. The rudder and elevator servos were placed just in front of the forward bulkhead, with the battery forward of the servos. The receiver barely fit under the wing, directly behind the forward bulkhead.

No control horns were supplied; I used Du-Bro 1/2A size horns and cut away the excess. Also, to limit weight, .032-inch piano wire pushrods (also not included) were Z-bent at both ends. The plans show the pushrods traveling along the center of the fuselage, which I found interfered with the rubber bands used to hold the wing in place.

The friction between the pushrods and the rubber bands didn't seem to cause a problem, but I decided to be safe and changed the location of the pushrods and servo arms. Instead of the servo arms facing towards the center of the fuselage, I placed them facing the outside of the fuselage. This placement spreads the pushrods apart and gives plenty of clear-

ance for the rubber bands. The receiver antenna was routed through the boom tube.

Control throws are not specified on the plans. Initially I set the rudder at 1-1/4 inches left and right, and the elevator at 3/8 inch up and down.

### PERFORMANCE

The completed model with radio and battery weighed an amazingly light 11-1/2 ounces. To balance it at the specified CG, I needed an additional 1 ounce of nose weight.

My first chance to fly the Merlin was on a brisk 20-degree day. The sky was sunny and bright, and the wind was stronger than I would have liked for the initial flights. We were flying on a very small knoll facing the wind. Hand launches were higher than I would have expected from such a light model. The plane responded well to the light slope lift, but the glide path was not as shallow as I had anticipated. At the time, I assumed that the wind was affecting the Merlin.

The next day's weather conditions were much the same, but without the wind. I decided to hand launch off the frozen lake behind my house. The plane again launched well, but the glide path was still not what I wanted. After removing some small weights and flying the model several times, the glide path became much better. The new final flying weight was 11-3/4 ounces. Even at the reduced weight, hand launches were not too adversely affected. I did reduce the rudder throw to 3/4 inch either direction. This made the Merlin less twitchy, especially while flying with gloves. The elevator was fine at the original setting.

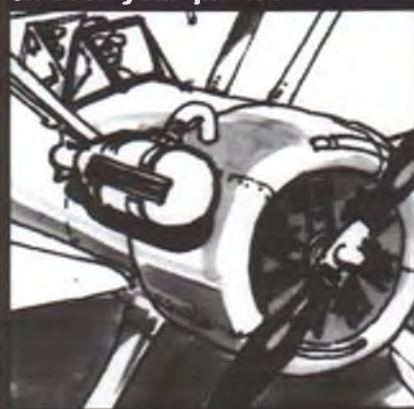
The most recent outing with the Merlin was much like the first two. Sunny, cold, 10 mph wind, and a medium inland slope—this seems to be Merlin weather. I have to admit that I had some reservations as to MM Glider Tech's claims of the Merlin being "incredibly aerobatic." But the loops are indeed round and quick and the rudder/elevator rolls are easier than I could have imagined. Admittedly, the rolls are not like that of an aileron ship, but they are fairly graceful. The plane is very responsive to light lift and control inputs.

The Merlin still seemed to be a bit nose heavy. I decided to remove the last 1/4 ounce from the under the battery. The plane flew even better, and the new flying weight is back to the original 11-1/2 ounces.

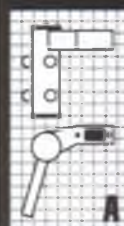
### CONCLUSION

If you are looking for a light, compact hand launch glider, the Merlin may be for you. The hardware needed to finish the kit is minimal; the quality of the kit is excellent, and the plane is really lots of fun in light air conditions. The kit is produced by MM Glider Tech, P.O. Box 39098, Downey, CA 90239; (310) 928-3034. **MB**

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# PLUG SPARKS

BY JOHN POND

## Anyone for a 1/2A 30-Second Antique Free Flight Event?

This month we are announcing a new 1/2A 30-Second Antique event as proposed by nationally known Harry Murphy of the CIA club (Central Indiana Aeromodellers). "Murf" points out the the 1/2AFF Texaco event is drawing contestants from all over, but that with 8-minute motor runs (which take the models practically out of sight), this type of contest is limited to large flying areas—something not easily found in the eastern U.S.

Murphy envisions a 1/2A version of the 30-Second Antique event as a compromise solution. This would call for models of about 3-1/2 to 4-1/2 foot wingspan. There are plenty of Antique designs which could be



Photo No. 1. R.O.W. flying, especially with Old Timers, is something seen far too infrequently these days. Photographer Fred Terzian captured Bud Romak's Super Cyke powered Foote Westerner doing its thing on a small triangular pond at the 1993 Oakland Cloud Dusters annual at Sacramento.

scaled up or down.

The proposed 1/2A 30-Second Antique event would have the following rules:

- 1. Engines:** Reed valve glow engines of .050 cubic inch displacement. Diesels are prohibited.
- 2. Size and Weight:** Unrestricted size, but all models must weigh a minimum of 12 ounces.
- 3. Designs:** Any SAM-approved, pre-1939 non-pylon model.
- 4. Flight Rules:**
  - a) 30 seconds maximum engine run.
  - b) All flights to be R.O.G.
  - c) Six attempts to make three official flights.
  - d) Flights over 40 seconds are official.
  - e) Official flights are 2



Photo No. 2. Tom Keppler flew his Ohlsson .60 powered Playboy Senior, a veteran of many contests, to 3rd place at the '93 O.C.D. meet. Sacramento's Waegell Field is one great place to fly!

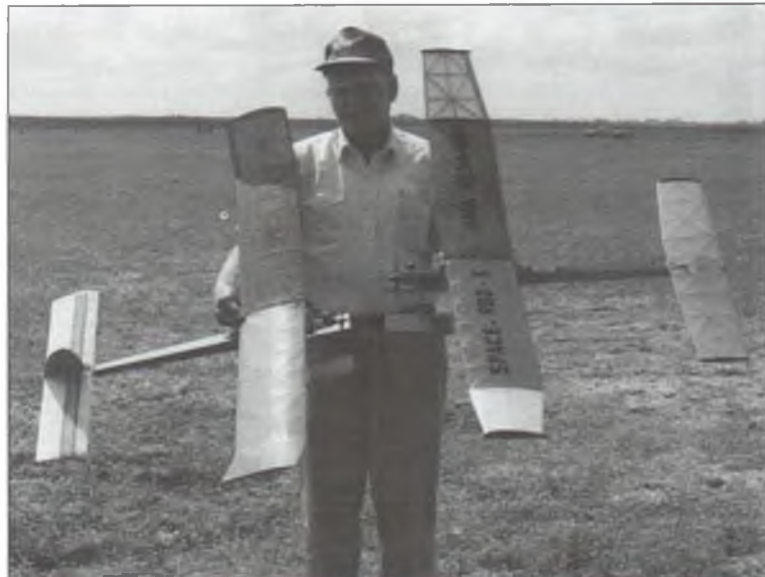
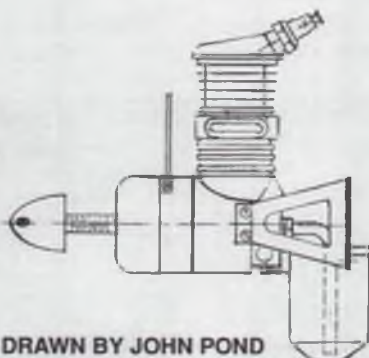
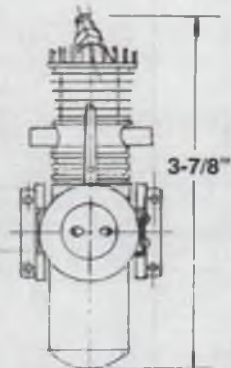
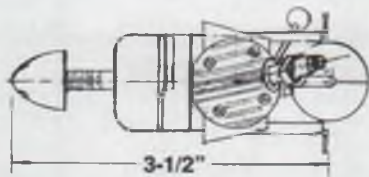
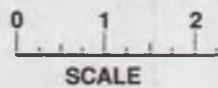


Photo No. 3. Old Timers weren't the only hydros flown at Sacramento: Vic Cunningham showed up with two great flying 1/2As, a Galaxie (left) and Space Rod X.



# PERKY



DRAWN BY JOHN POND

## ENGINE OF THE MONTH

minutes maximum.  
f) Flyoff, if necessary, will

be at the discretion of the  
Event Director.

What do you think? Doesn't that make you want to resurrect some of your smaller Antique models? They don't have to be super light, on account of the 12-ounce minimum weight requirement.

Murphy states a special 1/2A 30-Second Antique event will be held at the CIA contest of July 27-28 at Wright Air Force Base, Dayton, Ohio. Stay tuned to this column for a report.

## OAKLAND CLOUD DUSTERS ANNUAL

Here is a free flight meet that continues to grow. This year's contest was held at Waegell Field (near Sacramento, California) in

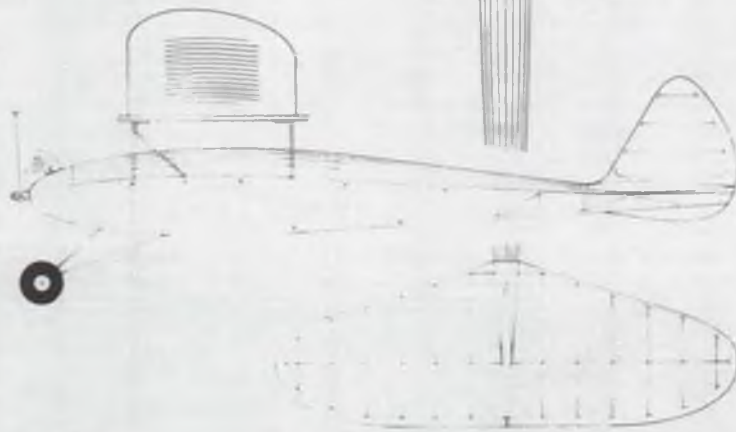
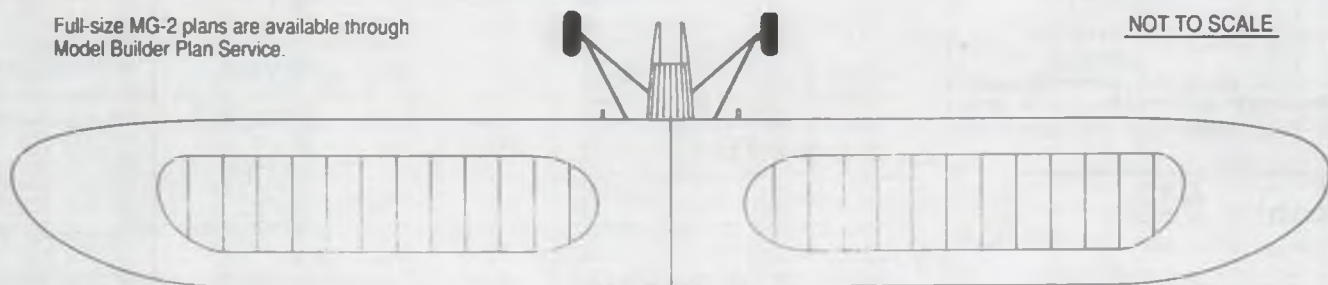
late April and featured contemporary, Nostalgia and Old Timer events. Several little-seen events were also staged, notably the hydro events. The shallow pond was made up in a triangular form, which eased the problem of getting enough water on the field while making the launches much simpler.

