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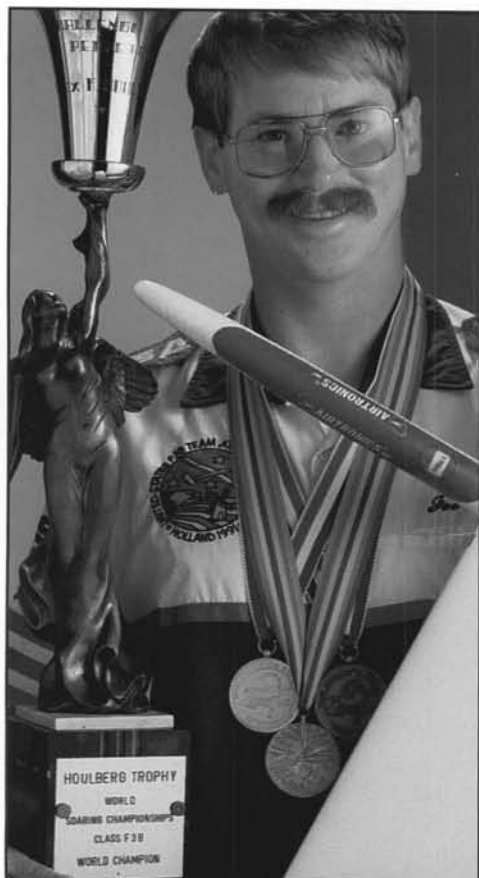


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# WORKBENCH BY PHIL BERNHARDT

This, the 243rd issue of *Model Builder*, is unique in that it's the first one in which Bill Northrop is not at the helm to write the "Workbench" column. Bill has officially retired from the magazine staff. We hope he'll be able to find time to do some serious modeling, something he hasn't been able to do for the past several years. We wish Bill the very best in his new endeavors.

So, what's in store for MB, and who is this Bernhardt guy who's writing this column?

Briefly, the magazine will continue as before, with no major changes in editorial content. We'll talk more about this next month.

As for myself, I've been associated with MB off and on for going on 20 years now, and have been brought aboard as managing editor. I'm an active modeler who has done a bit of CL, some FF and quite a bit of RC flying—mostly gliders and Old Timers, with some sport power stuff thrown in for good measure. As a sideline, I run a small backyard machine shop business specializing in antique spark ignition work. It used to be a full-time job for me, but has lately been forced to take a back seat to my work here at the magazine.

Speaking of the magazine, in case you

missed our ads in the last two issues, *Model Builder* is actively soliciting for good freelance material—construction features, how-to articles, general interest stories—that sort of thing. A copy of our Writer's Guidelines is available for the asking. If you or perhaps one of your flying buddies has something you think might interest us, why not give us a call or drop us a note? We'd very much like to hear from you!

## "WIN A RADIO" WINNER ANNOUNCED

As promised, on Friday, March 13, we picked four names at random from the many hundreds entered in our "Win A Radio" contest. This particular Friday the 13th turned out to be an extremely lucky one for Rex Sprague, of Delaware, Ohio, as he picked up a brand new Hitec Focus 6 FM system complete with all the goodies.

Second prize, a free one-year subscription to *Model Builder*, goes to Robert P. Austino, of Vineland, New Jersey. Paul Richer, of Pierre Fonds, Quebec, Canada; and Philip Tesler, of West Hills, California, were the third and fourth names drawn and will each receive a free six-month subscription to *Model Builder*. Congrats to all! **MB**

## TOM LAURIE

We're very sorry to have to report that a good friend and fellow modeler, Tom Laurie, died of leukemia on February 12.

Tom was a highly respected free flight scale builder/flier here in Southern California, participating in most of the Flightmasters club events, and holds the distinction of having had a construction article for one of his many scale models, a Fairchild 22, published in the very first issue of *Model Builder*. Among Old Timer enthusiasts, Tom is known as the designer of the Twin Cyclone and an elliptical-wing streamliner called the Experimental.

Tom's most stunning achievement, though, was the complete restoration of a full-size 1934 Stinson SR-5 Reliant, which he purchased as a basket case in 1974. I remember seeing the myriad of parts in his garage and thinking, *There's no way he'll ever get this finished, it's just too much airplane!* But finish it he did—to such a high degree of near-perfection that he was awarded the EAA Grand Champion Antique trophy at Oshkosh in 1984. Today the airplane remains as a tribute to Tom's perseverance and outstanding craftsmanship.

Tom is survived by his wife, Ruth, and daughters Pat and Susan. We at *Model Builder* extend our sincere condolences to Tom's family and friends.





# DEAR JAKE

## Advice for the Propworn

### DEAR JAKE:

You have commented before about what a terrible experience airline travel can be. I guess I never really believed you. I always assumed you were exaggerating to make a point, or trying to be funny. (You rarely succeed at that, by the way.)

But I got a promotion last month and my company sent me on my first ever business trip. You weren't kidding! In fact, you've been taking it easy on the airlines.

I never felt so much like a prodded head of cattle in all my life. No leg room, no courtesy, no recognizable food item on the entire tray. Why do people put up with it?

Next time, I'm taking the train!

Lost Luggage, Too in Laramie, WY

Dear Lost:

*It's not as bad as all that. If you'll just stick with it and give it a chance, after a few more flights you'll be a seasoned veteran able to appreciate the finer points of air travel.*

*I made a cross country flight*

*myself last month. Maybe I'm just mellowing with age, but I didn't seem to mind the overbooked L1011 experience I had from L.A. to the Midwest. I actually took a perverse enjoyment in the argument with the other two passengers who had been assigned my seat by the infallible computer. I probably wouldn't have found it so amusing if I hadn't been the first one there with my derriere firmly entrenched in seat 34G while the debate over its true ownership raged.*

*Now that I think about it, not much of anything bothered me on that flight. Sure, it was full of annoying people, but what flight isn't? Not even the guy sitting next to me, with the cough to rival Camille's, got on my nerves. Granted, he should have been in the hospital instead of infecting me, but rather than uselessly despising him, I found myself marveling at how many different color fluids could come out of one person's nose.*

*I admit there's no carry-on luggage room on an L1011, but that's not reason enough to stew through a four-hour flight. The designers probably had a very good reason for providing each row of nine seats with enough overhead storage room for two Lilliputians travelling light. Besides, I like putting my briefcase under the seat in front of me. The only other thing I might put in that useless space is my feet, and I'd much rather*

*have them on my briefcase so my elevated knees can be in the way when I lower my tray table.*

*Speaking of tray tables, I actually had a nice looking meal on this flight. I don't know how it tasted because I couldn't move my elbows or arms, so I never was able to actually eat any of it. It still looked nice though, even when the stewardess took it away, inquiring politely, "Not hungry, hon?"*

*Stewardesses. You gotta love 'em. They hounded everybody for correct change when they were selling headsets for four bucks so we could listen to the movie while we watched. Aren't airline movies great? They show them on a relatively small TV monitor suspended from the ceiling. From 15 or 16 rows back, the image size is just spectacular. Of course, it doesn't really matter that you can't make anything out, because the same stewardesses who took your four bucks are standing in your way while they serve the meal. I've become so used to this that I can't enjoy TV any other way. When I watch HBO at home now, I sit in the kitchen, which is two rooms away from the TV set, and I ask my wife to putter around in the dining room so she blocks my view. On this particular flight, the sound system failed early in the movie, so they had to refund everyone's money. Oddly enough, after all that correct change badger-*

*ing, we had to be able to make change in order to get our money back.*

*So, all in all, I don't think air travel is such a bad deal. And since my company won't pay my salary for four days of train travel when I have to attend a two-hour meeting at the other end of the country, I think I'll just grit my teeth and keep on enjoying the friendly skies.*

Jake

### DEAR JAKE:

Hi, it's me, Tommy Smith, again.

Did you know that super glue works great to repair a bicycle seat? It seems to make a good training aid, too. My kid sister is learning how to ride a two-wheeler, and ever since I fixed the seat she hasn't fallen off once. Come to think of it, I haven't seen her off that bike at all since I fixed it. She even sits on it to eat supper. What a weird kid!

Anyway, I just thought you might like to know I found another use for super glue. Feel free to pass it on to your readers.

Your Friend,  
Tommy Smith

Dear Tommy:

Thanks, I'll do that.

Attention Readers: If you ever have occasion to adhere a small child to a two-wheeled conveyance, Tommy Smith recommends super glue.

Jake  
MB



Minimax sailplanes are designed as high efficient, max duration floaters that will out fly all known wild birds in the world. \*(PLUS)\* On most days the 700 and 1000 will fly until the batteries go dead on a single launch. \*(PLUS)\* The construction is the standard built up professional style balsa with simplicity CAD designed full size rolled blue prints, making it simple for the first time builder. \*(PLUS)\* These models are light, resulting in very low wing loadings. Yet the wings won't begin to break until loaded to 18# or more. \*(PLUS)\* When we say machined parts, you will find our parts ready to pin and glue right out of the box. No sanding or trimming and they will all stand on edge as a coin will on a desk. \*(PLUS)\* We offer fast telephone backup service to all our customers. \*(PLUS)\* All our products are factory direct, saving you the cost of warehousing and middle persons.



#### TWO METER CLASS

Airfoil.....ME1033  
Wing Span.....78 in.  
Length.....44 in.  
Weight, ready to fly..19 oz.  
Wing Area.....719 sq. in.  
Wing Loading..3.8 oz. sq. ft.  
Price.....\$48.00

#### MINIMAX 700X

Same as the 700, except wing is bolted on and elevator push rod is streamlined out center of tail section.  
Price.....\$51.00



HIGH START.....\$46.00  
Factory

Best in the model market. 100' hot orange UV resistant 5/16 RAYTEX, (3 times stretch gets you 10# pull) 500' hot orange UV resistant 70# test. NYLON cord. 10" long steel stake. 1" round dead drop steel ring for automatic disconnect. All this is wound around a 12" easy wind UV resistant hot orange reel. YOU WON'T LOSE THIS ONE. Will launch up to a 5# glider, 600' high.



#### MINIMAX 1000X

THREE METER-TWO PIECE WING  
Airfoil.....ME1033  
Wing Span.....119 in.  
Length.....44 in.  
Weight, ready to fly..29 oz.  
Wing Area.....1095 sq. in.  
Wing Loading..3.8 oz. sq. ft.  
Price.....\$72.00



ANTI-STATIC PINE SAP WAX  
While attending shows the past 4 years, we were always asked by our customers what covering we use because of the shine. We use all kinds but clean it with our shop polish. We now bottle it including cloth. 8 oz pump \$5.50, Refill \$4.50

REMOVE BEFORE FLIGHT

REMOVE BEFORE FLIGHT

# 1992 SPORT FLYERS ASSOCIATION SAFETY CODE

1. I will not deliberately fly my model aircraft over spectators.
2. I will not fly my models in the presence of spectators until I have learned to fly safely.
3. I will not use metal propellers.
4. I will not buzz, tail, or harass any aircraft, car, animal, or any object in the air or on the ground.
5. I will not fly my models in the presence of others.
6. I will abide by all safety rules established by the FAA and any state or local regulations governing model flying. I will always obtain prior permission from property owners before flying. I will not fly any models in a careless, reckless or dangerous manner.
7. I will not use hazardous fuels nor fuels containing tetranitromethane or hydrazine.
8. I will not use any explosives in conjunction with model flying whether on the model, in the air, or on the ground. Rockets will be flown in accordance with the Safety Code(s) of the National Association of Rocketry. All fireworks must be present when using pyrotechnic smoke candles. Authorization may be granted by the SFA.
9. I will not power my models with turbine engines.
10. I will not fly my model higher than 400 feet unless it is flown in uncontrolled airspace, or unless it is a sport rocket flown in accordance with the Safety Code(s) of the National Association of Rocketry.
11. I will not fly my model aircraft within three miles of any airport unless I have received permission from the FAA or I am flying at an authorized radio control flight field.
12. I will always perform a ground check of my model before flight.
13. I will use only those radio control frequencies currently allowed by the Federal Communication Commission.
14. I will not fly my model aircraft in my flight model upon completion of function.
15. I will only launch Free Flight models at least 100 feet downwind of spectators, cars, or anyone not directly involved with the flight.
16. I understand that SFA insurance does not cover activities related to the flying of Control Line models.
17. I will retrieve any lost model with great caution, considering all circumstances thoroughly before proceeding, and will never attempt to recover a model from a power line.
18. Whenever possible, I will use a starter or stick to start my airplane. I will not prop with an unprotected hand.

## MEMBERSHIP APPLICATION

B

NAME (PLEASE PRINT)

ADDRESS

CITY/STATE/ZIP

CHECK ENCL.

☐ \$25 Adult ☐ \$15 Youth or Non-Powered Free Flight

☐ VISA ☐ MASTERCARD Exp. Date:

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

SIGN HERE FOR CREDIT CARD



1-800-745-3597

4145 Travis, Ste. 202, Dallas, TX 75204

Member Application Fax 214-522-0868

REMOVE BEFORE FLIGHT

REMOVE BEFORE FLIGHT

REMOVE BEFORE FLIGHT

## SAFETY CODE COMPLIANCE AND WAIVER STATEMENT

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

MUST BE SIGNED BELOW FOR ACCEPTANCE.

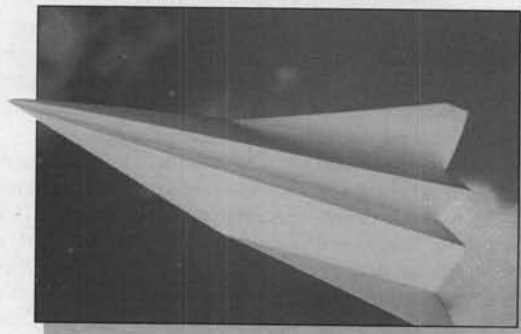
X

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

TO FLY THIS



OR EVEN THIS



NOWADAYS REQUIRES THIS



**For just \$25, join Sport Flyers, get full coverage for all of the above, plus this:**

**\$2,000,000 AGGREGATE, \$1,000,000 MEMBER R/C LIABILITY COVERAGE:** Underwritten by GAINSCO, an A.M. Best Co. "A" (Excellent) rated insurance company listed on the American Stock Exchange.

**SFA DISCOUNT TRAVEL CLUB:** Up to 70% off member airline ticket purchases.

**SFA PHONECARD:** Up to 40% off long distance calls.

**MODEL BUILDER MAGAZINE:** Only \$10 a year - 60% off.

**MONTHLY MEMBER DRAWINGS:** We randomly draw member numbers for free giveaways of Carl Goldberg kits and products.

**ZERO CLAIMS AWARDS PROGRAM:** Insurance rebates for safe flying are used to buy discounts with your favorite hobby manufacturers including . . .

CARL GOLDBERG MODELS INC.



HOBBY LOBBY INTERNATIONAL INC.





## Irving R/C Fliers Saves Their Flying Site From Closure Thanks to SFA's Liability Coverage

IRVING, TEXAS—One of the top three AMA clubs, Irving R/C Fliers Association (IRCEFA) was posted for closure by the City of Irving in February due to insufficient liability coverage.

During the last three years, IRCEFA has become well known for numerous national modeling events including the IMAA's Rally of Giants, ScaleMasters Tournament, and the George Meyer Memorial Fly-In. Club officers, including Dr. Miles Poor, Tommy Meyer, and Mike Darnell have been noted for their progressive site planning, national event management, and fund raising efforts with the city of Irving, Texas.

Despite this record, the city management was very concerned about having sufficient coverage and planned to replace the site with baseball diamonds which were perceived to carry less liability risk. IRCEFA officers contacted Sport Flyers to intervene. Although only five in the IRCEFA were SFA members at the time, Sport Flyers and GAINSCO, SFA's underwriter, responded immediately and succeeded in

issuing a policy that satisfied the city's specifications and kept the site open for both SFA and AMA members. SFA also provided statistical data to prove to city officials that aeromodeling historically has proven to have significantly less liability risk than baseball.

Sport Flyers recognized early on the threat of flying site closures due to inadequate liability coverage. The risk of closure is growing even for those clubs (like IRCEFA) that have never had a claim, or those that incorporate the latest safety standards.



DR. MILES POOR



TOMMY MEYER



MIKE DARNELL

## Some of the Top Events Sanctioned by SFA

### TOP GUN INVITATIONAL TOURNAMENT WEST PALM BEACH

TopGun  
May 7 - 10  
Palm Beach Polo Club



George Meyer Memorial Fly-In  
October 16 - 18  
Irving Northlake Park  
Irving, Texas



Schneider Cup Re-enactment  
October 30 - November 1  
Nautical Inn Resort  
Lake Havasu City, AZ

### SANTA CLARA COUNTY MODEL AIRCRAFT SKYPARK

Giant Scale Fun Fly  
May 16 - 17

2 Day Pattern Contest  
June 27 - 28

Airshow Extravaganza  
July 11 - 12

2 Day Giant Scale Fun Fly  
August 1 - 2

Warbird Race  
August 22

For More Information on  
SFA Sanctioned Events,  
Call 800-473-0220

# over the counter

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

## MIDWEST'S BENT-WING BIRD

Midwest's new Corsair .40 is the latest in that company's line of Success Series sport scale warbirds. What makes this kit really unique is the clever approach that Midwest's designers took to solve the problem of building the inverted gull wing. In this kit, the wing is actually built in five separate sections that are joined with balsa wedges (look like pieces of trailing edge stock) in between to give the "bent wing"

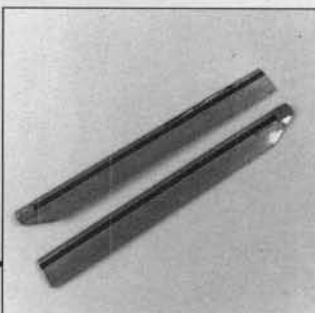


effect. The joints are then reinforced with a strip of fiberglass cloth and CA glue to provide adequate strength. It's quick, and requires no braces, angled ribs or complex jiggling to get it right.

Otherwise, the kit is typical Midwest, with Success Series plans and illustrated instructions, molded cowl and canopy, and two large decal sheets. The Corsair spans 60 inches and retails for \$129.95. It's produced by Midwest Products Co., 400 S. Indiana St., P.O. Box 564, Hobart, IN 46342; (219) 942-1134.

## HELIX ACCESSORIES

This month's *Model Builder* contains the second half of Martyn



McKinney's treatise on electric RC helicopter performance. Most of Martyn's research was done with the Kalt Whisper, distributed by Hobby Dynamics. Now HD is also distributing the new KSJ washout rotor blades for truly high

an accurate pitch measuring tool is a must. Hobby Dynamics is the exclusive distributor of the KSJ digital pitch gauge, an expensive (\$142.50) but extremely accurate device that can measure blade pitch angles to 1/100 of a degree (is that

close enough for you?). Sounds like an indispensable tool for really serious RC helicopter fliers.

From Hobby Dynamics Distributors, 1405 Fieldstone Rd., Champaign, IL 61821.

## SIERRA TRAINER

The second in Top Flite's line of Gold Edition kits, the "Sierra," was recently unleashed upon the modeling public. Billed as an RC trainer, the Sierra is a completely conventional appearing trike-gear high-winger

performance flying. The KSJ blades are weighted and have three degrees of washout, and although they're

for three or four channels, with a 60-inch span and what looks like a flat bottom airfoil wing (a definite



designed particularly with the Whisper in mind they could probably also be used on the Kyosho Concept EP or even the new Hughes 500 handled by Hobby Lobby. Suggested retail on the KSJ washout blades is \$53.29 per pair.

When setting up any helicopter,

plus for a beginner's airplane). Recommended engine is a .28-.46 two-stroke or .40-.60 four-stroke. Basic construction is balsa and plywood, and the parts are designed to interlock for extra strength and foolproof assembly. Look for it at your favorite hobby shop, or contact



the manufacturer directly for more info: Top Flite Models, P.O. Box 9021, Champaign, IL 61826-9021.

## ODOR-FREE CA

Carl Goldberg Models is now the third manufacturer that we know of to come out with an odor-free, non-



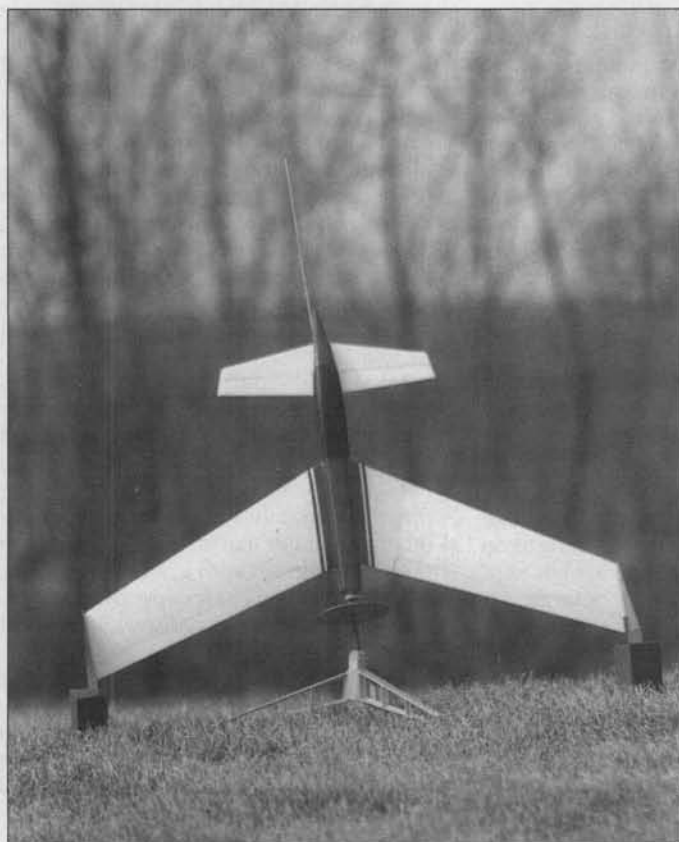
irritating version of its particular brand of CA glue. Goldberg's new Jet Free is said to have the same bonding characteristics as its popular Super Jet glue but without the smell and irritation. Jet Free is packaged in 1/2, 1 and 2 ounce bottles, priced at \$6.99, \$10.99 and

\$19.99 respectively, from Carl Goldberg Models, 4731 W. Chicago Ave., Chicago, IL 60651.

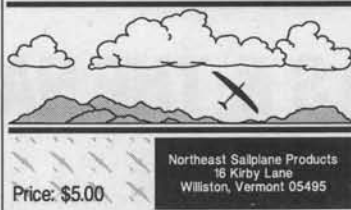
## RC ROCKET GLIDER

Estes Industries, long known for its extensive line of model rockets and related accessories, has created an interesting marriage of model rocketry and RC model aircraft with its "Astro Blaster" rocket powered RC glider. It's a very clean and very fast-looking 35-3/4 inch span swept-wing canard with tip fins, designed to accommodate two micro servos for the ailerons and elevator. Construction consists of fully sheeted foam core wings with balsa fuselage and foreplane—very simple and quick to build. We were fortunate enough to witness some of the finalized prototype's test flights and can vouch for the fact that the Astro Blaster is one fast climbing bird, going from a dead standstill to about warp nine in the blink of an eye, and has a fast and very flat glide. We can't help but wonder how it would perform as an aerobatic RC slope glider....

We hope to have a full product review on the Estes Astro Blaster in either the August or September issue. If you can't wait that long, check with your local hobby shop or contact Estes directly at 1295 "H" St., Penrose, CO 81240. The kit is scheduled to retail for \$74.99.



## 1992 Northeast Sailplane Products RC Soaring Reference and Catalog



## NSP CATALOG

We received our office copy of the new 1992 Northeast Sailplane Products catalog a couple of weeks ago and strongly recommend that you send for your copy right away, if you have even the slightest

interest in RC soaring. We thought last year's catalog was pretty darn good, but the 1992 edition is even better. What you get for your \$7.00—\$5.00 plus \$2.00 for first class shipping—is a full-size 8-1/2x11-inch, 115-page reference work that describes in detail all of the kits and soaring-related accessories NSP carries (considerably expanded over last year), plus a bunch of new articles contributed by several prominent RC sailplane designers and pilots. Stan Eames and Sal DeFrancesco have done a terrific job of putting together a catalog that is unequalled by any

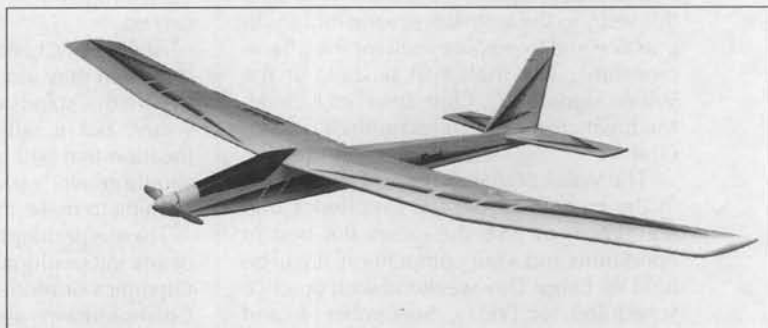
other in the industry.

To get your copy, send \$7.00—a bargain at twice the price—to Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 05495.

## ELECTRIC ARF GLIDER

Royal's "Electrosoar Mk III" is an ARF two-meter electric-powered sailplane that is supplied virtually complete except for the

motor battery and radio. The model's structure, we believe, is mainly balsa, and comes pre-covered with a multi-colored polyester film. The motor is a Mabuchi 550 fitted with a folding prop, spinner, and wiring harness.



All in all, the Electrosoar Mk III sounds like a quick and easy way to get involved in electric power at minimum expense. It's marketed by Royal Products, P.O. Box 5026, Denver, CO 80217-5026.

## BULLET CA GEL

Hobbico's line of "Bullet" CA glues now includes a CA gel, thick enough that it's claimed not to run, drip or spill, allowing a longer working time and more positioning ability. A .7-oz. tube is priced at \$8.99. From Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021. **MB**



## F3D TRIALS & THE NATS: SOME OBSERVATIONS

**T**he first subject this month is an invitation to attend this year's FAI F3D Team Trials as a competitor or a spectator. The trials will select a team to represent the USA at the 1993 World Championships.

As you may be aware by now, the last team was very successful by winning the World Championships in 1991. A new team must be selected for 1993. The selection process requires team trials to be held this year, so the team has several months to practice and to prepare itself for the Championships. The trials will be held at the Weak Signals RC Club field in LaSalle, Michigan, just a few miles north of Toledo, Ohio.

The Weak Signals have hosted this race in the past and have the experience and equipment to give the racers the best in conditions and a fair competition. It will be held on Labor Day weekend with practice scheduled for Friday, September 4, and competition on Saturday and Sunday, the 5th and 6th. A rain date of Monday the 7th will also be utilized, if necessary.

We will fly 12 rounds, which usually is enough to bring the very best pilots to the top—an important element. The desire to send an excellent team takes precedence as long as the process is completed fairly, and 12 rounds of flying usually sorts this all out. I have heard complaints about the system and how it allows less than the very best if the very best have a little bad luck. This is somewhat true, however, if it's necessary to select only the very best, we shouldn't make them *earn* a place on the team. We should just hand-select them.

This is not the best idea either because even the best pilots can have a string of bad luck at the Championships. If you don't think so, ask Dave Shadel, two-time World Champ, who was involved in a mid-air and then lost a second plane to radio failure at the '85 World Champs. David finished dead last, so arguing that we must send the best is no guarantee.

The one important point that many people forget is, we have such a wide variety of competent fliers in this country (which is fortunate for us), that we can send what some people might consider "less than the best" and still have a great team.

I'd be willing to bet I could hand-select six different teams that would dominate a World Championships in pylon. Therefore,

although our system could select a team of persons who don't always win, having a team of people who ordinarily finish in the top ten would still result in an excellent team and one that would finish very well on an international level.

Anyway, after all this digressing, we will select a team again this fall and that team will represent the USA at the next World Championships, which I do not believe has been finalized as far as location is concerned.

At the last Championships, South Africa indicated they would be submitting a bid. Where this stands now is unknown by this writer, but it will undoubtedly be in a location that will be attractive to visit and should generate some attendance by racers wishing to make the team.

There is nothing to match the atmosphere of any international event whether it be the Olympics or modeling. In fact, the World Championships are the Olympics of modeling. The flag raising, the awarding of medals, the national anthems, pin trading, teams from all over the world, all very much like the summer games and an unmatched experience.

The Weak Signals will host the Team Trials with an attempt to keep the cost to the individual competitor at a minimum, and will welcome every competitor with no entry fees, no food charge and good racing so make your plans to attend now. For information, contact AMA headquarters or the writer at (313) 941-6661.

The Nats are upon us and there are some particular features on some models we must address. We are starting to drift away from the rules or the intent of the rules, which I feel is generating conflict within the events, especially in the Quickie ranks.

The first is the rule requiring a removable hatch or a sight window so that the fuel tank can be observed. Several fiberglass kits are on the market and understandably, a removable hatch is hard to mold in, so usually it's left out and up to the individual builder to remedy. The obvious thing to do in this case is to incorporate a sight window, however, too many people are ignoring this and attending contests with illegal airplanes. If asked to see the tank while fueling, they state: "No problem, I'll take the wing off."

I allowed this at the Nats last year and took a lot of heat from other people. My

logic was that I didn't want to keep anyone from flying and removing a wing was not impossible, however, the fueling people found that removing wings at the fueling station was time consuming and impeded the flow of contestants. The net result was that those without a hatch or a window were passed through fueling without any check of their system.

This also resulted in some comments about people doctoring fuel which is normal when someone is faster than the complainer. I must admit there were times at the last Nats when I would have liked to observe some fueling but could not without removing wings so I turned my back and let it slide.

No more! I know a precedent was set with my allowing this deviation last year but I'm not going to compound it by letting it go any farther. We will get back to basics and this year *all contestants will be within the rules*. You will have either a removable hatch or a window or you won't fly! In addition, if you choose the window option, make sure it is clear and large enough to see if any fuel remains in the tank. Tiny little fuzzy windows that restrict vision are unacceptable! Wing removal to meet this rule is also unacceptable.

The second item on the "don't" list concerns carbs. Last year I allowed a contestant to fly with an engine that had the carb locked in the open position; his airplane utilized a fuel line shut-off. He argued the rule was being met because he did have an RC carb on the engine as the rule requires, and reasoned the rule did not state the carb barrel had to rotate. I also bought this argument in an attempt to keep controversy to a minimum and probably keep a friend racing.

Mistake! Boy, did we ever get heat on this one! And justifiably so. Although the rule only states an engine must be equipped with an operable RC carb—and true, it does not state the carb barrel must "rotate"—the *intent* is certainly there, plus there is another paragraph that states: "The airplane must be equipped with a radio having four separate channels to independently operate the engine throttle, rudder, ailerons and elevator."

One of Webster's definitions states: *Throttle—The valve controlling the volume of vaporized fuel charge delivered to the cylinders of an internal combustion*



# HOBBY LOBBY Call 1-615-373-1444

## Tools

TA0001A	Taig Lathe	269.00
HLAE801	Solingen Balsa Planer	7.40
HLH625	Balsa Stripper	12.60
HLMO0002	Modelers pins, 50	3.40
HLPS111	Permanent sanders set	33.40

## Building Boards

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

## 2x4 Connectors to make workbench, shelf

HLKE300	Workbench set	22.90
HLKE200	Storage unit set	39.90

## RC airplanes, glow powered

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

## Telemasters, Funster

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

## RC electric sailplanes

HLA130	Freshman	39.00
HLA131	Graduate	59.00
HLA10204	Excel WS 10	148.00
GR4207	Elektro-UHU (1.9M)	97.00
GR4208	Pink	105.00
GR4264	ASW 22 B270	279.00
GR4266	ET 200 RTF	127.00
GR4270	Elektro Junior ARF	192.00
GR4271	Cherry ARF	249.00
GR4274	Solar-UHU	128.00
HLAN1324	Sinus	284.00
HLAN1328	Sunfly	368.00

## RC Electric fast boats

GR2175	Taifun hydroplane	99.00
GR2118	Systems	89.00
GR2166	Cobra	58.00
GR2171	Key West	57.00
GR2173	Eco-Speed	65.00
GR2174	Key Biscayne	113.00

## Electric RC airplanes

GR4675	Race Rat racer	99.00
GR4678	Fokker E.III	123.00

GR4681	Zoff	109.00
GR4684	Partenavia P.68	133.00
HLAN1329	Aerofly	138.00

## RC Sailboats

GR2116	Miramare	348.00
GR2169	Collie	127.00
HLKK1423	Tina	138.00

## RC Sailplanes

HLA120	Topaz	114.00
HLA303	High Sierra	132.00
GR4265	ASW 22 B270	259.00
HLT225	Piggyback Launcher	29.90

## Retract Landing Gears

MT12056	3 Gear Retracts	28.40
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## Complete hi-start outfits

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

## RC helicopter

HLA400	Sport 500	199.00
HLA401	Sport 500 with collective	285.00
HLA404	Sport 500, assembled	412.00

## Snow skis for RC airplanes

HLBB160	6" single	11.75
HLBB180	7" single	12.75
HLBB200	8" single	13.75
HLBB240	9-1/2" pair	35.70
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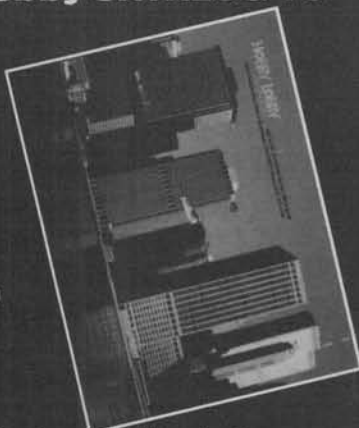
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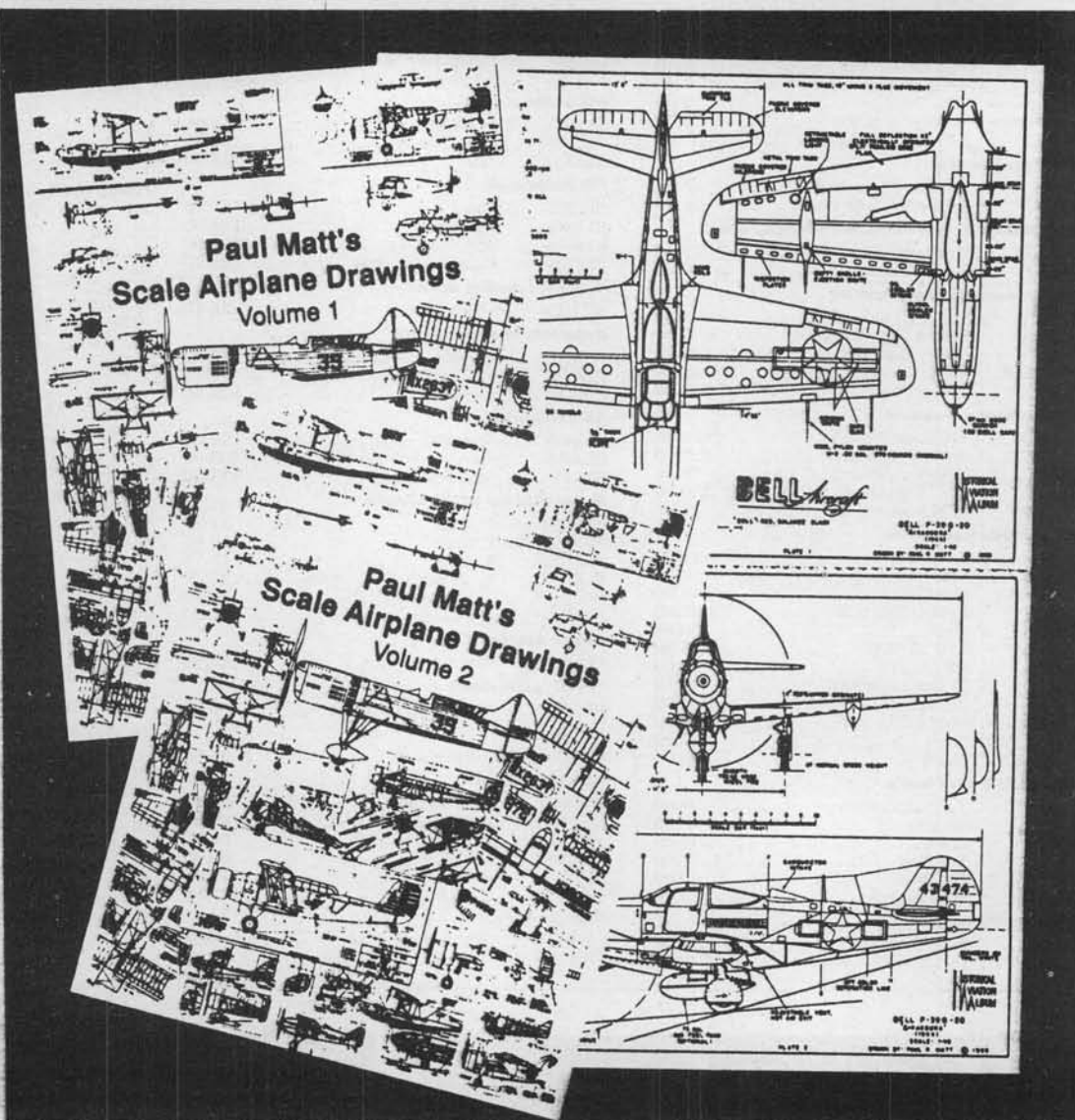
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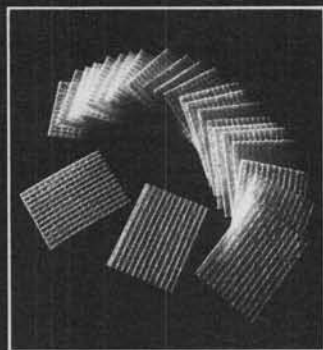
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## RC PYLON continued from page 12

engine.