Photo No. 1 is an excellent shot showing Bud Romak launching his Super Cyclone powered Foote Westerner. As can be seen, the model had an excellent takeoff attitude, barely gaining enough altitude to clear the tank sides. Unfortunately, just as the model would clear the edge, the downthrust would

## MODEL OF THE MONTH

Full-size MG-2 plans are available through Model Builder Plan Service.

NOT TO SCALE



Mike Granieri's 1936

## MG-2

Span — 114 in.  
Wing Area — 1484 sq. in.  
Overall Length — 66-1/2 in.

### WING

V-dihedral, Eiffel 431 airfoil. Balsa sheathed leading edge, trailing edge, tips and center section, capstripped ribs, top and bottom spars fore and aft. Spar configuration allows easy modification to two-piece wing.

### FUSELAGE

Simple built-up box of 1/4" square stock (spruce longerons), truss bracing, formers and stringers on top only. Wing mounted on wire cabane, held on with rubber bands. Landing gear also mounted with rubber bands.

### TAIL SURFACES

Built-up construction, symmetrical airfoil.



## MG-1

Mike's original model was this cabin ship, built in 1935. It was damaged in early 1936 and rebuilt into the parasol MG-2.



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1935 Miss America 84"	\$75.58
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1938 Cirrus Mk I 72"	\$55.88
1938 Cloud King 63"	\$44.48
1938 Powerhouse 84"	\$58.24
1938 Record Breaker 96"	\$73.04
1938 Trenton Terror 72"	\$42.80
1939 Korda Wake 44"	\$20.12
1939 Mercury 72"	\$81.26
1938 Zipper 54"	\$56.24
1940 Ranger 48"	\$33.55
1940 Sailplane 78"	\$89.00
1940 So Long 50"	\$31.88
1941 Englander 56"	\$42.79
1941 Super Quaker 78"	\$76.40
1941 Playboy Jr. 54"	\$32.72
1941 Playboy Sr. 78"	\$53.72
1941 Brooklyn Dodger 56"	\$44.48

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## PLUG SPARKS

take over and the model would trip in the long grass. Romak finally conceded that the tank was a shade too small for his large Class C model. He took the floats off and went on

peccable weather!

### ENGINE OF THE MONTH

We are again indebted to Robert



■ LEFT: Photo No. 4. Pink and green (!!) MonoKote was Angus Crosbie's covering of choice for his Schumacher "Josephine," which he sport flies with a K&B .26. The Josephine is one of a handful of Schumacher designs, some of which could be real sleepers in O.T. competition, that were never kitted or published but which have been approved by SAM. ■ RIGHT: Photo No. 5. CAAMA sparkplug Jack Bolton built his O&R .23 powered Scientific Coronet to be an exact duplicate of the original model, going so far as to use vintage spark ignition components exclusively.

to win the Class C Old-Timer event.

Most of the entries were in O.T. Rubber 34 entries total. By contrast, the O.T. Gas events brought only six entries. Photo No. 2 shows Tom Keppler of SAM 32 launching his Play-boy Senior. This model has been around for a long time and has garnered more than its share of prizes. This photo gives a good idea of the field conditions. The power lines in the distance are two miles away. A beautiful place to fly in the lush spring grass.

The hydro event really brought out the old time modelers, as seen in Photo No. 3. Vic Cunyngnam, now living in Exeter, California, had a great time with his two R.O.W. ships, a Galaxie and a Space Rod X.

Nothing succeeds like success. The Oakland Cloud Dusters are already planning for next year's meet. Same great field and im-

McClelland, the MECA Secretary-Treasurer, who so kindly supplied this month's engine for the three-view drawing. The engine shown is the 1943 Perky "Supercharger A" model with swept-back spark plug. According to the manufacturer, the engine could be mounted on beams or radially. The engine came with mounting brackets as well as coil and condenser.

Descriptive literature for the Perky points out that the port area is better than twice that of similar size Class A engines. Intake and exhaust ports together represent better than 60 percent of the cylinder circumference. Claims were made that this allows complete scavenging and charging at speeds of 15,000 rpm (rather extravagant!).

One of the interesting features of this engine is the fixed fuel jet in a type of throttle

Photo No. 6. Two sizes of Diamond Demons for SAM RC events, both built by SAM Hall of Fame inductee Jerry Stoloff. Model on the left is scaled up 50 percent (72-inch span), the other is the original size 48-inch ship.

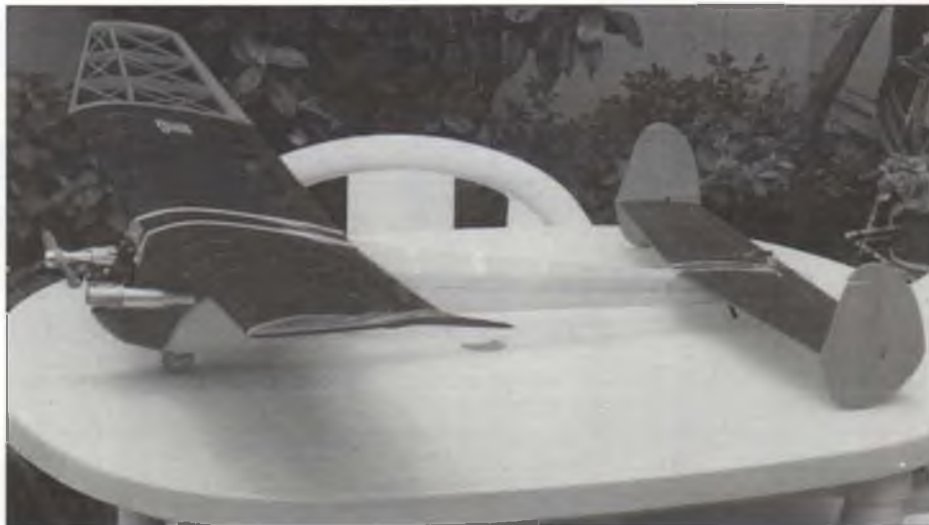


control carburetor. Another feature is the self-locking timer, requiring only a slight touch to advance its position. Although fully enclosed, the timer could be taken apart for

a cabin design (the MG-1) that met its untimely end when it tangled with the bumper of a car. With a big contest coming up, Mike elected to rebuild the fuselage with the wing

mounted on a cabane setup. Both versions were eventually approved by SAM as authentic Antique designs.

*continued on page 72*



■ LEFT: Photo No. 7. Beautifully made ABC square-fin .21 diesel by that Australian master of the engine building art, Gordon Burford. It's a rear-intake design that appears to use an O.S. RC carb assembly. Gordon has this engine mounted in a V-K Challenger and another in a Kanga Cab. ■ RIGHT: Photo No. 8. Here's one you don't see every day: a Hal DeBolt "Blitzkrieg," this colorful example built by Albert Fisher of Australia. The 53-inch model weighs in at a very light 24 ounces and is hauled aloft by a Super Tigre X-11.

cleaning and adjusting the point gap.

This engine, which came out in 1943, was available after restrictions on critical material were declared. With many of the parts already in stock, this was possible for about a year.

The Perky was manufactured by Baycraft Miniatures and distributed by Mercury Model Airplane Company of Brooklyn, New York. Specifications were as follows: Bore, 39/64 inch; stroke, 21/32 inch; displacement, .181 cubic inch with a rated horsepower of 1/8 at 7,500 rpm. The cylinder (including fins) was machined from tool steel, as was the piston. The connecting rod of hardened steel had no bushings in either end, but the crankshaft did run in a bronze bushing.

In 1946, the Perky again made an appearance with small changes to the timer and the timing cam being placed on the shaft.

### MODEL OF THE MONTH

One of the lesser-known model designs in the early days of SAM was the MG-2, designed by Michael Granieri of New Jersey. It was not until several SAM chapters had been formed that Mike's original model was discovered in his loft.

In less time than it takes to describe, Mike was prevailed upon to take the model down and make up full-size drawings. This design proved to be an instant success, as quite a few MGs were built with outstanding results at various meets.

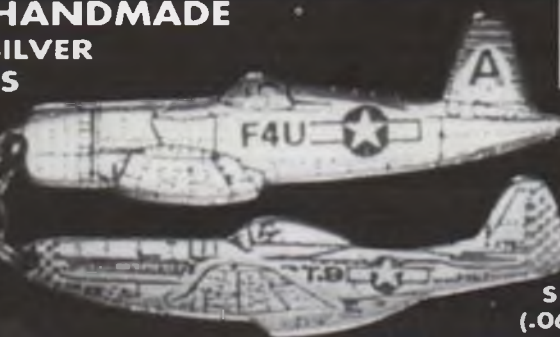
Actually, the model started out in 1935 as

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## Chopper Chatter

# What's New In Model Helicopters

James gives us a rundown on some of the newest helicopter goodies unveiled at the WRAM and Toledo shows.

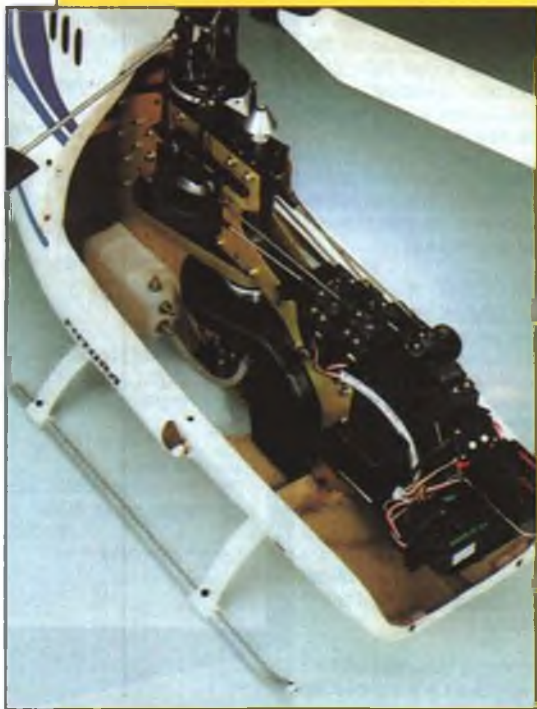
BY JAMES WANG

**T**his month we'll discuss the new heli items on display at the WRAM and Toledo shows last spring, and I'll tell you about a couple of the goodies we have recently tested.