Obviously the valve in this case is the throttle and since the controls paragraph states a channel must be included to "operate" the throttle, one can only conclude the carb barrel must operate upon command by radio control. The intent of the rule does not allow locking this feature out and utilizing a shut-off for stopping the engine.

Simply enough, we will not allow any deviation from this rule at the Nats in '92.

Another requirement that we looked for at processing but missed in some cases is the rule requiring registration numbers. Many models show up without them, but we will be looking harder this year and will require complete rulebook adherence. Quickies with any corner radii larger than 1/4 inch will be rejected. This takes in outside and inside corners, meaning the wing-to-fuselage junction is a corner and no large fillets will be allowed.

The last item we are starting to have a problem with is the requirement for a minimum of 500 square inches on Quickie wings. This problem may be the result of a particular kit's design, for example, a wing with a 10-inch chord and 47-1/2 inch span would result in a total of 475 square inches minus the tips. This is where the problem is occurring because many fliers are building small one-inch wide tips that may only contain approximately 7 or 8 square inches in each because of the rear taper to zero. These wings end up having a total of approximately 491 square inches, which results in an undersize and therefore illegal condition!

Because of the large number of entries and a desire to keep things moving, we have been very lax on checking wing area in the past. Need I tell you what we will be doing this year?

The last item in Quickie is props. I have been dressed up and down from various people about the number of illegal props in use. There are stories floating around about people who refinish their props and re-stamp the manufacturer's name on them. There are people who think rework is allowed on the top or bottom as long as it's only on one blade. The rule is very clear on this. It states: "One blade may be 'SANDED' on the 'TOP' side only for balancing." Did you understand that? You are not allowed to touch the back side, where the pitch is determined. This year I'm bring various props with me to be used as finish standards. I will be comparing and woe to anyone suspect!

In all honesty, we do have people who, if anyone defeats them in a race, feel that person must be cheating, therefore, the complaints must be taken with a grain of salt. However, if they are correct, it absolutely is not fair to them or anyone else, so we will make a concerted effort to look harder this year. See you in Chicopee! **MB**



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BY ELOY MAREZ

## The Awe & Mystery of Trickle Charging



What our EC columnist most enjoys about his magazine affiliation is the many friendships it has brought him, even though most of them are only through the mail. Meet his latest friend—isn't she beautiful? No doubt pondering whether she would rather grow up to be a world-class RC flier or Miss Russia, eight-year-old Natacha Ivanov tries on her father Vladimir's Graupner (JR) transmitter for size. Natacha lives in Moscow, where Vlad is an aviation engineer, and obviously a devoted RC'er.

Integrated circuits, or ICs as we commonly call them, are probably the most taken for granted parts of our RC electronic equipment. Rightly so I guess, as an IC used in accordance with its design parameters asks only for a few volts and often even fewer milliamps of current, in exchange for which it works its little heart out for you. I thought that if you have never really looked at an IC, you might want to do so—you wouldn't want to hurt one's feelings by overlooking its importance, now would you?

The one I picked for this rather intimate, inside and outside introduction is a good example of how such a simple looking device can be so complex. It is what is most often referred to as a "three-terminal voltage regulator." They come in a variety of physical sizes, from the almost-microscopic surface-mount and normal transistor sizes to the larger TO-220, TO-218 and TO-3 packages. See

Figure 1.

The function of this family of ICs is to reduce and stabilize an input voltage, even one varying in amplitude, to a given design value. Such ICs are available for outputs in all of the most often required values, such as 5, 12, and 15 volts, either positive or negative, from inputs as high as 35 volts. There are also adjustable regulators which, with the addition of a few external components, can provide those odd voltage values not otherwise available. Wonder-

fully useful devices—in RC equipment we find the smaller ones in receivers and transmitters; the larger ones in chargers and other support equipment. Though often used with some input and output filtering (capacitors), these regulators can actually be used without them, requiring only three connections: input, output, and a common ground. Regardless of physical size, they all work in the same manner and are as complex internally, the difference being in the amount of current that they are designed to handle.

Now take a look at the schematic diagram in Figure 2. Going by the circuit designators, the designers have managed to cram 29 transistors, 43 resistors, seven capacitors, and two normal and three Zener diodes into the package. Notice too that there are a number of multiple emitter transistors, a very uncommon component, included in the overall circuit. And if all of this is not enough to impress you, let me say that the package such as you see it in the sketches is not actually the size of the working IC, it is that size merely to make it easy to handle and to dissipate whatever heat is generated. The IC itself is probably no more than one-quarter inch square. And you can buy and use all of this technology often for less than one buck.

### TRICKLE CHARGE EXPLAINED

Nickel cadmium batteries have gone ignored here in EC for the last couple of months—now how do you suppose that happened? No more; back to

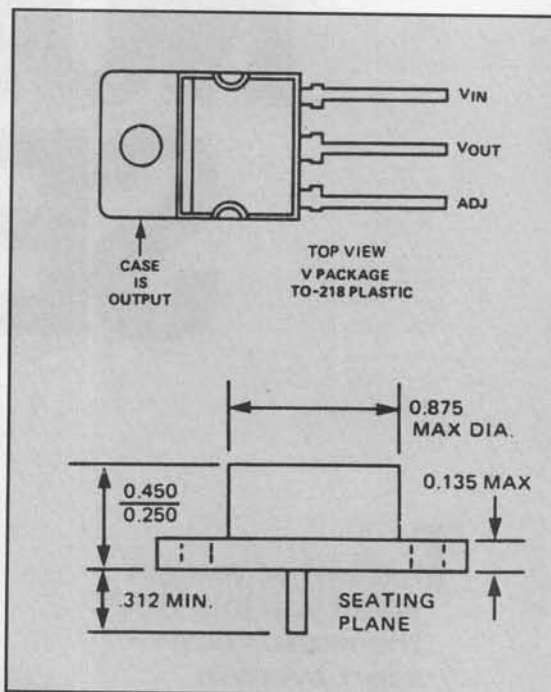


Figure 1. Full-size drawings of simple/complex voltage regulator ICs discussed in this month's column.

one of our most asked-about subjects, the actual subject this month being the trickle charging of these most useful and critical items. First heard from on the subject is Park Abbott, of Santa Rosa, California, who asks:

"It has been some time since I last wrote you. I always read your column for all the great advice you offer. I'm writing this time because there is a problem (for me) concerning the on-board ignition batteries I use on all my Old Timer models that operate with an ignition system.

"I usually sport fly my glow-powered models without any problems as I am only concerned with keeping the Rx batteries in shape. With my Old Timer models which I operate with an ignition engine, coil, condenser, points and gasoline, I use three 1.2 VDC NiCds for 3.6 volts. This all operates OK with everything in order. To charge the three ignition batteries, I plug in a separate outside (one-cell) 1.2 volt battery to make up a four-cell unit (three inside the fuselage and one hanging outside at the charging



plug—does that sound clear?). I cycle them the same way. It works OK.

"My question is: How can I trickle charge these three on-board ignition batteries without plugging in a separate outside battery to just hang there while they trickle charge? I have six models to trickle charge and I don't want to make up six separate batteries with plugs and all that. I'm using Ace trickle chargers on all my receivers and they all work okay. I'd hook Ace tricklers to my ignition batteries if I could get away with it—can I? I want to trickle all the on-board batteries and be ready to go when the various O.T. contests come up on the calendar. Any advice for me?"

Well yes, Park, there are a number of relatively simple solutions to your predicament, but first let's read another letter on the same subject. This one, from George Delacruz, of Pittsburg, California, says:

"I just ran into something that has me baffled. I was attempting to add trickle charging to my 45 mA Futaba transformer charger. I added a 100 ohm resistor to the positive lead and this reduced the charge rate to 15.2 mA. But in trying to double check by using Ohm's Law, my answers didn't make any sense:

$$V(5.29) = I \times R \dots 0.152 \times 100 = 15.2?$$

$$I = V/R \dots 5.29/100 = .0529?$$

$$R = V/I \dots 5.29/.052 = 348.026?$$

"I am using a 3-1/2 digit Radio Shack DVM 22-188. I guess I need a good basic electronics course but until then I sure would appreciate your help."

Well, first of all, as those of

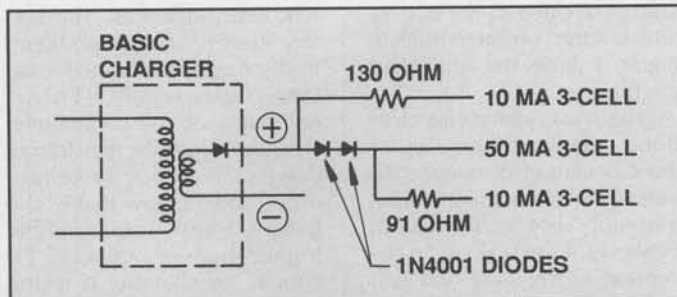


Figure 3. A basic RC system charger with external modifications for different outputs—in this case, a three-cell, 500 mAh pack.

you who have been with me for some time know, I like to use correct terminology even if those who make our equipment for us don't always do so. A good example is "trickle" charging! Since the advent of electric powered models and

charge of a fully charged cell, is  $C/50$  (capacity divided by 50). For a 500 mAh capacity cell, that works out to 10 mils.

Other terms that require clarification are:

Ignition—referring to "spark" ignition. All heat engines, including glow plug and diesel, operate by ignition of the fuel.

Nicads—a trademarked name correct only for nickel-cadmium cells produced by the Saft Company; the chemical name for all others is NiCd.

Cell—a single unit; two or more cells make a battery.

Cycle—in true battery parlance, this is actually a charge/discharge cycle. In RC circles it refers erroneously to measuring capacity (rate vs. time).

Picky, huh!

Well Park, there is more than one way to skin this particular cat. Though you didn't say just what charger you are using, most system chargers are quite

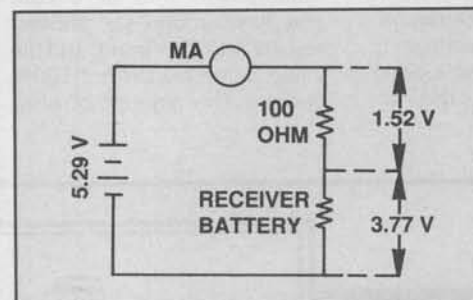


Figure 4. The voltage distribution across a battery charger modified as described in text.

fast charging, in many cases the makers of such chargers have taken real liberties with the trickle rate, often using it to describe a slightly longer period during which to boil NiCds. According to the real authorities—in this case, those who manufacture NiCd cells—the trickle rate, which is applied, as Park states, to maintain the

similar and I'm sure the one I used for some testing is representative. To start with, a 50 mA four-cell charger connected to charge three cells increases the rate only to 65 mils, or by 30 percent more. All good quality cells now available can handle that without any fear of being overcharged. To correctly charge a fully discharged three-cell pack in this manner, you need only to decrease the charge time by that amount. If you feel more comfortable with the 50 mil rate, simply add two 1N4001 diodes in series in the positive charge lead. See Figure 3.

To get the original charger down to 10 mils to trickle three cells, use a 130 ohm resistor in the lead. If you opted for the diodes, adding a 91 ohm resistor diode will further reduce the rate down to the required 10 mils.

Capacity testing your three-cell packs is not quite that easy, and the best way with your existing equipment is to continue to add the extra cell when so doing. However, anytime new equipment is being considered, keep in mind that the new Ace RC Digipace II can be programmed for odd numbered cell packs such as this. Another important point is that the Ace trickle adapter is a timed device! That is, it does not measure the battery charge and stop when it is fully charged; it always delivers the full charge and is best used with fully discharged batteries.

I strongly recommend that the currents flowing in your particular charger/battery system with the resistor values specified be checked and adjusted if necessary—there are many variables involved that can have different effects.

Now for our patient friend George! George, your formulas are correct, however, the application is not. The first one stated gives us the voltage drop across the 100 ohm resistor if 5.29 volts is applied and 15.2

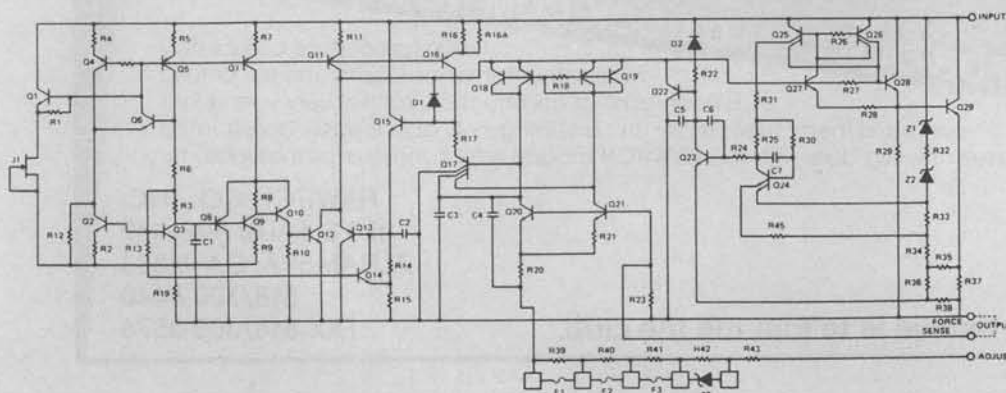


Figure 2. Schematic of a voltage regulator IC shows its high part count and complexity.

# ELECTRONICS CORNER

mils flow. Similarly, the second one results in the current through the resistor with the stated voltage applied, and the last one is the resistance present in a circuit in which 5.29 volts are present and 15.2 mA are flowing.

The information obtained is not incorrect, it just has to be applied properly. Bear in mind that the charger sees the battery as a resistance, through which a given amount of current will flow. When you added the 100 ohm resistor, the charger then saw the total of the two resistances in series; the increase caused less total current to flow. Effectively, you now have what is called a voltage divider circuit, in which each resistance has a voltage across it relative to its value, i.e., in ratio to the total circuit resistance. The voltage dropped across the added resistance decreases the

voltage applied to the battery and thus the current through it. Figure 4 shows the equivalent circuit.

Like in everything else electronic, there are formulas for the calculation of voltage dividers; the whole thing is actually not very complicated. However, I am making an exception in this case and will not go into the subject any further for a quite valid reason. These formulas, like all others, are based on constants. In this application, the opposite is true—it seems everything is variable and whatever you do has an effect somewhere else that throws all calculations out the window.

To start, the output of the transformer/diode combination has very poor voltage regulation. The no-load voltage is much higher than the loaded voltage, and drops as the cur-

rent drain increases. The battery itself is another problem; its discharged to charged resistance varies widely. This circuit can fool you completely; should you load the transformer down so much that the voltage drops down below that of the battery, you will still read the higher battery voltage. Of course, no charging is taking place and the charger gets hot real fast! Though I know the satisfaction that comes from working out a problem such as this using data and formulas, and having the circuit fly right from the first, in this case I must recommend the cut-and-try method.

Another consideration is that when you insert your milliammeter into the circuit, you have added yet another resistor into the circuit, and the value being read is not 100% correct. The amount of error

introduced in this case is pretty much determined by the quality of your meter. It is far better, if your meter is to be believed, to measure first the out-of-circuit true resistance of the series resistor, and the in-circuit voltage across it. Then using our old friend,  $I=E/R$ , calculate the current through it, through the entire circuit and of course through the battery itself.

Am I getting too critical about this measuring business? Well, maybe. We are not exactly designing satellite communications here, but as I stated here recently, I feel that the test procedures and equipment used and described much too often in the model press are in fact no better than wetting your finger and sticking it up to measure wind direction and velocity.

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



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# STRICTLY SCALE

BY AL TUTTLE

## A VISIT WITH MASTER MODELER ED IZZO

This month's featured modeler is well known to those of us who have been in this sport for very long. Meet Ed Izzo, presently residing in Winter Springs, Florida. Ed has been a modeler for many years. He showed me a picture of the Syracuse, New York Model Club, taken at the 1938 Detroit Nats, with 14-year-old Ed among the group. He said: "We had a nice club put together. Nineteen of us went to the Nats. I flew Indoor Rubber, Indoor Stick, Outdoor Rubber and Outdoor Stick. They gave medals in those days and I still have mine. I used to like competition in those days. In fact I still do."

Ed went from free flight to control line and came out with the first metal CL speed pans. In 1947, he had a small company called the Syracuse Experimental Model Airplane Products and manufactured A, B, C, D and F speed pans.

When asked how he got started in RC, Ed said: "I was out at the flying field one day and Walt Good came out with his radio controlled plane and Hal DeBolt was there and they flew them and they had motor control! Well, when they demonstrated motor control, I said, that's for me. This was about 1948 or '49."

Ed used to work at the General Electric Semiconductor Division and did a lot of work in applying this new technology to RC. The switching circuit that was used in the Bonner servo and the first all-transistor servo controllers were developed there at G.E. Ed made his own transmitters and receivers using the technology developed at G.E.

Ed is probably best known for his development of the foam wing, which revolutionized aircraft construction, not only in the model world but full-scale aviation as

well. Here, in his own words, is how he happened onto this construction method.

**MB:** What prompted you to start working with foam as a building medium?

**Ed:** "In 1964, I got the idea to use foam. The rubber bands were crushing my wings and I needed to put some braces inside. I had some two-part foam that we were experimenting with. I worked for Carrier (a major manufacturer of air conditioning equipment) at that time. We used it for insulation. So I mixed some up and put it in the wing and it expanded and almost blew the wing up. So I said there has got to be a better way of doing that."

"Then I was just going to make leading edges. The original ones were made out of foam in two pieces. We hollowed them out then put them together. I worked with mastic and every type of adhesive I could lay my hands on. In those days we didn't know

what mastic to use. I would call companies and the only way they would sell it to me was in five-gallon cans. So we got five-gallon cans. We would try them and sometimes the adhesive would be too heavy or something like that and I would have to throw it away. My wife, Louise, said I was spending more money on mastic than anything else. So that evolved like that.

"When I published the first article, we got a heck of a response from

We'd like to think that Ed Izzo spent his time just for this photo, but after seeing his immaculate models, we wouldn't bet on it. The big F6F Hellcat is from a Byron kit—and yes, there really was a yellow Navy F6F! (Insert) Beautiful building job by Ed on this Art Chester "Jeep" racer.





all over the world. In fact, full-scale aviation companies called me and wanted to know how the thing was accomplished. Then I got a call from Bell Labs. Bell Lab wanted to come down and have me make some sections. I told them that they would have to bring down the rib forms. They came down and wanted them cut from polyurethane foam. They opened up this case and they had these beautiful aluminum templates. So I cut them for them. I asked, what are you going to use these for? They looked at one another and said they were using it for radar penetration.

"Rutan's airplanes are constructed from foam in a similar manner as models. A lot of homebuilt airplanes are constructed this way. But the model aviation industry got no credit for it, and they should have. This is one of the few if not the only major innovation used in full-scale aviation that came from the model world."

**MB:** *How did you happen to find the big sheets of foam? I had never seen any prior to your coming on the scene. But thanks to you, we modelers were made aware of this material.*

**Ed:** "What happened was that I was interested in getting foam. We used to get foam and use it as insulation in air conditioners and I knew the big warehouse that handled it. So I went over and got these great big blocks. Then I found out they cut these big blocks with Nichrome wire. That's how they cut these blocks in slabs. I said, Aha! Then I got some Nichrome wire and made a loop and everything and that's how we cut the wings. First we started slow, then we got better. Louise used to help me all the time. We put letters and numbers on the templates and we kept going straight around the front, leading edge and all. One time Louise started the cut on the top and I started on the bottom and we made two cones. Then the covering of the wings and all that. That's how the concept evolved."

"We showed it at the Buffalo Symposium and showed it at Toledo. The model clubs, when they heard about it, used to call me up and say, would you explain it? I said, well, it's going to be a long process. They said, Don't worry about it, we pitched in to cover any extra costs. You keep talking as we want to know all about it."

I met Ed in 1964 when he came to one of the New England Radio Control Modelers (NERCM) meetings and demonstrated the foam wing concept. Needless to say, it was a hit. He also covered a wing with the then new Top Flite sticky back MonoKote. He recalls:

"I knew Sid Axelrod very well (Top Flite), he had this new covering (sticky back MonoKote), and he said 'I'm going to send you some samples to see what you can do with it.' The first wing I covered but just sealed the edges. I shrunk it and it looked good. I went out to fly the plane and of course the top, being in the low pressure area, just took the top covering right off. I realized later on that I had to iron it all over."



Ed Izzo with his fabulous Turner Special, with close-up details of same. We'll have more info on Ed and his models in next month's column.

We had a lot of fun in those days. I like to experiment."

Ed flew Pattern for many years, and told me that he was the only guy who placed in the top five in radio events at the Nats in Pattern, Scale, Giant Scale and Pylon Racing.

**MB:** *When did you get interested in scale?*

**Ed:** "I was chairman of the contest board and Dick Allen said that scale was getting too technical and we're not getting any interest or many entries. He wanted to start a new category that could be called 'Stand-Off Scale.' This was in the late sixties, early seventies. I told him to send me a proposal. He did and I pushed it through the board. And then I decided to make a scale airplane. I made a P-40 with strip ailerons. It looked like a P-40, but it wasn't exact scale and that's how I got into it. But the intent then was to get more guys flying scale. It worked great."

"Modelers came out of the woodwork and scale boomed. Now it's evolving into museum scale. I call it 'Skin Scale.' These guys have got all these hatchets, rivets, panel lines, screws and everything. I'm one of the culprits, too. But it isn't fair, really. They (modelers) are making it so specialized, so precision, that the interest is going down. The AMA has an event called Fun Scale which appears to be breathing new life into scale."

**MB:** *There were a couple of pattern fliers at this year's Tangerine meet in Apopka, Florida, who shared an Ultimate biplane with another modeler and had a ball flying in this event, and they said they were hooked.*

**Ed:** "It shows you that this is the way to go."

Next month we will continue the visit with Ed and show you some of his magnificent models, finishing and detailing techniques, etc. Ed makes his own muffler/smoke systems that are quite unique. We will look at this also.

#### PAUL MATT SCALE DRAWINGS

Having trouble deciding what your next

scale project is going to be? There are countless subjects to model, but finding three-views is a time consuming task. We scale modelers now have another reference source available to us. This is the recently released *Paul Matt's Scale Airplane Drawings*, published in two volumes. Quoting from the press release:

"The life's work of scale airplane drawings by the late great Paul Matt has been published and is now available in a set of two volumes. More than 325 pages of three-view drawings are included for 124 types of airplanes. Each drawing is highly detailed and is an accurate working print with all dimensions, specifications, airfoils, cross sections, templates and color schemes included."

"The drawings are part of the collection of the internationally-acclaimed *Historical Aviation Albums* by Paul Matt. In addition to drawings, each book contains several detail photos. The two-volume set includes drawings from Golden Age, WWI, WWII, Classic and modern eras, including some of the most popular and obscure airplanes ever produced."

Volume 1 contains all airplanes listed A through G. Volume 2 contains all airplanes listed H through W. Three- and four-view engineering presentations, in large (17x22-inch), easy-to-work standard scales are available. Plan prices run from \$8.00 for two-sheet drawings, to \$13.00 for a six-sheet set. Drawings are scaled depending on the size of the full-scale aircraft and number of drawings.

Volume 1 and Volume 2 sell for \$24.95 each with a total shipping charge of \$3.50. The books are 8-1/2x11 inches, soft bound, and may be ordered from the publisher—SunShine House, Inc., P.O. Box 2065, Terre Haute, IN 47802, or call (800) 999-0140. These two books are a worthwhile addition to your library. They are expensive, but in my opinion are well worth it.

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

# RC AEROBATICS

BY RICK ALLISON

## PATTERN, CANADIAN STYLE

**T**his month it is time for the old pattern stew pot once again. It'll be nearly summer when you read this, but as I write, wife Joan and I have just returned from the depths of winter in Toronto, Ontario. And Toronto, Ontario, besides having a minor problem with vowel proliferation, has a serious winter temperature problem. Briefly, they don't seem to have any. All I can say is *Brrrr*, which at least doesn't use up any more vowels.

Actually, Toronto was merely where the plane landed. Guelph, Ontario, which is a little southwest of Toronto, was our destination. The Desert Inn (covered with snow; one of life's little ironies) in Guelph is the spot where Ivan Kristensen's annual Pattern Fun and Fellowship seminar takes place. This year the date was January 25, and no, it wasn't warmer in Guelph, but at least most of the festivities were inside.

I don't know what the attendance was, but there were definitely a lot of us, and a lot of nice airplanes on the tables. How so many people are able to come up with finished winter projects so early in the year ranks with the mysteries of the ages as far as I'm concerned. I'm not the type that installs the radio the night before the first contest of the season and trims before the pilot's meet-

### IS OUR FACE RED!

We on the MB staff blew it big-time when we mistakenly identified columnist Rick Allison's wife as "Sandy" in the caption on page 49 of the April issue. Her real name, of course, is Joan Anastasio—otherwise known as "Joanie" by those she competes with. Turns out she is quite an accomplished precision aerobatics pilot, having brought home the only Nats trophy currently in the Allison/Anastasio household—seventh place out of about 65 entries in Sportsman at the 1989 Tri-Cities Nats.

This year, Joanie is competing at the Advanced level. She's also past president of the Marymoor RC Club. That's a pretty impressive record, and when Rick telephoned to point out our error, it was easy to tell that he is very proud of his wife's accomplishments. So, we extend our apologies to Joanie—we won't let it happen again!



Beauty event winners at Ivan Kristensen's Pattern Fun and Fellowship seminar at Guelph, Ontario, Canada; in foreground is first place winner Karl Buchemain with his Summit III, on left is second placer Greg Marsden with his Legend, and on right is Helmut Schmitter, third place, also with a Legend.

ing, but January?

The guest of honor this year was Steve Helms, Futaba Corp. of America's Director of Marketing and well-known pattern competitor, and Steve favored us with a talk on the history of radio control in the marketplace, and especially the role of Futaba in making that history. Interesting stuff.

Also on hand were all the members of the World Champion Canadian FAI/F3A Team (Ivan, Greg Marsden, Dave Patrick, Team Manager Cheryl Marsden and wives/mechanics Sue Patrick and Diane Kristensen) to receive honors from MAAC (Model Aircraft Association of Canada) President Stan Shaw. Dave Patrick presented a first class slide show of the World Champs with some very insightful commentary from the Canadian point of view.

Peter Alexander presented the new MAAC

patterns for '92, which include some big changes in the lower classes. The MAAC Intermediate schedule, which corresponds to our Sportsman class, and the MAAC Advanced schedule, which corresponds to our Advanced class, both got a healthy increase in difficulty. They are now significantly more difficult than the equivalent AMA patterns for '92-'93.

The MAAC Intermediate is an all-turn-around schedule rather than partial turn-around like AMA Sportsman pattern. MAAC Advanced goes from 15 maneuvers and 28 total K, to 19 maneuvers and 39 total K. The AMA Advanced schedule for '92-'93 is the MAAC Advanced schedule from last cycle. The conclusions are pretty obvious: The



Colin Campbell displays the extremely light foam core and balsa wing skin he created on the spot at Guelph.





Seen on static display at Guelph was this beautifully finished Legend with YS 1.20 power, built by Denis Plante.

Canadians are still leading us into the Turn-around Age, and we will be playing catch up for a good while yet.

Before anybody gets excited and demands to know why the good old USA isn't in the forefront of Pattern Change, I should point out that it is in the American nature to argue and dispute, which is exactly what we did when the FAI decreed turnaround to be the wave of the future, while the Canadians joined hands and jumped on it. Ergo, the patterns we have now in the lower classes are just about what our pilots can handle, at least according to the consensus of the American pattern community as expressed in the last NSRCA poll. The price for hanging back and dragging our feet will be paid on the installment plan over the next several rules cycles as we modernize.

On one matter, I do feel that our Canuck cousins have made a major mistake. They have instituted FAI style "10 or Zero" land-

ing and takeoff sequences in all classes above their novice event (which they call Sportsman). I'm the guy who has always said that landings and takeoffs aren't aerobatic maneuvers if you do them right, but they are important flight skills, and their skillful execution should be rewarded proportionately. If the rewards go away (or are made too easy to come by, which is the same thing), then practice goes away. Well-done landings and takeoffs add a lot of grace and beauty to pattern—as well as a significant amount of safety. Perhaps they

will prove me wrong on this point, but right now I don't think so.

The MAAC Expert schedule remains the same, which is to say that it's the same schedule as AMA Masters for '92-'93.

Out front in the model and manufacturer display area, the goodies were stacked and

the vast majority of the many airplanes were gorgeous. One of the most striking was Dave von Linsowe's USA Star, the airplane which Dave used to place third at the World Champs.

This airplane is BIG, 1145 sq. in., 8 lbs. 12 oz. worth of big, and the workmanship is beautiful. YS 1.20 powered, and no, I don't have a picture. I unfortunately had one entire roll of film spoiled due to a flash timing problem with the camera. Take my word for it; nice airplane. Dave is still pondering kit possibilities.

Canadian balsa supplier Dick Grieve has sold his business, C&N Balsa Supplies Inc., to R.J. "Bud" Lemon. The new address is 47 Bridge St. E., Unit 4, Kitchener, Ontario, Canada, N2K 1J7, phone (519) 743-0620. Under Dick, C&N was the source of some of the finest light balsa available in this solar system, and the new owner seems determined to keep the quality level where it was. The prices aren't the lowest, but you don't get a Rolls for the price of a Ford. They advertise guaranteed weights.

One of the niftiest new products seen was Landing Product's new APC prop for large engines, which features a bolt-together aluminum hub which captures individually molded blades. There should be a photograph of same around here somewhere. This will come in two- and three-blade versions for the big bangers.

Colin Campbell was on hand for a building demo. He showed up with some foam and balsa, proceeded to manufacture wing skins, and then cut and completely honeycombed a set of Nova wings in front of the very eyes of all. Look Ma, no secrets.

As to the rest, Canadian team member Greg Marsden was showing Legend kits, Phillips Aircraft had Colin Campbell's Nova design on display, and various other local and not so local suppliers were showing their wares. In the middle of all of this, Dave

von Linsowe and Steve Stricker tramped out to the frozen wastes of a deserted parking lot with Dave's fun fly airplane, and Dave proceeded to wow the curious (most of us!) who had followed him out with some aerobatic magic that never got more than 100 feet from himself or more than 30 feet high, and most of the time those figures were more like 30 and 10. All this in temperatures where you can freeze meat by leaving it outside. Although I was unable to stay for the banquet, I understand the camaraderie continued well into the evening. I have definitely had worse Saturdays. Four Stars and Recommended, if you find yourself looking for a place to burn (freeze?) a weekend next January.

Up the very next weekend, on February 1-2, was the Puyallup Model Expo, the premier model show here in the Northwest.



R/C City produces an extensive line of very high quality pattern kits, as seen here on display at their booth in the Northwest Model Expo at Puyallup, Washington.

As usual, Jim Graham of RC City was up showing his full to overflowing line of pattern kits. New for this year are Quique Somenzini's Desafio (designed by his father, Mario) and Mike McConville's 1.20 sized Desire, as well as Steve Stricker's

Bob Renaud is justifiably proud of the new Airtronics Infinity 1000A, a state-of-the-art ten-channel RC rig that promises to be one of the favorites of serious pattern competitors.



Coming soon from Landing Products are these new "modular" APC props, in two- and three-blade versions. Individually molded composite blades are clamped securely between the two halves of the machined aluminum hub.

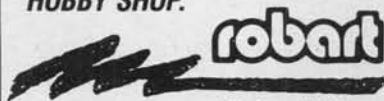
ing and takeoff sequences in all classes above their novice event (which they call Sportsman). I'm the guy who has always said that landings and takeoffs aren't aerobatic maneuvers if you do them right, but they are important flight skills, and their skillful execution should be rewarded proportionately. If the rewards go away (or are made too easy to come by, which is the same thing), then practice goes away. Well-done landings and takeoffs add a lot of grace and beauty to pattern—as well as a significant amount of safety. Perhaps they

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1939 Mercury 72"	\$61.28
1939 Zipper 54"	\$56.24
1940 Ranger 46"	\$33.55
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38% TOC Ultimate biplane. A new design from Jim himself is in the offing, the Avanti III.

Steve Helms (that man again) and Richard Verano were up showing the Futaba line, including the new YS 1.20 with the air chamber. Like the new O.S. 1.20SP, this monster looks like it would be right at home powering a motorcycle. By the time you read this, it should be available wherever Futaba products are sold.

George Sparr of Aerospace Composites was up with his line of epoxies and carbon fiber/fiberglass goodies, including a vacuum bagging system that sells for a mere \$75.00. The address is P.O. Box 16621, Irvine, CA



The awesome YS 1.20 air chamber four-stroke engine—a true monster motor!

92714, (714) 250-1107. George's catalog is another thing you need if you are building pattern ships.

Bob Renaud was showing the prototype of the Infinity 1000A RC system at the Airtronics booth. With 10 channels and 1024 step resolution, plus a multitude of other features, this one looks like a serious competitor to the top JR and Futaba radios for pattern work. At your local dealer soon is the word.

At the Hobby Dynamics booth, National Sales Manager Mike Fritz and Pete Bergstrom were showing off JR radios and Webra engines. The news here is that the Webra Long Stroke Red Head .61 pattern engine is now available with the long awaited integral pump. This is the engine that Chip Hyde used to win the World Championships in F3A, and it is reputed to be very, very strong, and like all Webras, nearly unbustable. Now the choices for two-stroke fliers look like red (Webra LS), red (O.S. Hanno), and black (Y.S. LS). Anyone for Roulette? Also available is the new Hobby Dynamics Glow Driver. This looks like a rebirth of the much missed JR Glow Driver, which has been out of production for some time now. All of the Hobby Dynamics line is available through your local



hobby dealer.

Another item of interest at the show was the Zurich R/C Sunglasses display by Newman Optics. These glasses are high quality unbreakable polycarbonate wrap-arounds designed to fit over your regular specs, if any, and they are optically perfect. Physically similar to the safety glasses you may have seen advertised elsewhere, these offer 100% UV-B block at 400 nanometers, and over 98% of UV-A at the same level. They also filter blue, white, and flat light, which creates high definition vision and strong color perception. The secret seems to be the very high quality and scratch-resistant quartz coating applied to the glasses. And all of this data does not come from reading the handout. I bought a pair, took them to my regular optician who tested them, and then went out and flew with them in bright sunlight. They are simply the best sunglasses I have ever flown with. I was able to fly right to the edge of the sun's disc without discomfort and with perfect control. They also come with a lifetime warranty against normal breakage. Get them from Newman Optics, 5083 Ridgedale Drive, Ogden, UT 84403; telephone (801) 479-7733.

Last, I need to say a short word about N-PAC, the National Society of Radio Controlled Aerobatics—Pan American Aerobatic Championships, which will be held July 26 through August 1, 1992, at the Mid-America Flight Center in Vincennes, Indiana, the site of the last two AMA Nationals. This is the first year for this meet, which is designed to be a true national championship meet in all classes, including Novice. Despite the sponsoring group, you need not be an NSRCA member to enter. Phone N-PAC Registration Chairman Charles Castaing at (318) 364-7221 for forms and instructions. Preregistration is required, and the cut-off date is July 1 for all classes except FAI/F3A, whose cut-off date is June 20. This will be the pattern event of the year; don't miss it. **MB**



Hobby Dynamics' Mike Fritz holds the new HD glow driver. This company is also distributing the new Webra two-stroke .61 pattern engine—see text.

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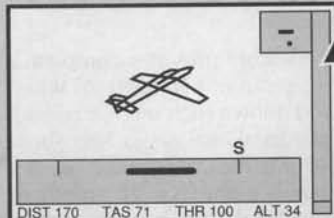


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## WING STRUCTURES AGAIN

In our December 1991 column, we talked about wing structural design, including placement of spars and wing spar design. I was a bit out of my field in that effort and made a few mistakes, which some of you sharp and sharp-eyed readers promptly called to my attention.

Will Kuhnle, of Richardson, Texas, a contributor to the technical accuracy of this column and the winner of our windmill-sailing-cart contest, wrote:

"I agree with your concept of spar design; but I think your enthusiasm for spar depth led you to overstate the facts. The one-inch deep yardstick I-beam is about 19.6 times (not 25 times) as strong as one flat yardstick. Doubling the depth of the I-beam to two inches increases the strength by a factor of 2.5 (not 4), making the two-inch beam about 48.8 times (not 100 times) as strong as one flat yardstick. For the strength of an I-beam to be proportional to the square of the depth, thickness of the flanges (caps) must be increased in proportion to the depth. If the flanges are not changed in thickness (and are thin relative to the total depth of the I-beam) then the strength is approximately directly proportional to the depth."

Thanks for catching me on that, Will. You are right. I thought I had put a statement in the column to the effect that the square-of-the-depth law wouldn't fully apply in my examples, since I wasn't increasing the cross section of the spar caps, but I see now that it didn't get said.

In the same column I had made some sketches of possible spar locations on a rib, and said I didn't think much of example number 4, where a lot of little spars are distributed along the upper surface of the wing, with no spars below.

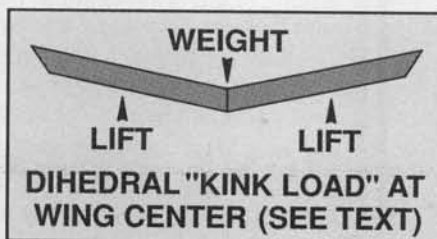
Regarding this one, Will wrote, "I think you underrated example No. 4, especially for rubber models where the covering is proportionally thicker and not negligible. The upper spars serve as the top flange [of a complex beam], the leading and trailing edge serve as the bottom flange, and the covering serves as the shear web."

### SHEAR WEBS

J.M. Fletcher, of Lexington, Massachusetts, also took me to task. I had written, "The shear web should be installed with the grain vertical," and went on to explain why I thought it should be.

Fletcher provides complete mathematical proof of his positions when he writes, and quotes such recognized authorities on structural analysis as Timoshenko. His first letter to me contained 25 pages! He called that one the "Great American Novel." I answered him in three pages, and then received a short 16-page letter from him.

Mr. Fletcher is apparently a retired engi-



neering professor from the University of Toronto, and he knows his stuff. Some of you will also approve of his choice in modeling: He builds rubber powered models.

So, after wading through Professor Fletcher's proofs, step by rigorous step, there is no doubt that for maximum strength-to-weight ratio, shear webs should be installed with the grain *horizontal*. That is interesting, since most model airplane designers and builders install them vertical (if they use shear webs at all... which they should).

As I already knew and Jack's analysis shows, the actual stresses in the shear web of a beam under load are *diagonal*, with tension in one diagonal direction, and compression in the opposite diagonal direction. But cutting diagonal-grain shear webs would be messy, and the gain too small to be worth it. Actually, for our models, if the rib spacing is not excessive, the advantage of horizontal-grain shear webs over vertical is also minor. In fact, if I interpret Jack correctly, if the rib spacing were less than the depth of the spar, vertical-grain shear webs would have the advantage. This is a purist argument.

When I recommended putting the shear web grain vertical I was trying to solve another problem unrelated to shear itself. Under certain conditions there will be forces trying to compress the upper and lower spar caps together at the center of the wing, or trying to pull them apart at the center. Jack recommends putting separate vertical-grain structural ties at the center of the spar, as

required to take care of such loads, instead of trying to do it with the shear web.

A significant vertical compression load between the upper and lower spar caps occurs at the center of wings with dihedral. Jack calls this a "kink" load. In the configuration shown in the sketch, with no shear webs or ribs, the lift force and weight load would tend to cause the dihedral to increase. When the dihedral increases, the upper and lower spar caps try to move closer together at the center. I can see that intuitively, and Jack proved it to me by formal analysis, but *Model Builder* won't give me sixteen pages to show you his proof, so you are on your own.

If you have a dihedral brace joining the two halves of a built up wing with dihedral, it will invariably have more than enough compression strength to take care of the kink load, so don't worry about it. If you don't use a full-depth dihedral brace, you should, especially if the wing has a lot of dihedral.

Jack Fletcher goes on to point out that gluing the shear webs to the edges of the spar caps, making a J-shaped beam cross section, is better than putting tailored-length shear webs between the caps to make a true I-beam. This is true because the glue joint is more apt to fail in the I-beam type. His analysis shows nearly a 33% theoretical gain in shear web strength by using the "J" configuration.

Another frequent correspondent, Jim Stevens, of White Rock, B.C., Canada, also strongly prefers the J-beam configuration over the I-beam.

Exact figures for how much shear web is required will of course depend on the model, and how it is to be flown. Even then, Jack points out that we don't know enough about the structural properties of balsa to be really sure. At any rate, like the spar caps, for minimum weight the shear webs should be tapered (stepped). At the tips there is no shear load, and it linearly increases to maximum at the center of the wing.

Jack Fletcher worked out one example as follows: Assume a six-pound model, single J-beam spar with shear web, one-inch spar depth, three-inch rib spacing, with the model pulling a load factor of 5 g's maximum. The theoretical hard-balsa shear-web thickness required, according to his calculations, is less than 1/64 of an inch. He doesn't trust

*continued on page 80*



# WORLD CHAMPS NEWS



Wayne Mann

Curtis Youngblood

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2nd—Wayne Mann—X-Cell .60

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2nd—Wayne Mann—X-Cell .60

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

### 1991 Kyosho .30 Challenge

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

### 1991 Michigan Champs

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

FAI— 1st—Lance Murphy—X-Cell .60

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# RC SOARING

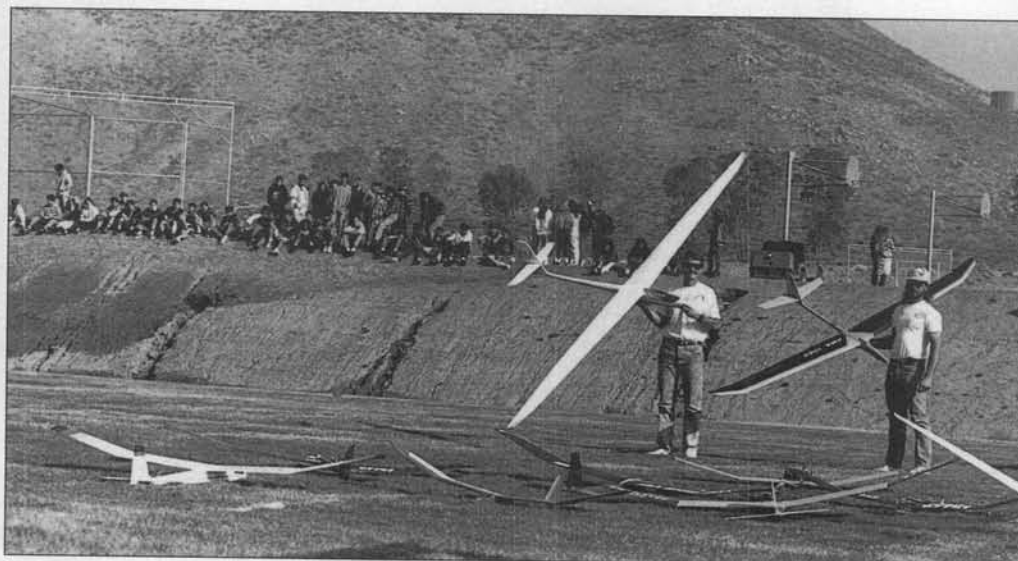
BY BILL FORREY

## GOT A CASE OF THINNING RANKS? RECRUIT!

**P**eople go through phases, in hobbies as in anything else. If your club is thinning out these days, don't fret, it's probably nothing you've said or done. RC soaring's loss might be archery's gain (or golf, or fishing, etc.). However, it works in reverse too, and that's where keeping your thoughts and energies on the positive side can make a world of difference!

If you are in a club which is facing declining membership, face it, it may be time for you to start hunting recruits, not just thermals. As I see it there are two main categories of hunting: active and passive. An active search is one where you seek out new fliers from anywhere at all, get them interested enough to check out RC soaring, and then try to win them over. The passive method lets interested parties come to you. They already have the interest, now they need to get hooked.

Maybe your club is like the Inland Soaring Society (ISS) of Riverside, California—



Jerry Snedden and Vince Botkin were two of a crew of five Inland Soaring Society members who recently gave soaring demos to 40+ high school honors class physics students.

very stable or slowly growing. Your club may have a bunch of enthusiastic glider pilots who are very willing to share the excitement and joy of soaring with energetic new prospects. If it does, it can grow.

Regardless of whether your club is growing or not, it's always a good idea to promote your brand of RC soaring in the local community. When it comes to saving flying fields or gaining legal access to new ones, it really pays to be known and welcome with the powers that be.

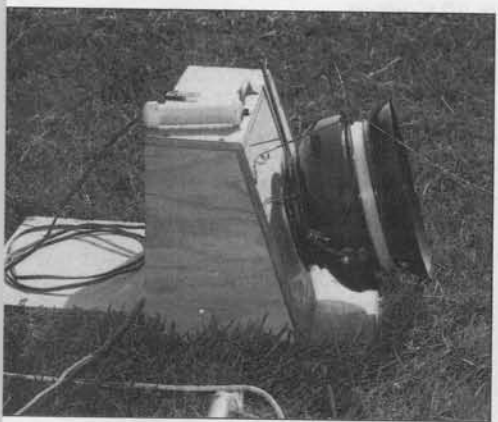
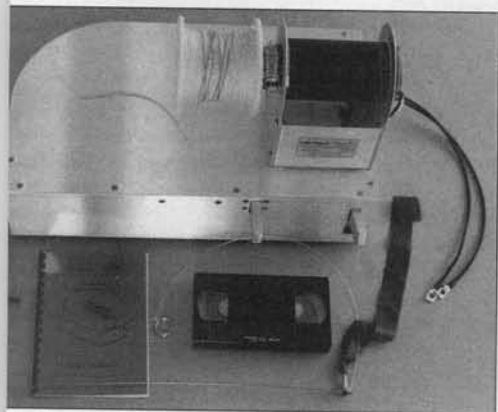
Rich Shelby (ISS soaring pilot and biology teacher at Lake Elsinore High School in Southern California) is a guy who likes to bring the classroom to life using fascinating, unusual experiments. About twice a year he asks for and receives permission to put on model soaring demonstrations at local junior and senior high schools. He has been giving these demos for several years

now, and each time an entire classroom of kids comes out to witness Bernoulli's Principle in action. The kids, the teachers, and the principals all love the very practical and empirical lessons that Rich gives on basic aerodynamics and model making—so much so that his "flying field trip" demos always generate a heartwarming "please come back and do it again next semester" invitation.

Last December, Rich invited me, as well as three other ISS club members, to participate in one of his model soaring demonstrations. All of us took time off work to attend. It was a good old-fashioned gesture of

Jerry Snedden launches the new ARF Explorer 2M from Thunder Tiger for Vince Botkin and student pilot Steve Andrich. Winch and retriever setup was part of the demo.

(Left, above) Ernest Barter of VMC Flight produces this very professional looking winch line retriever called the "Model 20." Made from sheet aluminum, it weighs 20 pounds. This view shows the line guide in the launch position. Very little drag is produced. Note the propeller and shaft device on the retrieve line. This is the line untwister which actively untwists the line during the retrieve. (Left) Jim Harger of Innovative Product Design produces this unique line retriever and light aircraft launcher called the "E-Z Retriever." Spool is stationary during the retrieve. The bale lays on line just like a spinning reel. Putting line on as it comes off eliminates line twist. Can also be used to launch small, lightweight sailplanes.





caring and sharing from the community (our club), a committed teacher (Rich), and the principal of the school (Ron Foland) to the students.

The location of the demo was the athletic field of Temescal Canyon High School on the north side of the city of Lake Elsinore, where more than 40 students from the physics honors class assembled with their teachers. This school has been open less than a year, so the field was in great shape for flying.

Our involvement was enthusiastically received and appreciated by all, and that alone made it extremely worthwhile. But there were other rewards, too.

The students benefitted from the demonstration. It provided an opportunity for many to expand their understanding of what makes sailplanes fly. They also got to see what RC soaring is all about. A handful of the most interested teens (six or seven) got actual stick time at the controls of two different model sailplanes. Who knows, these teens may possibly get involved in model making, ISS club flying, or perhaps even go on to careers in the aerospace or aviation industries.

Did we benefit from the effort? We sure did. Rich Shelby, Jerry Snedden, Vince Botkin, Ian Douglas, and yours truly had FUN that winter morning. It was well worth the interruption in our normal work schedules. We made new friends, introduced model sailplanes to dozens of teens and adults and possibly gained some new soaring club members. The new members would surely be icing on the cake.

Part of the fun in being there was the chance to fly at a new site—a delightful change of pace. In addition, our efforts were appreciated by the school's administration. This time the appreciation was manifested in weekend field use permits for organized ISS model sailplane meets (should we request them).

Are we planning to do it again? You bet. Perhaps your club could try it for a first time. It may sound like a lot of work, but it's not. It's fun. You have everything to gain, and nothing to lose. Activities like this give a very positive image of RC modeling to the community. Favorable public awareness is really needed for the future growth of our sport/hobby.

### HELP YOUR ROSTER BY HELPING YOUR LOCAL HOBBY DEALER

Actively seeking out recruits from high school science classes is certainly one way to gain new members and influence the right people, but it is tough. An easier way is to let them seek you out.

Talk with your local hobby dealer. Tell him when and where your club flies gliders, and that you welcome newcomers. Tell him that you have an instructor program for novice fliers who seek help in learning how to build or fly sailplanes (if you don't have one, create one fast!).

Make a broadside for the shop's bulletin



No doubt this flight will be a long-term memory for Steve Andrich of Temescal Canyon High School, Lake Elsinore, California. Buddy box system is a great (safe) way to learn! Instructor has instant control in time of need.



Gentle giants of a bygone era. From left: Gordon Ritschke (Airtronics Aquila XL), George Joy (Airtronics Super Grand Esprit) and Dave Condon (Airtronics Aquila XL) pose for photos at the Harbor Soaring Society's Lee Renaud Memorial SC-squared contest. Aquila XL sold for \$130 over 15 years ago when it was in production.



board, front counter or front window. Give it tear-off tabs with the name and phone number of the instructor(s) or club officers. Draw a map to the field so newcomers will have no difficulty finding it. Have a stack of flyers printed up like miniature broadsides. Be creative. As an incentive, give discounts on club membership for new members. Point out the fact that you have launching equipment for them to use, or have knowledge of good slope sites for beginning fliers. Tell 'em how friendly glider guiders are (that's a fact!).

Your hobby dealer will appreciate the help because he can't take his valuable weekend sales time off to teach newcomers how to build or fly. The newcomers will certainly appreciate your help, and they will most often show it by helping out at

club activities (contest timers, winch line runners, etc.). And you will definitely build up your club roster quickly and easily. It's an efficient, mutually beneficial situation for your club and your local hobby shop.

### TWO NEW WINCH LINE RETRIEVAL SYSTEMS

Sometimes great minds think alike. When they act alike, it can be a little weird. Case in point is a pair of winch retrieval systems that claim to end the line twisting common to previous retrievers. Information of the two was sent seven days apart from California and Oklahoma.

The first letter came from Ernest F. Barter of VMC Flight, 18971 Fernbrook Court, Saratoga, CA 95070. Inside were photos of

Time to land! The Thunder Tiger Explorer 2M settles in for a gentle landing in the soft grass of a new athletic field. Don't trip on the trainer cord, guys!



Blair Atwell is the Southern California Soaring Club's season points champ for 1991. Proud new papa won an Airtronics Vision 8SP in the raffle, too! Luck and skill together in an all-around nice guy! Original design ship flies and lands very well.

the VMC Flight "Model 20" retriever, which at \$319.00 comes complete with retriever line, an untwisting device (patent applied for); custom ball bearing, low current consumption motor; a foot-operated on/off switch, and foot-operated line guide positioner.

How the main parts of the retriever work is little different than previous designs. As the plane is launched, the line spirals off the end of the stationary spool, putting one twist per revolution in the line as it feeds off. The line is wound back onto the spool 90 degrees to the armature shaft and hub, adding no more twists but removing no twists either. This is where the (patent applied for) "untwisting device" comes into play.

This device is not described in the text accompanying the photos, but it is easy enough to figure out. It's not just a ball bearing swivel—which is only somewhat effective—as used in most other retrievers; it's a model aircraft propeller mounted on a shaft of some sort! This actively removes the twists created by the spiral line pay-out and linear retrieve. It must work well if they are willing to go to the trouble of protecting the idea with a patent.

If all this sounds like a good idea to you, contact VMC Flight at (800) 225-0364 to order. Information can be obtained at (408) 973-3333. For ten bucks (refundable), a video can be obtained for a closer, pre-purchase look. This retriever is very profes-

sionally built and attractive. It ought to be worth your \$10 to see it in action.

The second line retriever system eliminates the line twist problem by failing to create the problem in the first place. We have George Voss of Oklahoma City, Oklahoma, to thank for sending along this information, and it is worth noting.

We've all seen or used spinning reels before in fishing. Well, I just described how the E-Z Retriever from Innovative Product Design (IPD) works. It is so much like a spinning reel that you can even use fishing monofilament line if you desire!

Line spirals off the open face of the spool parallel to the hub just like any other retriever. However, the bale mechanism is the thing that is completely different. It spins around, putting the line back on in spirals just as it came off! The spool doesn't move. The line doesn't twist. The bale is automatic, and through it all, your hands don't need to be near the retriever! It's so automatic and hands-off, you can retrieve your own line using the optional foot pedal switch. And, it has enough power to serve as a non-retrieving winch for lightweight Class A and Class B gliders (up to 78 inch span). I'd say that was innovative, alright.

Because it's so different, you are probably wondering if it works well. Jim Harger of IPD writes, "I've made over 200 retrieves at a contest off a single 50 amp hour battery with power to spare. For fun flying, run it off the same battery as the winch. A new feature just added to the retriever is a variable speed drive. This allows you to pull the line out of the air quickly in high gear, and then shift to low gear to pull in the line when it nears the ground. This provides more pulling power and reduces wear on the line, winch, and retriever."

George Voss writes, "Enclosed is the flyer on the IPD E-Z Retriever. I built the first kit version this past year. The assembled version has been out for about three years. The

## WORLD CHAMPION!

CONGRATULATIONS TO  
JOE WURTS AND  
DARYL PERKINS

ON THEIR 1ST AND 2ND PLACE SWEEP  
OF THE 1991 WORLD CHAMPIONSHIP  
IN HOLLAND WITH THE  
FLITE LITE COMPOSITES — EAGLE F3B

## NATIONAL CHAMPION!

CONGRATULATIONS TO BRIAN AGNEW  
ON HIS SWEEP OF THE  
THREE WINCH LAUNCH SOARING CLASSES  
AT THE 1991 AMA NATIONALS

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**FLITE LITE COMPOSITES ● 466 PRIMERO CT., SUITE E ● COTATI, CA ● (707) 792-9174**



retriever works exactly like a Zebco spinning reel. We've had excellent results with it."

For more information about this unit, may I suggest you contact IPD directly at (314) 443-6708, or write Jim Harger, IPD, 1911 Wolcott Drive, Columbia, MO 65202. The price is \$325.00 for the ready-to-use model, and \$250.00 for the kit model. No need to send money until Jim tells you he's ready to ship.

### LEAGUE OF SILENT FLIGHT 1992 NATIONAL CHAMPIONSHIPS

This subhead could just as easily say, "The SOAR Nats have returned!" Hoping to revive the fervor and excitement of the "good old days" of pre-AMA SOAR Nationals (mid 1970's), the powers that be at the League of Silent Flight in general, and Michael Stump of Cadillac, Michigan, in particular, have conjured up a similar event to be held in Vincennes, Indiana on July 18 through July 25. Yes, it is the same site as the 1990 and 1991 AMA Nats, Lincoln High School. And no, unlike previous LSF events, no pre-qualifying is necessary—just provide proof of AMA membership and get signed up!

If all the claims of glider guiders being reduced to "AMA Nats second class citizens," and if all the bellyaching about the AMA's lack of attention to the sailplane events at the AMA Nats can produce any ACTION and not mere hot air, then the LSF Nats should produce a very large turnout.

Here's your opportunity to be entirely in the limelight, to fly in several different soaring events, to fly with experienced help and experienced pilots, to fly on all 50 channels, to fly man-on-man in thermal events, to share technology and expertise, to take soaring in a new direction, to become the first LSF U.S. National Champion in one or more events.

Nine events are planned:

- Saturday, July 18, Cross Country.
- Sunday, July 19, F3B multi-task.
- Monday, July 20, SMT (Sportsman Multi-Task).
- Tuesday a.m., July 21, Hand Launch (Class A).
- Tuesday p.m., July 21, Scale (O'Neil Airport).
- Wednesday a.m., July 22, 2-Meter (Class B).
- Wednesday p.m., July 22, Scale (O'Neil Airport).
- Thursday, July 23, Standard (Class C).
- Friday, July 24, Unlimited (Class D).
- Saturday, July 25, F3J Thermal Time Slot, man-on-man, hand tow.

The entry fee is \$20.00 per event (\$12.00 AMA Jr./Sr.), AMA Gold Stickers are required on transmitters, and entries will be limited to eight per frequency per event. Contact Mike Stump at 607 Washington St., Cadillac, MI 49601 for more information and entry blanks.

Please note LSF's new address for all LSF

Level achievement vouchers: LSF, 10173 St. Joe Road, Ft. Wayne, IN 46835.

Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92530; (714) 245-1702. Phone calls are preferred, between 6-9:30 p.m. PST weekdays, anytime before 10 p.m. weekends. **MB**



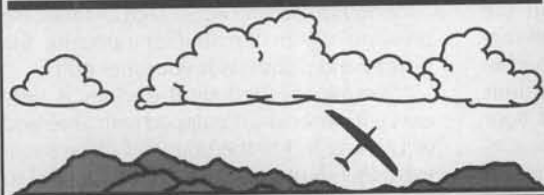
Barbara Renaud of Airtronics hangs a gold medal around Joe Wurts' neck for winning the year-ending HSS SC-squared contest and Lee Renaud Memorial. Airtronics supported the raffle with very generous gifts. One hundred thirty-two modelers flew in the event last November.

# Just when you thought it was safe to stop building for the soaring season...

## 1992

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# CONTROL LINE

BY JOHN THOMPSON

## UP CLOSE & PERSONAL

If we could climb into the cockpits of our model airplanes and go with them into the sky, they wouldn't be models anymore. But control line model airplane pilots believe they have the next best thing to riding in their aircraft—their hands actually on the controls.

Orin Humphries, of Lynnwood, Washington, a master Navy carrier and scale competitor and all-round possessor of great model aviation wisdom (not to mention an encyclopedic knowledge of full-scale aviation history) provides some food for thought on the thrill of control line flying:

"One of the frequent things we control liners encounter is the opinion of non-modelers as to which control mode would be more exciting: radio control or control line. (How would they know?) Your December (1991) column mentioned the most commonly heard attraction of CL, the direct connection and all that it passes to us.

"For me, there are two other major attractions that one seldom if ever hears about. They are the immediacy and intensity as compared with RC.

"Immediacy means that since we don't have the whole visible sky to drift around in, the airplane is right up in your face, a mere 35 to 70 feet away at all times.

"This produces the other facet, intensity. In RC you usually have hundreds of feet—vertically, to shield you from mistakes, gusts, etc. We usually have between five and 20 feet, right up in our faces, and for our airplanes it's live or die every 1/10 of a second we fly.

"In RC, once the plane is trimmed out, you can take your eyes off of it for short periods and chat, eat a sandwich, hand the controls to someone else. They get about 30 seconds, total, of the immediacy and intensity we feel, when they take off and land; the rest of the 20-minute flight is hum-drum city.

"I feed off the adrenalin high, the intense focus, the tunnel vision you get from concentration that comes with precious few

exceptions only from CL and for the entire flight, with no naps."

Orin's "tunnel vision" is a reference to what some others call the "focus" required of the control line flier. A level of mental focus is required for control line flying that is present in few other activities in life. A great number of CL fliers choose to step to an even higher level of mental focus by becoming involved in competition.

The competitive control line flier often feels a level of physical and mental refreshment after a period of intense compe-

combat match requires each pilot to make a separate and distinct strategic decision (based on the goal of cutting the string leader or the streamer and in reaction to the offensive maneuvers of the opponent) every one or two seconds. If both airplanes are in combat for even half of the five-minute match, and the pilot reacts to a new situation, calculating conservatively, every two seconds, that's 75 separate decisions to be made in a 2-1/2 minute period, an error in any one of which can result in loss of the match, or the airplane, or both!

As Orin says, no naps!



One of the new hotbeds of control line activity is the Tri-Cities area of Washington State, where the 1989 Nats were held. The Columbia Basin Balsa Bashers have a regular schedule of small contests. At a contest in Richland in late 1991, Don Stewart showed off his Super Snake, a Northwest Super Sport Racer. That's Mac Ryan looking on.

tition that is comparable to the feeling that athletes have after a strenuous workout or competition.

Each form of competition flying has its own particular type of activity. In the multiple-pilot events like combat and racing, the intensity is related to the need to react to constantly changing conditions produced by the similar reactions of your competitors. In individual events like carrier and stunt, the focus is on perfection of the task at hand in view of prevailing—and possibly shifting—conditions of weather and site.

As an example of such concentration levels, I've estimated that the average fast

prime the engine using a small hypodermic syringe. The size used by diabetics works fine, and it's hard to flood the engine with it.

"Another method is to attach a crankcase pressure tap in the muffler opposite the piston, and prime with your fuel bulb.

"Starting inverted stunt engines is very easy with an engine equipped with a method of priming it. Fill the tank and force some extra fuel through with the vent plugged so that fuel runs out the venturi. Pull the prop tight up against compression in the 'normal' counter-clockwise direction. Attach the battery. Give the engine a good prime. Then, hit the prop backwards, or clockwise,

### MAILBAG

For the past three months, this column has been devoted to special articles on the topics of old-time stunt and electronic control of scale aircraft. That has allowed the *Model Builder* control line headquarters mailbag to fill up with some excellent contributions from readers.

George Lieb, of Omaha, Nebraska, expands on a topic we mentioned last year:

"I was looking through some of my old *Model Builder* magazines and would like to add a little to what you had to say in the March 1991 issue. You said that muffler-equipped engines can't be primed. Here's how to get around that little problem.

"Drill a small (1/16-inch or less) hole in the muffler directly opposite the piston. Then



very hard. The engine will start first flip almost every time.

"If you don't hit the prop hard enough, there's a good chance of flooding the engine. If it doesn't start first flip, it should start in one or two flips in the normal direction, unless it's flooded.

"You also showed a picture of Joe Wagner's engines with a long venturi for better fuel draw. For side-mounted engines in profile planes, it's a good idea to use the long venturi with the needle valve moved up, too.

"This is fairly common in slow combat and some sport race events and gives very good runs without resorting to putting the tank through the fuselage."

Thanks to George for some excellent engine-starting advice. The prime/backwards flip (away from compression) is an excellent tip that even many experienced modelers take a while to discover.

A word of caution, however, about priming inverted stunt engines: Be conservative with the amount of fuel inserted; it should be not much more than it takes to wet the top of the piston. An over-prime will lock up an inverted engine because there's nowhere for the fuel to drain away. The only solution is to turn the airplane upside down and start the engine in that position.

Flying model airplanes is a diversion from the work and stress of daily life. It's fun and relaxing—even if the relaxation comes through forgetting our "real world" troubles for a new set of challenges provided by flight and competition.

But just because it's a leisure activity doesn't mean that we can forget the real world entirely. One area where the real world *must* be kept in mind is in the area of safety. In a hobby with spinning props, flying objects, flammable fuels, toxic finishing chemicals and space-age adhesives, the wise control line modeler is always on the lookout for danger.

Charles Jacob of Rocky Ford, Colorado, illustrates that point with a personal anecdote about a workshop accident:

"I read, with much interest, the safety tips in the February issue of *Model Builder*—particularly the recommendation for safety glasses. I'd like to share an experience with you that demonstrates the importance of always wearing eye protection in the workshop, and a bit of advice on immediate action which saved my sight and may be of help to others who have an 'accident' with paint or other caustic chemicals.

"Back in 1971 I had just finished mixing some K&B epoxy paint for a model I was finishing, and was closing the containers before applying paint to the model. It was about 9 p.m.

"The two-part epoxy paint was in metal cans with the standard paint can lid that fits down into a groove in the top of the can. I had put the lid on the catalyst and as I rapped the lid smartly with the plastic handle of a screwdriver to seat it in the groove, a bit of the catalyst that was trapped in the groove spurted upward, striking me in my left eye.

"It was only a tiny droplet, but the shock was instantaneous—like being struck in the eye with a fist. I was standing at the kitchen counter at the time, and instinctively stuck my head under the water faucet in the sink, turned on the water and flushed the eye for a full 10 minutes.

"I dried myself with a towel and tried to go to bed, thinking I might be better in the morning, but the pain increased until about 11 p.m. I got my wife to drive me into town to the hospital emergency room, where the doctor laid me on my back on the table and poured sterile water over my eye for another 30 minutes, applied some soothing ointment and bandaged the eye with a gauze pad.

"First thing in the morning, I was sent to an eye specialist in a larger nearby city. I

brane and I would probably have lost the use of the eye. The final result was that I regained full use of the eye, with the only damage being a small permanent scar on the surface of the sclera.

"Accepted protocol for any chemically induced eye injury is to immediately flush for a long time with clean running water.

"A tragic sidelight to this experience is that a young construction worker, who was in the eye specialist's office at the same time I was had just had concrete sprayed into both eyes when he looked into the end of the pressure pump hose to see what was clogging it up, and the obstruction broke loose just as he did so. He was not wearing his safety glasses and the concrete penetrated both eyes, totally blinding him.

"My fervent advice is: Always wear your safety glasses, and if you get even a drop of any sort of chemical in your eye, drop everything and immediately begin flushing with water."

Charles raises an important point about the chemicals that we use in the workshop—there are any number of ways to get such chemicals in the eyes and the only sure way to prevent it is safety glasses.

Paint catalyst is a chemical that needs particularly careful handling. Perhaps the most extreme example of a chemical that needs careful handling in the workshop—in regard to vision—is the catalyst that comes with polyester resin. K&B Super Pox polyester resin is an excellent construction and finishing material, often used by speed and racing aircraft builders both as an adhesive and a finish. It frequently is used in conjunction with fiberglass cloth to provide bulletproof construction and a fine hard finish.

This material is sold in two parts—a large can and a tiny bottle of catalyst. The catalyst is added to the resin at 8 or 10 drops per ounce. Every report I have read or heard about the

catalyst is that a single drop in an eye causes instant, permanent blindness. With that in mind, a few suggestions for using such a catalyst:

- Always open the catalyst bottle with the top pointed away from your face. Changes of temperature in your workshop could have caused the chemical to expand and therefore be under pressure in the bottle. It could spurt on opening.