In our Chicago show report (March 1993 *MB*) the theme was on the new heli radios from Airtronics, Futaba and JR; the theme of the WRAM and Toledo shows was on helicopter items. Miniature Aircraft USA displayed its new carbon-graphite side frame XL-Pro helicopter. The complete kit will sell for \$1399 and should be available by the time this is in print. The helicopter will come with a totally new wood blade design with a special new airfoil selected by yours truly and modified by Ted Schoonard. Wayne Mann says this new blade does great autos and gives fast forward flight speeds. The blades are available in 710mm and 690mm and 650mm lengths and are 14mm thick at the root. I have been testing a pair of the 710mm blades on my Futura—they

fly great! The blade root end has a molded plastic plate along with a layer of carbon fiber for reinforcement. The blade root is more streamlined than X-Cell 60 blades. Each finished blade weighs 200 grams.

All of the wood blades made by Miniature Aircraft USA now



■ **LEFT:** Schluter's new mechanics for the Futura Royal fuselage. This has the engine facing forward for easy access and to keep the CG forward. The side frames are only 1.5mm thick to reduce weight. James will be reviewing the pod-and-boom Futura (with rearward facing engine mechanics) in a coming issue.

■ **RIGHT:** The "Moskito" is the new .40-.50 size helicopter from Robbe/Schluter. It will be out this summer. Note that the engine is mounted transversely and that the cooling fan points to the left side of the fuselage. The model comes with both the standard skid arrangement seen here and with a tricycle wheeled landing gear.



## A Look At Mat's 6-Volt Battery & Accessories

Tom Gruenebaum from Model Aviation Technology (MAT) has been promoting his company's 6-volt, 1200-mAH sealed lead-acid receiver battery along with their new charger and battery checker. I have been using a MAT battery for the past three months. The following are my impressions.

I have noticed that on 6 volts, the gyro turns much faster and the servos also move faster. The cyclic, collective and tail rotor control transient response rate have all improved by about 20 percent. (Transient response refers to how long it takes to reach a steady state pitch rate, or roll rate, or yaw rate after a control input is given.) I like this fast response for hotdogging. A faster spinning gyro flywheel is better than turning up the gain because turning up the gain also increases the electronic noise at the same time. The best way to improve the signal-to-noise ratio is to strengthen the input signal. A faster spinning flywheel does this.

Many contest fliers use a pack of

five cells (6 volts) or even six cells (7.2 volts) and then use a JMW voltage regulator to step down the voltage to a constant 5 volts to the radio system. The advantage of using the regulator is that it keeps the gyro at a constant rpm (because it's always at 5 volts) even as the battery voltage drops. I have not tried a regulator in series with the MAT 6-volt battery, but it would probably work also. MAT claims the lead-acid battery holds a charge longer and is more vibration proof than a NiCd pack. I have tested the MAT battery in a high-G crash from 100 feet, and it still works (it was an involuntary test).

The performance of the MAT lead-acid battery depends on how well it is charged. If you are going to get a MAT 6-volt battery, I suggest you also get the MAT charger designed for it. The charger automatically detects when the battery is fully charged, then goes into the trickle charge mode. The charger can be used with both a 110-VAC wall outlet or 12-VDC car lighter jack.

Another useful item from MAT is an expanded scale voltmeter that can be used to test a 4.8-volt NiCd pack, 6-volt MAT battery, or a 9.6-volt NiCd transmitter battery. I have bench tested the MAT ESV against a digital voltmeter and find the reading to be fairly accurate.

I have tested MAT's 6-volt battery with Futaba, JR, Airtronics and Kyosho receivers and servos, with no damage or ill effects to any of them. The only drawback of this battery is that it is quite heavy—10 ounces. By contrast, a 1000-mAH NiCd pack weighs 4-5 ounces, and a 1200-mAH NiCd pack 5-6 ounces.



have a 1/8-inch wide hardwood trailing edge strip to prevent dings. The trailing edges on these wood blades are very sharp, which can reduce the blade aerodynamic drag by as much as 10 percent. I think these are some of the best .60-size wood blades on the market.

MA also showed its new Pro-II fiberglass blades. These glass blades come in only one length (665mm). They have a symmetrical airfoil and a sawtooth at the trailing edge. I am not sure if the sawtooth has any aerodynamic purpose, but I found the blades to be pretty good for hotdogging. The Pro-II blades have a 14mm blade root so they will fit the X-Cell, Schluter and Hirobo models. MA's 1993 color catalog sells for \$6.00. The price list section is like a book, there are so many heli items in there.

Len Sabato of Horizon Hobby Distributors was showing the

The new .60-size Tsurugi helicopter from Hirobo is being imported by Altech Marketing in New Jersey. It has a forward facing engine, rear mounted fuel tank, SST Eagle clutch, wire drive tail rotor, and molded plastic main rotor head.



The two new scale fuselages from Robbe for the .60-size Futura include a huge BK-117 and Hughes 300. To make these scale models complete, Robbe is also producing beautifully made three- and four-blade rotor heads.



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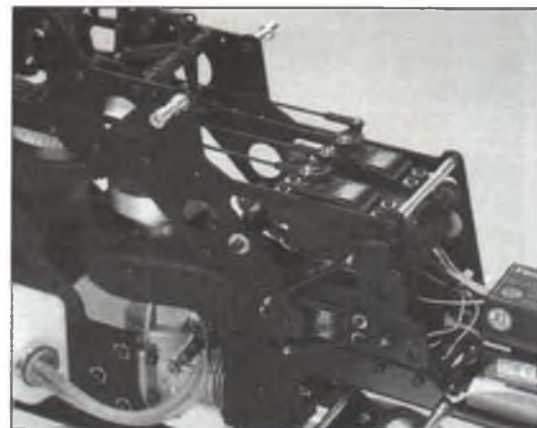
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new Enforcer ZR. This helicopter looks like the old Enforcer, but the inside has been vastly improved. (*Editor's note: See Dick Grossman's review of the ZR in last month's Model Builder.*) A new metal clutch and clutch bell have solved the gear wear problem. The new wood blades are made by K&S in Japan. The Enforcer blades come ready to use. They are weighted with lead, covered with a clear shrink tubing, and factory balanced. They are 30mm longer than the old Enforcer blades and have a 45-degree sawed-off blade tip.

Because the old Enforcer had only one spring steel plate, the model tended to pitch up in fast forward flight, and the blades could strike the tail boom in autorotation. The new rotor head has two spring steel plates to increase the flapping stiffness, not blade damping as quoted by some writers. The double steel plates provide stiffer "spring" action to help stabilize the model by resisting the tendency of the fuselage to tilt relative to the rotor.

The newest helicopter from Kalt is the .60-size Grand Prix. This is a very high quality and expensive model designed specifically for F3C competition. It has an all-metal rotor head and frames. I understand that this model will be available on a special order basis only.

John Adams at Horizon is presently flying a Grand Prix with a new K&S push-pull rotor head. Each main rotor blade is hinged individually, but underneath each blade grip is a 90-degree bellcrank, and the two grips are linked together with a connecting rod. When one blade flaps up, the other blade is pulled



A rocking servo tray is used for collective control in the Tsurugi. The collective servo is seen here on the side. Pitch and roll cyclic servos are on top; they move back and forth as a unit. All controls have push-pull linkages. The photo shows the optional driven tail rotor system on the main gear.



The "Saber 6" is a new transmitter tray design from Petal Manufacturing. Constructed from smoked acrylic, it is unaffected by fuel. It is adjustable in height and tilt and comes with a wide neck strap.

## News Flash!

We've just learned that Altech Marketing and Hirobo Ltd. are again teaming up to present the Second Annual 1993 Hirobo Cup Helicopter Contest on August 21 and 22, at the Dorbrook Recreational Area in Colts Neck, New Jersey. The meet promises to be of interest to all heli fliers, from rank beginners to seasoned FAI competitors.

Saturday will be devoted strictly to novice fliers, new heli owners and prospective buyers. Hirobo factory team fliers and other experts will be on hand to give setup and flying tips and in general help out in any way they can. Sunday will be a three-round FAI competition beginning at 8 a.m., featuring some of the world's top heli pilots. Awards will be presented to the top three finishers.

We realize this announcement is coming on very short notice, but if there's a chance you can get away for the weekend, you really should try to make it. For more details on the 1993 Hirobo Cup, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391; (908) 248-8738.

to flap downward. It is therefore built like an articulated rotor, but it behaves like a teetering rotor. Horizon is importing the K&S push-pull rotor head for .60-size models that have a 10mm main shaft.

Great Planes is also importing an all-metal push-pull head made by Zeal for the Concept 30. (Zeal is a special Kyosho product line that makes high-quality upgrade items for the Concepts.) These push-pull rotor heads are not cheap; the K&S .60-size head retails at over \$500, and the Zeal .30-size head is priced at over \$300.

Altech Marketing, the importer of Hirobo helicopters, announced a new .60-size model that may be available around July. It is called the Tsurugi; the word refers to the Japanese sword used by medieval Samurai. The price is surprisingly competitive: \$825 retail.

The Tsurugi uses a combination of metal and plastic construction. The side frames are metal, the rotor head is plastic. The clutch bell is from the top-of-the-line Hirobo SST Eagle. Collective control is done by rocking the pitch and roll cyclic servo tray fore and aft. The collective, pitch and roll cyclic controls all utilize push-pull linkages to reduce slop. The control system looks quite innovative.

continued on page 74

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## "Could All Top Pilots At the '93 USA FC-3 Team Trials Be Wrong?"

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2nd -	Wayne Mann	XL-Pro/Optima
3rd -	Wendall Adkins	X-Cell .60 Custom/Triumph
4th -	Cliff Hiatt	XL-Pro/Optima (Team Alternate)
5th -	Dan Chapman	XL-Pro/Optima

*Other Notable '93 events thus far . . .*

### Tangerine Champs

FAI		
1st -	Wayne Mann	XL-Pro/Optima
2nd -	Dan Chapman	XL-Pro/Optima
3rd -	Wendall Adkins	X-Cell 60 Custom Triumph

### Class II

1st -	James Griffith	X-Cell .60 Custom
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### British FC-3 Team Trials

2nd -	Alistar Newman	XL-Pro
4th -	Dave Wilshire	XL-Pro (Team Alternate)

### Scotland - Carlisle FAI

2nd -	Dave Wilshire	XL-Pro
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### Brazilian Champs/FC-3

1st -	Jefferson Elias	XL-Pro
2nd -	Richard Pinmo	XL-Pro
3rd -	Lucifer Brendler	XL-Pro

### Australian Nationals

FAI		
1st -	Ian McDonald	X-Cell .60 Custom

### Columbian Nationals

FAI		
1st -		X-Cell .60

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# HANNAN'S HANGAR

BY BILL HANNAN

**"To watch one of these fascinating little ships of the air, which you have fashioned and built with your own hands, actually rise from the earth and soar aloft with a swallow's swiftness, is perhaps the greatest sport in the world."**

Our flowery quotation, from the 1910 work *The Boys' Book of Model Aeroplanes* by Francis A. Collins, was found in the Colorado Indoor Barnstormers newsletter, edited by Mark Young. This newly formed group puts the accent on fun, as may be judged from our photo showing Mark Young and Jeff Kumpf with their fleets of brightly decorated Boxy Bipes, built for the club's recent indoor dogfight contest (!). This design, similar to Sig's Uncle Sam biplane kit, was chosen for its ease of construction, since so many were required.

The event was conducted over a specially marked gymnasium floor "playing field," complete with observation and barrage balloons, no-man's land, and scoring circle. Involved were balloon-busting and ground-to-air combat between opposing Allied and Axis team members. There was even appropriate background music,



A sampling of Eccles Brothers cast metal "Dimestore toy collectibles" includes passenger and cargo monoplanes, available in kit or finished form, as well as semi-flat Graf Zeppelin and CrackerJack premiums. See text for more information.

ming was so easy. After checking the CG and attaching the wings at 50 percent, a tweak of left rudder and 100 prop winds, all but one flew perfectly on the first flight!"

Anyone interested in subscribing to the Barnstormers newsletter (three have been

the 1930s.

If you have ever priced old metal toys, you will be aware of the astounding values placed upon them by antique dealers. By contrast, the Eccles reproductions are quite reasonably priced, especially considering their limited production. Note



■ ABOVE: Jeff Kumpf (left) and Mark Young, of the Colorado Indoor Barnstormers club, prepared these 16 colorful Boxy-Bipes for exciting gymnasium jousting. See details in article. ■ ABOVE RIGHT: Al Backstrom's 82-second HL-2 Polish parasol is charmingly displayed by Liz McGee, of Texas. The rubber-powered free flight model is based upon modified Lubomir Koutry plans.

such as the 1812 Overture and Wagner's Ride of the Valkyries!

Fourteen pilots participated, and when it was all over, the gym floor really did resemble a battlefield. There were no injuries (everyone wore safety goggles) and all but one plane survived almost intact, four or five needing no repairs at all. Quite amazing when you consider that half the pilots were children, the youngest only four years old! Said Mark: "We really expected most of the planes to be destroyed. Flight trim-



published so far), which contains plans, building hints and humorous tidbits, should send \$12 for 12 issues to Mark Young, 2207-1/2 W. Colorado, Colorado Springs, CO 80904.

## COLLECTOR TOYS

One of our photos shows a few of many available Eccles Brothers collectible toys. Although they are newly made, they are cast in molds originally employed by such companies as Barclay, Manoil and Ralstoy, dating as far back as

that these cast-alloy toys are not intended for children, but are specifically intended for adult collectors.

Among the items offered by Ron and Debby Eccles are cars, trucks, figures, animals, accessories and even some genuine CrackerJack premiums. Our prime interest, however, is in the aircraft, which include such diverse subjects as an early primary glider, a Spirit of St. Louis, a tin-wing Monocoupe, and twin-engine transport and military monoplanes. Of particular





■ FAR LEFT: Ron Thornton, of England, constructed this magnificent RC Hall Springfield Bulldog racer from Vern Clements plans. In spite of skeptics, Ron reports the model is "...a precise pussycat to fly." ■ LEFT: The structure of Otto Kuhl's intricate Gasparin CO<sub>2</sub>-powered ARUP S-2 Peanut, based on Mark Allison's scale drawings. Note the laminated propeller, detailed dummy engine and absolutely exquisite workmanship. ■ LEFT BELOW: This 94-1/2 inches long Akron dirigible, made of pine, spruce, bass, plywood and silver-doped silk, was made by Walt Grigg, of Florida. A tiny Curtiss F9C-2 biplane, hanging on its trapeze, is barely visible above the "1" in 1920 on the museum wall.

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interest to model builders is the fact that the products are available fully finished, signed and dated by Debby, or in unassembled, unpainted form. It would be difficult to imagine a simpler "kit," which can be completed in about 20 minutes. Or, if one may care to spend extra time and effort, there is ample scope for refinements. Components such as propellers and wheels are also sold separately, in case you may need to repair or restore similar toys.

Whether you are a serious collector or have only a casual interest in nostalgic toys, we think you may enjoy having an Eccles catalog, which are truly charming publications. There are two different ones: Catalog A features airplanes, automobiles, trucks, figures, accessories and Crackerjack premiums; Catalog B shows the semi-flat figures, ships, animals and the little profile Zeppelin castings. Each catalog costs \$3, from R.W. Eccles, R.R.#1, Box 253-D, Burlington, IA 52601.

### **SPEAKING OF TOYS**

According to *Toy and Hobby World* magazine, a company called Toymax is marketing a vacuum forming machine. Readers may recall how popular the long-out-of-production Mattel Vac-U-Form unit was among free flight modelers for making canopies and other lightweight plastic parts. We hope to present more information on the Toymax version in a future column.

### **THOSE FEMALE FLIERS**

John "Thud" McElroy, of Mineola, Texas, sent some kind words regarding our female modelers coverage, saying his personal favorite flying partner is his three-year-old granddaughter, Lizzy Knight, who can "chase gliders with the best of 'em!"

And from France, Georges Chaulet writes that the French magazine *Modele* recently published an article by Francoise Briquet, a modeler's wife. We extracted and slightly edited the following from Georges' translation:

"Hello you fans of stunt, quarter-scale, multi-planes, flying soapboxes and so on. For six years I have been married to a crazy modeler who does everything from thinking up a design to putting it up into the air. Not to mention his ARF planes, the kit models which may or may not include the two- or four-cycle engine, the hardware or a warranty. The models we love, or the ones which find their way into a garbage-can. Well, if such models had not been so costly, they could have been thrown away immediately, and instead I would have preferred to buy some useful gadget for the house.

"I'm tired of hearing my husband always angry about a model he's not able to trim, and spending most of his time trying to fly his planes. Nevertheless, he succeeded in convincing our sons to take up model building. After two months they were able to fly a "slightly warped" model.

"At the beginning, I only watched the models in the club of which my husband is

president. Then I found it was more interesting to time the models with a stopwatch, instead of knitting or reading during a contest. And less annoying. Next, I went further by asking for a Model Airplane Federation card to become a judge. Starting with a small 12-inch model, I studied the aerobatic flight regulations, then began as a tenderfoot judge; hard work, especially during the cold winter, but so pleasant to watch teenagers piloting so masterfully.

"It is quite different to be on the other side of the fence observing others who are fighting the wind, the radios, the engines.... My philosophy is that a wife can do much better than staying inside the car, waiting for the time when her husband has finished playing with his toys."

### PRODUCT NEWS

Plans for a modern reproduction of the 1929 Texas Temple parasol two-seater monoplane are the latest release from Al Lidberg. Al's plan packet includes crisply drawn construction drawings for a 37-1/2 inch span rubber-powered model, proof-of-scale documentation, detailed building instructions, and a small pressure-sensitive decal sheet with markings, Temple logos and its instrument panel. A mere \$1.50 will bring you a 16-page illustrated catalog showing this and many other designs. Write to A.A. Lidberg, 614 E. Fordham, Tempe, AZ 85283.

Vern Clements offers plans for models such as the Hall Springfield Bulldog racer shown in one of our photos. Vern's exceptionally detailed delineations are now offered in several sizes, making them applicable to free flight, control line or radio control use. His most recently revised plan is for the Culver Cadet, which was extensively researched in conjunction with Lawrence Low, of the Culver owners' club. For the complete catalog, send \$3 to Vern Clements, 308 Palo Alto Dr., Caldwell, ID 83605.

Diels Engineering has settled into a new location, and owner Dave Diels has released additional rubber-powered model kits and plans. Among them are Spitfire and Hurricane kits from New Zealand, Diel's North American O-47A, Me-109E, and a limited-edition Globe Swift. For a current catalog, send \$2 to Diels Engineering, Inc., P.O. Box 263, Amherst, OH 44001.

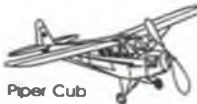
Edward Schlosser has located more old-time model items, such as plans for the 34-inch span Dyna-Moe class C rubber cabin job with retractable monowheel; the Flea, a 36-inch span Scientific semi-endurance model; and a 37-inch span Fairchild 24, a two-time national scale championships winner. A stamped, pre-addressed return envelope will bring you complete descriptions of these and other vintage items, from Edward Schlosser, Box 412, Ridgefield, NJ 07657-1418.

Please tell 'em *Model Builder* sent you!

### SIGN-OFF

"People who take off in a rage, generally make a bad landing." (Author unknown.) **MB**

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# FREE FLIGHT

BY BOB STALICK

## The "Window Plane" by Art Ellis— a different approach to P-30

What's in a name? Does a rose by any other name smell as sweet, as William Shakespeare suggested? Does a free flight by any other name fly as well? Would a Starduster or a Zipper or a Sailplane be different if they were named Clunker, Zapper or Ground Diver? If nothing else, I am sure that the kits would not have been sold in such great numbers without those ephemeral names. So, names do make a difference—at least to me!

If you have been following my columns, you know that I have a penchant for unusual or odd names. For example, some of you may remember the AWonder, an A-1 glider I designed over 15 years ago. How about the Lawrence Wake ("turn off the bubble machine"), the Good Vibrations Mulvihill



Remember the "Crazy Checks," last month's featured three-view model? Here's one with a Johnson .35 being displayed by 14-year-old Jenny Coffin, whose dad, Jim, finalized the original design back in 1952-53. Full-size plans are available from Jim—see last month's *Model Builder* for details.