- If the bottle is plugged, never squeeze it to clear the obstruction. Find some way to clear it without applying pressure, and, again, work with the opening pointed away from you.

- When measuring it out for use, keep the bottle at a distance from your face and pointed away. *continued*



Ron Hales of Richland shows off a Sig Skyray.

took the paint can with me so the doctor could read the chemical makeup of the catalyst to help determine further treatment.

"I underwent more examination and treatment, and was given some steroidal ointment to apply several times a day and had to keep the eye bandaged for several days.

"The specialist advised me that I had done precisely the right thing to save my sight: Getting the eye under the running water within seconds after it was hit with the caustic chemical had prevented full penetration of the sclera (the white part of the eye). Had I allowed the chemical to remain for even a minute on the surface of the eye, it would have penetrated the mem-

- Clean your hands thoroughly after using the chemical, to avoid inadvertently rubbing it into your eyes.

- Always wear safety glasses.

The above tips also apply to the use of cyanoacrylate glues (instant glues such as Hot Stuff, Jet, etc.). Many of us keep these glues in our freezers to extend their shelf life before they are opened. Let the glue return to room temperature before opening it. Use extreme caution when opening a plugged applicator tip—the possibility of spurting glue always exists.

Cyanoacrylate is not as dangerous to the eye as epoxy or polyester catalysts, but it can be an irritant and can require hospital treatment if it gets into an eye. And who wants to go around for a couple of days with an eye glued shut?

### S.W. CL REGIONALS

One of the great long-running control line annual competitions is the Southwest CL Regionals in Tucson, Arizona, which took place this year on January 18-19, sponsored by the Cholla Choppers at Silverbell Park, with Ed Hagerlin as contest director.

Jon Simpson of Escondido, California, formerly of Australia, provided a report on his activities at this year's contest that illustrates what the fellowship of model competition is all about, and he forwarded some results.

"It was really harried weather in Tucson, cold, and a wind you wouldn't believe," Jon writes. "Some of the smarter folks kept their gear in the trunk, to save for a better day. Others, myself included, laughed and flew and crashed merrily into the sunset.

"What I know about aerobatics I could write on the head of a pin; most of the 40-plus years of my modeling career, I've been a go-faster kind of guy, speed and team race. So, seeing I had the honor of all Australia riding on my shoulders and VH-3732 emblazoned on all my outboard wings, I went and flew. Took four aircraft, backups for backups. All of them met the earth one way or another, damage running from slight to total. But it was fun.

"We even had some juniors join the fun. Everybody tried to put something in the air, and then fought like crazy to keep it there. Ever been blown 90 degrees out of a wingover? You had to see it to believe it.

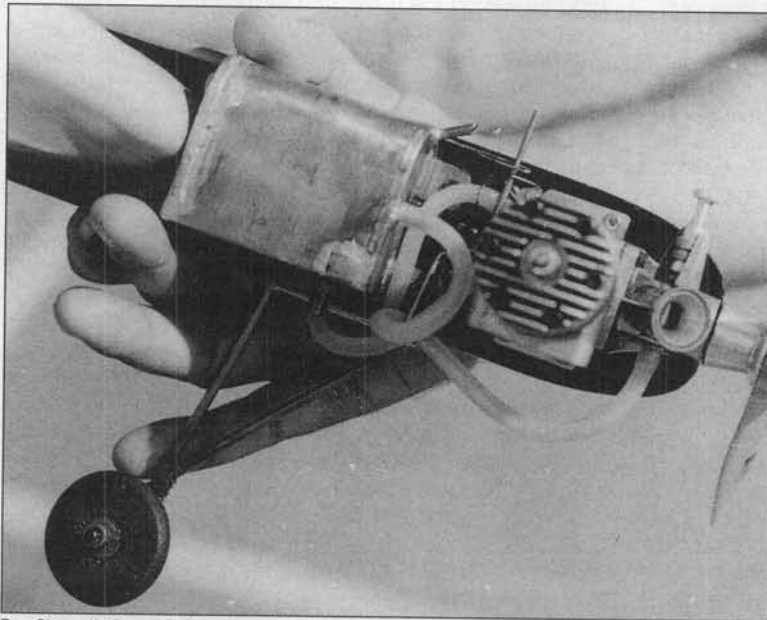
"Basically it was a stunt (aerobatics) championships, but we also had combat, rat, scale and carrier.

"Who had the least trouble with the wind? Combat, naturally. I kind of envied them that ability to penetrate. Most of their landings were mid-air so that was a moot point. (While good combat planes can pen-

etrate almost any wind, the wind does have a significant effect on their turning radius and predictability, making it hard for pilots to aim and causing quite a few collisions! —jt)

"The racers penetrated but tended to be blown about like a leaf in the wind after the fire went out. Scale would tend to use throttle control to land, then have someone quickly grab the airplane before it got blown into Maricopa County somewhere. Carrier fared somewhat better.

"And the FAI Team Race chaps boycotted us completely over a silly little rule, that



Don Stewart's Super Snake uses a clever shutoff mechanism. While shutting off the fuel flow (bottom), the device also opens the overflow tube (top) to allow fueling. When the shutoff is reset, the overflow is closed, as needed for proper operation of the Uniflow Tank. Engine is a K&B .35, a typical Super Sport engine.

being set by the city of Tucson as they've given us the use of the park. Signs up all over say you must: 1) have a valid AMA license in your possession, and 2) have a safety thong between wrist and handle on all flights.

"Now, they quoted all past histories of FAI competition that no one had ever been injured by a flying airframe because the pilot let loose of his handle, so therefore refused to participate.

"For myself, having flown FAI Team Race for a good many years, I would have, if I had a racer prepared, gladly stuck my wrist in the safety thong and flown. I'm so used to it that it's second nature now. We may find safety thongs and mufflers ordered for speed and team race soon anyhow, regardless of how much insurance coverage we have. And I hear of flying sites being lost daily for one reason or another. The nearest place to us now is 76 miles away. The next alternative is 110 miles one way. So, go with the rules; don't fight city hall. Put on the strap!"

Jon also reports that there were more than 40 entries in precision aerobatics, coming from New Jersey, New Mexico, Texas, Arizona, California, Nevada and Washington.

Having flown for 13 years on a site where safety thongs are required in all events, and for that same period in a region where nearly everyone uses thongs voluntarily without giving it much thought, it always surprises me to discover that some people still consider the use of thongs to be controversial.

I have seen a great many airplanes saved by safety thongs, and serious accidents prevented, and very seldom have seen any advantage to the lack of thongs. Changing hands in an emergency is frequently cited as a reason for having no thong, but it is

seldom done successfully even by expert pilots. And, do I as a contest director want competitors switching hands in the middle of an emergency situation? No way!

Any competent flier should be able to adjust to whatever inconvenience a thong causes within a few minutes. The idea that a whole group of fliers would give up flying in an important competition just to avoid putting a strap around their wrist is astounding. It raises some questions about whether these fliers really have much competitive motivation in the first place. The essence of competition is rising to meet challenges. As challenges go, a safety thong is a pretty small one, and one that would defeat no true competitor.

As it turns out, a great many competitors did overcome the challenges of the weather and the safety thong to participate

in the Southwest Regionals. Here's a list of the winners:

Old-Time Stunt: Jim Hoffman (304 points). Junior Precision Aerobatics: Josh Flack (89.5). Beginner Precision Aerobatics: Lyman Lew (174). Intermediate Precision Aerobatics: Randy Carr (408). Advanced Precision Aerobatics: Rusty Brown (447.5). Expert Precision Aerobatics: Jim Hoffman: (513). Profile Scale: John O. Wright, P-38 (140). Sport Scale: Ted Snow, P-40 (133.85). 1/2A Combat: Dave Stewart. 80-mph Combat: Allen DeVeue. AMA Combat: Dave Stewart, Jr. 1/2A Mouse Race: No flights because of wind. 1/2A Mouse Race: No flights because of wind. Texas Quickie Rat: Ron Tanner (only flight, due to wind). Formula Unlimited Race: Rusty Brown (7:39.2). ACLA Slow Rat Race: Rusty Brown (only flight, due to wind). FAI Team Race (demo): Cancelled. Lo-Tech Carrier: Al Gluck (only flight, due to wind). .15 Carrier: No flights because of wind. Profile Carrier: Mark Bowen (202.19)

• • •

As always, contest reports, questions, technical tips, photos and other information are welcomed. Write John Thompson, 1145 Birch Ave., Cottage Grove, OR 97424. **MB**



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# BIG BIRDS

BY BRUCE EDWARDS

## VISITING THE NORTHWEST MODEL EXPO

**F**ebruary in the Northwest means it is time for the Northwest Model Exposition. The show, hosted by the Mount Rainier Radio Control Society, is known by those folks who have come to know and enjoy it as "doing the Puyallup." The 1992 edition was the eleventh year of the show, which is considered one of the top three model shows in the United States.

This year 113 companies that supply our great hobby with equipment exhibited their products to more than 15,000 spectators. Those who attended the show were able to view and purchase some of the best radio control hobby equipment in the world.

It is my privilege to be the Expo's electrician, which requires little more than seeing that each exhibitor has a safe power supply—properly grounded. Occasionally a problem crops up, but it is usually nothing serious. I get around to every booth at least once, so it's easy to chat with each exhibitor prior to the big rush when the doors open for the crowds.

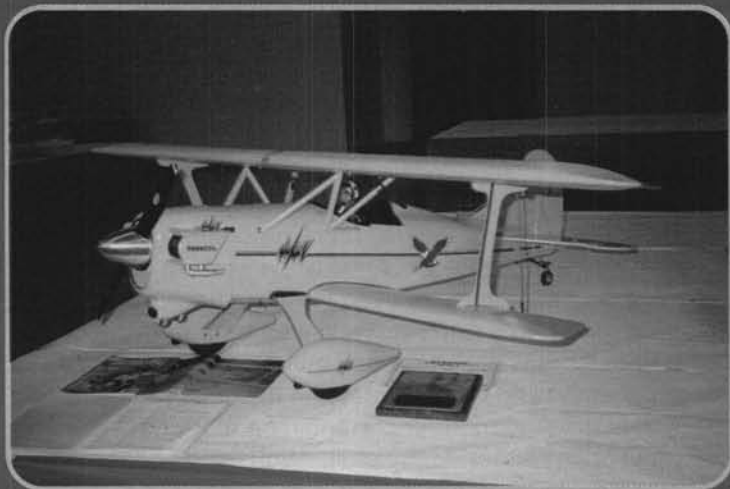
I usually start my rounds at the Byron Originals booth, which is always impressive. These fellows seldom require any assistance, because they are well prepared and usually the first group set up and ready to go. Byron has been with Expo since its inception and remains one of the top suppliers of Giant Scale aircraft and support equipment.

Bruce Godberson tells me that the Ida Grove Show has been sold and will not be presented this year. It will reappear in 1993, possibly in Sioux City or Des Moines, Iowa. I am sure we will get the word in plenty of time for everyone to make plans.

Sig Manufacturing has attended every Northwest Model Expo, and this year Maxey and Hazel were able to attend and assist their able crew in displaying Sig's excellent line of planes, which will include a two-place version of the Spacewalker later this year. This is welcome news to those Big Bird pilots who enjoy the sport aviation and scale style of aircraft. Sig's display aircraft was in a very bright red and yellow paint scheme.

J&Z Products continued its support of the Northwest Model Expo. Joe Zingali's Zinger props remain very prominent in the industry. Joe has supplied props for Big Birds for many years and was instrumental in supplying the correct airscrew for many of the big racers at the Unlimited Races last year

Walt Wyrick's "Der Jaeger" is no hangar queen, with over 40 flights in the logbook. It managed to take first place in Fun Scale.



John Eaton's big Unlimited P-51, Miss America, was entered in Military Standoff Scale. It received an Honorable Mention.



Paul Shultz's Macchi M.52R was entered in Fun Scale. Paul is a member of the Portland Skyknights Club.





at Madera, California.

The extensive line of Proctor kits never ceases to be a standout whenever they are displayed. Proctor's Giant Scale kits would make any Big Bird fan's mouth water. Dave Brewer's First Place in Expo's Military Standoff Scale with a Proctor Albatross DVa proves not only the quality of Proctor planes, but their ability to take home the gold.

Directly across the aisle from Proctor, we found Bubba Spivey displaying his line of

Lanier ARF models. In the last several years, Bubba has brought Lanier into the Big Bird arena by introducing his Stinger, which is not an ARF, nor is it scale. It is, however, a very fine large aerobatic sport aircraft.

Pete Bergstrom was displaying the new Webra 1.2 cubic inch, two-stroke glow engine in the Hobby Dynamics booth, as well as the JR line of radios. The 1.2 Webra looks like it will be a real strong engine and should help fill the gap between spark ignition and glow engines, while JR radios

guide many Big Birds through the air.

Fourmost Products supplies some very fine accessories for the modeling community, one of which is a dandy new hinge that uses a piece of 1/32 music wire to hinge on. It is gapless and runs the full length of the control surface. Thick CA is used to attach the hinge and no gouging hole is required. I intend to use these hinges on my electric Quarter Scale Cub, and I will be sure to let you know how they work out.

Bob Banka displayed his Scale Model Research wares. This is a good place to seek authentic paint schemes and details for your latest scale project.

It would probably take a lifetime to review all the plans that Bob Holman has available. These plans come mainly from the U.S. and Europe and are of excellent quality. Bob also has some very nice partial kits that have outstanding glasswork, and best of all, many fit into the Giant Scale category.

Bob Renaud and crew were attending to the Airtronics booth and displaying their newest radios. Airtronics has some very powerful new servos that lend themselves well to Big Bird use. I was surprised at both the small size of these new servos and their speed. Airtronics is a highly regarded radio. Years of reliable service certainly help keep a good name for a fine product.

Guy and Fran Walker were displaying Walker Machine's version of the Sachs 3.2 and 4.2 cu. in. engines. Guy and his company take a Sachs engine and make a new aluminum crankcase, which retains the original Sachs internal parts including the crankshaft and bearings. A CH ignition system with throttle coupled spark advance is added and the result is a smooth running, powerful engine that should give many years of reliable service. Guy has promised to loan me one of his engines for bench testing, so I should be able to give you a more accurate report in a future column.

Steve Helms and Richard Verano were manning the booth for Futaba Corporation of America. Richard was a member of the Dave Bridi team that entered a big F7F Tigercat at Madera. Futaba remains one of the leading radio manufacturers worldwide, with excellent equipment to fly our Big Birds.

RCD looked like it had brought its entire Madera racing crew to Puyallup. Dave and Dan Abbe were showing RCD's latest radio systems, with assistance from Jim Kelly, Tom Strom and Brian Richmond. There are a lot of RCD receivers out there performing as well or better than advertised. We can thank Dave Abbe and company for refusing to settle for anything less than the best.

R/C City was represented by Jim Graham. Of special interest to Big Bird enthusiasts are R/C City's scale Skybolt, Krier Kraft, Weeks Solution, Ultimate, and Supermarine S-4 Schneider Cup Racer. These are all excellent fiberglass-and-foam kits that are reasonably priced. I have been drooling over the Krier Kraft biplane for two years.

*continued*



Author's favorite plane at the Puyallup Expo was Bill Sharpsteen's PT-17, which also took first Place in Giant Scale. It was scratch built and well detailed. Bill is a member of the Boeing Hawks club.



Sid Tanabe placed first in Precision Scale with this Decathlon. It features a scale aluminum tubing fuselage and wood wings. Sid is a member of the Boise Area R/C Society.



Harold Leininger built this Ralph Saxto P-51 into a very nice flying plane. It is Zenoah G-62 powered, 100-inch wingspan, and weighs 28 pounds. The static display prop is made from Bondo.

I may break down and buy one soon.

Robert's Tom Walker had a great display of retractable landing gears and other support equipment such as hinges. I have been using Robert hinges on my models for a number of years, and I have had no failures.

Model Center Radio Control was represented by John Eaton, who was attending the Expo for the first time. John sells a very nice ARF kit of the Extra 230 and a Magnum 2 engine to power it. The 230 is also available in a conventional kit should you wish to save a few bucks. John also brought his beautiful Unlimited P-51 racer for the static display. John was very competitive at Madera and his plane had one of the best finishes seen at the big race.

Mark Thiffault, publisher of *Model Builder*, and Pete Fussleman, were offering some real incentives to purchase subscriptions to Gallant Models magazines. A one-year subscription included a very colorful T-shirt, two-year subscribers received the T-shirt and a transmitter carrying case.

There were many other exhibitors at the Northwest Model Expo, and the Mount Rainier Radio Control Society was pleased to have them. I wish I could mention every exhibitor, but space limits me to those of Big Birds special interest.

Without the support of our exhibitors, the Northwest Model Expo would not be much of a show. The exhibitors in the hobby industry feel that their treatment in the Northwest is among the best in the country. How else would you treat the people who make your show work? Behind every manufacturer or distributor, large or small, are people. The Mount Rainier R/C Society feels they should be made welcome and well looked after. That is the way we do business, because that is the way we would want to be treated if we were in an unfamiliar strange city, far from home. The formula works. Many exhibitors are already signed up for Expo number 12.

M.R.R.C.S. is a twenty-five-year-old RC club that usually has between 75 and 100 members. Dave Baxter is president and Bob Ford the director of the Northwest Model Expo.

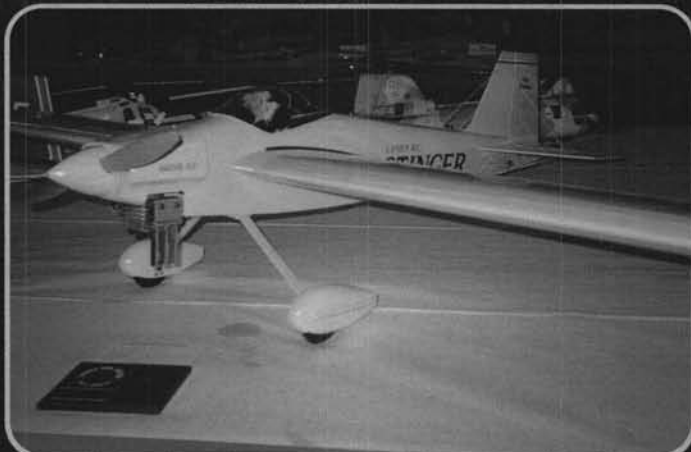
Each year, the president and director put out the word that Expo setup starts two days before the big event; for several members it starts a week before, when the exhibitors' equipment starts to arrive. Magically, every year there are enough club members who show up to do the job. Those of us who have been with the Expo for some time show new club members the ropes. There is no real boss, because the guiding rule is: "If you see something that needs doing, do it! If you need help, get it!"

Surprisingly enough, the formula works and on the assigned day, Expo blossoms into a wonderful two-day extravaganza. Expo 1993 will be here before we know it and it is with a certain amount of pride that Mount Rainier Radio Control Society looks forward to its Twelfth Northwest Model Exposition. **MB**

John Cobb placed third in Giant Scale with his Brown B-2 Racer. John is a member of the Cascade Model Aircraft Association.



Dave Baxter's Lanier Stinger placed first in the Large Non-Scale category. Dave is M.R.R.C.S. president.



Mike Brewer proudly displays his Proclor Albatross DVA—first place in Military Standoff Scale. Mike is a member of the Lower Columbia RC Club near Astoria, Oregon.



Bob Benjamin placed first in the Sport Monoplane category with his Electric Tigercat "E" at the Northwest Model Expo. Model is an enlarged version of his Tigercat Mk II that was featured as a construction article in the July 1989 MB.





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boom, the Sturdy Birdy is built to survive the worst punishment. With the included, photo-illustrated instructions, only 6-10 hours of assembly time are required. Hobbico's Sturdy Birdy kits clear the way for anyone to successfully build and fly a radio-controlled model airplane.

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# ELECTRIC POWER

BY MITCH POLING

## Light-weight Building Techniques for Electrics

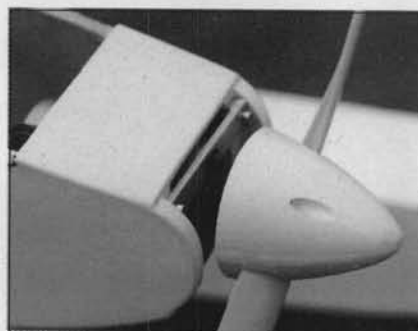
I have been flying the 40 size electrics quite a bit lately. Mine use 18 to 21 cells and direct drive with output power in the 230 to 480 watt range (.30 to .65 horsepower). The usual flight currents are in the 20 to 35 ampere range, controlled by a Jomar SM-4 throttle. Flight weights range between 5-1/4 to 6 pounds, depending on the type of batteries used. Let's take a look at the methods I use to build light, yet strong, structures for these 40 models.

My oldest 40 size plane is a scratch built Ace 4-40, which has been so highly modified that it really isn't a 4-40 anymore. Perhaps I should call it an E-40 (the 4 stood for four-stroke). Done! The E-40 uses a



taildragger gear. It has a 56-inch span, 616 square inches of area, and a flying weight that varies between 5-1/4 and 6 pounds, depending on the battery pack and motor. The semi-symmetrical airfoil looks like the one that was on the original Goldberg Falcon 56.

The E-40 wing is the single spar open "old timer" type of construction with no sheeting, and weighs 12.3 ounces. This is about as light as I think a 40 size wing can safely go. The trailing edge is 1/16 or 3/32-inch sheeting as shown in the drawing; ailerons, if used, are 3/16-inch sheet stock. The leading edge is 1/4-inch square spruce. The single 1/4x1/2-inch spruce spar is reinforced with an arrowshaft bound to it for 28 inches of the span (14 inches each panel) and a 20-inch long 7/32-inch diameter steel rod

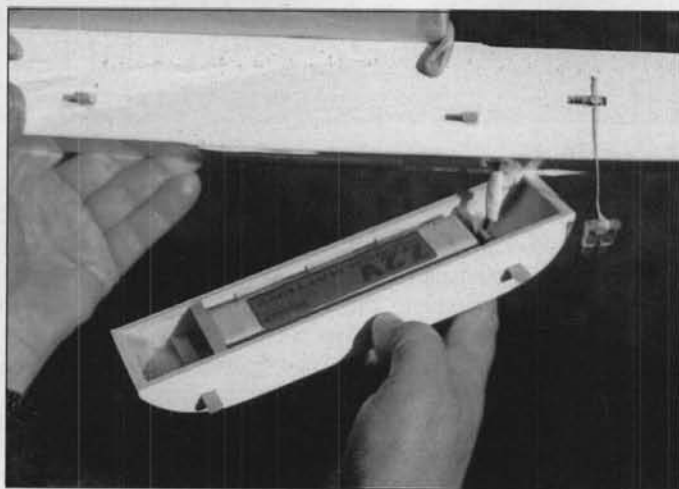


(Top) Svendsen's Aqua Sport gets up on step quickly even on only 14 cells, thanks to its excellent float design. (Above) The "block and bar" motor mount in Jon Svendsen's Aqua Sport, as described in the column.



(Above) Jon Svendsen's clever electric conversion of the Goldberg Gentle Lady involves putting the battery pack in a pod that straps to the bottom of the fuselage—saves having to rearrange the equipment inside.

(Right) Battery pod is held in place with rubber bands and can be easily and quickly removed. Two nylon screws, one each fore and aft, would work well also and would present a cleaner, more attractive appearance.

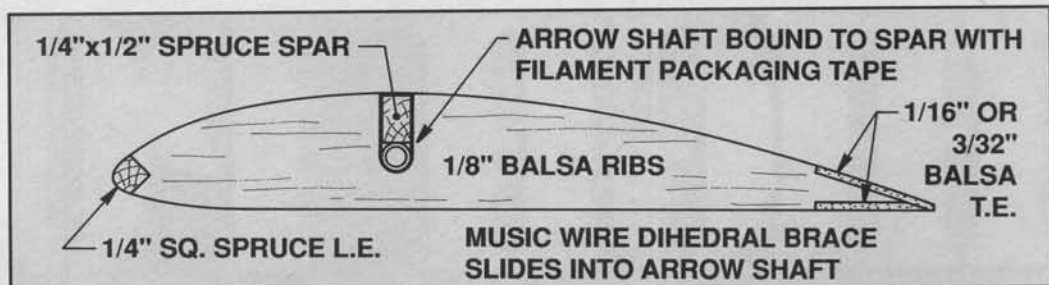


dihedral brace. The wing can't break! It could flutter, but the plane usually flies between 30 and 50 mph. I don't think flutter would be a problem up to 60 mph.

The fuselage is 1/8-inch sheet balsa, 38 inches long, 3 inches wide and 3-1/2 inches high maximum. If I were building the plane now, I would add half an inch to both the height and width, as the plane is really cramped inside and it is quite a challenge to get everything to fit. Coverite fabric is used as a doubler inside from nose to tail. This makes the fuselage very resistant to splintering or bursting. The fuselage has no formers at all, not even a firewall. It is essentially a square tube. I built it using balsa formers that I knocked out after the structure was finished. The weight of the fuselage with



Hallco aluminum landing gear and Sullivan light wheels is 16 ounces. The tailfeathers are built up from 3/16x3/4-inch balsa stock, and weigh three ounces all up.



The E-40 climbs very fast on 18 cells and a Keller 50/24

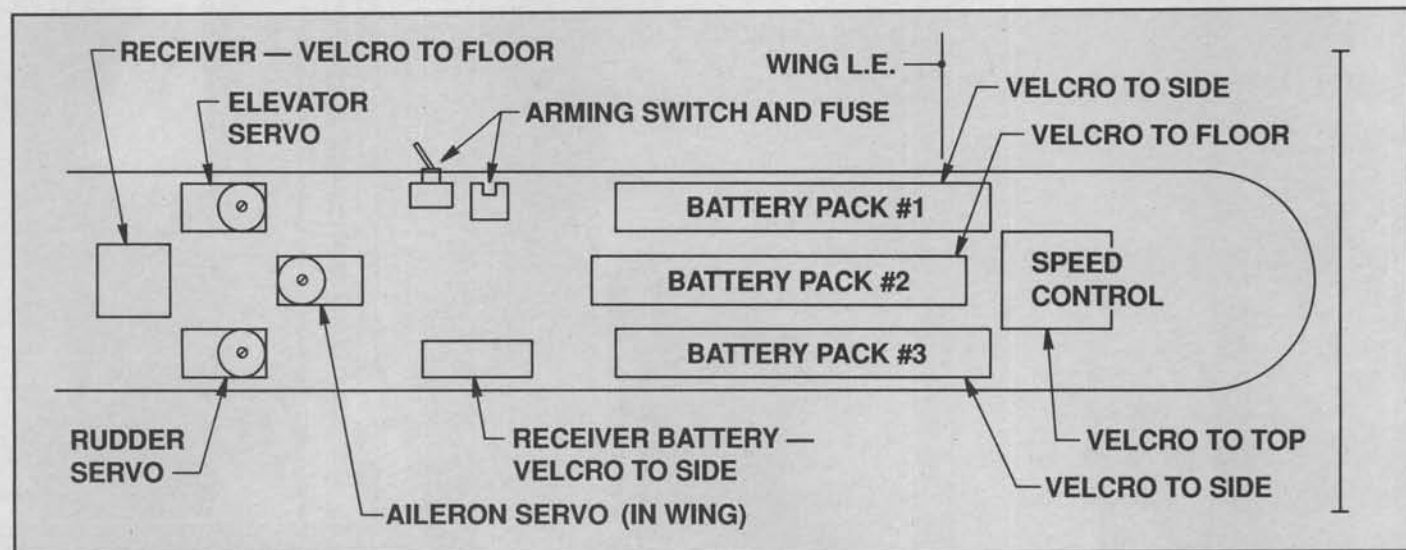
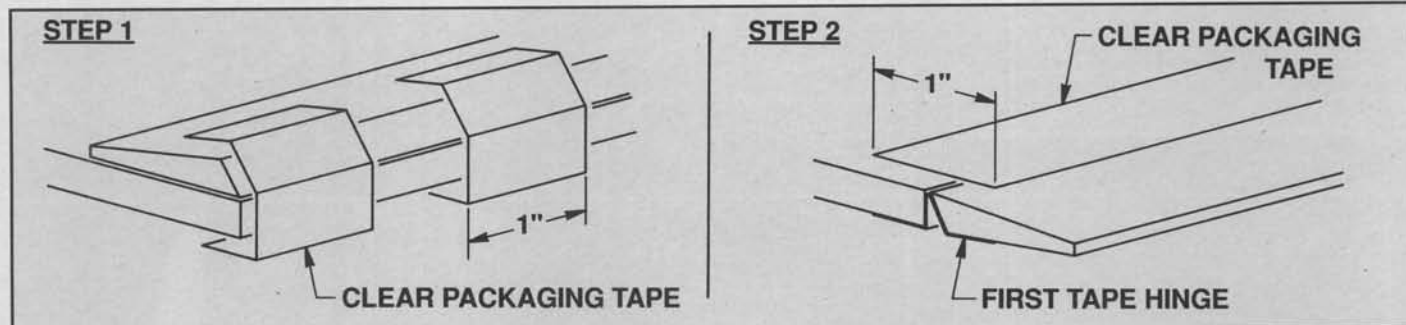
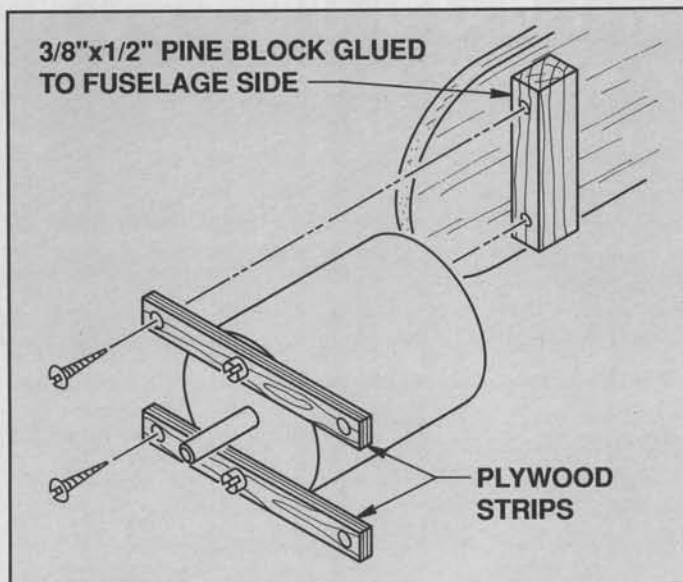
turning an 11x8 Graupner prop. Flying weight in this configuration is six pounds. It will fly nicely on 14 cells as well. Eventually I will try 21 cells, though that is probably overpowering it. It does loops from level flight on 18 cells easily. I have also flown it on floats, and find that it has no problem taking off water with just 14 cells.

My other 40 size plane is a Midwest Aero Sport 40 built from the kit, but again with much modification. The wing is stock and uses the standard D-tube construction with cap stripping. It has a 50-inch span and 600 square inches. A lighter wing could be made by using 1/16-inch sheeting instead of 3/32, a hollow trailing edge instead of the solid one, and 3/16-inch thick ailerons and wing tips instead of the 1/4-

inch ones. I would also use iron-on fabric instead of the fiberglass cloth and glue for the center section sheeting reinforcement. The present weight of the wing is 20-1/2 ounces; with these changes it could get down to 16 ounces. That would be about the minimum for safe construction on the D tube type of wing. The D-tube wing is much more flutter resistant than the single spar wing. I think the Aero Sport wing would have no problems up to 100 mph.

I built the fuselage from the pieces in the kit, but saved weight by leaving a lot of the pieces out, including all the formers, all the doublers, all the triangle brace strips, and the nose gear and its associated hardware. The fuselage weight with 5/32-inch wire landing

*continued on page 82*



# HIGH POWER

## AN INTRODUCTION

BY DAVID PACHECO

Do you remember when you were a kid? Either a teacher, a Scout leader or someone's dad took you to the nearest field to fly the model rocket that you had so painstakingly made all by yourself. They read the model rocket safety code to you and you signed on the bottom that you would follow it.

Do you remember the sense of anticipation that you had before your model's first flight? And the feeling when it actually worked as advertised? For two or three hours that Saturday, the sky was filled with small plastic parachutes, streamers and gliders. The sound of swoosh... pop, swoosh... pop filled the air.

Eventually you reached the power limits of your little blackpowder motors. Other things like cars and girls grabbed your attention. Your rockets wound up in the closet, broken, forgotten, then finally discarded.

Well, when you weren't looking, rockets grew up. Advanced High Power Rocketry is now the largest growing hobby in the country.

Rockets up to eight inches in diameter and over 12 feet long are not an uncommon sight at most high power rocket meets (referred to as "launches").

Remember the little A, B, C and D motors measured in ounces of thrust? Today's high power motors are rated in pounds of thrust that

*continued on page 60*



Lots of power being generated here! Rocket belongs to Ron Urinsco, measures 121 inches long, 6 inches diameter.

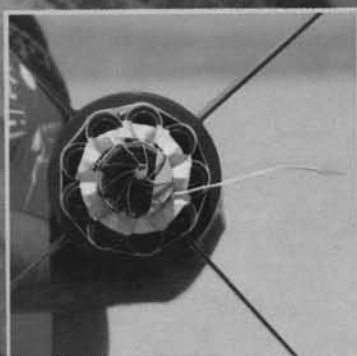


(Far left) Daun Barber and his beautifully finished 11-foot "Intruder". (Left) Incredible 1/34-scale Apollo 7 by David Gianakos. (Above) Dave Bolduc and his full-scale replica of a Nike Hercules.



# R ROCKETRY

Ray Dunakin's "Hako 5" camera rocket provided this spectacular view of Mexico from several thousand feet up.

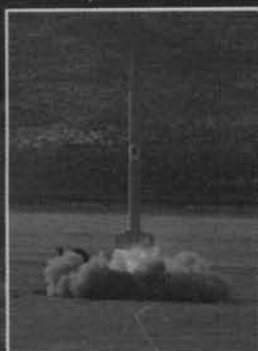


The business end of one of the bigger models. Seen here are nine small motors clustered around one big one, all of them wired to fire at once.



Doug Gerrard has used his 13-foot, 56-pound "Talon" for experiments in aerial photography.

Launch sequence of an eleven-footer flown at SoCal meet in February. Photos by Bill Rice.