(no shimmy or shake in the prop shaft), or the simple FAI man (a completely rectangular FAI model published in *MB*, designed before the F1C appellation became in vogue)? I remember when Fast Richard Mathis published Tearalong, the Dotted Lion (a polka dotted control line model) and my all-time favorite, the Hypodemic Nerdel (an A-2 glider). These monikers and several others are catchy and appealing.

Consequently, when I came

across this month's three-view, the Window Plane P-30, I was immediately taken with the name. It conjures up a nearly transparent, simple model. I like it a lot. So, read on to find out more about this unusually named and unusually designed but very competitive model.

### SEPTEMBER THREE-VIEW: THE WINDOW PLANE

by Art Ellis

This article is excerpted from a lengthier and more complete version that appeared in the Spring 1993 edition of *Flyoff*, the newsletter of the Brooklyn Skyscrapers.

"The Window Plane is quite different from the typical P-30. It has a dramatically larger wing and stab area, uses a much longer motor run, and is covered with clear Mylar, which gives it its name. These design elements, combined with a number of less-obvious features, result in still-air times in the 3 to 4 minute range—a quantum jump in performance over the 2 minute times of a well-executed standard P-30.

"The flight of a typical P-30 consists of a motor run of approximately 30 seconds to a height of 150 feet and a glide of 90 seconds. The Window Plane's flight profile consists of a motor run of 60 seconds to 200 feet and a glide of 150 seconds. The three major differences are the longer motor run, the 50-foot increase in altitude, and the slower rate of descent. The slow descent of the Window Plane is simply a function of its large wing area.

"The trick is how to build a plane almost 50 percent larger to minimum weight and make it stable enough so as to not be upset by turbulence. The 1/4-mil Mylar covering is singularly the answer to the weight problem. This Mylar weighs .75 gram per square foot. Typical P-30 tissue and dope weighs 3-4 grams per square foot. The result is a weight saving of 2 grams for a wing that is 50 percent larger, and this includes the Sig Stix-It used to attach the

Mylar to the frame. Mylar is more than adequately stiff for the P-30 structure.

"The stability issue is mainly solved by using a relatively forward CG and a very large stab. The CG is at 60 percent, and the stab is a huge 4x16 inches. The stab is also mounted on the bottom of the fuselage, which, together with negative incidence in the wing, gets the stab away from the retarded slipstream caused by the windmilling prop and makes the stab more effective.

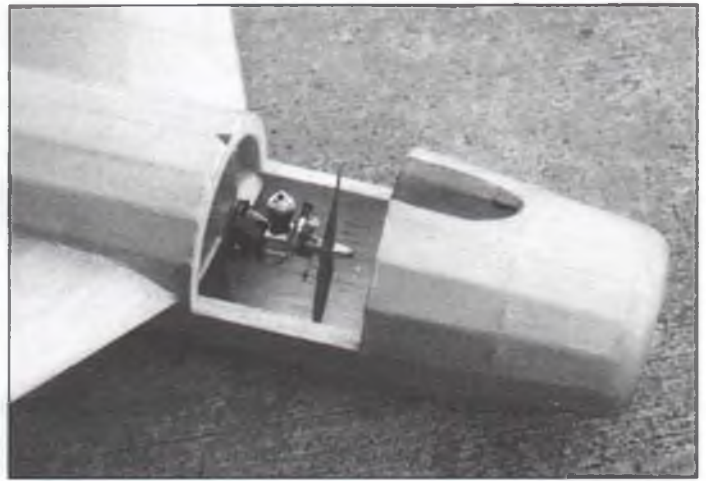
"There is no question that the use of Mylar is critical to the design. The component weights illustrate this:

Fuselage with fin and rubber peg .....	10.0 grams
Wing with D.T. tube and paint .....	15.0 grams
Stab .....	3.4 grams
Prop and nose block .....	9.8 grams
Rubber bands and motor hook .....	1.2 grams
Ballast .....	0.6 grams
Total .....	40.0 grams

"The climb of the Window Plane is demonstrative. It is not dramatic—it is noticeably slower. But it seems to go on forever and ever, with the final result that is very high and the timekeeper's watch reads 1 minute. There are three elements to this improved climb: light weight, the use of miniature bearings on the prop shaft, and a very efficient climb profile.

"The Window Plane uses miniature 3/16-inch ball bearings on a .055-inch shaft. The bearings are a press fit on the shaft, eliminating almost all vibration, as well as making a very easy running front end. A source for these bearings is: PIC Design, P.O. Box 1004, Benson Rd., Middlebury, CT 06762. Ask for part number B2-17.

"The Window Plane uses the Peck 9.5-inch prop, which has a large area and relatively low pitch. I typically measure these props at a P/D ratio of 0.9. The slower flight speed of the Window Plane is needed to make this prop efficient. I use three strands of 3/16 FAI tan 25.5



David Sherman of Puyallup, Washington has been experimenting with .010 designs, among them this standoff scale YAK 30 with the engine mounted inside the fuselage. Weighs in at 4 ounces, has a span of 30 inches and flies nicely, according to Dave. He starts and adjusts the engine, then snaps the hatch into place before launching. (Editor's note: Does anyone remember George Richter and his "Ric-Jets" of the late '60s-early '70s? George used to show up at Sepulveda Basin—formerly a premier SoCal FF site—with a bunch of his Ric-Jets every weekend. They were scale-like models; he had a couple of 737-type airliners, a Lear Jet and even an F-104. All of them used a tubular fuselage of balsa or cardboard, open at both ends, with a profile nose and tail glued in place. They were similar to what Dave Sherman is doing here, in that an .010 engine was enclosed in the fuselage, but George's models instead had a demountable wing with the engine mounted on a center pylon. He'd start and tune the engine with the wing off, then rubber band the wing to the fuselage and launch. They all seemed to be great fliers. George tried to market them, but for some reason they never caught on. The last I heard, he was developing a full-size homebuilt using a ducted fan setup. Does anyone know if George is still active in modeling or if his homebuilt was successful?)

inches long, wound to 1150-1350 turns. This produces 2.6 ounce-inches of torque just after launch and 1.3 at cruise. A standard P-30 typically uses six strands of 1/8 rubber, 19 inches long, wound to 750-850 turns and yielding 3.4 ounce-inches after launch and 1.7 at cruise.

"The most important ingredient for flying slow in the early part of the climb is 'speed stability.' Good speed stability means that if the plane gets off track, it will return quickly to its proper speed and climb angle. The secret to good speed stability is a strong pitch-down moment when speed decreases and a strong pitch-up moment when speed increases. Good stability will be achieved if this increase in thrust results in a pitch-down moment. This effect will occur when the wing is set at negative incidence relative to the thrust line. For this reason, the Window Plane carries 3 degrees of negative incidence in the wing—and more might even be better.

"A few other miscellaneous comments may be helpful to understanding some of the peculiar details of this model:

"1. Rudder size. The plan calls for a piece of 1/32 sheet on top of the vertical tail. To get good directional stability in the climb, the rudder should be as small as possible. But if it's too small, Dutch roll will be excessive in the climb—dependent upon the amount of dihedral. On this model, 4 inches of di-

hedral requires an 8 square inch fin; 4-1/2 inches of dihedral requires 9 square inches. I find it easier to make the fin get bigger than to have to remake one smaller, hence I used the 1/32 sheet.

"2. Wing D.T. The fuse burns through the rear wing band to dethermalize. The result is the nicest slow inverted spin you ever saw.

"3. Nose block adjustment. Four 2-56 machine screws are used to trim the thrust line. The difference between a so-so climb and a spectacular one is less than 3/4 of a turn in adjustment.

"4. Right wing washin. In the initial climb this washin helps prevent the quick rolloff to the inside that can waste so much energy. In the glide, this washin results in a flat turn and forces the right wing to stall first in turbulence. When the inside wing stalls first, recovery is snappy and little altitude is lost.

"5. Winding. I remove the stab to get the rear peg into the winding stooage.

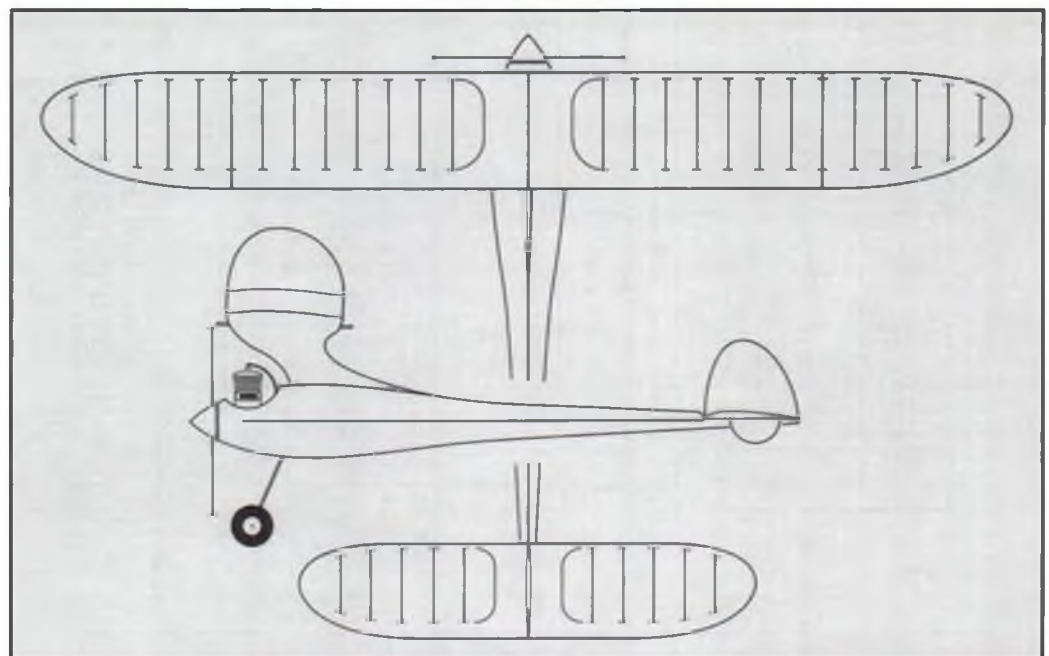
"6. Freewheeler. This ancient freewheeling arrangement is simple, works masterfully, and is widely used. I'm indebted to Stan Colson for showing it to

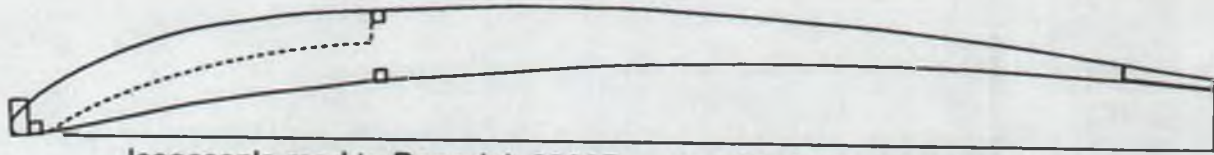
me. The tension from the motor is carried by the 1/16-inch wheel collar. The prop has to be manually pulled forward and held there when the nose block is attached to the wound motor. When torque dissipates, the prop slides rearward to free-wheel."

## SEPTEMBER MYSTERY MODEL

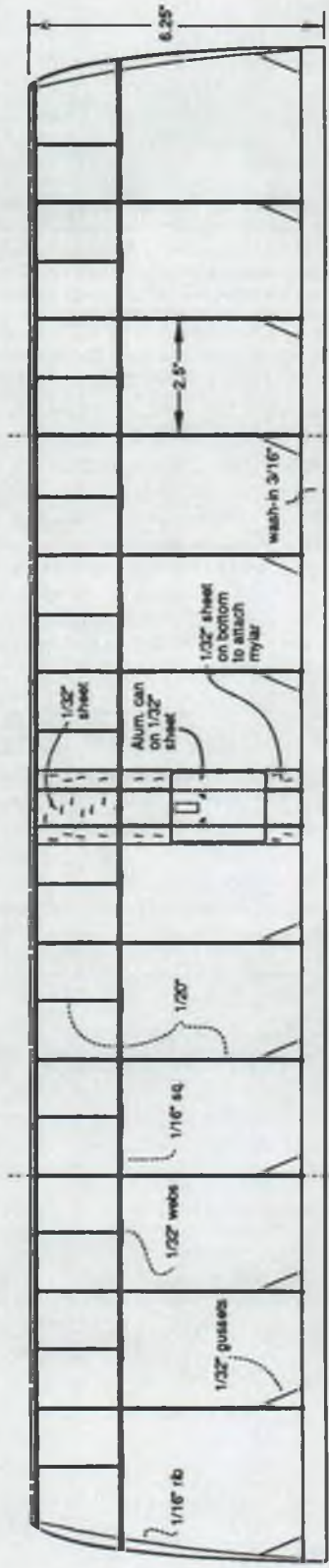
Immediately following WWII, a few magazines other than *Air Trails*, *Model Airplane News* and *Flying Aces* featured model airplane construction features. Such is the case with

### MYSTERY MODEL

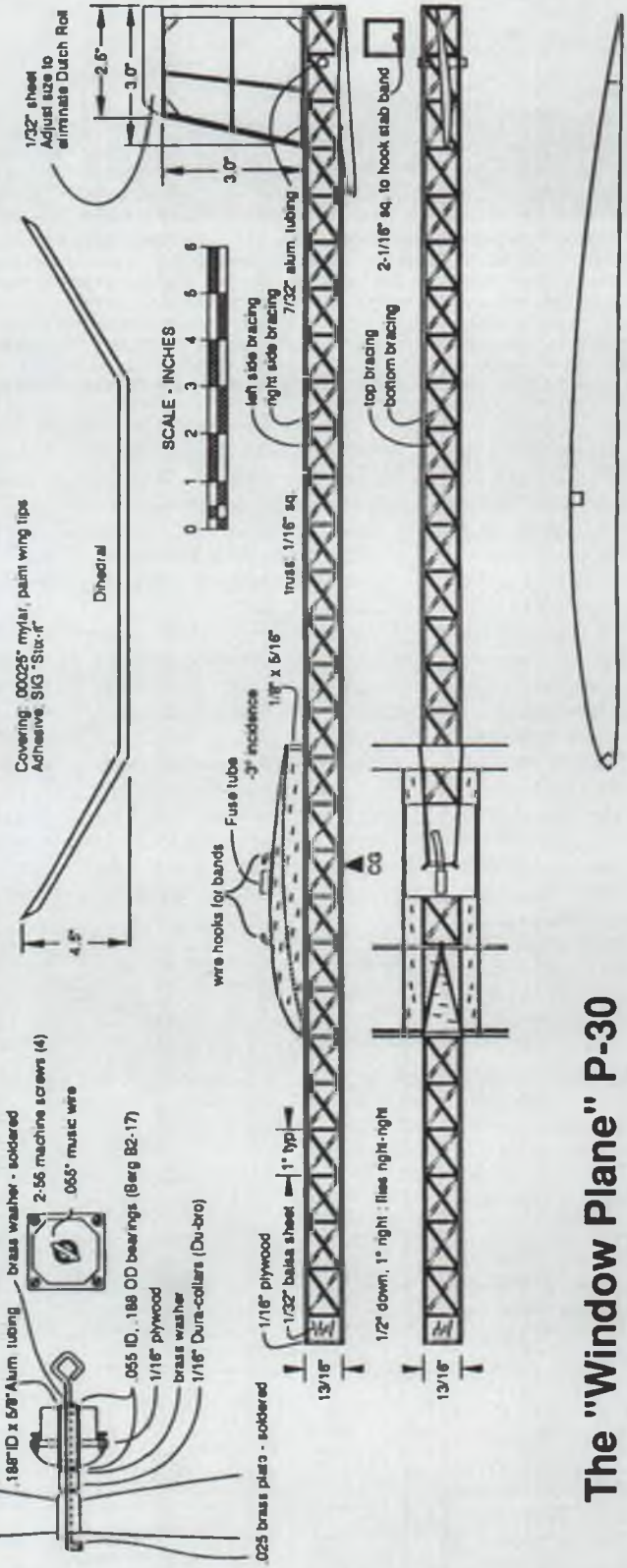
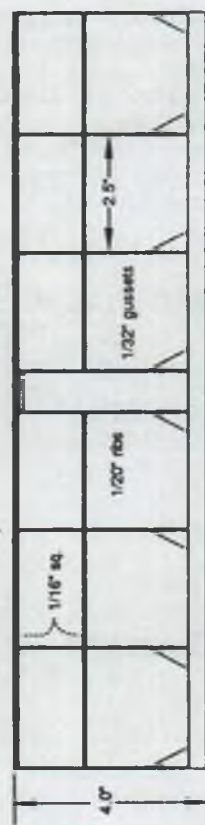




Isaacson's mod to Benedek 6336B — see *Model Builder*, June 1989



Plan is 1/4 size; airfoils are shown full size. Dihedral sketch and nose details are not to scale.



**The "Window Plane" P-30**  
 1992 AMA Nats winner  
 Designed by Art Ellis

# FREE FLIGHT

the September Mystery Model. This little ship was intended for the small Arden .099 or similar spark ignition engines. It is from the so-called "pencil bomber" school of design, and the plans appeared 1/2 size in the magazine. It is a sleek ship and is on the approved Nostalgia list as an ignition-eligible design.

If you think you know the name of the model, send a postcard or letter to *Model Builder*. Include your name and address and the name of the model. The winner will be drawn from among the correct entries received, and wins a free one-year magazine subscription.

## JUNE MYSTERY MODEL WINNER

The PAA Junior Jet by Brent Hawkins was one of those eleventh-hour efforts that paid off with a 1st place win in the Junior Jet event at the 1956 Nats in Dallas. Brent showed up with a model that didn't meet the rules—he misunderstood the event being flown—and stayed up all night to convert an unused hand-launch glider to carry a payload dummy and a Jetex 50B motor on the belly. Its first powered flight the next day was an official, finally going O.O.S. on its fifth and last flight, landing Brent in the winner's spot. *Model Airplane News* carried full-size plans for the model in its July 1957 issue.

The magazine subscription goes to Windsor Whittle of Baton Rouge, Louisiana. We also had an entry from Brent's father,

Robert Hawkins, of Tucson, Arizona. Larry Loucka of Willoughby, Ohio wrote that he built a PAA Junior Jet in 1958, but that "... flying was a little scary because it had HLG 0-0 decalage. If the nose dropped under power, it was crash city!" Frank Beatty of Granite City, Illinois wrote that, by coincidence, his Curtiss R-6 control line scale construction article appeared in the same issue.

Then there was Dick Hawes, of Omaha, Nebraska. Dick wrote twice, first to say that the model was the PAA Jet by Brent Hawkins Jr., then to correct himself—the PAA Junior Jet by Brent Hawkins. Wrote Dick: "I had all the words there, just not quite where they belonged!"

## THE .010 SCENE

There's still time to get your application in to host an .010 postal event in your area. There is no cost for entry and you can win some nice prizes, including Cox .010 engines, *Model Builder* T-shirts and subscriptions. If you haven't sent for your registration materials yet, do it now. Send an SASE to Bob Stalick, 5066 N.W. Picadilly Circle, Albany, OR 97321. You have until October 15 to get your flying done.

## NEW NOSTALGIA RULES BOOK

Bob Larsh announces that rules book #5 is now available, as noted here last month. I did quote the wrong price for the book, however; the actual price



Ricky Cochran shows off one of the new all-foam Russian CO<sub>2</sub> FF models that will be sold by Sig Mfg. Co., according to importer, Dan Rutherford. See text and also "Over The Counter" for details.

is \$3 plus two first class postage stamps (42 cents). The new book corrects a number of technical errors from edition #4 and provides a different organizational numbering system so that items can be located easier. Also, newly approved models and some changes in the engine definitions are included. Send to Bob Larsh, 455 S. Whitcomb Ave., Indianapolis, IN 46241.

## RUTHERFORD'S RUSSIAN ENGINES

A couple of issues ago, I noted that Dan Rutherford was importing some very nice looking and exceptionally powerful .049 engines from Russia. I have since obtained one for my own use and found it to be significantly better than my best Tee Dee .049. Dan tells me that George Aldrich is selling these VA .049 engines for \$45 each plus \$5 postage for every three you order. Contact George at 12822 Tarrytown, San Anto-

nio, TX 78233. I understand that the first order of 100 engines has been sold, but by the time you read this, the next order will be in place awaiting your call.

Dan also shared with me a copy of a new Russian CO<sub>2</sub> motor and ready-to-fly CO<sub>2</sub>-powered foam free flight model. This whole setup is very nicely done and uses standard CO<sub>2</sub> cartridges for the power supply. As best as I can tell, the displacement of the motor is .27cc. Construction of the motor is a combination of hard plastic and aluminum. All charging equipment is provided, and the instructions are in English.