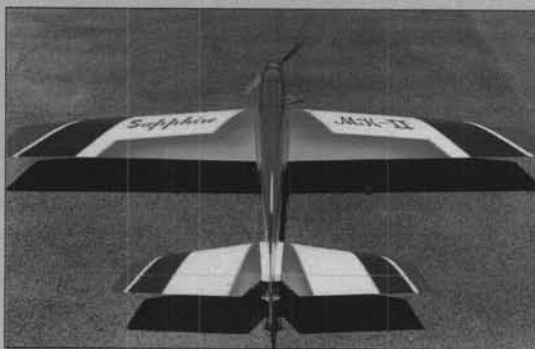
By Wayne Apostolico

# The ABC's of Airbrushing

A = Airbrush • B = Badger • C = Creative



(Above) Our author shows his beautifully finished original design Sapphire MK II pattern ship. Model incorporates a number of the painting techniques described in this article. (Right) Upper view of the Sapphire MK II offers an example of color fading. Center section of the wing and stab are pink, with burgundy sprayed on along the color separation line to give the "fade" effect. Surprisingly, the techniques detailed here require very little practice to get satisfactory results.



If you've ever desired to have a plane that is appealing and different from the average plane on the flightline but didn't know how to add those finishing touches, you may want to consider some airbrush work on your next winged wonder using a Badger airbrush.

If you've never airbrushed before, don't worry—it's simple, fun and adds a nice touch to your plane that will distinguish you, your cat, dog, kids, will lower your rent and yes, sets your plane apart from all the others at the field. (OK—so it won't lower your rent.)

After a few minutes of practice you'll be able to do shading, simple scaling, stenciling—both positive and reverse—and other wonders that will boggle the minds of mortals.

If you feel you're not creative, don't worry. In this article, you'll find a cafeteria list of ideas that are simple to do and definitely add a

nice touch to your finely crafted flying machine.

If you louse up the paint job, oh well, better luck next time. You have a choice to make at that point:

1. Throw the plane away—recommended for those with cubic money.

2. Sand it off or respray it. No problem!

Use the techniques described

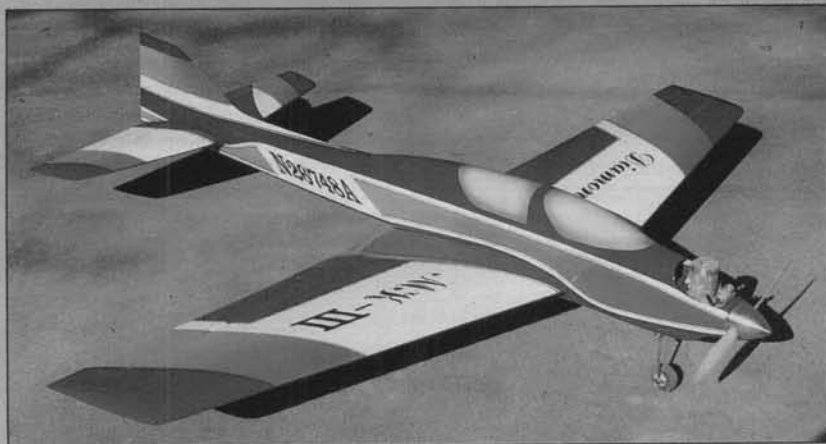


Badger's model 150 airbrush will do a fine job of duplicating any of the painting effects detailed here.

above and you'll find women flocking to your door. Even though it's hard to believe the previous statement may be a slight exaggeration, let me share a true story that happened to me.

Years ago I was flying a pattern contest in Kansas City, home of the KCRC where Charlie Reed, John Britt and



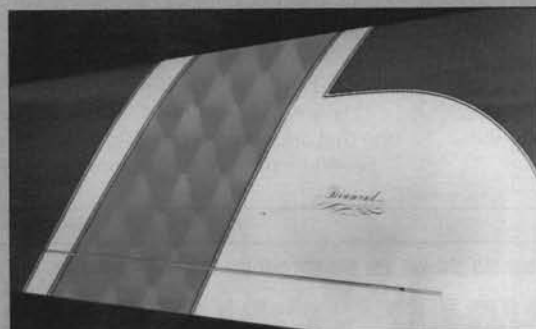


Canopy on the author's Diamond MK III is a powder blue base with darker blue around the edges. Photo also illustrates the technique of fading one color into another; in this case, red fading to orange, to yellow.

both the 200 and 150 models and love them both. My Badger 200 is 15 years old and is still going strong.

When buying an airbrush there are several features you should be

Badger single-action internal mix unit (model 200)



(Top) A thin cardboard template, cut with pinking shears, is used to create a novel diamond pattern. Other shapes such as half circles could also be used to get some really attractive special effects. (Above) The finished diamond pattern.

that is ideal for both beginners and pros. I have

aware of.

#### TERMS

**Internal mix:** An internal mix airbrush is one that mixes the paint and air inside the airbrush in a proportion the

Overtone effects—fading from one color into another—are clearly shown in this photo of the author's Diamond MK I, MK II and MK III.

operator controls. This internal blending of air and fluid gives a finer spray pattern than an external mix airbrush. If you desire to do work that requires a fine spray pattern, an internal mix gun is the one to use.

**External mix:** An external mix airbrush is one that mixes the air and paint outside the nozzle and gives a courser spray pattern. The terms "course" and "fine" spray are obviously subjective in nature. Either type works well for our purposes.

**Single-action airbrush:**

This refers to the action necessary to trigger the airbrush. When the trigger is depressed a pre-

Spraying a cross-hatch pattern with a cardboard mask—simple and quick, with potential for some very colorful schemes.



Tom Cook hail from. I had one of my designs called the Mariyha airbrushed with a blue-on-white lace paint job. Several of the competitor's wives came over to me while I was fueling up the plane and made a number of compliments about the paint scheme. One of them said they were rooting for me because they just loved my plane.

#### EQUIPMENT

First of all, just what is an airbrush and are all airbrushes created equal? An airbrush is a

miniature spray gun that typically holds 1/4 ounce to 2 ounces of fluid, as compared to the spray guns usually referred to as "touch-up" guns, which usually hold about 8 ounces of fluid. Full size guns hold a quart of more and are suction or pressure feed.

An airbrush can spray a fine line ranging from 1/32 to 2 to 3 inches wide, depending on the size tip you use and is typically used for fine detail work.

If you currently don't own an airbrush, let me recommend the



set amount of fluid is sprayed. The amount of fluid can be regulated by turning the needle adjustment at the back of the handle.

**Dual Action airbrush:** This term likewise refers to the action necessary to trigger the airbrush (down for air, back for fluid). This



Example of graphics sprayed on through stencils. Base color is pink with blue on top and burgundy on bottom.

extra action allows the operator to change the width of a line and volume of fluid while spraying.

The dual-action unit is more versatile than the single action unit and takes more skill to operate, however, both units are user-friendly.

Some units come with additional tips and needles to give the operator added flexibility in choosing the best tip for the type of paint being sprayed.

The Badger model 150 shown here comes in an attractive wooden case filled with accessories, including a braided flexible air hose, additional tips; 1/4, 3/4 and 2 ounce jars, airbrush holder, wrench and instruction booklet. Badger has been producing these fine products for almost 30 years.

## LET'S PAINT!

I use R&M automotive acrylic lacquer, which is available in thousands of colors and can be custom blended to your specifications.

There are several simple techniques that



An irregularly torn paper towel serves as a pattern for a pretty convincing cloud pattern.

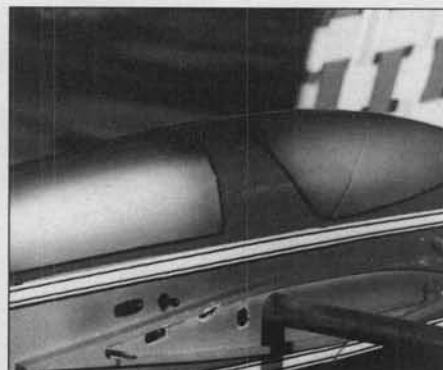
can be performed by the novice airbrush user. The following will be discussed or illustrated in this article.

1. Shading canopies & color separations.
2. Use of stencils—positive & negative.
3. Basic colors & overtones.
4. Spaghetti striping.
5. Diamonds.
6. Lace.
7. Masking.
8. Clouds.
9. Hatching.
10. Outlining.

## SHADING CANOPIES

This simple but effective technique is one that adds a nice touch to your project. Several color combinations work well

for canopy accent colors. My Diamond MK III uses a powder blue canopy color base. You'll note the accent color which is a darker blue and runs around the perimeter of the paint line color separation. Another example is shown in the photo of my Sap-



Canopy shading on the Sapphire MK II features a silver base coat with a mist of silver-blue painted around the perimeter.

phire MK II (inverted engine version of the Diamond MK III) which uses a burgundy, pink, and royal blue on white paint scheme. I chose to paint the airplane with a silver canopy accented with a silver-blue line around the perimeter.

The technique is simple. Mask off and paint your base color. Some people let the base color dry and then paint the accent. Not me—I spray the base color and let it flash off (surface of the paint starts to skin over), then spray the accent color around the edge. Let the whole thing dry and then pull the tapes.

It is important to remember that you can always darken a color but it is very difficult to lighten a color. I make several passes, gradually darkening the shade with each pass.

When spraying, the paint should be sprayed half on the canopy and half on the masked paper. This will give you a nice gradient of shading. You can practice this effect on scraps of white paper before actually tackling your project.

When I shade my canopies I thin the paint way down, as I like a subtle but noticeable effect. I usually use 75% thinner and 25% paint. Several passes are needed to get the desired effect as you gradually darken the surface with each pass. You can use less thinner and more paint and get a more distinct pattern faster, but I like the little extra margin of error so I don't get the shade too dark too fast. Most of the thinner evaporates quickly from the surface, so work progresses quite fast. If you use a lot of thinner in the mixture be careful not to lay the paint on too thick or it will run.

## COLOR SEPARATION

If you take the same technique described above and apply it a little differently you can get a nice effect by shading one color into another. My Diamond MK III is shaded with red fading into orange into yellow.

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Wing Planform: Tapered chord  
Flying weight: 82-85 oz (2300-2400 gm)  
Engine: 40-60 two cycle/45-90 four cycle  
Radio: 4 channel  
Accessories: Complete

**CONSTRUCTION**  
Fuselage: Balsa, light plywood  
Wing: Foam covered with balsa  
Stabilizer: Balsa  
Vertical fin: Balsa  
Finish: Iron-on covering film

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This effect is very simple to do, by spraying the base yellow first, followed by spraying red over the yellow. You have to move the airbrush quicker over the areas you want to stay light and slower over the areas you want darker. Several passes are needed to get the desired effect. The nice part of this is there is no right or wrong. It's whatever looks good to you.

My Sapphire MK III center section in the photo was airbrushed first with pink and shaded across the color separation line with burgundy spiked with metalflakes. It looks neat and sparkles like a jewel in the sunlight. You can buy metalflake at almost any paint store that sells paint supplies for cars.

## STENCILS

Many of us have used stencils at Christmas to decorate our windows with fake snow. The same technique can be used to decorate your latest project. There are many fast sign shops that can make stencils for you. The examples in the photos were airbrushed with three colors. The center is pink, the top is royal blue and the bottom is burgundy. The whole process took about five minutes to spray. I had my three colors mixed and ready to spray. I sprayed the pink center first because it is the lightest color. The burgundy color was sprayed next and then the blue. Don't wait for the paint to dry between colors. You may also note that

each letter is outlined in black. We'll discuss that later.

## REVERSE STENCILS

Most people lay a stencil on the surface and spray through the pattern in the stencil to create the effect.

You can reverse this process by creating a stencil that is solid in the center and spray around the edge. For example, airbrushing over striping tape and then peeling the tape off is easy and will give you interesting results.

## COLORS-OVERSPRAY-OVERTONES

You can mix two or more colors and obtain an entirely different color. For example, if you lay down a yellow base and spray red lightly over the top you will see an orange overtone result. I need to point out that you can't lay on a flow coat or the red will cover the yellow. To get the desired effect, pull the airbrush away from the surface several inches and *mist* the paint on. You can watch it change as you spray. Blue over yellow creates a green overtone; and blue over red makes violet. You can experiment with various color combinations to get the effect you are looking for.

## DIAMONDS

The technique I get asked the most questions about is the diamond pattern. The photo shows the template I used to create

the effect. The template can be half circles or irregular edges if you want a unique look. I happen to like the diamond pattern.

The base color is sprayed first, and when completely dry the template is laid over the base color as shown. Now spray red over the edge of the template, half on the wing and half on the template. Move the template down the surface and align the points and again spray the surface. You will see a distinct diamond pattern develop as you progress. Repeat this process until the surface is covered with diamonds. At this point the edges will be rather sharp and distinct. I soften the color separation by moving the airbrush back several inches and fogging the overtone color across the surface. Make sure you keep the gun moving or you will get dark spots on the surface. Stop when you get the desired darkness.

When you finish this process the surface will look dull. Don't worry— beautiful women will knock your door down, the IRS will forgive your back taxes and the city will cancel your overdue parking tickets when you spray the entire surface with a coat of clear. Behold the beast turns into a beauty, the luster returns and you have a finish that will stand out on a moonlit night.

## LACE

Lace paint jobs are fun to do and are a way to add a distinct look to your plane

*continued on page 86*



### FOR INFORMATION CONTACT:

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# MARC SHOW

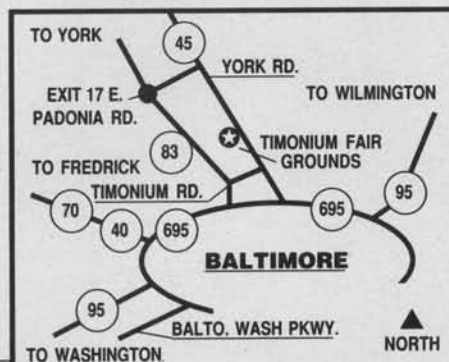
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# THE TWISTER

BY HANK STUMPF • PHOTOS BY CHARLES STUMPF

(Right) Author poses with his Twister. Large wing and strong, light structure are the keys to spirited performance. (Below) The Twister on the runway center stripe at the Cape Coral, Florida, municipal model flying field. Classic U-control stunt ancestry is clear in this view.



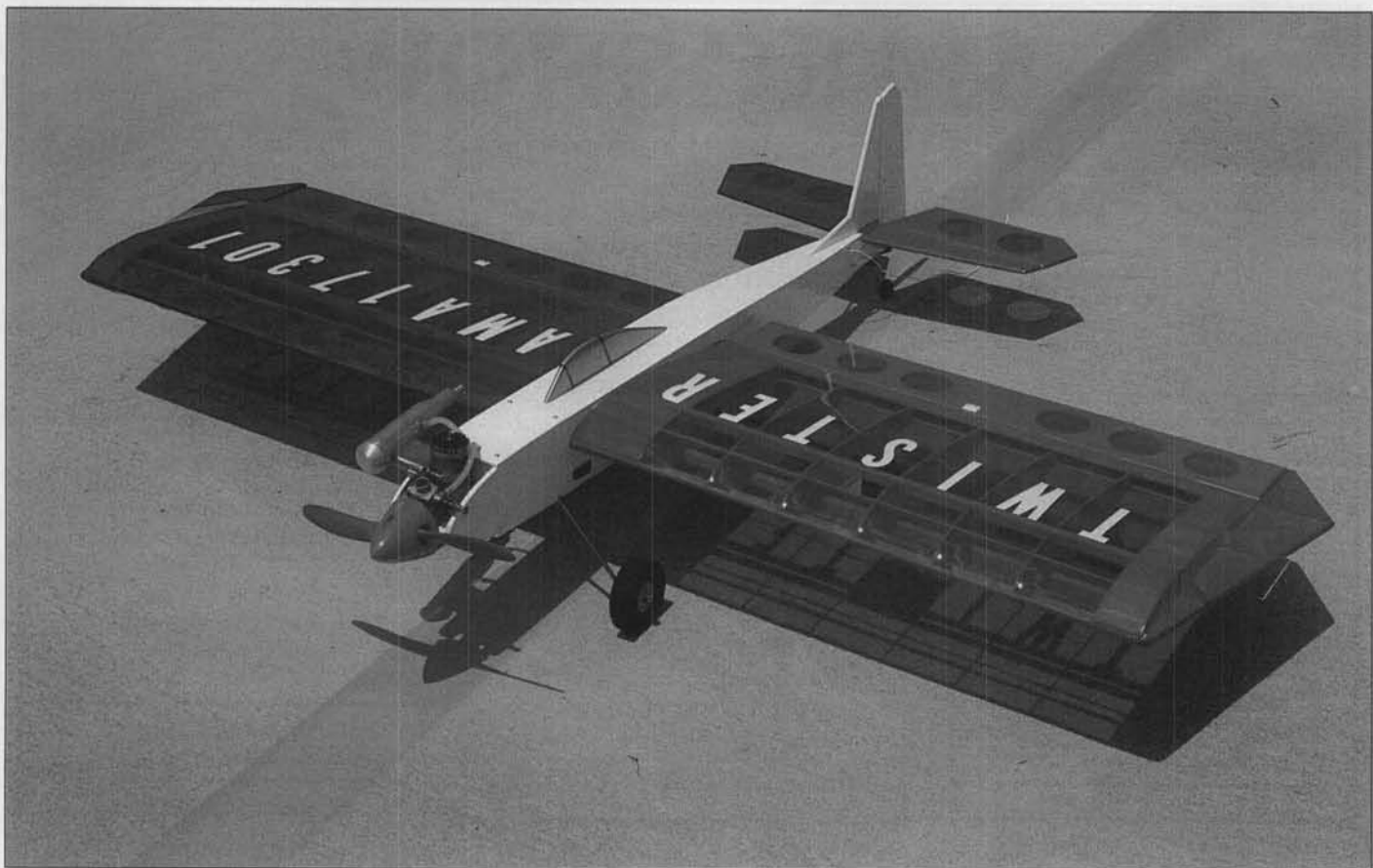
Not too many years ago, you could go to a fun-fly with your favorite sport model and expect to do well. How times have changed! The age of specialization has taken over and you now need a plane designed for maximum maneuverability to have an edge in these events.

These new fun-fly models clearly owe their origin to the golden age U-control stunt planes of the mid '50s, such as Jim Saftig's Zilch, Bob Palmer's Chief and Hal DeBolt's All American, to name a few. These stunts all featured large area symmetrical airfoil wings mated to a simple lightweight fuselage and tail. All were able to perform the pattern rapidly in a very small airspace.

The Twister is one of the new generation RC fun-fly stunts with the features of these U-control greats. Its maneuverability will amaze your friends and confound the competition. It can turn on a dime and give you nine cents change. All you

have to do is set the control surface throws to match your desired adrenalin level. With large surface throws it's a real tiger, but it can also be rigged to be quite docile with small throws. I suggest you start flying with relatively small throws until you are familiar with the plane, and then increase the throws to the level of performance you prefer. Because of its low wing loading, low weight and aerodynamic configuration, the Twister can perform typical fun-fly tasks in about half the time of more conventional models.

Like its U-control ancestors, the Twister is constructed in one piece. Due to its compact size, it fits easily into this author's Ford Escort hatchback. Construction is straightforward, using balsa, spruce, Lite Ply and aircraft plywood to complete a strong, light structure assembled from a small number of large parts. No gingerbread construction here!





## CONSTRUCTION

Because of the way this model assembles, it is recommended you start with the fuselage. Cut the fuselage sides from 3/16-inch medium hard sheet balsa.

formers F1A, F1B, F2A and F2B to the fuselage sides using epoxy glue. Be sure everything is squared up before the epoxy sets. Next install formers F3 and F4 and glue the sides together

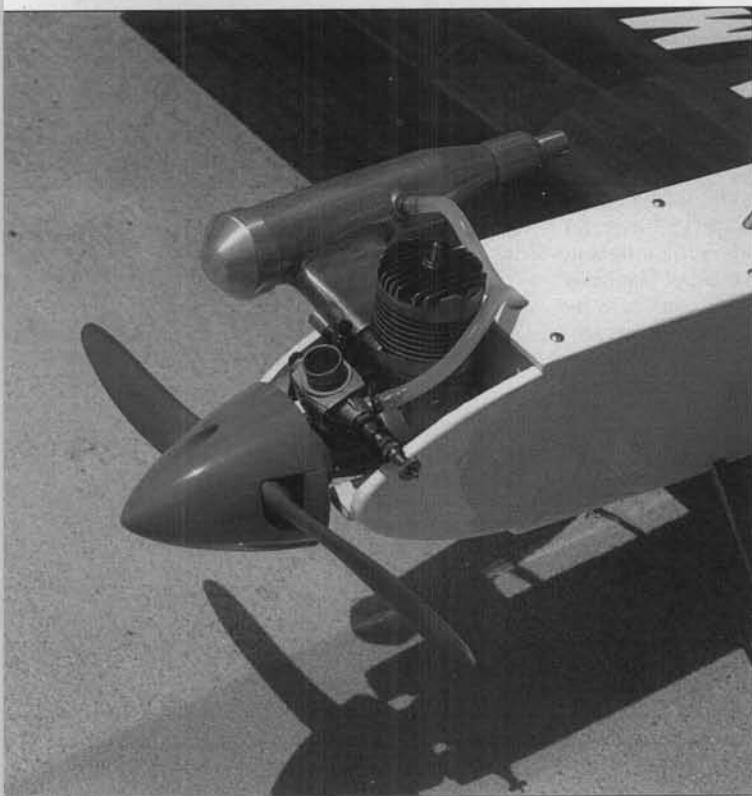
to make a plywood rib template of the W1 rib and cut all 18 to that size, and then trim 3/32-inch off the outside of eight of them to make the W2 ribs.

The span of the wing (less tips) is exactly 48 inches. Your local hardware store or lumber yard can supply a 5/16-inch diameter, 48-inch long dowel for the leading edge. Finding 48-inch long balsa for the spars

Once you have all the pieces ready, assemble the wing by pinning the lower 3/8-inch square spar to a flat building surface and gluing the ribs in place. Be sure to set the ribs 90 degrees to the building surface. A simple scrap balsa template will help.

Do not glue the two center W2 ribs at this time, just fit them in place. Next glue on the dowel leading edge and the upper 3/32-inch balsa trailing edge sheet. Once the glue is dry, you can continue the wing assembly by installing the top

(Left) The engine installation, fuel tank hatch, fuel line and muffler pressure line show up here. This is the well-used O.S. Max-H 40 engine used during initial flight testing.



Try to match the hardness of the two sides so they will bend evenly to form the aft fuselage. Cut out the slots for the wing leading edge, spars and trailing edge to permit installation of the completed wing later. Also be sure to make the 1/2-inch diameter holes just aft of the main spars to permit passage of the aileron servo cables from the wing into the fuselage. Cut out all the remaining fuselage formers, engine mount and landing gear pieces.

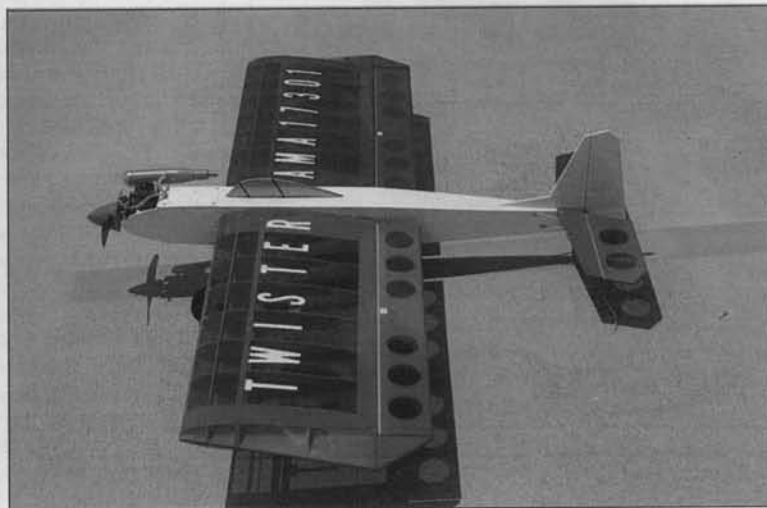
Assemble the engine mount plate M1, doublers M2 and

at the tail. Install landing gear mount formers L1 through L7 and the 1/4x3/8 spruce servo mount rails, also using epoxy glue.

Trial fit your servo tray and servos in the fuselage and mark the location of the rudder and elevator pushrod sleeves on former F3. When holes for the sleeves have been made in F3 and F4, install the sleeves in the fuselage as shown on the plans, using epoxy glue. If you want to run your receiver antenna wire inside the fuselage and out the tail, now is the time to install a third sleeve for this purpose. This routing was used on the original Twister, and provides a neat installation with no radio problems.

At this point, set the fuselage aside until you have completed the wing structure and cut out the tail pieces.

Start the wing by cutting out all 18 ribs and the tips. You may find it advantageous



(Top) A view from above shows the lightening holes in the ailerons and elevator, the patriotic color scheme and the silver profile canopy. (Above) Here is how the rudder and elevator pushrods are installed. Also, note the antenna wire exiting from the aft fuselage. See text for details of antenna routing.

and trailing edge pieces is not so easy. You will probably have to use 36-inch long pieces and splice on the extra length. Use epoxy glue on the splices and alternate the splices, i.e., if you put the lower spar splice on the left side of the wing, put the upper spar splice on the right side, etc.

3/8-inch square spar, the 1/8x1/4-inch turbulator spars, the lower 3/32x1-inch trailing edge sheet and the 1/4x3/8-inch trailing edge cap strip.

Now trial fit the fuselage between the two center W2 ribs and glue them in place to match the fuselage width. Complete the wing structure by installing

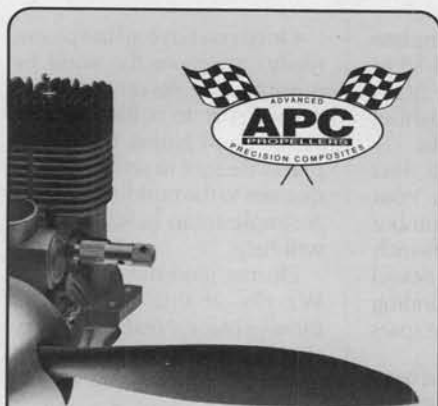
# TWISTER

DESIGNED BY HANK STUMPF

A four-channel fun-fly model for .30-.50 cu. in. engines.

### Specifications—

Length: 37 in.  
Wing Span: 53-3/8 in.  
Wing Area: 710 sq. in.  
Weight: 4-1/8 lbs.



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11 x 3, 4, 5, 6, 7, 8, 9	\$2.49
11.5 x 4; 12 x 6, 7, 8	\$2.89
13 x 6	\$4.25

## REVERSE PITCH PUSHER:

9 x 6; 10 x 6, 7, 8; 11 x 6, 7	\$3.95
--------------------------------	--------

## COMPETITION:

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

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3/32-inch sheet on the wing center section and tip ribs. Finally, install the 1/8-inch plywood aileron servo mount plates, the wing tips and wing tip gussets.

Cut the dorsal, fin, rudder, elevators and ailerons from 1/4-inch sheet balsa. The lightening holes in the elevators and ailerons are best cut with a two-inch diameter hole saw. If you don't have a hole saw, a scroll saw can be used. Bend the elevator joiner from 3/32-inch diameter wire as shown on the plans, drill and notch the elevators to fit the joiner and epoxy the joiner in place.

Sand all surfaces smooth and round the edges. You are now ready to hinge the surfaces. I strongly recommend Granite State No. 610 Iron-On Gapless Hinges. This hinge is easy to apply, requires no cutouts in the surfaces and produces improved aerodynamic efficiency, because it is continuous and gapless. If you prefer conventional hinges, use a type that can take abuse, such as Du-Bro No. 117 Nylon Hinges with a metal hinge pin. The ailerons require four conventional hinges per side, three hinges per side on the elevator and three hinges on the rudder. Limit your surface gap to 1/32-inch when using conventional hinges.

Take the completed wing structure and slide it into the slots in the fuselage sides until it is in the correct position. Draw the wing rib centerline on the fuselage sides first, to help get the wing properly aligned. Use CA glue to attach the wing to the fuselage. Fill in the slots in the fuselage sides with scrap 3/16-inch sheet. Next install the 1/8-inch sheet fuselage top panel. Make the top panel from one piece with the grain running lengthwise. Lastly, install the 1/8-inch sheet bottom panels and the 1/8-inch plywood tailwheel bracket mount.

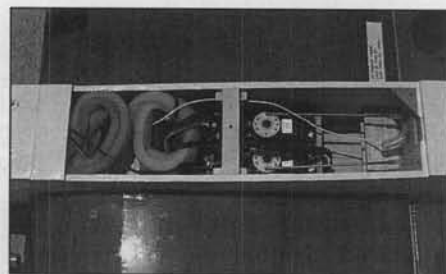
Sand the fuselage lightly and complete the basic airplane assembly by installing the tail assembly, the fuel tank hatch and the radio compartment hatch.

Bend the two main landing gear struts from 5/32-inch diameter piano wire to match the pattern on the plans. Install the struts with metal or nylon straps and wood screws after covering the model. To keep weight down, use lightweight wheels such as Dave Brown Lite Flight 2-3/4 inch diameter wheels. Install a Du-Bro 40 size tailwheel bracket on the plywood mounting plate and put a 3/4-inch diameter wheel on the wire strut to complete the job.

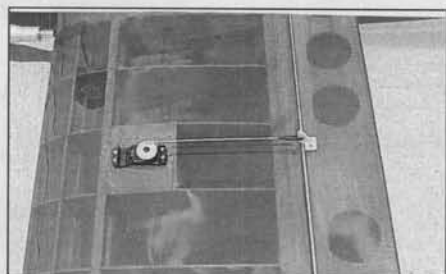
Coat the fuel tank compartment, engine mounts, firewall and fuel tank hatch with epoxy resin and sand smooth. Before covering, sand the entire structure smooth.

The model is covered with iron-on film. With so many brands and colors available, choose the type and colors you prefer. The original Twister is covered with MonoKote, transparent red on the left wing and horizontal tail and transparent blue on the right wing and horizontal tail. The fuselage is white with a silver profile canopy trimmed with black striping tape.

The Twister was first flown with an old,



Looking into the radio compartment, from left to right, are the battery pack, the receiver (both wrapped in foam), the throttle servo and the rudder and elevator servos. Note the antenna wire routed into a tube in the aft fuselage.



An underside view showing the details of one aileron servo, pushrod and control horn. This model requires two aileron servos, one in each side of the wing.

but potent, O.S. Max-H 40 engine. Later on, a Magnum GP .40 engine was installed to see if the flight performance was noticeably reduced by a sport type engine. The results indicate that sport engines have plenty of power to pull this plane around. The four-ounce Sullivan fuel tank is installed in its compartment and held in place by a 1/8-inch plywood cover attached by four wood screws. This tank may seem small, but you will find it is plenty large enough for fun-fly events.

An Airtronics Vanguard PCM radio was installed in the original model. In spite of the small fuselage with the wing passing through, there is more than enough room for standard size radio components if you follow the arrangement shown. The rudder, elevator and throttle servos are mounted on a plastic servo tray which is secured to the spruce servo rails with wood screws. The receiver and battery pack are wrapped in foam and installed in the locations shown. To complete the radio components installation, you will need two aileron servos, one in each wing with a "Y" cable to connect them to each other and to the receiver.

## FLYING

Before flying, check the balance of your completed Twister. The CG should fall within the range indicated on the plans; if not, add weight to the nose or tail as required to get the CG in the correct range. Set all surfaces at neutral and adjust them for moderate throws for the first flight. Check for smooth operation and range check your radio.

The original Twister flew fine and required just a little down trim on the first flight. Takeoff roll is short due to the low weight and large wing area. Good luck with your Twister! **MB**

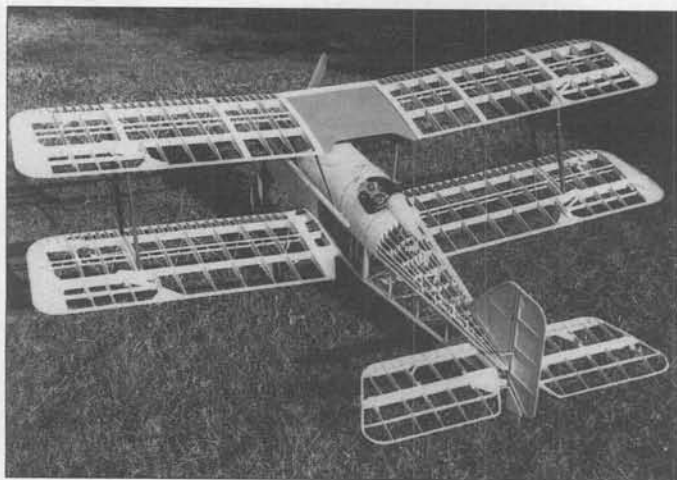




# HANNAN'S HANGAR

BY BILL HANNAN

**"...designers  
the world over  
feel less and  
less the  
senses of time  
and space  
between them.  
Ideas are  
apparently  
simultaneous."**



It's a shame that Italy's Carlo Mapelli is going to cover the wonderfully intricate structure on his RC S.E.5a. Bare-bones frameworks are often more esthetically pleasing than the finished models.

Our lead-in quote, by Ella Moody, from her book *Modern Furniture*, is equally appropriate in our hobby—note the many countries represented in this month's Hangar! We are quite fortunate in having our own equivalent of the Olympic Games.

## SCINTILLATING STRUCTURES

The esthetics of carefully constructed model aircraft frameworks make it almost a shame to hide them, especially with opaque covering material—which may help explain the continuing popularity of transparent or translucent finishes. Certainly we should all pause to admire and savor our patiently assembled skeletons and perhaps photograph them

before covering?

Among those who did is Tom Hallman, of Allentown, Pennsylvania, who spent many months researching and building his Henderson-Glenny Gadget. While reflecting upon the bare bones of his model, he made the following observations: "As always, it has been a long time coming. But I've had a great time watching it come to life. Mostly I've enjoyed gathering the various materials to build her. They all have their special uses; balsa of course, hinoke and basswood, styrene, acetate, reed and 1/64-inch plywood. And I'm sure some other stuff has sneaked its way

into this ship when I wasn't looking..."

## THE ROCKETEER

As we had guessed, the Walt Disney Studios have released their movie "The Rocketeer" on videotape. In less than a week it had reached the number one position in local rental stores. Rocketeer souvenirs have been available since the film opened in theaters, however, some examples are already collector's items. There must be a message there.

## BETTER THAN DISNEYLAND?

Well, at least to model builders. We refer to Old Warden Aerodrome in England, home of one of the world's finest collections of flyable vintage aircraft. Additionally, Old Warden is host to various flying model activities from time to time. George Kandylakis was a long way from his home in Greece and was quite unprepared for Vintage Model Weekend at Old Warden. In his own words:

"Well, having no advance warning, I found myself quite amazed, in the middle of what must be one of the largest free flight events in England, certainly one of the most well-attended by modelers.

"It was really something. Models flying everywhere, no matter where you looked, of all kinds and shapes, mostly diesel, rubber and CO<sub>2</sub>, but even Jetex, hand-launched gliders, etc.; truly magnificent.