You can buy the motor by itself or the model complete with the motor; the cost is \$25 and \$35 respectively. Dan tells me that Sig Mfg. Co. will be selling both units and should be advertising them by the time you read this. **MB**



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## PLUG SPARKS continued from page 59

A photo of the MG-1 first appeared in the "Aircraft" section of the *Sunday Call* of Newark, New Jersey, on February 16, 1936. The following is a quote from the newspaper's account of the model's demise:

"Unproperly trimmed, it did a neat exhibition of stunting... unintentionally, of course. After climbing for a while, the model started to stall. The nose dropped, picked up speed, then looped. Then, loops and loops until finally, it lost sufficient altitude to land at the bottom of a loop. An automobile was in the way. There were minor clanking noises as the plane struck the bumper. Then, it was no longer a thing of beauty."

Several versions of the MG were built, including different wingspans (from 8-1/2 to 9-1/2 feet), different airfoils, different shaped tips and even some variations in the tail shape. Regardless of which is used, there doesn't seem to be any real advantage of one over another.

### READERS WRITE

Probably the most prolific RC O.T. builder in Southern California is Angus Crosbie of North Hollywood. This time he sent no less than six photos of what he has been doing. Among them, we have selected Photo No. 4 as representative of the type models he likes to build—in this case, a Dick Schumacher "Josephine," powered by a K&B .28 Sportster and done up in green and pink MonoKote. His latest project is to scale down a 12-foot Lanzo "R/C'er," sometimes called the "Racer." (It is anything but!)

### EASTERN ECHOS

Finally heard from Jack Bolton, formerly a USN Commander stationed at Lakehurst NAS, where I first met him at the first Eastern Old Timer SAM Champs.

Seen in Photo No. 5 is Jack with his free flight Scientific Coronet powered by an Ohlsson .23. This model has been carefully re-created in the same mold as the original kit, i.e., paint scheme, tissue/silkspan covering, plus clear Randolph dope with red Sig trim. Incidentally, all ignition parts are at least 50 years old (coil, spark plug, Austin timer, etc.). The model not only flies well, but recently took 2nd in a "Spirit of SAM" event.

### AND FROM FLORIDA

While writing on East Coast activities, the latest SAM Hall of Famer, Jerry Stoloff (9330 Lime Bay Blvd., Tamarac, FL 33321), sends in Photo No. 6 showing his two RC Bay Ridge Diamond Demons, in 48- and 72-inch wingspans. The big one is powered by a Royal .28; the 48-inch model uses an unspecified .15 or .19 engine.

### AUSTRALIA

This columnist always looks forward to letters and information from Gordon Burford, well known for his tremendous versatility in



diesel engine design. Although Burf does not produce engines in quantity, he does spend considerable time developing new concepts in engine design.

Such is the case as seen in Photo No. 7 showing Burford's latest diesel engine, a rear-intake .21 with square fins. Burford reports it took him two years to develop this engine, which is currently flying a V-K Challenger.

Burford writes rather enthusiastically about the recent SAM 1788 Champs held (as usual) at Canowindra, N.S.W. The four days, in the fall, were ideal with very low winds and temperate weather. Burford reports his Challenger was an excellent combination for scoring a flight of 28 minutes in the Texaco event.

### MORE AUSTRALIA

In the eight trips this columnist has made to Australia promoting Old Timer flying, I am still amazed at the number of friends I have made. One such active builder is Albert Fisher of Guildford, N.S.W., who submits Photo No. 8 showing his Hal DeBolt Blitzkrieg.

Al's model is quite colorful, with red and yellow wing (black on the bottom), orange and red tail and green fuselage with yellow and pink trim. Powered by a small Super Tigre X-11, this 53-inch span model has turned out to be a very good flier.

### THE WRAP-UP

This month, we indulge in a little humor as expounded by Bob Angel, newsletter editor for SAM 26. This was brought about by "brain fade" (or am I just getting too old?) that results in you rushing from the desk to the workbench only to find you have forgotten what you were going for! In this columnist's case, this is particularly exasperating, as going up and down the staircase to the garage workshop is a real chore.

This brings up the crux of the discussion: the disappearance of items left on the workbench. This is particularly true if you remove the item with your right hand (say, a prop nut) and lay it down with your left. When you go to pick it up, you guessed it... gone! And I mean gone for at least one or two days, despite diligent searching.

Angel visited Eut Tileston and discussed this phenomenon. Eut offered this solution: "The part has moved temporarily into the fourth dimension. You just have to wait until it returns to its original location or a nearby spot." This was proven by the loss of a crankcase nut from Eut's O&R 60. After a thorough search, they took a coffee break. When they came back, lo and behold! The nut was promptly found!

Bob discussed this with his No. 2 son, Ed, who explained, "This is a Reverse Hallucination." Wha-a-t! "You know what a hallucination is? That's when you see something that isn't there. So, then a Reverse Hallucination is when you don't see something that is there." Double haw! That'll put an end to scientific explanations! **MB**

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## CHATTER continued from page 62

Yellow Aircraft showed five .30 and .60-size fiberglass fuselages, which can be ordered either painted and ready to use, or unfinished. Also displayed were seven different fiberglass blades; three for .60-size and four for .30-size machines. They are very inexpensively priced—less than \$100 a pair. They look like most other fiberglass blades. There is a swept-back blade tip, but the leading edge of the sawed-off tip seems to me to be too round to promote any vortex rollup that boosts lift on the retreating side. Without the rollup effect, the sawed-off tip can only reduce profile drag, and the full benefit of the swept tip is not gained. However, any swept-tip blade is still better than a plain rectangular-tipped blade.

Paul Schwartz and A.E. Stanley of Hel-x were displaying their line of painted and unpainted vacuum-formed canopies. In the July 1993 *MB* we reviewed their G-10 fiberglass side frame upgrade kit for the Shuttle. Hel-x is also now selling ready-to-fly fiberglassed wood blades, already painted and balanced. The fiberglassing is done using the vacuum bag technique to prevent air bubbles. They have an excellent finish and paint schemes of shaded neon, color droplet or plain white.

Pete O'Connor of Petal Mfg. showed a nice transmitter tray and a new main rotor head button for the X-Cell 30 and 60. I received one of the head buttons from Pete and passed it over to my friend Ron Everett for testing. Ron loves the head button because the fluorescent red color makes the center of the rotor head very easy to see. Ron is a beginner, and he says it helps him orient the model and improves his hovering. The head buttons also come in fluorescent green or yellow.

Petal's transmitter tray comes with a strap and a transparent plastic tray that is quite comfortable. The tray is not so good for hotdogging because your hands are constantly making large movements; however, it is a great aid in precision flying and practicing contest maneuvers. It allows you to anchor your palms solidly against the transmitter sides.

Robbe/Schluter also announced a new helicopter kit. The new .40/.50-size model is called the "Moskito." This is a radical design! The engine sits sideways with the cooling fan on the side. The model can be used with skids or tricycle wheel landing gear. The side frames and servo tray are all molded from glass-filled nylon.

Robbe has added two more scale fuselages to their Futura helicopter; the MBB BK-117 and the Hughes 300. I am presently flight testing my Futura, and after I have logged another 50 or so flights, we will have a review and setup description. I think the Futura is a bargain for its high quality metal parts. The machined parts are practically flawless. **MB**

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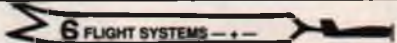
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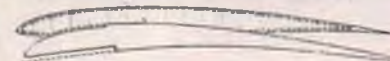
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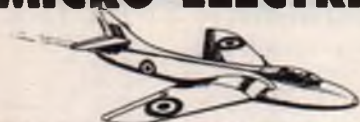
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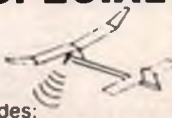
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## MODEL DESIGN cont. from page 17

form by man. Pure silicon is hard, brittle, and a lustrous grey/black. It is considered a non-metal, but has some metallic properties. It is used in making silicon transistors, diodes, solar cells, and integrated circuits. The element germanium preceded silicon as the basic material for transistors and diodes, but modern solid-state electronics is almost entirely silicon based.

The "silicones" are a special series of man-made compounds containing silicon. But only a few silicon compounds are silicones. Silicone oils and silicone rubbers are the most common. It makes no more sense to call a silicone "silicon" than it does to call carbon dioxide "carbon." They ain't the same thing!

In model airplane work, of course, we use silicone rubber for fuel tubing and exhaust extensions, silicone sealer for fillets, gaskets, etc., and occasionally some silicone oil; but the silicon in our integrated circuits is not silicone. To remember which is which, we add something to silicon to make silicones, and we add to the word silicon to make the word silicone. If any of you mistake them again, you get an "F" for the course.

### COLD FUSION

Because of its potential for powering our model airplanes someday, I have great interest in the possibility of cold-fusion energy. The fact that it could also solve all of the energy problems of the entire world forever is, of course, of secondary importance.

In 1989, Doctors Pons and Fleischmann announced they had achieved fusion of the deuterium (heavy hydrogen) in heavy water into helium with a release of energy. The

experiment was at room temperature and atmospheric pressure. Ever since then there has been a dribble of news on the subject.

Pons and Fleischmann were raked over the coals by the scientific community at the time, and they were not able to substantiate their claims to everyone's satisfaction. But most scientists agree that something they can't explain goes on in some such experiments. Therefore I was particularly interested when the following information appeared in *The Wall Street Journal* for October 19, 1992. A Pennsylvania inventor by the name of Randell Mills says he has produced 68 watts of power in a cold fusion cell that required 18 watts of input power! In six months this test cell has produced "214 kilowatts of power." That no doubt should have read "214 kilowatt-hours of energy." And this was supposedly done with ordinary "light" water, not deuterium-based heavy water.

If I haven't made a mistake in arithmetic, there is 80 million kilowatt-hours or 270 billion BTUs available in a gallon of heavy water! The above news release indicates we may not even need the deuterium, but if we do there is no problem. Heavy water occurs naturally in ordinary water in the ratio of one part in 6,900. There is millions of times more deuterium in the waters of the world than we could ever need.

At least five laboratories now claim heat production from ordinary-water cold-fusion experiments. Scientists are still divided. Some claim there must be measurement errors, and others claim something very significant is taking place.

If we someday have practical cold fusion power, the world will change rapidly. Small portable power units may be possible. If so, we would fusion power all land, sea and air vehicles; at high speeds with almost unlimited range and close to zero fuel costs.