"And then there were the



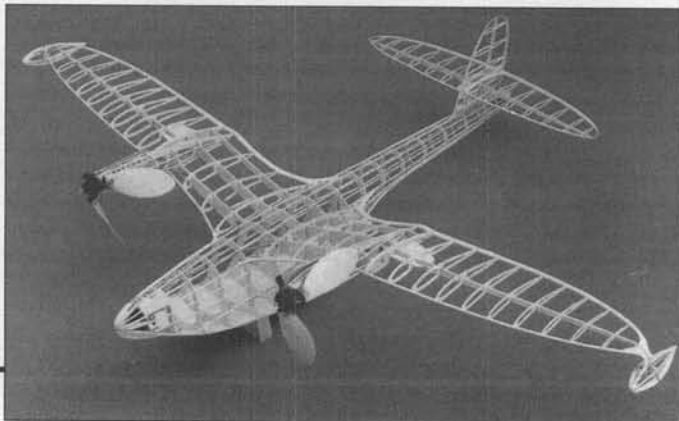
Almost a tandem-winger is this Westland P-12, originally derived from the Lysander. Peanut Scale replica was built by George Benson, of Mill Valley, California.

scale jobs. It is impossible to single out any of these, as there was everything, and everything was great. Large models, small models, everything in every size. Autogiros, Jetex-powered scale models, gliders heading for the sky with high speed, leaving trails of smoke behind them; it seemed as if forty years of modelling history were parading in front of my eyes. When you are used to flying free flight alone, or with a couple of friends, or, when flying together with my RC friends, 20 or 30 people at most, then the comment that a nice gentleman, whom I had the great pleasure of meeting, fits me like a glove: "It was as if one had died and gone to heaven." But it was real."

## THINGS TO SEND FOR

The manufacturers and suppliers are keeping busy offering new products for our hobby. If any of the following attract your interest, you are invited to send them stamped, pre-addressed

Emmanuel Fillon's spectacular "Retro Hydrocoque" employs a rubber motor in the hull geared to flex-cable drives that connect to the twin three-bladed folding props.



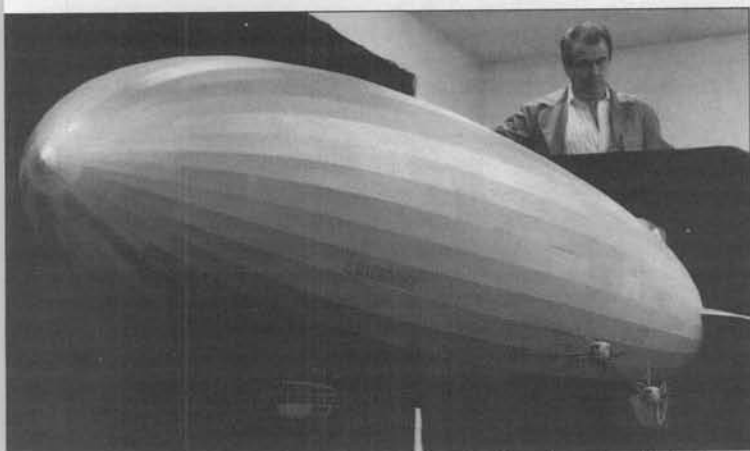


return envelopes for more information. When you do, please mention *Model Builder*. Thank you!

• Beginner's kits: Vicky Alu, widow of the late Sal Alu, is continuing Sal's business. These basic kits may be just the thing to start some deserving youngster in flying model airplanes. Write Vicky for descriptive literature: Skyblazer Models, 8603 97th Ave., Ozone Park, NY 11416.

• CO<sub>2</sub> engine accessories:

Society president Tony Italiano. Contents of this newsletter include indoor model plans and handy hints as well as contest news and results. Article contributions are also encouraged to help the new editor off to a flying start. With tongue firmly in cheek, Dr. Bates says that it will be a copy-rite publication. He will copy anything, and hopes to get it right! Subscriptions are \$7 in the USA and Canada, or add an extra \$1 for overseas postage. Issues are



Professional model maker Mike Fulmer examines the "Luxembourg" model airship used in the Disney production, "The Rocketeer."

Daniel E. Baird, 3529 Koon Lane, Knoxville, TN 37931, continues to add to his range of finely-machined products, which include special chargers for larger CO<sub>2</sub> capsules, miniature filling valves suitable for all engine brands, and removable tank charging systems designed especially for competition fliers.

• Adhesives, materials and vintage model items: Glue, solvents, ES metal, dethermalizers, bobbins, bamboo dowels, turned birch wheels and old-time plans are offered by Edward Schlosser Associates, Inc., Box 412, Ridgefield, NJ 07657.

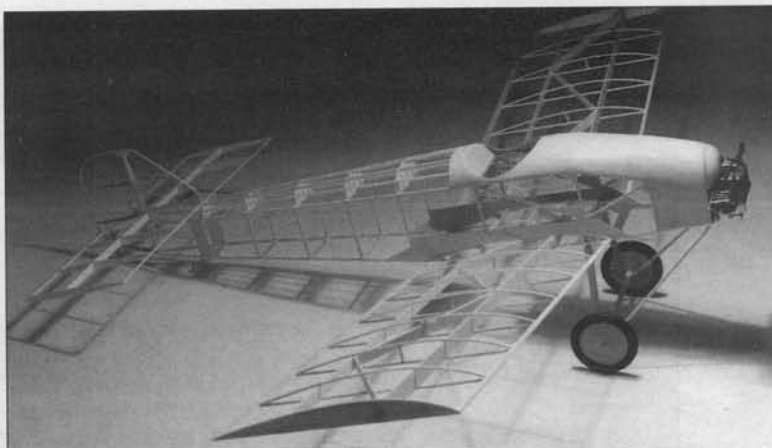
## INDOOR NEWS AND VIEWS

The voice of the National Indoor Model Airplane Society has a new editor. Plenny J. Bates was "volunteered" for the position by National Free Flight

published quarterly, so this is quite a bargain.

## MINI-STICK MADNESS

Speaking of indoor models, the eight-inch span Pistachios are about the practical lower size limits for scale models, however when it comes to non-scale types, the current Mini-Stick models span a mere seven inches, yet are capable of durations of up to nine minutes! Further, Mini-Sticks are able to be flown in spaces as small as living rooms, so contests are possible even in small homes. This has led to international postal contests which have attracted as many as 40 entrants. Although this year's event may have already passed, details are available for future events by sending three International Reply Coupons to Mike Colling, 403 Mossy Lea Road, Wrightington, Wigan, WN6



Tom Hallman used a number of different materials in the structure of his lightweight 36-inch Gadgetfly, as explained in text.

9SB, Lancs., England.

In case you may not care to design your own, complete kits for Mini-Stick models are available from Indoor Model Supply—see their advertisement elsewhere in this magazine.

**Pistachio Proxy Proposition:** Dr. John Martin has announced the 1992 Pistachio Inter-Gnats and Fly-In will be held at Miami Dade South College on April 11, with Part II and Florida record trials April 25-26. As in previous years, proxy entries are invited. Here's your chance to have a lot of fun at low cost! Complete rules are available for the usual SASE to Dr. John Martin, 2180 Tigertail Ave., Miami, FL 33133.

**Peck Memorial Event:** Another forthcoming international contest will be held this summer, honoring the memory of the late Bob Peck. This will be a one-design meet for models constructed from Peck-Polymers Peanut Nesmith Cougar kits. Proxy entries are cordially invited, and complete rules and contest date information may be obtained by sending three International

Although the late Sal Alu is seen here with a scale model, his company produces beginner's kits, which are still available from his wife Vicky's Skyblazer Models—more in text.



Reply Coupons, available from your local post office, to: Mr. Shoichi Uchida, 3-24 Asanaka, Ogaki-shi, Gifu-Ken, 503 Japan. A fine way to pay tribute to a remarkable gentleman.

## MODELS IN THE MEDIA

Mentions of models sometimes turn up in unexpected places—even in a hardware store advertisement, as pointed out by clipping collector Mark Fineman. In an advert for tools was featured a man and his young son working on what



This cute 1936 Gordou Daspect 3 would be right at home with contemporary ultralights. Doug McHard, of England, produced this 18-inch span replica for CO<sub>2</sub>.

appears to be an electric-powered RC model. The curious aspect is that the tools shown are large furniture clamps, a hot-glue gun, plumbing type pliers, two spirit levels and a tape measure. Well, at least the needle-nose pliers and screwdrivers shown in the advert look plausible...

"Rocket Scientist" was the headline of an article from the *Tampa Tribune*, of Florida, sent to us by Art Ford, concerning Walt Good, who with his twin

*continued on page 76*

## Calculations of Hover Flight Time for an Electric Helicopter

BY MARTYN MCKINNEY

*Editor's Note: This article is a continuation of last month's Chopper Chatter, with information supplied to James Wang by Martyn McKinney.*

These calculations are derived from the standard lift-drag formula for an airfoil:

$$\text{Lift or Drag} = 1/2 \times \rho \times C \times V^2 \times A.$$

Where  $\rho$  is the density of air;  $C$  is the lift or drag coefficient;  $V$  is the velocity; and  $A$  is the area.

This formula is for an airfoil moving at a constant velocity through the air. Every portion of a helicopter blade, however, is moving at a different velocity. Therefore the equation must be integrated along the length of the blade to take this into account. Choosing the proper units, the result is:

$$\text{Lift} = C_l \times \text{RPM}^2 \times \text{Diameter}^3 \times \text{Chord} \times 8.45 \times 10^{10} \text{ ounces.}$$

Where  $C_l$  is the lift coefficient, diameter is in inches; chord is in inches.

The lift coefficient  $C_l$  is a dimensionless coefficient dependent on the type of airfoil, aspect ratio and pitch. For an aspect ratio of 9 to 1, which approximates most helicopter aspect ratios,  $C_l = \text{pitch} / 12.5$  (where pitch is in degrees).

Those of you who wish to design your own helicopter can use this equation as long as the blade aspect ratio is approximately 9:1:

$$(1) \text{ Lift} = \frac{\text{pitch}}{12.5} \times \text{RPM}^2 \times \text{Diameter}^3 \times \text{Chord} \times 8.45 \times 10^{10} \text{ ounces}$$

The first step in calculating the power needed to fly a helicopter is to weigh the helicopter. This weight is the thrust that will have to be developed to hover. For the Whisper this weight is approximately 45 ounces.

The next step is to calculate rotor RPM to achieve this thrust. Rearranging equation (1):

$$(2) \text{ RPM} = \sqrt{\frac{12.5 \times \text{Weight}}{(\text{Pitch} \times \text{Diameter}^3 \times \text{Chord} \times 8.45 \times 10^{10})}}$$

Weight is in ounces (for the Whisper 45 ounces).

Pitch is in degrees (for our example we'll choose 5 degrees).

Diameter is in inches (for the Whisper 37.75 inches).

Chord is in inches (for the Whisper 1.75 inches).

For these conditions the example becomes:

$$\text{RPM} = \sqrt{\frac{(12.5 \times 45)}{(5 \times 37.75^3 \times 1.75 \times 8.45 \times 10^{10})}} = 1189 \text{ RPM}$$

It is now possible to determine the power necessary to achieve this lift at this RPM. From our initial equation:

$$\text{Drag} = 1/2 \times \rho \times C_d \times V^2 \times A.$$

$$\text{Torque} = \text{drag} \times \text{distance.}$$

$$\text{Power} = \text{torque} \times \text{speed.}$$

Integrating over the length of the blade and substituting the proper units:

$$(3) \text{ Power} = C_d \times \text{RPM}^3 \times \text{Diameter}^5 \times \text{Chord} \times 3.0 \times 10^{14} \text{ watts}$$

The drag coefficient, like the lift coefficient, is also a dimensionless coefficient dependent on airfoil type, aspect ratio and pitch. For an aspect ratio of 9 to 1:

$$C_d = .01 + \frac{(\text{Pitch}^2)}{4000}$$

For a pitch angle of 5 degrees:

$$C_d = .01 + \frac{(5^2)}{4000} = .01 + \frac{25}{4000} = .016$$

From this equation it is possible to see that as pitch increases, the drag increases by the square of the pitch. As the pitch approaches 10 degrees the drag becomes significant and the lift-to-drag ratio decreases dramatically.

For our example the power necessary to hover our 45 ounce Whisper at 1189 rpm and 5 degrees pitch is:

$$\text{Power} = .016 \times 1189^3 \times 37.75^5 \times 1.75 \times 3.0 \times 10^{14} \text{ watts} = 143 \text{ watts}$$

If we assume a motor efficiency of 70%, which is typical of most ferrite motors drawing approximately 20 amperes, the power into the motor would have to be:

$$\text{Power} = \frac{143}{.7} = 204 \text{ watts.}$$

The selection of commercially produced electric RC helicopters recently grew by one with the introduction of this Hughes 500 being distributed by Hobby Lobby. It's a fixed pitch machine designed by Nick Leichty, whose company, Ultra Efficient Products, is involved in full-size ultralight aircraft. Hobby Lobby has a video available (#7) that shows the Hughes 500 kit up close, including the additional items necessary to make a complete, flyable model as well as footage of the machine in action. Ask for Video7—it sells for \$9.00, and you can return it for a \$6.00 refund or credit after you've viewed it. Call Hobby Lobby at (615) 373-1444 for details.







The Hobby Lobby Hughes 500 features some interesting construction, including a phenolic tube tail boom and a chassis made of a foam/phenolic laminate. Total flying weight is 52 oz., which includes a 17-oz. eight-cell NiCd pack. Rotor diameter is 34 inches. Motor is not included, but any of the popular 100-watt (05) motors should do just fine.

If we are using an eight-cell (9.6 volt) battery pack, the current drain would be:

$$\text{Current Drain} = \frac{204}{9.6} = 20.9 \text{ amperes.}$$

If we are using 1200 mAH cells, the hover time at 5 degrees pitch would be:

$$\text{Hover Time} = \frac{1200}{1000} \times \frac{60}{20.9} = 3.45 \text{ minutes.}$$

From these data it is thus possible to determine the approximate flight time of an electric helicopter. Although the above equation gives a good first approximation, there are many other variables that come into the picture. In the above example, I have chosen a motor efficiency of 70%. Electric motors are more or less efficient depending on their operating current. No provision has been taken into account for tail rotor drive power. By performing the same calculation with the tail rotor drive it can be shown to be on the order of five watts and not significant in this example. The blade airfoil can have an effect on the lift/drag ratio. Even taking into account all these approximations, I have found the above technique to be a valid method of determining flight times.

It is interesting to change some of the parameters to determine if longer times may be achieved. It will be found that significantly longer times may be achieved by increasing pitch and decreasing rotor rpm. The problem with this in practice is that the batteries that we use do not have a constant output voltage under load over their discharge cycle. If one were to choose a pitch that would just hover the helicopter at the beginning of the flight, it would be found that there wasn't enough rotor rpm left at the end of the flight to maintain hover. Therefore some compromise must be made between rotor rpm and blade pitch at the expense of flight time to achieve maximum performance throughout the flight. At the present time I have set up my electronic speed control so that it comes on at full speed during hover. One experiment I intend to perform to see if it results in the anticipated longer flight time is to adjust the speed controller so that it comes on at full power at approximately 3/4 full stick position. By overgearing the

helicopter (choosing a slightly larger than calculated pinion gear) and using this throttle setup, it should be possible to obtain crisp flights from beginning to end and also have long flight times. I have set up a Whisper as a fixed-pitch helicopter and the flight times were slightly longer than the collective pitch version setup with max throttle at hover.

If one were interested in designing an electric helicopter or modifying an existing gas helicopter, the next step would be to

*continued on page 85*

## PROGRAM FOR CALCULATION OF HOVER FLIGHT TIME

(ASSUMING A MOTOR EFFICIENCY OF 70%)

ROTOR DIAM in.	CHORD in.	PITCH deg.	# CELLS	CELL SIZE mAH	HELI WT. oz.	BATT. WT. oz.	TOTAL WEIGHT
37.75	1.75	5	8	900	33.0	12.0	45.0
ASPECT RATIO COEFF.	LIFT COEFF	DRAG COEFF	LIFT/ DRAG	ROTOR RPM	POWER OUT Watt	CURRENT AMP	TIME MIN.
4.81	0.42	0.015	27.17	1161	127	17.7	3.05

Cl (lift coeff.) and Cd (drag coeff.) vs. Pitch Angle

PITCH (Degrees)	Cl	Cd	Cl/Cd
0	0.00	0.010	0.0
1	0.08	0.010	8.2
2	0.17	0.011	15.4
3	0.25	0.012	21.0
4	0.34	0.013	24.9
5	0.42	0.015	27.2
6	0.50	0.018	28.2
7	0.59	0.021	28.4
8	0.67	0.024	28.1
9	0.75	0.028	27.3
10	0.84	0.032	26.4
11	0.92	0.036	25.4
12	1.01	0.041	24.4

## Fiberglassing Rotor Blades

BY A.E. STANLEY JR.

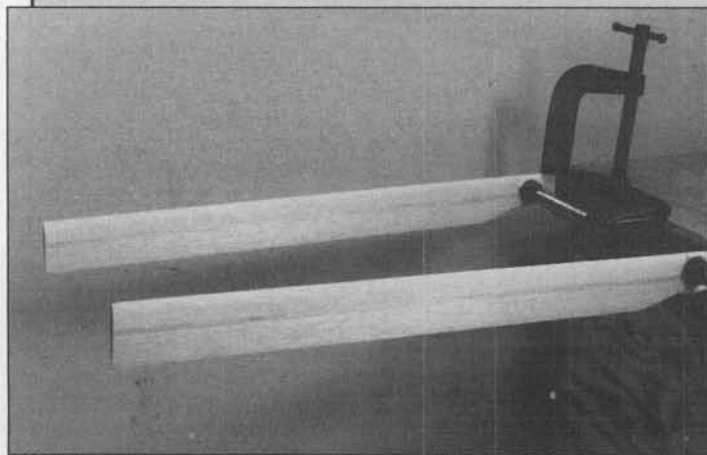
**A**fter you have spent some time flying helicopters you begin to notice things that were never apparent, or possibly not important to you before. One thing that has become very important to my flying are the blades I use. I have tried several different types of blades from a number of manufacturers and have formed my own conclusions of what I prefer to fly. One type of blade that has eluded me has been fiberglass, the obvious reason being the cost—\$125.00 and up per pair.

I have read a lot of material on glass blades. Every pilot I have spoken to who owns a set has had high praise for them. The manufacturers claim that because of their stiffness, the blades run

holes and throw the CG off.

Make sure you sand the blades well, then mount them (leading edge up) to your bench with clamps, or perhaps in a vise. With the blades clamped in place, wipe them down with a rag slightly dampened with acetone. This will remove any oils left behind by your hands. Now cut two pieces of 3/4-oz. K&B fiberglass cloth. The cloth should extend from the blade's root and hang over the end about a half inch, and should drape over the blade with about a half inch extra on each side. Check the cloth on the blades while they are still dry, then set the cloth aside.

The next step is to mix the resin. I like K&B Super Pox polyester

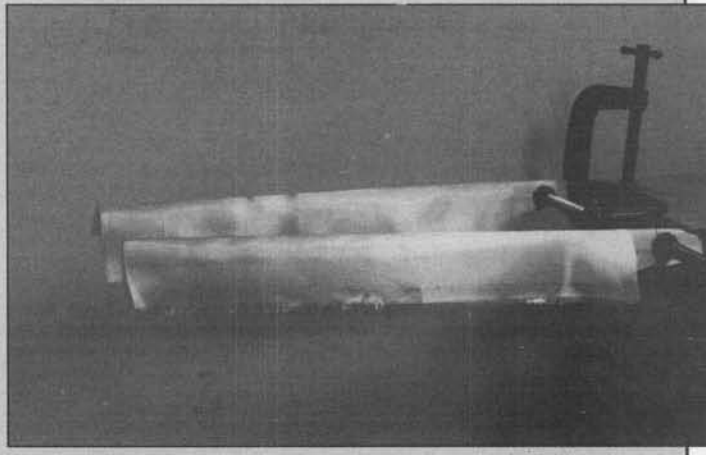


After the blades are prepared in the normal fashion (weight and CG corrected) and sanded, they are both mounted to a solid surface, leading edge up.

quiet and blade flutter is reduced, but I still could not justify the cost. So naturally I chose the next best thing: I made my own. Aside from the performance aspect, glass blades would also solve the problem of peeling blade covering film and cut down on the dents and nicks of day-to-day flying.

### CONSTRUCTION

The materials needed to fiberglass and finish a set of blades are listed at the end of the text. The first step is to choose a set of blades and prepare them just as you would if you were going to use a covering film. I chose to glass a set of Tech Specialties Vortech blades for the Concept. These blades are very stable in hover and give good performance in forward flight. It is important to choose a set of blades that you are comfortable with. If you don't like how a blade flies with covering film, it is not likely that glassing them will improve their performance that much. One blade I don't recommend is the type with lightening holes in the trailing edge. These blades will be hard to cover and the resin will pool in the

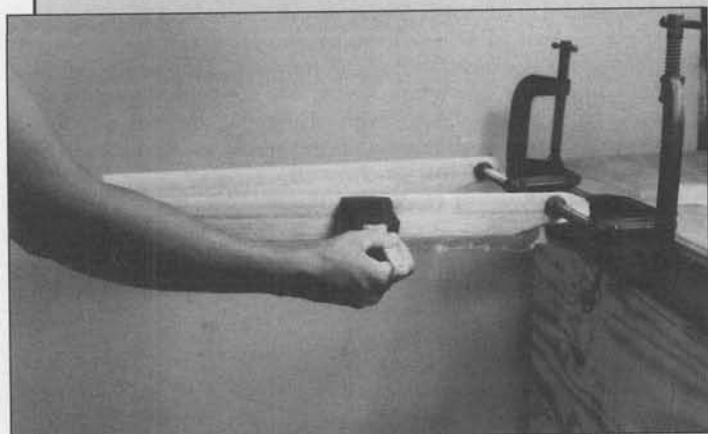


Pieces of 3/4-oz. K&B glass cloth are cut so that they hang past the trailing edge and extend past the tip.

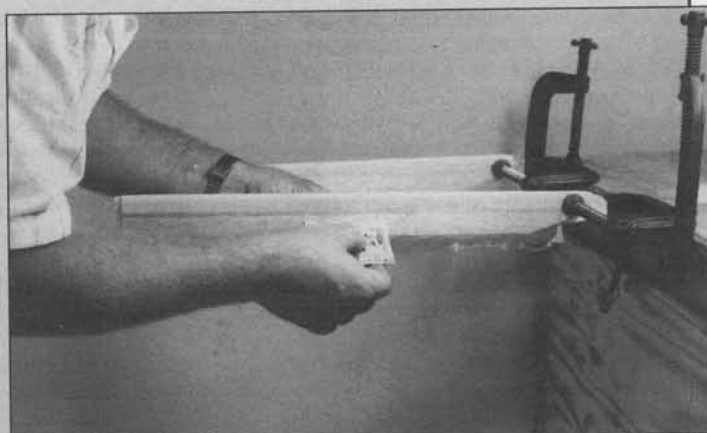
resin. I have found this resin flows well and is very easy to work with. You will need about two ounces of resin for the first coat. Do yourself a favor and don't make too little resin, as it is a hassle to mix up more resin in the middle of glassing a blade. Apply a light coat of resin to one blade with the foam brush, then drape a piece of fiberglass cloth over the blade. Adjust the cloth on the blade until it butts up against the root and the overhang is equal on both sides.

With the cloth in place on the blade, the next step is to smooth it out. This is done by using a squeegee in each hand and working both sides of the blade at once. I use baseball cards as squeegees because they are cheap and you don't have to clean them up later. Work from the root to the tip and from the leading edge down to the trailing edge. Make sure you get all the bubbles and wrinkles out now because once the resin is dry, you are stuck with it. Once the cloth is smooth, brush on a little more resin and squeegee it one more time. Check the blade one more time for bubbles and wrinkles, and let it dry. Pay special attention to the





Apply polyester resin to the blade, working from the root to the tip and from the leading edge down. Author likes to use inexpensive foam brushes for this job, as they give a very smooth finish and require no clean-up.



Using baseball cards as squeegees (a 1952 Mickey Mantle—value over \$25,000—works especially well), work the top and bottom blade surfaces simultaneously to remove excess resin and smooth out the cloth. Make sure you get rid of all the bubbles and wrinkles now or they will haunt you forever.

trailing edge when working out bubbles, as this is where they show up most. Repeat the process on the other blade.

Let the blades dry for about forty-five minutes. By this time the resin should be dry to the touch, but will not be really hard yet. At this time, trim the extra cloth from the trailing edge and from the ends of the blades. Trim as close as possible to the trailing edge without cutting into the wood. After the trailing edges are done, set the blades back on the bench and let them dry until the resin is hard. When the resin is completely dry, check the weight again. One blade will most likely be a bit heavier than the other, but this can be remedied by sanding. Each blade must be sanded before applying the second coat of resin. Check the weight as you sand—you should be able to bring the weights back together. Make sure not to sand through the cloth!

Now that the blades are sanded smooth, clamp them back on the bench and prepare them for the second coat of resin. Wipe them down with acetone. Mix up another batch of resin; use about an ounce and a half for this coat. Paint the resin on the blades as before, but this time pull the brush from the root out to the tip only. This will help smooth the resin. Try to get the resin as smooth as possible to cut down on sanding later. Make sure there is enough resin on the blade that it will build up a little on the trailing edge. Let the blades dry until hard.

Take special care with the final sanding of the blades. Start with 240 grit paper and take down any rough spots. Still working with the 240 grit, start sanding the trailing edge. Use a sanding block and sand the blade from end to end, holding the block flat on the blade surface. Keep switching from top to bottom on the blade and you will see the taper starting to form on the trailing edge. Don't go too far with the 240 grit, as it is easy to cut into the cloth. Switch to 400 grit paper and continue sanding the trailing edge.

## MATERIALS

- K&B polyester resin
- Squeegee (baseball cards)
- Blades
- Paint brush
- Sandpaper
- Hobby knife
- Fiberglass cloth
- Acetone
- Paint

## COMPANIES

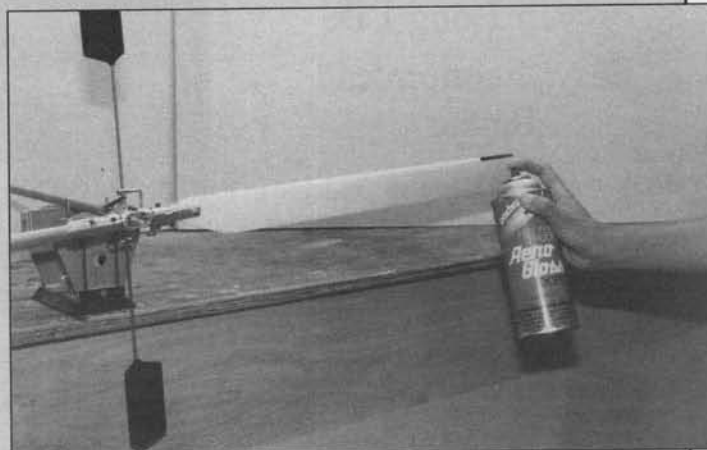
- Tech Specialties  
218 Vernon  
Greenville, PA 16125.
- K&B Mfg. Inc.  
2100 College Ave.  
Lake Havasu City, AZ 86403.
- Pactra-Testors Corp.  
620 Buckbee Street  
Rockford, IL 61104-4891.

Sand the surface until you end up with a straight edge from root to tip. I like to make a couple of passes with the block perpendicular to the blade along the trailing edge after the blade is completely sanded. This will take the sharp edge off the blade and will make the blade less brittle at the edge.

The final step in the process is to paint the blades. I like to use Pactra Aerogloss because it is a lacquer and is the lightest paint available. Sand between coats with 800 or 1000 grit paper, to get an extra smooth surface. The last coat should be a clear coat. After the clear has dried, I mount the blades on the rotor head and put the whole thing on my High Point balancer. I use another coat of clear to do the final balance on the blades. Just spray clear on the lighter blade until they come into balance.

With my first set of fiberglass blades bolted on, I went out to the field to give them a try. After setting up the tracking, I pulled up into a hover. The machine had a slightly smoother feel in the hover than with my normal blades. But the real difference showed up in forward flight. The machine felt much cleaner in straight and level flight and responded much better to all inputs. I also noticed an absence of blade slap during heavy pitch changes.

If you've always wanted a set of fiberglass blades, but couldn't



With the painted blades mounted to the rotor head and the whole thing resting on a High Point precision balancer, final balancing is done by spraying clear Aero Gloss on the light blade. Not all that much work after all, was it?

part with the cash, give this method a try. I don't think you'll be disappointed. Happy flying! **MB**

burn up to 10 seconds!

The high power rocket motors of today are a composite made of different oxidizers and a fuel similar to rubber. The image of a backyard bomber blowing up dad's garage is also out of date. Reliable composite motors are available from several commercial manufacturers for less than a person can make. The accidents that occurred because of trying to reload a hot motor just don't happen because both ends of the motor are sealed with epoxy.

Remember using any old tube you could find to make a rocket? High power rockets use special paper tubes, phenolic tubes and fiberglass tubes designed to withstand forces up to 200 G's!

You no longer use white glue to bond balsawood fins on a thin tube, either. Fins made of plywood or fiberglass go through the outer tube wall to the motor tube and are epoxied or CA'd on. Some fiberglass fins are actually woven onto the tube using Kevlar thread or piano wire, then bonded into place. Why would you go to that much trouble? It's one of the techniques used to keep the rocket in one piece at speeds of Mach 1 and over. Yes, Mach 1.

All of this didn't happen at random. The Tripoli Rocketry Association was estab-

lished in 1985 solely to promote high power rocketry. The well established National Association of Rocketry has also started moving into high power rocketry.

During the first weekend in February 1992, over 700 people participated in the high power launch at Southern California's Lucerne Dry Lake.

One of the first things that you may ask is, "How much does high power rocketry cost?" Like any hobby, as little or as much as you want. Rocket kits are available from about \$25.00 to 18-foot rockets costing \$200.00 or more. Motors range from about \$12.00 to over \$500 each, depending on power requirements.

I have been asked how to justify spending \$35.00 for a kit and \$60.00 on a motor, and literally seconds later witness two RC models have a midair. I recover my \$35.00 rocket and watch two crews pick up over \$1000 worth of debris. Cost and price really aren't the same thing.

High power rocketry is a great spectator sport because one doesn't actually have to be flying a rocket to enjoy a great flight. The sight and sound of a large rocket making a successful flight is indescribable. This may be the only hobby in the world where the more people flying, the better!

People are attracted to the various aspects of the activity. Some design and build airframes, some build payloads and others enjoy the power of the motors. There are a

number of different RC gliders that boost upwards under rocket power and are flown by RC back to earth. How high do high power rockets go? Flights of 10,000 feet are almost routine, with the highest flight last year being over 22,000 feet. The current high power record is almost 24,000 feet!

Staying safe and legal are the primary goals of both rocketry associations. High altitude flights are cleared through the F.A.A., with insurance, fire marshall approval and local approval obtained prior to any launch.

How do you know where it's going to go? Like free flight model aircraft, rockets have known launch characteristics and predictable flight patterns. At launches, there is a Range Safety Officer who checks the construction of your rocket, the motor used and its static stability, before any flights are allowed. Spectators are also not allowed any closer than 150 feet from the pad area, as a safety consideration.

Where is the next launch? When can I fly? The high power rocketry list is too long. There are launches in many states at least every three months. For information, contact:

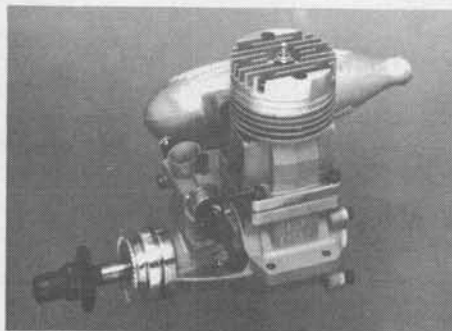
- The Tripoli Rocketry Association, P.O. Box 40475, St. Petersburg, FL 33743-0475; membership is currently \$40.00 per year.