Large central powerplants with their cross-country high-voltage power lines would disappear (and the price of copper would come down). The multi-megawatt hydroelectric, fossil fuel, and nuclear power plants would be replaced by small cold-fusion units in cities, in industrial plants, and perhaps even in private homes. Then we would have no more power outages due to bad weather. The home units would provide heating as well as electricity.

To the extent that food shortages are caused by lack of power or lack of water, the world would be much better fed. Fresh water for all uses including irrigation would become very inexpensive everywhere there is salt water to desalinate. And in arid areas hundreds of miles from salt water, fresh water would also be cheaper than now, since the power required to ship it by rail or truck, or the power needed to pump it, would be of minimal cost.

Safety? A little neutron shielding would probably be required, but there would be no atomic waste, no melt-downs, and no radioactive gas leaks. I can hardly wait—to see if it comes about, at least. I predict we will see the beginnings of either cold or conventional commercial fusion power in the next 15 years. I hope it turns out to be cold, which promises to be far cheaper, safer and more portable. How about a fusion power unit in the fuselage of your model airplane? That I won't live to see, but some of you might.

### PARTING WORDS

The last time I had my car serviced I paid \$6.00 for new oil and an additional \$6.40 hazardous waste fee to get rid of the old oil. Hmmm?

Francis Reynolds, 3802 127th Ave. N.E., Bellevue, WA 98005-1346. SASE please. (206) 885-2647. **MB**

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## AEROBATICS *continued from page 15*

side. Again, pick a calm day if possible. If the airplane slowly rolls proversely (up-right) or adversely (tuck under), it should be possible to mix out the tendency without causing other problems. By slowly, I mean 15 degrees or less per 100 meters. If it rolls more than that, the dihedral should be

physically adjusted in the proper direction. On plug-in wings, the tube can usually be bent slightly. With one-piece wings, the fix is to saw halfway through the top center, epoxy the new setting in, and reglass the center.

If you choose to mix, the best source of advice on exactly how to accomplish it is the manual that came with the radio. Basically, it's a matter of slaving the ailerons to

the rudder. When the rudder moves, the ailerons will move a tiny bit and counteract the roll couple. Leave the mix in all the time; don't switch it on only for knife-edge. If the airplane rolls in knife-edge, it also will roll during line corrections and stall turns.

Once the airplane is trimmed for yaw/roll in knife-edge and the wing is truly unloaded, you can proceed to yaw/pitch. Again, roll up and apply top rudder to hold



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position. Either the airplane will pitch up (toward the canopy) or down (toward the belly), or will not pitch at all. Choice number three is my personal favorite (you get to smile and quit!), but it isn't as common as the other two.

If the airplane goes to the belly in both knife-edges it is very likely tail heavy. If it goes to the canopy both ways, it is nose heavy. This is simply because the plane needs either downtrim (tail heavy) or uptrim (nose heavy) to fly straight and level, and the trim is causing the pitch. In either case, moving the balance point (BP) is your first choice of cures.

Providing that all of your problem is not due to simply building in the wrong incidences to start with, you will not usually see much result from adjusting the wing or tail incidences without also moving the balance point, as any new combination of incidence settings (combined with elevator trim) that will produce level flight trim at the original BP setting will also produce the pitch problem in knife-edge. The right sequence is to adjust the BP first, then, if possible and convenient (convenient means if you have an adjustable wing and stab), the incidences can be adjusted to eliminate the elevator trim needed at the new BP setting. Be aware that a large BP change at this point usually means going back to the drawing board on the up and downlines.

If the airplane has been behaving itself

well to this point (good up and downlines with only minor adjustments needed), it would really be surprising if the knife-edge trim were not fairly close as well. Trimming is a very holistic, interactive process. Major problems always show up in multiple places, and usually a good fix on a major problem (such as moving the BP or adjusting the wing dihedral or incidence) will cure several other associated minor problems. The trouble many pattern pilots get into with trimming is trying to patch around a major difficulty, either because it was too much trouble to fix or because they weren't aware of and hadn't yet identified the real problem. When the big trouble is finally found and dealt with, it's then necessary to go back and take out all the minor patchwork measures!

Back to knife-edge. If the pitch is mild, either up or down, and the airplane is doing everything else well, mixing is a good option. In this case the elevator is slaved to the rudder. Again, follow the directions.

Another very common situation exists where some designs will pitch slightly to the canopy in one knife-edge (usually left) and slightly to the belly in the other, even with the BP and incidence settings right on the money. In this case, mixing is really the only option that makes sense. Incidentally (no pun), these ships will often proverse roll couple in only one knife-edge (left) as well. The culprit is probably a combination of

torque and spiral slipstream.

I leave loop trimming until last, because it usually isn't a problem for me. Loop tracking problems are almost always due to poor building and setup procedures. If the airplane has the proper right thrust (we set that last month), and is gap sealed, trammed properly, has equal elevator throws, unwarped wings and is anywhere close to laterally balanced, it will loop well, both inside and outside. If you have a problem with loops, these are the places to look.

Check the loop tracking "end-on," and directly into the wind if possible. Most pattern models perform loops far better than their owners do; that is, the source of a good 75 percent of all loop problems is simply pulling into the maneuver from a bank. The end-on technique lets you check for level wings to start with, so that you know that the airplane has the problem, instead of the pilot.

Adding tip weight to correct a "heavy" wing problem should be the very last option. Models which loop poorly solely because of a heavy wing are about as rare as consciences in oil company boardrooms. The real problem is that somebody didn't build properly, measure well, or set up the control linkages straight. After going to the nearest mirror and complaining to this person, you should go back and do over whatever it was that you didn't have time to do right in the first place. **MB**

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## CONTROL LINE continued from page 23

so that there's a little free movement of the elevator. This has been observed to tame hunting planes dramatically.

These ideas should correct most basic trim problems. We'd be interested in hearing from individual fliers on their particular trim techniques or anecdotes about how trim problems were solved.

### PRODUCT NOTES

• Jim Holmack of Osprey Mfg., located in Vancouver, Washington, has begun producing a wooden control line handle contoured for either right-handed or left-handed fliers. The handles have adjustable line spacing and come in two sizes. They are carved from hard maple and finished with clear urethane. Replacement leadout cables are available. One mail-order source for the handles is Cascade Linecraft, 3860 Lancaster Dr., Eugene, OR 97404, which sells them for \$39.95. For information from the manufacturer, write Jim Holmack at Osprey Mfg., 9904 N.W. 20th Ave., Vancouver, WA 98685.

• Fred Cronenwett and Grant Heistand of California have produced an instructional videotape on how to use electronic control systems in control line airplanes, a topic covered in this column last year. For a copy of the tape, send \$15 to Fred Cronenwett, 7352 Independence No. 201, Canoga Park, CA 91303.

• A new service offers a computer-designed wing plan for built-up versions of foam-wing airplanes. R&R Associates sends interested fliers a questionnaire about their wing design and provides rib templates for the design. Also provided are building instructions and an optional instructional video rental. For information, write R&R Associates, P.O. Box 6157, Big Bear Lake, CA 92315.

• Those with a taste for the exotic may

want to get the catalog of Mejzlik Modellbau, a distributor of CL planes, engines and accessories in Czechoslovakia, operated by Tomas Mejzlik, a member of the Czech combat team. The catalog has combat and speed planes, engines and parts, props, engine mounts, control system parts, lines and a variety of other items. Write to Tomas Mejzlik, Jurkovicova 19, 638 00 Brno, Czechoslovakia.

• Bob Burch is offering dump-style fast combat flyaway shutoffs, full-complement bearings, and Bosta combat plane drawings. Write Bob Burch, 718 Gunderson, Oak Park, IL 60304.

Speaking of combat shutoffs, we have heard through the combat grapevine that manufacture is in the works for a very compact pinch-off style flyaway shutoff. It is to be built in Russia and distributed in the U.S. in limited numbers. More information will follow when details are firmed up.

### NEWSLETTER OF THE MONTH

*Roundup* is the title of a newsletter that serves control line fliers in northern New Mexico, and is edited by Gil Merriman of Los Alamos.

Published every three or four months, it contains news about events in the region, technical tips, a contest schedule and highlights from other newsletters. Gil says it costs \$5 to get on the mailing list, and subscribers are asked for more when the money runs out.

Write Gil Merriman, 3370 Villa St., Los Alamos, NM 87544.

### PHOTOS WANTED

Want to see your pride and joy in print? Send a photo of your favorite plane and some information about it to John Thompson, 295 W. 38th Ave., Eugene, OR 97405. Also welcomed are contest reports, technical tips, and any other items of interest to CL fliers. **MB**

# 35 Years of Innovative Products Have Made DU-BRO The Modeler's #1 Choice.

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#609 Kwik Grip E/Z Connector Wrench

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# Super 7 Soaring System

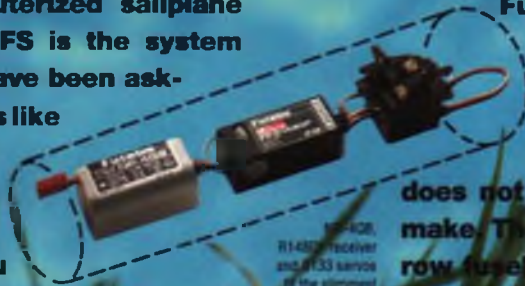
7UGFS

## FM SAILPLANE SYSTEM

Out on the slopes where the wild thermals play lurks the latest in computerized sailplane systems. The Futaba 7UGFS is the system competition glider pilots have been asking for. The transmitter feels like a custom-fitted glove, all controls configured and adjustable for soaring. Software programming gives you precise mastery over mixing to make complicated maneuvers appear routine. Program normal, speed or start presets and add butterfly or airbrake mixing. 4-model memory, dual and exponential rate control, programmable aileron/flap and flap/aileron mixing can all be

easily entered in the transmitter thanks to Futaba's user friendly input system and tips from the Don of glider fliers, Team Futaba's Mr. Edberg. Yet a computerized, fully customizeable transmitter alone

does not a competition sailplane system make. The 7UGFS package includes a narrow fuselage fitting R148DF dual conversion FM receiver with in-line connector block, NR 40B 500mAh NiCd and a pair of micro S133-SM7 servos. Available in 50 or 72MHz FM, the 7UGFS system has everything the contest sailplane pilot could possibly ask for and more.



NR 40B, R148DF receiver and S133 servos fit the slimness of the fuselage



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