- National Association of Rocketry, 1311 Edgewood Drive, Altoona, WI 54720; membership is currently \$25.00 per year. **MB**

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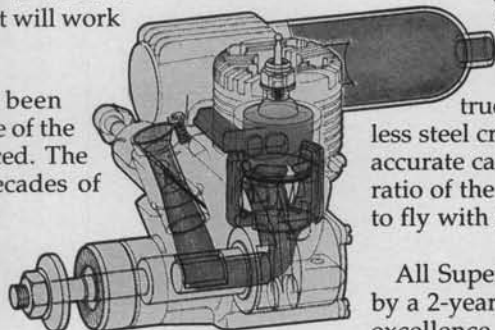
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# MINICRAFT'S JAVELIN ARF

ALL ABOUT ARFS BY ART STEINBERG



After years of assembling, flying and reviewing almost every conceivable kind of ARF, the airplane I am reporting on this month has proved to be one of the most fascinating projects I have ever undertaken. I say this not because it is an unconventional appearing model such as a canard or a tailless wonder, nor is it unusually oversized or miniaturized or bizarre in any way. Instead, it is truly one of the most

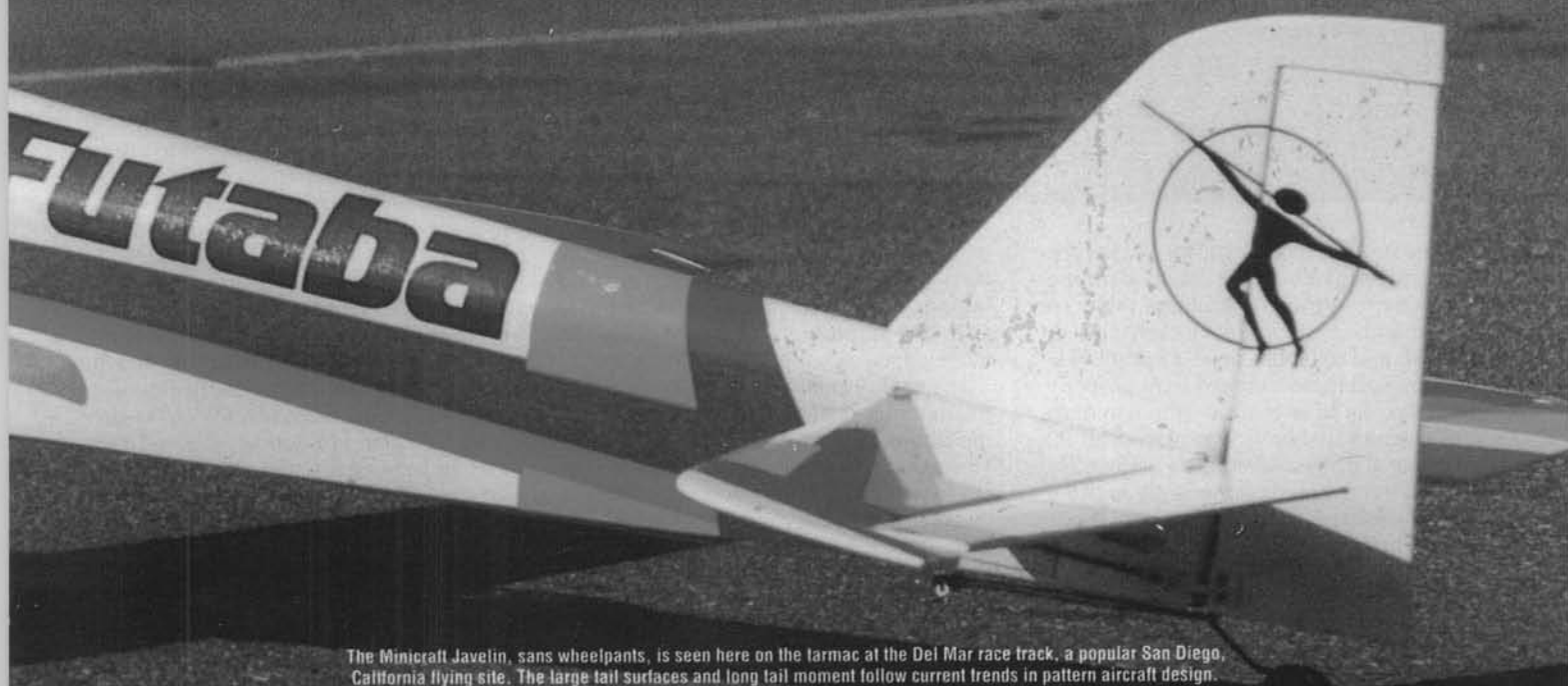
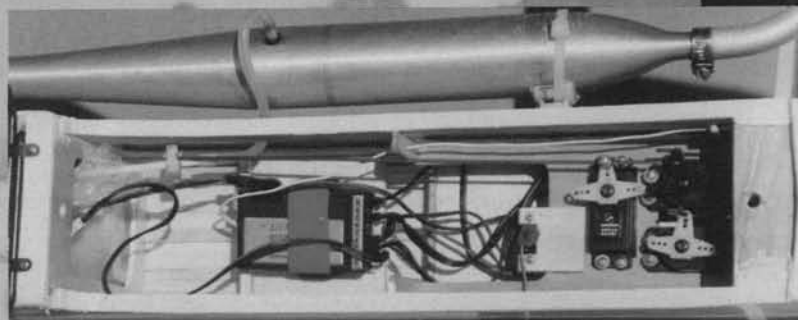
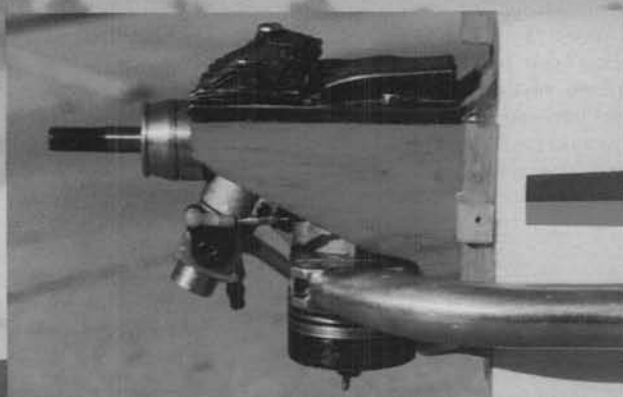
beautiful, graceful, colorful ARFs yet shown in the pages of *Model Builder*.

This month's ARF is called the "Javelin," and is manufactured overseas by Minicraft Co., Ltd. Those of you who pay keen attention to these columns will remember that Minicraft is the manufacturer of the "Ultima" biplane, and of a number of other ARFs. True to the form of the Ultima, the Javelin is

also virtually hand-built entirely of balsa, with a foam core wing. Rather than being covered with the less expensive stick-on material, it is completely covered with Goldberg Ultracote, a high quality film covering which is a popular choice of many experienced modelers today.

No effort has been spared in this kit to provide quality components throughout. Every bit of hardware is furnished, including all neces-





The Minicraft Javelin, sans wheelpants, is seen here on the tarmac at the Del Mar race track, a popular San Diego, California flying site. The large tail surfaces and long tail moment follow current trends in pattern aircraft design.

sary screws, wheel collars, metal landing gear straps, threaded pushrods, clevises, control horns, torque rods, and nylon hinges with metal hinge pins. Also supplied was a first-rate set of lightweight wheels, a really state-of-the-art seamless fuel tank, and a nicely made plastic spinner. I found it curious that Minicraft did not include a ready-made engine mount, but instead the kit contained die-cut plywood

parts which had to be fitted together and epoxied into a solid structure. At first it seemed to be a rather undesirable arrangement to me, so I thought about just rummaging through my box of motor mounts and selecting one that would fit. However, I thought it was only fair to follow the manufacturer's instructions as closely as possible, so I did put the wooden motor mount together, and when it was finished,

I was truly amazed to find it quite strong and very light in weight. I mounted it to the firewall and it has not caused a bit of trouble.

The Javelin is covered completely white and the color trim is supplied to be applied by the builder. This comes in the form of a gigantic sheet of adhesive vinyl trim, which is printed in some of the most vivid and attractive colors I have ever seen on a model. The various trim

sections were carefully cut out and placed on the airplane, a job that took just over an hour.

There are a number of ways to apply stick-on trim. The Javelin instructions recommend using a spray coat of detergent solution so that the trim can be shifted around easily. I like to make sure the trim on my models is on to stay, so I run a bead of thin CA glue around all the edges to seal against fuel seepage. If the trim is not sealed in some way, you can be certain it will eventually come loose and end up wildly flapping in the breeze.

The cockpit comes already covered with black trim. No pilot was furnished, so I

All pushrod material is furnished, these rods being made of balsa dowels about 3/8-inch thick. There are those who would avoid using balsa for pushrods, but I have never had a problem with them. The threaded rods were slipped into grooves in the pushrods, wrapped with thread and CA glued in place, then covered with the heat-shrink tubing supplied.

I did find a cause for complaint when it came to the landing gear, as I don't care for the piano wire type on a plane of this stature. First of all, I was afraid they were mounted too far forward and would cause bouncy landings. Also, I would have preferred to have them mounted in the wings

The cowl and wheelpantz come in two halves which have to be glued together, filled, sanded, and finally painted. I suppose this job could be done more easily by just gluing the parts together and covering the seams with white vinyl material, but it isn't as professional as the method I used. However, as an ARF devotee, all this seemed too much like real work to me, more in keeping with the assembly required in more conventional kits.

With a wingspan of 58 inches, a fuselage length of 51 inches, and a wing area of 612 square inches, the recommended powerplant is a .40 to .50 two-stroke or a .48 to .70 four-stroke. Here's where I made

a mistake, as I chose my Rossi .40 with a MACS muffled tuned pipe, figuring this powerful combination would be plenty spirited for the Javelin.

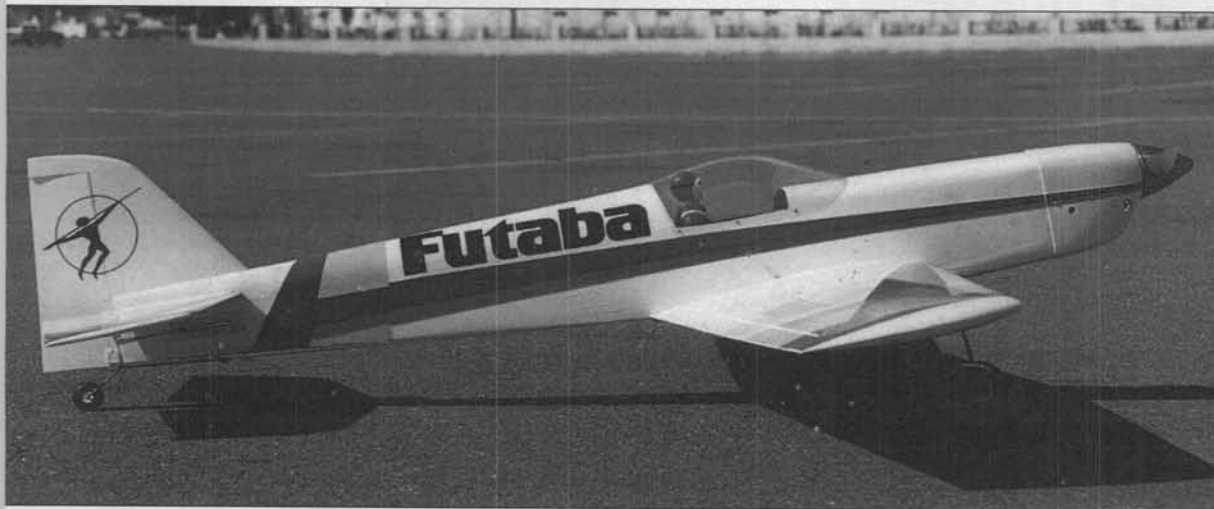
With everything finally assembled, I checked the CG, which is supposed to be about 3-1/2 inches behind the wing leading edge. To my dismay, it was an inch too far backward, indicating a seriously tailheavy condition. I got out some scrap lead sheeting and kept loading it into the engine compartment until the CG was correct. This added nine ounces of useless weight, and I

kicked myself for not using a bigger .60 engine rather than ending up with a smaller engine plus a cargo of lead!

Now it was time to weigh the Javelin to see how close it would be to the manufacturer's recommended flying weight of 70 to 78 ounces. When the old kitchen scale indicated 111 ounces, I figured it was time to get a new scale! However, subsequent weighing proved the ready-to-fly Javelin actually was unmistakably *thirty-three* ounces over the maximum design weight! We're talking just over two pounds here, and for the life of me, I couldn't blame myself for it, except for the nine ounces of ballast needed in the nose.

My radio was a standard Futaba PCM with the usual battery pack, and the Rossi .40 engine, even with a tuned pipe was no heavier than the average engine. I did a few wing loading calculations and found that with a wing area of 612 sq. in. the manufacturer's specified wing loading ranged from a low of 16.47 oz./sq. ft. (an almost impossibly light figure for a sport/pattern plane) to a more believable figure of 18.35 oz./sq. ft. My Javelin had a wing loading of 26.11 oz./sq. ft., and I wondered what the performance would be!

Well, I didn't have to wait long here in sunny California for a nice flying day, so one morning I found myself at my favorite field, an 800-foot paved runway. The engine was ready to go, as I had spent the



looked around the hangar for a volunteer and ended up giving the job to a competent-looking Williams Brothers pilot. He looks great in his jaunty red jacket and flight helmet, and so far has done a fine job. The canopy had to be trimmed to fit properly, but there are lines to show where to make the cuts, and when it was placed on the fuselage, the fit was absolutely perfect. The canopy is not glued permanently in place, but is instead held on by six screws—a nice touch if the pilot or cockpit has to be worked on at a later time.

The two wing halves went together beautifully, with a good, strong spar in the center. Minicraft understands the stresses such parts must endure, so they supply fiberglass tape to reinforce the center wing joint. My regular readers know that I am a staunch advocate of fiberglassing wing center joints, as too many manufacturers omit this bit of insurance. Hence, I have every confidence that this wing will never fold in flight.

The tail surfaces are generously oversized and are also tremendously strong, being made of solid balsa throughout. Slots are not pre-cut in the fuselage for the pushrod exits, which is just as well, as I prefer to cut my own slots according to the locations I think best. I usually enlarge any pre-cut slots in ARFs, as I am paranoid about possible binding of the pushrods. Therefore, the slots I cut were substantially oversized.

where they would be more attractive to my eye, and this would have given me the option of installing retracts. But what really gave me a problem was installing the wheelpantz.

First of all, let me say that with wheelpantz, the model is really beautiful, even though the landing gear struts look thin and flimsy. However, at no time did the landing gear fail to perform perfectly during landings or takeoffs, nor did they show any tendency to cause bouncy landings. They were plenty strong and did their job very well—except when the wheelpantz were attached! The cause of all this difficulty is the fact that Minicraft made the landing gear axles too short, which led to a comedy of errors. First of all, because of the short axles, the wheels could not be properly centered in the wheelpantz, as they rubbed against the inside of the wheel openings. As a result, I had to lay the excellent Minicraft wheels aside and substitute a pair of thin Williams Brothers wheels. Then the wheelpantz would not remain solidly in place because they could not be anchored to the short axles, so they kind of swiveled from side to side. This was almost disastrous on takeoffs and landings, as it caused the wheels to bind against the pants. Eventually, the wheelpantz were removed, and it is my intention to devise a way to lengthen the axles and find a method to attach the wheelpantz more firmly.



previous three afternoons tuning it up in my driveway. While the Rossi is a real powerhouse, it gets annoyingly cantankerous running inverted, and every time it is installed in a new airplane I have to thoroughly adjust the top end, the idle, and the mid-range.


The Futaba 1024 system tested reliably as it never fails to do, so I lined up the Javelin for takeoff and eased in full throttle. The run was straight and true with only a slight bit of right rudder input. The tail lifted nicely, and just as I applied a touch of up elevator for liftoff, those darn wheelpants started flopping around and rubbing up against the wheels! This made the Javelin start zigzagging, but I managed to get the aircraft off the ground and settled into a nice, stable climb.

I soon found that the Javelin is not only a beautiful looking airplane, its flight performance leaves absolutely nothing to be desired. I found the roll rate was much too slow at first, and it was necessary to adjust the ailerons for maximum throw to attain top performance. The extra long tail moment smooths out all maneuvers and helps to make even low-time pilots look like experts. While the Rossi did a good job, it certainly didn't deliver outstanding vertical performance on this almost-seven-pound airplane, and my recommendation is that the Javelin be powered with a .60 displacement two-stroke engine if at all possible. In any event, for beginning pattern flying, or for just plain sport flying, this model is capable of doing almost any given maneuver, given a sufficiently powerful engine.

Landings with the Javelin are just pure joy, and even though I had my reservations about the piano wire landing gear struts, every touchdown was light as a feather and absolutely bounce-free. The Javelin is a real floater, and if the runway is short, it needs to be flown down to ground level. However, with an extended runway, the approach is long and the sink rate is very low, resulting in graceful landings with plenty of oohs and aahs from the crowd, and sometimes even a round of applause. It's too bad that after the first flight I found it necessary to remove the handsome wheelpants, and as soon as I can devise a way to remount them more securely, they will be reinstalled.

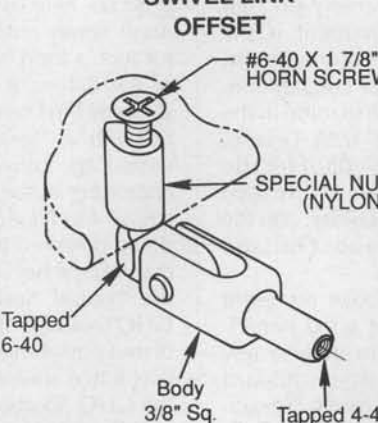
I think most pilots would be proud to show up at the field with such an attractive plane which flies like a dream, to say nothing of the fact that it goes together in just a few evenings. It is built tough as a B-17, and is easily repairable using conventional materials. For a top quality, virtually hand-built pattern type model, the Javelin is reasonably priced at \$229.95 and is available from your local dealer, or from Cermark Model Supplies Company, 7107 Edward Ave., Fullerton, CA 92633; (714) 680-5888.

Art Steinberg, 2267 Alta Vista Drive, Vista, CA 92084, (SASE for personal reply, please); (619) 726-6636. **MB**



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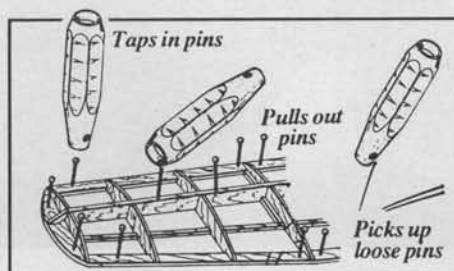
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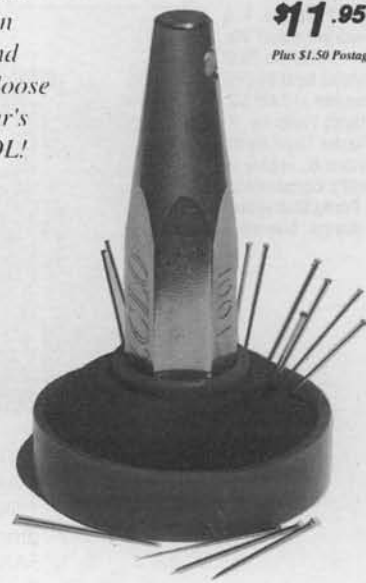
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# PLUG SPARKS

BY JOHN POND

## The Newly Proposed Brown Jr. Event

One of the best things to come out of the extremely popular Old Timer movement is the constant creation of new events, either for sport or competition. Those that come to mind in the last decade are 1/2A Texaco, Pure Antique, 05 Electric L.M.R., 1/2A Flying Texaco Scale, O.T. RC Glider, and the Ohlsson 23 and Ohlsson Sideport events.

While the above represent acceptance and good participation, there are quite a few spinoffs from the standard events such as Foxaco (Texaco with Fox engines only), Multi-wing 1/2A Texaco, O.T. RC

a joint effort by SAM 100 and SAM 66, held in August 1991, drew seven entries. Amazing for such a short notice! Typical of the entries is Photo No. 1 showing Jim Davenport of SAM 66 with a "Sportster" as designed by Julius Unrath and appearing in the July 1936 issue of *Model Airplane News*. Being powered by a Loutrel at that time, it became known as the Loutrel Sportster. When GHQ took over the production of the Loutrel engine, the model was kitted under the name of the GHQ Sportster.

Fellow SAM 66 club member, Charley Thuet, also produced an interesting Brown Jr. powered model, the Scientific Commodore seen in Photo No. 2. This model, along with a series of models put out by Scientific in the 1937-39 era, was the brainchild of Ben Sheresaw.

Based on the sensational success of the first Brown Jr. powered event, another meet was held on November 10 at the LVRC Field at Myerstown, Pennsylvania. Enthusiasm had developed to the point where William L. (Bill) Brown and Herb Wahl were invited as special guests to this meet. Seen in Photo No. 3 is Bill holding



(Above) Photo No. 1. A real old timer! We mean the GHQ Sportster built by Jim Davenport of SAM 66. (Right) Photo No. 2. Charlie Thuet starts Brown Jr. engine in Scientific Commodore. Pretty Sheresaw design. Also won!



scale, ignition-only Texaco, Class B Electric, and others.

Now comes an event being pioneered by SAM 100 and SAM 76 for O.T. models with Brown Jr. engines. Two contests have already been held on the East Coast, with very satisfactory results. The first contest,

his original Brown Jr. with Andy Phillipczah and Paul Vignone.

With interest at an all-time high, John Delagrange proposed that the Brown Jr. contest event be held at the 1992 SAM Champs at Lawrenceville, Illinois, on July 9 as part of the RC O.T. schedule of events. John



Photo No. 3. Bill Brown was a special guest of the SAM 100/76 Brown Jr. contest. Bill is seen with his original Brown engine. How appropriate!

Delagrange ran the following questionnaire in his SAM 100 newsletter:

1. Do you have a Brown Jr. or Wahl Brown engine?
2. Do you know where you can get one?
3. Do you have a friend who will loan you one?

If you were able to answer yes to any of the questions, you were immediately invited to participate in the Brown Jr. special event, reserved for pre-1939 models. Flying will be based on two official flights of unlimited duration with 90-second engine run. Flying will take place on July 9, followed by static judging on July 10. Guess what the prize is? A Wahl Brown Junior Custom donated by SAM 100!

Needless to say, this writer has a framed Kloud Queen with a Wahl Brown Jr. mounted ready for covering. Barring a catastrophic sickness, accident, etc., Bill Bowen and I will be there!

### MODEL OF THE MONTH

We have a surprise for you this month, an old time rubber twin pusher! After the published story of Carl Carlson's large 1931 gas design, "Big Crate," in our January 1992 column, Carl sat down and made some excellent drawings of his original twin pusher used in the AMLA contests of 1928-30.

Of particular interest is the novel I-beam A-frame which delivers superior strength, yet maintains a light framework. Light weight (as ever) was the prime interest in those days.



Try these weights out: Wing, 20 grams; A-frame, 42 grams; elevator, 4.7 grams; propeller, 8.8 grams, giving a total weight (without rubber) of 75.5 grams or 2.67 ounces. Power that up with 8 to 10 strands 1/8-inch rubber, and you have a real climber!

The plan as shown is based on a series of twin pusher designs developed by the Illinois

Photo No. 4. Howard Robinson's Lanzo Bomber.



Photo No. 5. Paul Schmitz of Oneco, Florida, was one of the local contestants at the Florida Winter Fly, with his green Lanzo Bomber.

Model Aero Club. The influence of the 1927 Lucas/Lefker Nats winner can easily be seen.

Of course, over a period of three competitive seasons, there were bound to be changes and/or improvements. The rear elevator went from 2 to 5-inch chord. The original elevator section featured a heavily cambered section with flat bottom wing airfoil. This evolved into a gently under-cambered elevator rib section and a well under-cambered wing section.

Also of note was the change of square wing tips to S.E.5 type tips proven by the English R.A.E. Shop to be the most efficient for tip losses. These tips also gave a slightly larger wing span to

improve the glide.

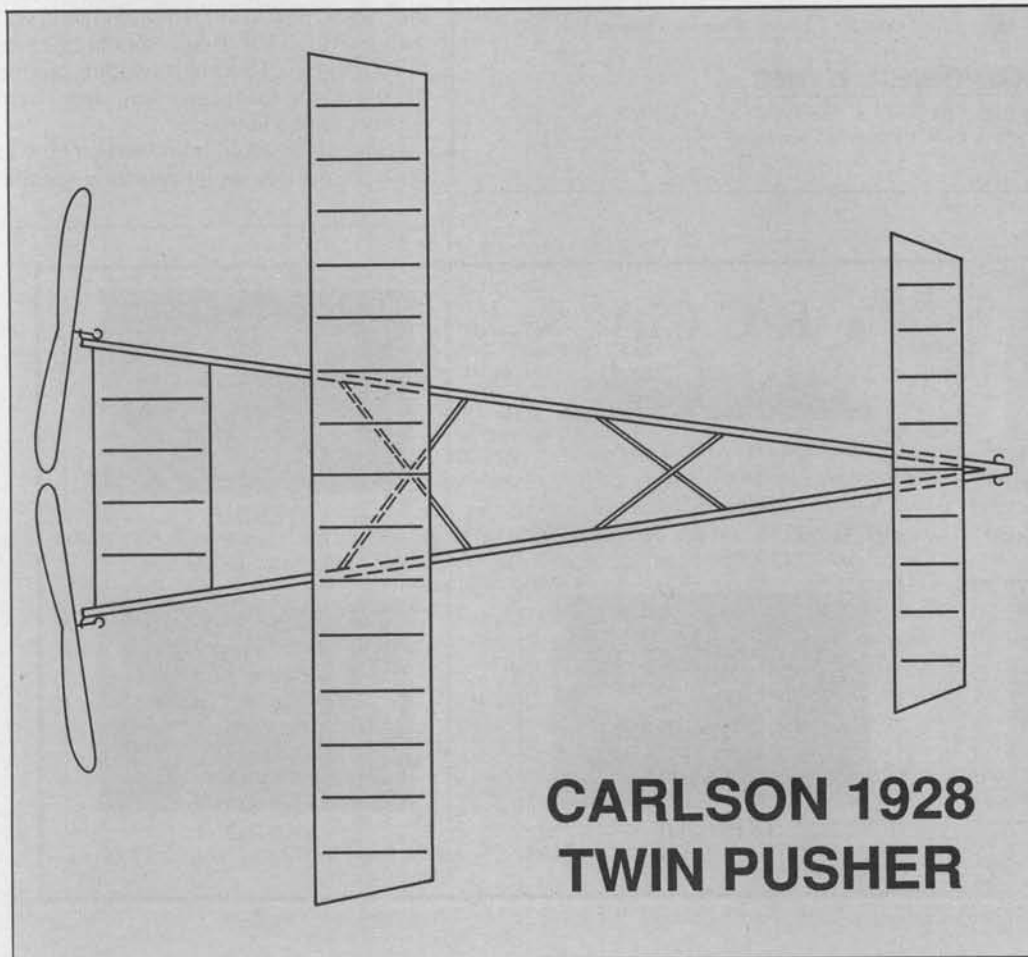
Careful development of the design and flying techniques resulted in some remarkable performance records:

May 1928 Chicago Tribune

Photo #6. Herb Walters, of Maryland, flew this Dallaire Sportster for the Texaco event in Florida.



## MODEL OF THE MONTH



1992 issue was a shot of Dick Everett holding a Thermic glider. The inference here was that this model was built and flown by Everett at the AMA Nats at Los Alamitos NAS.

No such thing, says Howard L. Robinson, who writes to say he was on the other end of the towline. The model is Howard's Jasco Thermic 50 with swept-back turbulators on the wing and elevator. Of interest is the "Shelby Balsa Buzzards" decal and the AMA 802 number on the wing.

Robinson goes on to say he has been using this number for the last thirty years. To prove his point, Howard submits Photo No. 4 of his latest model, a 1/2A Lanzo Bomber with the same AMA number. Although he flies free flight, Howard has no less than 10 RCO.T. models on tap for most any contest. Best part is that he is 72 and still going strong!

## FIRST FLORIDA WINTER FLY

At this time of the year (Janu-

## PLUG SPARKS

activity is the Southwest Regionals, held annually for the last 30 years in the Phoenix, Arizona area. Reports on this meet this year were very favorable as far as weather and competition went.

However, Fred Mulholland, of Tampa, Florida, writes to inform one and all of the very successful First Annual Florida Winter Fly held on January 17 through 19. Using the West Pasco Model Pilots Association

flying field was like a modeler's dream come true, according to Tom Jozwiak, *Planes-men* newsletter editor. Starting with a blacktop runway in the middle of a flat pasture, off in the distance is a swamp area inhabited by alligators and



Photo No. 7. Bill Brenchley produced this later version of the Aeroneer 1-B, and excellent 1/2A Texaco scale flying model.

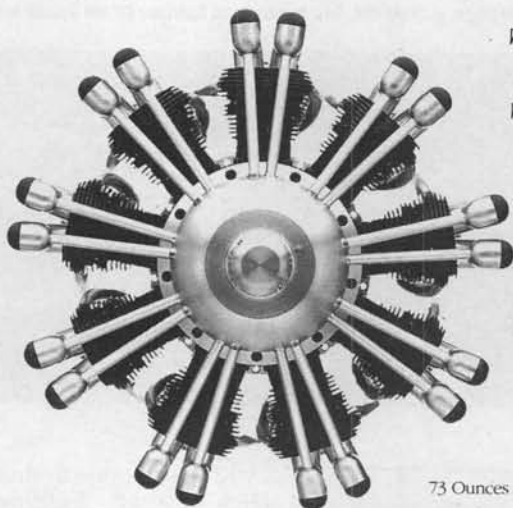
water moccasins. Just make sure your radio model is under full control! Photo No. 5, Paul Schmitz with a Lanzo Bomber, clearly shows the field and surrounding background.

As Jozwiak recounts, these people know how to live, the clubhouse being equipped with a telephone, running water, and electricity. The meet was favored with heavy crowds due to the excellent publicity generated in the *Tampa Tribune*. The media coverage was excellent with a large photo of a Lanzo Bomber taking off.

Modelers came from all over; Larry Davidson from Long Island, Tom Jozwiak from Ft. Worth, to name a few. We feature Photo No. 6 showing Herb Walters of Maryland getting ready for a flight with his Dallaire Sportster.

Well worth noting was the gang that came up from up north with contestants from Massachusetts, New York, Pennsylvania, Ohio, and a host of others. This meet drew 40 contestants. If this meet is any indication, next year Fred Mulholland will really have his hands full. Should be close to 100 next year! Sure beats wading around the snow when you can enjoy clear warm weather with a light wind.

A tip can be taken from Fred on how to organize a meet, as he provided specific



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#### DESIRE

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



#### SKYBOLT

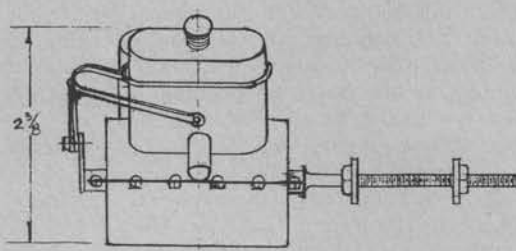
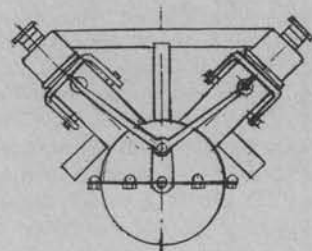
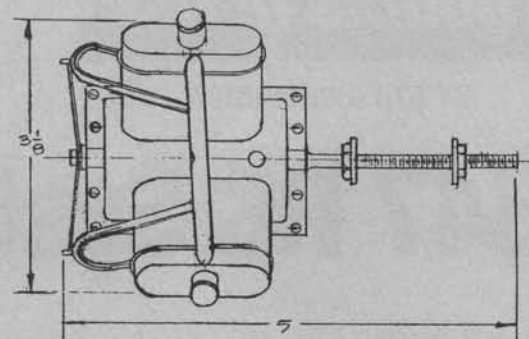
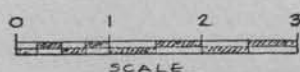
Wing Span: T/77" B/66" Weight: 20-25 Lbs.  
Wing Area: 1625" Engine: QUADRA



# IMP V-4

"TORNADO"

DRAWN BY: JOHN POND



## ENGINE OF THE MONTH

parking areas for the contestants and the public. All pits were lined with yellow rope, and spectators were kept behind that line. The food concession was excellent...another way to help the sponsoring club break even! Best of all, fifty trophies were awarded!

### ENGINE OF THE MONTH

It has been a long time coming but we finally got around to the IMP V-4 CO<sub>2</sub> engine so kindly lent us by Bob McClelland, that tireless Secretary-Treasurer of MECA. We featured the IMP S-2 in the September 1986 issue.

IMP motors (I.M.P. was short for International Model Products) were imported from Japan. This was one of the first firms to introduce Japanese products; most notable was the line of Paulowina propellers. Of course, in those days, the Japanese manufacturers did not have the complete know-how or the proper equipment to correctly produce the desired item. Nowadays, it is an entirely different story.

In the IMP S-2 write up, we described the

CO<sub>2</sub> generator tank and method of starting. The V-4 used the same parts as the S-2 including the same generator. Where the S-2 motor was first introduced in 1936, the V-4 engine followed almost a year and a half later.

No question about the lack of power in the S-2. This led to the combining of two S-2 engines to form the V-4. However by this time, the American manufacturers had solved the problems of making two-stroke internal combustion engines run reliably. Even the smaller sizes, which were more cantankerous to start, had much improved starting ability.

As noted previously in the S-2 write up, by the beginning of 1938, the sales of IMP motors had dropped precipitously. Efforts were made to adapt them to compressed air engine tanks. However, the IMP engines had shown conclusively that they were unable to lift the heavy generator. It remained for Bert Pond to perfect the lightweight cylindrical tank that proved the practicability of compressed air power.

Today's modern air engines are a far cry from the old ones, as metallurgy has improved, and most important of all, plastic tanks capable of withstanding better than 100 psi are much lighter.

## ANNUAL ENGINE RUNNING EXTRAVAGANZA

Here is something all SAM clubs should consider during the months when flying in cold weather causes problems. For years now, SAM 32 (AMPS) has been conducting what they call an Annual Engine Running Extravaganza. The idea here is to run all your engines prior to installation and/or flying to get the "bugs" out.

The AMPS engine running session is gen-

continued on page 81

Photo No. 8. A P-B 2 by Albert Fisher of Sydney, Australia, features a pressurized fuel plumbing system. Note height of fuel supply.



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BY STU RICHMOND

## JR's x-347 RC System

It's kind of hard to find the brand name on a Mercedes Benz car; the brand name on the subject of this review isn't boldly emblazoned either. But if you closely look below the liquid crystal display window of the JR x-347 transmitter, in letters barely 1/16 inch high, you'll see the lightly embossed name "JR Propo." On the Mercedes, the name appears in letters usually 1/8-inch high on a small round emblem just above the grill.

Both are quality products; both have some of the world's best engineering, and both handle well. The Mercedes has earned a worldwide respected reputation. We think the x-347 will earn similar respect among the world's RCers. The numbers refer to modern computer capability inside the transmitter. The x-347 was the company's developmental project code for the transmitter. The "3" is for three different types of aircraft (helicopter, airplane and glider) the transmitter will control. The "4" is for the ability to store full setting data for four different aircraft, and have the data readily available for recall and use by the pilot. The "7" indicates seven separate channels of control are available for each individual aircraft.

RC helicopters require a series of control features far beyond the ordinary needs of fixed wing power or glider guiders. In Japan, JR is quite well known and advertised as being the "helicopter people." In the x-347 they've shrewdly taken the most-used features of their upscale (and quite costly) PCM-10 system, which has enjoyed worldwide helicopter success, added some "plus" features and put them all together in a newly styled casing that has that wanted bio-good feel. The PCM-10's touch-to-input data window is replaced with a large liquid crystal display window and a series of only six keypads to do all the inputs. There is no way to accidentally press a keypad in flight and cause a crash. This possible problem simply doesn't exist.

It's possible to buy this tomorrow-type system and use none of the features except its low piece count reliability—install the servos so controls move in the right direc-

tion—and fly forever with a yesteryear installation! But you may find the manual intriguing...you may find you can readily follow the examples...you may read about a feature you like (such as the built-in stopwatch or mixing for coordinated turns or dozens more goodies) and then you'll really start to enjoy owning the x-347.

JR's x-347 is bought to fit your expected primary need of the three aircraft types. The box contents vary slightly as does the matching price. You can even have your

hobby shop place your order with the servos of your choice and UPS can make second day delivery in most cases. It's now a bit like ordering a new car—you get what you want, not what's on the showroom floor! Our review radio came as primarily a fixed wing powered aircraft system with four standard NES-517 servos and a normal 550 mAH battery pack. All orders ship with the all-inclusive 116-page manual that covers all possible uses for the x-347 system.

There's growing controversy about the inclusion of PCM. Is the safety advantage worth the cost? Is there a safety advantage, or is it simply another link in the command chain that may prove to be weak? It's a can of worms that this review will leave shut. But the x-347 doesn't care. If your choice is PCM with the ability to have the onboard computer pull your throttle back in the event of interference, you simply set it so a large "C" shows next to your available voltage in the LCD. If your choice is FM transmission and you're willing to take a hit and keep right on flying, you simply use an FM receiver instead of a PCM receiver and set the LCD to show a large "F" next to available voltage. Either way, the x-347's transmitter still has all of its features

working for you.

It's a shame to have a transmitter like this flying only one airplane. We opted for an additional set of the more costly NES-901 servos and a less costly extra NES-527X ABC&W JR FM receiver. There's a still less



The x-347 was JR's developmental project code name. The x-347 will fly three different aircraft types (power/heli/glider), hold memory for four different models and is a seven-channel system. The six keypads on the lower front, along with the on-off switch, allow an unbelievable amount of user programming. User manual has simple examples that are easy to follow and understand.

The x-347's upper area can have different functions assigned to the various switches. Rear left switch will deliver wild snap rolls, but Stu uses it to start and stop the built-in stop watch. Set can be ordered on Mode 1 (throttle on right stick).



The large liquid crystal display (LCD) shows two minutes and fifty-four seconds of "on" time, the big "C" indicates the system is operating on PCM (an "F" would indicate FM operation), and the available battery voltage is 10.2 volts. Transmitter will beep at you when voltage gets too low.







Most JR sets come with NES-517 servos, which are of average size, speed and torque for sport flying. Here the circuit board has been lifted out. Motor is nearest the case top.

costly NER-327X ABC&W FM receiver that works just the same but is made slightly different with lesser manufacturing costs. This review radio is sport flying on PCM and pylon racing on FM.

Rather than clutter this article with details of what this modern radio does, we feel it better to explain more of its background to you. The JR receivers, from the least costly to the most costly, all use a unique and patented ABC&W electronic circuit. ABC&W stands for Automatic Blocking Circuit with Window, and does the same thing to your incoming signal that dual conversion does. Technical types are thinking maybe it does an even better job of straining and giving the purest incoming signal. It is an electronic windowing circuit with an extremely narrow window that only allows narrow electrical signals to enter; wider signals won't enter and get shunted to ground. The signals that do enter are amplified, filtered and cleaned up and again sent through the window. The signal section that may be too wide gets automatically blocked out and is discarded to ground. Only the good stuff gets through to the receiver's logic section.

We fly in the electronically "dirty" Orlando area and often have all six flight stations in use simultaneously. With an ICOM-7000 we've found at least nine pagers among the RC frequencies that are extremely active, but we're locally having tremendous success with the JR receivers. To quote from JR: "The conventional method of both dual and single conversion has one stage of filtering and amplification. With ABC&W, once a signal fits through the narrow window and is cleaned up and amplified, it is looped around and must fit in the window once again. It actually goes through the window three and four times, but there is no appreciable delay since everything is happening at just about the speed of light."

The JR x-347 gives computer control to throttle, aileron, elevator, rudder, retract gear, flaps and spoilers for powered airplanes. For helicopters it replaces those last two controls with pitch and an auxiliary. For gliders the sequence becomes spoilers, aileron 1, elevator, rudder, aileron 2, flaps and an auxiliary.

Let's talk about the "plus" points of the x-347. It's an absolute delight to finally find

that there is a user-settable tension on the throttle stick's movement. The manual is written to basic levels. The bio-good feel of the two-pound two-ounce transmitter is paralleling that of the newest and finest Nikon camera. The transmitter has two plastic feet, so it can be laid on pavement without mutilating the rear of the case. The important data in the LCD is a big 5/16-inch high. The standard NES-517 servos use an indirect "spoke and yoke" drive and they'll probably have their delicate feedback potentiometers last an extremely long time. There's a five-plus year lithium battery that backs up all settings or computer inputs—they'll not be lost if you accidentally leave the Tx switch on overnight. In addition to a constant in-flight voltage display in the transmitter, the thing beeps at you when the voltage starts to get low.

You can also program the system to retard the model's throttle when airborne voltage starts to get low. I've seen this feature save one of those big Byron twin fan jets that the world famous Cloud Dancers Show Team flies here at their Florida practice field. I personally like the idea of having the model name showing in the LCD window (it'll show four different names for the models it controls), and I fell in love with the stopwatch display. The internal timer will count up or down as well as tell you the elapsed operating time since the last charging. The list of "pluses" goes on and on.

On the "minus" side, all five of us who were involved in the testing—Ed Stone, Dr. Ted Noel, Herman Perez, Bob Benton and myself—immediately and individually found a problem that has an easy (and quite acceptable) fix. All four trim levers have an extra deep detent that they "click" into at neutral. If you're flying with trims in the neutral detent and want to add one click of control change, it's hard to do! We found that as you move the trim from the center detent you'll come out of the deep detent with four or more clicks of travel when you only intended to have a single click of change! The fix for this bugaboo is to simply set your trims five clicks off the deep detent to the right and set the elevator for five clicks of up. The same phenomenon exists in the JR FM Max 6 system that uses these deluxe stick assemblies. For those who like the deep detent, there is no problem, it's there to use! The other "minus" is that we couldn't find the minimum range check distance in the manual. The JR Computer Max 6 manual specifies antenna-off range at 50 feet, so we assumed the same for the x-347. We range checked over 175 feet with the PCM NER-627XZ supplied receiver, and over 75 feet with both FM receivers (NER-527X and NER-327X), and we've flown our test model all over with the antenna fully collapsed with no problems.

We perform bench testing of each system's supplied servos and came up with numeric percentages showing (within 5%)

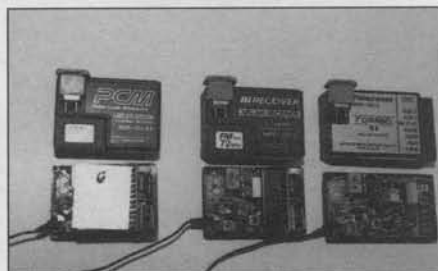
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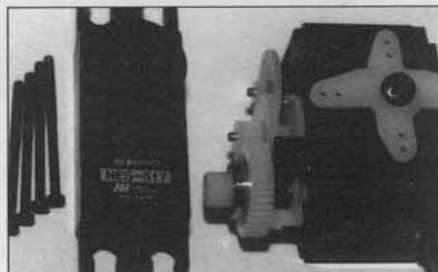
The JR x-347 system comes in three styrofoam packs. One holds the transmitter, a second holds all RF (radio frequency) components, and this third section contains the servos, battery, direct servo controller umbilical, switch harness, trays, etc. The three packs fit into a master carton.



The transmitter module (left) plugs into the back of the transmitter and will drive both a PCM and an FM receiver—your choice.



The NER-627XZ (left) is the normally supplied PCM receiver. A sheath of grounded copper reflects the camera's flash (the copper shields the microprocessor from stray signals). In the middle is the NER-527X FM receiver of upscale manufacture and middle cost. The NER-327X (right) is an FM receiver of still lower cost due to manufacturing techniques. Stu uses PCM for sport flying and FM for competition. All JR receivers have ABC&W circuitry—text explains.



With the 517's top removed, you can see the ball bearing on the output shaft.



The internals of the NES-901 servo are much different from the 517 sport servos. This is one of the highest quality best performing JR servos for competition use. The NES-901 turns through 60 degrees in .27 seconds.

# FREE FLIGHT

BY BOB STALICK

## A Close Look at F1J

Bill Lynch has been extremely successful with his Hurry Up design in both 1/2A and F1J events. The ship, and Bill, are the current F1J AMA record holders. The model can be flown with either a hot TeeDee, Shuriken, or one of the C.S. 1cc imports. Bill was kind enough to share the following information on his design, so that you can see just how this ship came



The "Hurry Up II" pictured here with designer Bill Lynch is the current record holder in F1J competition. Model has many high-tech features and is powered by a C.S. 1cc screamer. Text tells how this model came into being and also shares Bill's thoughts on F1J competition in general.

about and how it performs. Here's the scoop from Bill:

"The story of the Hurry Up design began back in 1986 after my thirty-three-year hiatus from modeling. I wandered into a hobby shop in Sacramento one day and noticed a posting of NCFRC events—I hadn't been part of the model contest scene since 1952, and my curiosity was piqued. Without any idea what to expect, I showed up at the next meet at Waegell Field on the southeast side of Sacramento. As I rolled up, someone put up an F1C model—seemed like a rocket with wings—what an eye opener! The three decades of progress I saw that day was hard to comprehend. Needless to say, the old free



Giant "Gool," originally designed by Ted Enticknap, about to be launched by builder Larry Dona and his son, at Harts Lake Prairie. Center section wing pod contains the timer that controls the wing spoiler DT system.

flight bug had stuck his horns into me again. In the next few months, I built and flew a design of my own, circa 1950. Not good by today's standards, but a start."

After joining the Sierra Eagles Club, and competing in a number of contests, Bill began to develop his own models, which he flew at the U.S. FF Champs at Taft.

"I left determined to be back at Taft in 1988, but with better equipment—hopefully a model with a bunt system. Over the next year, I built and flew models with different setups and by the time the 1988 Free Flight Champs rolled around, my Hurry Up was much improved. The VIT control system runs off a Seelig mini four-function timer. I put up seven maxes before I lost the model. I picked up third place while Bob Sundberg established a new record.

"At the 1989 USFFC, 46 contestants were entered in 1/2A. Terry Thorkildsen set the pace with his Astrostar. By early afternoon, I'd put up nine maxes, but I was still one down to Terry, and he was in good air again. I fired up and hit a boomer dead center under power. I took off on my bike, but I lost the model after about four minutes. Terry went on to set the record at 73:01. That record may never be broken. Gus Sundberg finished second with 56:02, exceeding his 1988 record. I finished the day in third place with a score of 47:26. That day, the first three places put up an incredible total of 176:29 minutes.

"I flew my first F1J event at



Columnist Bob Stalick built his San De Hogan in 1987 and flew it for the first time at the 1992 Misery Meet at Harts Lake Prairie, in Washington. Engine is a K&B .32 Greenhead.



the Sierra Cup FAI meet in 1989. We had an outstanding group—fifteen in the field. At the end of five rounds, Bruce Augustus, Randy Archer and I were clean and moved to the fly-off round late in the day. Archer's Xenon failed to max, so it came to Bruce and me.

"Hurry Up couldn't match Bruce's light, well-trimmed model in the late, cool air. He finished first. Later, Russian champ Eugene Verbitsky congratulated me and observed, 'Your little plane fly like a real power model.'

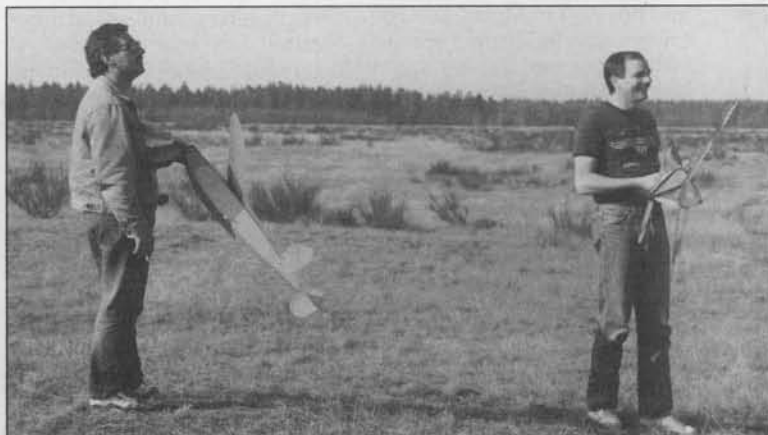
"At this point, I decided to work the design over some more. To reduce weight, I started working with the rolled tube fuselage concept. In doing so, I was able to trim more than an ounce off the weight. The 1990 version weighs about 7.5 oz. This model took first at the SCAT meet ahead of Terry Kerger and Roger Simpson. It took third at the 1990 USFFC in both 1/2A and F1J.

"For the 1990 Jim Patterson FAI meet at Lost Hills, Terry Kerger and I faced off for the flyoff. Terry was flying Archer's Xenon design. We both maxed for the three minute round, and for the four minute round. In the fifth round, I caught a better piece of air than Terry. My time was 21:24. Randy Archer

pointed out that I'd just set a new F1J record.

"Over the past two years, the model has demonstrated great potential, with consistent showings in major competition in spite of frequent pilot errors on my part. I believe it has evolved to the point that an experienced flier will find it an exciting new challenge, and in the hands of a top flier, who knows? In any event, this is a fun airplane that gets lots of attention, lots of picture takers. Its fast, straight-up climb and great calm air glide make it ideally suited for the FAI format.

"Some closing comments about the F1J event. The five qualifying rounds are flown within specific time frames, usually starting well after that good heavy early morning air is gone. Flyoff rounds are flown within very short time windows of three to five minutes, with the max time going up one minute in each succeeding round. Typically the flyoff rounds start in mid to late afternoon, often after the strong lift has dissipated. Therefore, one can see that this format is vastly different than the AMA event, which might be characterized as a sunrise to sunset, fire-at-will marathon. Some of us older folks welcome the discipline that the F1J event af-



Also at the Misery Meet, Nigel Tarvin (left) and Bruce Mathews wait for some evidence of thermal activity before launching their O.T. rubber models.

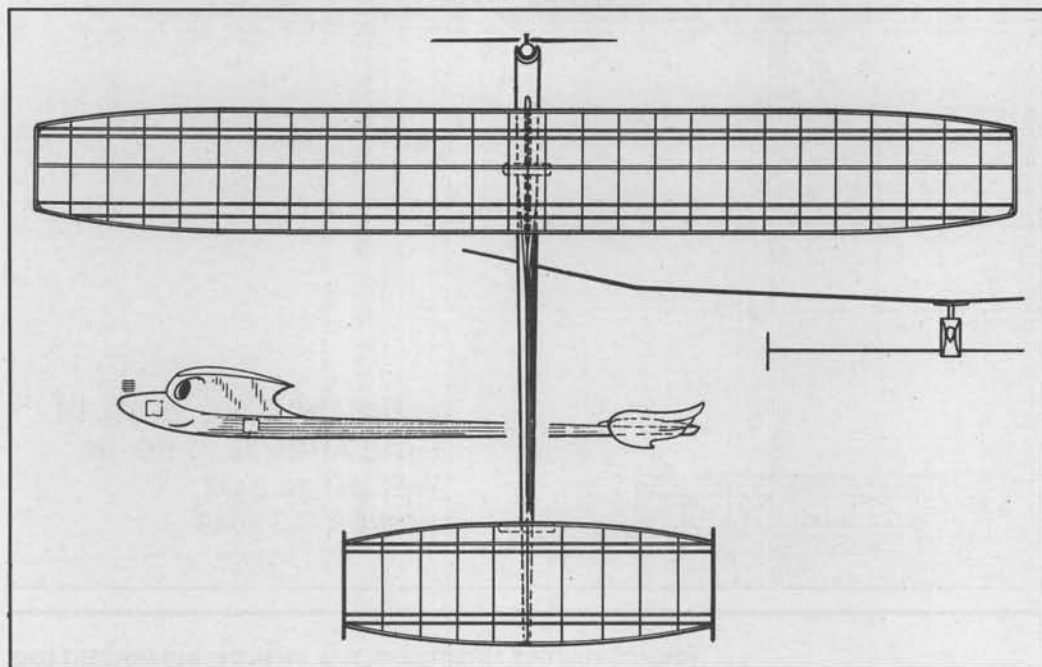
fords, because it tends to move the emphasis back to pure model performance and the excitement and challenge of head-to-head competition. Clearly, the F1J event, flown in the proper FAI format, is in no way redundant and by design is not meant to be run in the fly-at-will AMA style. Because of these differences, it is perhaps more difficult than the AMA event.

"It's a fun event. So, Hurry Up! Try it—you'll like it!

"The Hurry Up models feature a tube fuselage made of balsa, carbon fiber and aluminum. Engines are radially mounted with an aluminum backplate that mates to an aluminum firewall. The VIT

system now features a machined aluminum module that mounts in the rear of the fuselage. I do all of the machine work and design myself. For those who may wish, I can provide detailed plans for the TeeDee version, which is the correct size for a Shuriken as well, and the three-views to the Hurry Up II, which includes construction detail and VIT info. The TeeDee/Shuriken plans are \$12 per set, and the II version package is \$3. I would be happy to provide help to F1J builders if they contact me. For orders or information, contact Bill Lynch at 11137 Creekhaven Court, Auburn, CA 35603."

## MYSTERY MODEL



## JUNE MYSTERY MODEL

I have been told that one's memory is the second thing to go, and that most can't remember what the first is. Periodically, I find that I have featured the same Mystery Model more than once. However, such is not the case with this month's selection. This is a true 1/2A power model that was designed, built and flown in the 1950s by a well-known free flyer of the time. It is so unusual in outline that I am certain many readers will recognize it immediately. If so, you have a distinct advantage over those who are younger and may not recognize the ship. If you know the name given to this model, all you need do is to write it on the proverbial postcard or letter

# FREE FLIGHT

and fire it off to *Model Builder*. Entries with the correct answer will be put into the hat and a winner drawn. What do you get if you win? A free one-year subscription to this magazine, of course!

## AIRFOIL BOOK COMING

In the many years that I have done this column, just about every conceivable airfoil section has graced these pages. Since my selection of airfoils has seemingly run its course, I have decided to discontinue the Darned Good Airfoil feature for the time being. If new and exciting airfoil developments show promise for use in freeflight models, I will do those as a special addition to future columns. Consequently, if you are interested in a complete compilation of the Darned Good Airfoils, I am planning to

put together a full set of these airfoils in another book. At present I am not sure when the book will be ready for publication, but I will let you know. For those who have inquired as to the availability of the old compilation of airfoils, which was up to date as of October 1987, this publication is no longer in print and no copies of it are available.

## TWO BUILDING TIPS FOR YOUR CONSIDERATION

Over the years, each of us has developed a number of standard practices in construction and flight that we take for granted. Recently, I was surprised to learn that everyone does not do the following when building models. So, for you, here are a couple of building tips:

1. Firewall installation. For

over twenty years, I have epoxied a 1/16-inch magnesium plate to my firewalls. This addition allows you to make positive and unchanging thrust adjustments with a solid firewall to tighten your mounting bolts against. Such a firewall front also keeps fuel from seeping into the front of the fuselage. The magnesium sheet is ideal because it is very hard and extremely light. If you cannot find magnesium, hard aluminum will do.

If you are tired of having your thrust adjustment washers mush their way into the plywood firewall, it is time to put a hard metal front on that model. I usually make the regular firewall out of plywood, then epoxy the magnesium to the front of it. After the epoxy is cured, I drill the engine mount holes and install the blind nuts. When adhering the plate to the



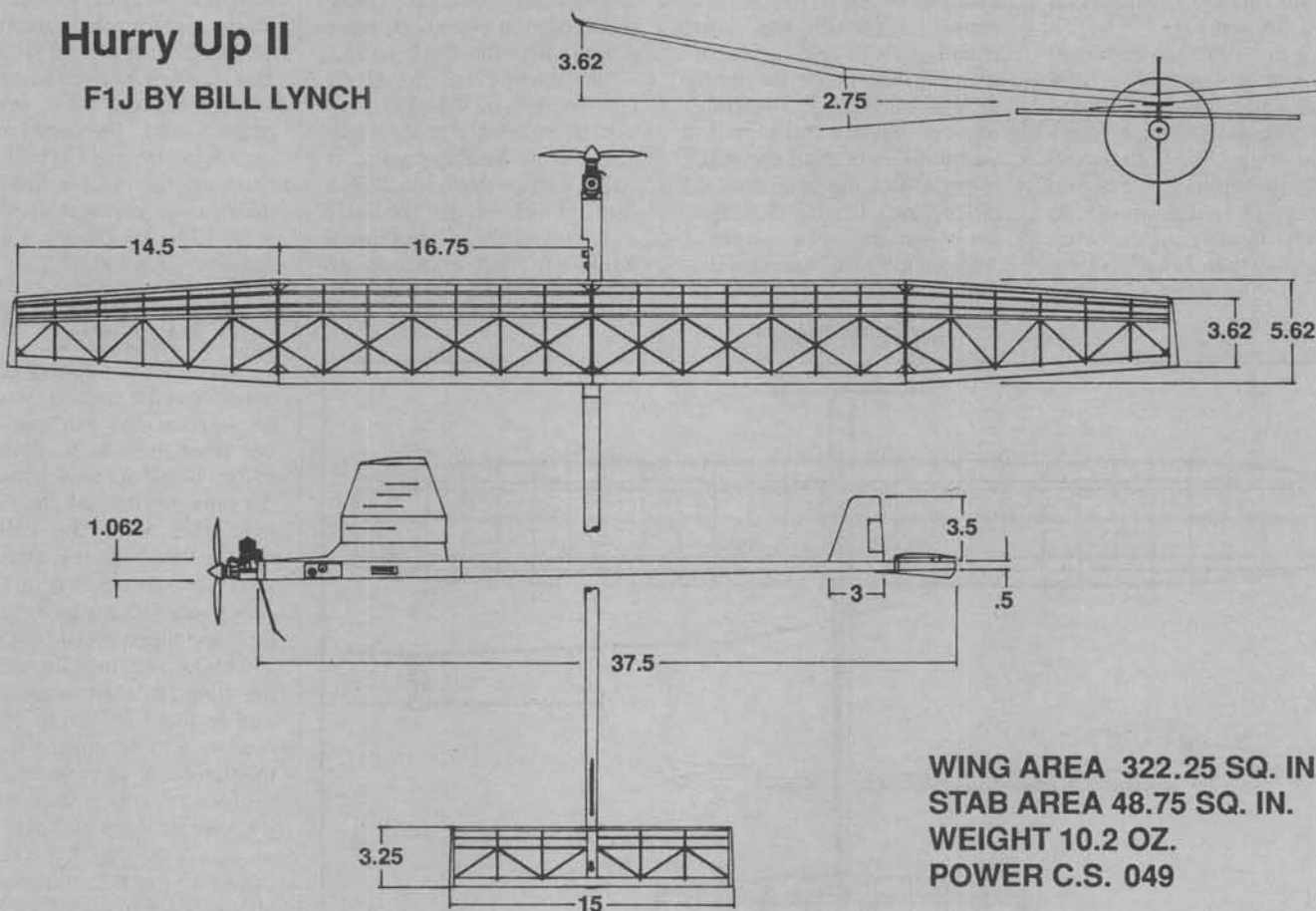
Nostalgia time. Lyman Armstrong sent along this photo from the early '50s, showing Robert Fizer putting up his Nationalist 560. Site is thought to be Marysville, California.

front of the fuselage, I use thixotropic epoxy and let it set up for a day or two. It never comes off.

2. Mounting timers. I have had my share of troubles when it comes time to mount timers in the fuselage. I have used those little wood screws as well as blind nuts with 2-56 bolts. Now I have begun to use the

## Hurry Up II

F1J BY BILL LYNCH



WING AREA 322.25 SQ. IN.  
STAB AREA 48.75 SQ. IN.  
WEIGHT 10.2 OZ.  
POWER C.S. 049



.....

yellow Nyrod tubes that the RC guys use as control rods. The inside diameter of the yellow Nyrod is just the right size to accept a 2-56 bolt. All you need to do is drill out the timer mounting holes to accept a 2-56 size bolt, then drill through the timer faceplate into the fuselage where the timer will mount. Insert the Nyrod into the fuselage where each bolt will enter—you only need to have a piece about 1/4-inch long—and CA it into place. It will stay there for a long time, and the screws will never come out inadvertently.

### VIC JAY'S FAI MODEL PLANS UPDATE

Last month, I noted that Frank Parmenter has made available full sized plans for Vic Jay's FAI model, a Nostalgia eligible aircraft. Frank just informed me that he has named the model the "Jaybird," and has remeasured the plans to determine exact wing area. The new information is that the original 1956 Jaybird has a projected wing area of 400 sq. in. and two enlarged Jaybirds are projected at 607 squares and 655 squares.

All are available postpaid in a large envelope. The costs are \$6.00 for the 400, and \$8.00 for either the 607 or the 655. Want copies? Contact Frank Parmenter, 4106 Sequoia Trail East, Georgetown, TX 78628.

### INDOOR NEWS AND VIEWS RETURNS

The national newsletter of the indoor free flight fraternity, *Indoor News and Views*, is ready for a return. The new editor, Plenny Bates, has the first issue in the hands of avid indoor fliers as you read this. So, if you are interested in the latest in international and national indoor trends, you need to subscribe to this long-standing publication. INAV can be yours at least four times a year for \$8.00. Contact Plenny Bates, 2505 White Eagle Trail S.E., Cedar Rapids, IA 53403.

### THE FIRST THERMAL OF '92

I just came back from my first contest of the year, the annual Misery Meet, held at Harts Lake Prairie, Washington. It is a big event in the Northwest, and traditionally held in February. Regardless of the meet title, the weather was beautiful—no rain, little wind, and temps in the low 60s. I caught my first thermal of the year on a test flight—fuse didn't light, and I watched the model go out of sight overhead in 22 minutes. It was a wonderful flight, and I hope I get the little ship back soon.

Good luck getting your first thermal for 1992, and don't forget to light that fuse. **MB**

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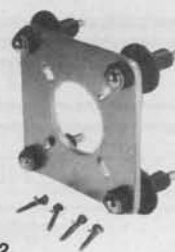
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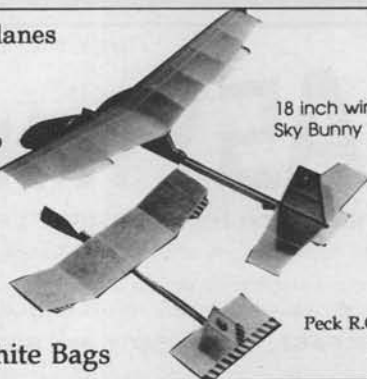
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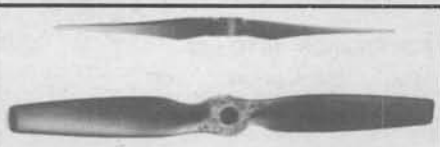
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## HANNAN'S continued from page 55

early radio control developments. Now 75 years of age, and a retired physicist, Walt recalled his start during the 1920s, with rubber-powered models, and his early RC experiments which eventually led to his career in electronic guidance controls for missiles, many of which he is thankful have since been destroyed. He continues to enjoy models in the form of RC sailplanes which are, according to reporter Daniel Berger, "quiet and gentle like their builder."

"Airplanes on the Ceiling" was the title of an item from the *Detroit Free Press* shared with us by Don Campbell. Authored by Donald G. Smith, it compared the lifestyles of men versus women in home decorating. Described was a bachelor whose apartment featured all manner of electronic systems plus some 67 model airplanes suspended from the ceiling. By contrast, according to Mr. Smith, the average woman prefers to keep her possessions concealed. "No woman would ever build a permanent exposed track to run an electric train, through a house. Many men would and do. Women who have offices rarely have trophies and gadgets displayed." Thus, says Smith, it is no wonder that marriage creates conflicts "that can only be accommodated, never resolved." Hmmm.

In the December, 1991 Hangar column, we published an item written by Barbara Wallace, who methodically destroys selected examples of her husband's models as an outlet for emotional frustrations brought on by his actions. Among the comments we received was one from French modeler Georges Chaulet: "Whaff whaff! I got a big chuckle reading the article about Barbara squeezing the unable-to-fly models! I feel happy that my wife allows me to stay for hours in the workshop, without breaking my autogyro blades (which don't need any extra breaking!)."

### SIGN-OFF TIME

Over the years we have employed many quotations to open and close our Hangar doors. Recently we were privileged to have an advance look at Frank Zaic's latest "Orange Book." Featuring a cover illustration by Otto Kuhni, this volume is quite a departure from Frank's famous yearbooks, published since 1934. Yes, there are references to model and full-size aircraft, however it is more nearly an autobiography, with reminiscences of a fascinating lifetime, with lots of philosophical musings and humor to ponder. As Frank put it: "A 'Quote' is not something that can be deliberately created by sitting down and banging it out on the typewriter."

We think this new book, entitled *Frankly Speaking*, will yield many meaningful "Quotes" to enrich our lives, and would like to share this one: "Pick a hobby as you would a lifetime companion." **MB**



# There's a change in the air



## Introducing the new Concept 30 SR

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

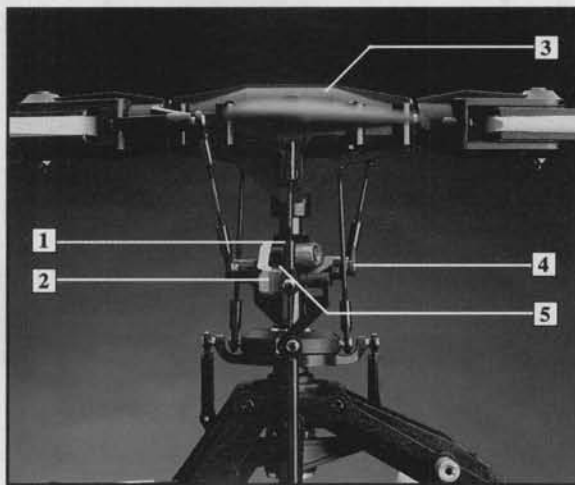
The SR starts with all the great performance features of the former SX and then goes even further. Its rotor diameter and tail boom have been "stretched" in order to produce a slightly larger Concept 30. The result is a helicopter that approaches the smooth flight characteristics and superior autorotations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

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

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

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

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### A complete lineup for all your heli needs

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

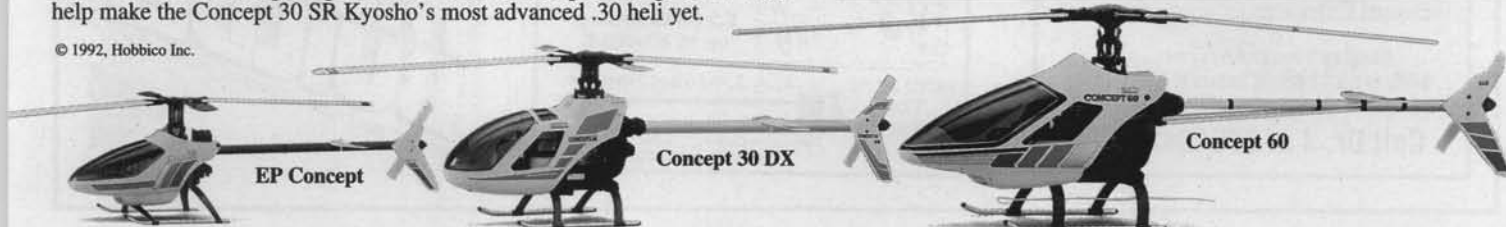
Of course the SR and all Concept helis are backed by Kyosho's Total Support Program, which includes monthly newsletters, excellent parts availability and answers and advice from the Concept Hotline team.

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this, however, talking about balsa allowables, and whether the "block shear" or the "crippling shear" should be higher.

I am reminded that the more we know the more we see that we don't know. At any rate, Jack recommends 1/16 or 3/32 shear webs at the center of this wing, to be safe. I think that from mid-span out, 1/32 medium balsa shear webs are plenty safe on that size model.

I had sent Jack a copy of the balsa data sheet, included with this month's column, which he used in his calculations. I hope some of the rest of you will also find it useful. While I'm at it, there is also a chart on other modeling materials. An earlier version of it was published in this column about three years ago, but I suspect some of you missed it.

For very light models, such as rubber powered, Fletcher recommends shear webs of doped tissue. Such models are usually designed without any shear webs, but Jack points out, and I agree, that tissue shear webs would add hardly any weight but add a great deal to the wing strength. They would also add a lot of torsional rigidity, if the wing is covered on both top and bottom.

## FUSELAGE SHEETING

I asked Jack another question: Why do most model designers specify that the balsa sheeting on the top and/or bottom of the fuselage be installed cross grain? His answers confirmed my own conclusions. The fuselage would be much stronger in bending and longitudinal compression (crash resistance) if the sides and the top and bottom sheeting all have the grain *longitudinal*!

For handling loads, such as holding the beast while you are starting the engine, or in some cases while hand launching, cross-grain top and/or bottom sheeting can eliminate local crushing. Also, if there is a lot of side-view curvature in the top or bottom, cross-grain balsa will conform to the curve easier.

My own choice in the matter is to always have all the fuselage sheeting longitudinal for best strength-to-weight ratio. I add cross members or doublers locally, as required, to resist the handling loads.

Thank you, Professor Jack Fletcher, for the education.

## ON GETTING OLD

I received a letter from my longtime modeling friend L.S. "Wiggie" Wigdor, formerly of London, England, who has retired to New London, New Hampshire. Wiggie is about my age, I think. We both design, build and fly RC, he is also an active skier, and neither of us is ready for a retirement home, but I quote a line from his letter: "I am going through agonies as I design and build. This seems to become more difficult for me as the years go by."

## "Strength & Related Properties of Balsa & Quipo Woods"

Excerpts from U.S. Forest Service Mimeo No. 1511, June 1944.

- Balsa (*Ochroma lagopus*): Chiefly from Ecuador, also West Indies, Central America, and Mexico.
- Quipo, also known as Bongo (*Cavanillesia platanifolia*).
- Specific gravity of both are about the same, averaging 0.13 and ranging from .06 to .24 (3.7 to 15 lb./cu. ft.)

Balsa is slightly superior to quipo in everything but compression perpendicular to grain.

The following data is for balsa at 10 to 12% moisture:

- Stress at proportional limit in static bending, at sp.g. of .12 = 1200 psi, and at sp.g. of .24 = 2400 psi.
- Modulus of rupture in static bending at .12 sp.g. = 2000 psi, and at sp.g. of .22 = 4000 psi.
- Modulus of elasticity in static bending at .12 sp.g. = 400,000 psi, and at .20 sp.g. = 750,000 psi.
- Compression parallel to grain, stress at proportional limit at .12 sp.g. = 840 psi, and at .18 sp.g. = 1600 psi.
- Compression parallel to grain, max crushing strength at .12 sp.g. = 1200 psi, and at .20 sp.g. = 2400 psi.
- Compression parallel to grain, modulus of elasticity at .12 sp.g. = 430,000 psi, and at .20 sp.g. = 900,000 psi.
- Shear parallel to grain at .12 sp.g. = 240 psi, and at .20 sp.g. = 400 psi average.
- Tensile strength perpendicular to grain at .12 sp.g. = 110 psi and for .20 sp.g. = 150 psi average.

I know exactly how you feel, Wiggie, because I feel the same way. "Let's talk about it," as the psychiatrist might say. We have lots of company out there, since my mail tells me that a big percentage of "Design & Technical" readers also started building model airplanes back in the dark ages when we did.

You may remember that Bill Hannan mentioned the same problem in his "Hannan's Hangar" in the November 1991 issue. I quote Bill in part: "According to our mail from readers, by far the most-mentioned of all the obstacles (in model building) is overcoming one's own inertia." Amen.

When I was a teenager I never seemed to get tired, and had boundless energy. As the years went by the ambition slowly attenuated and the planned projects became less grandiose and more practical. As a young man I could work at my job all day and build models most of the night, night after night. In my fifties I recall an increasing frustration because I still had lots of projects I wanted to undertake, and did, but there just wasn't enough "time." Actually there were still 24 hours per day as before, but there wasn't as much energy. After I had worked at Boeing all day, and fought Seattle traffic morning and evening, paid some attention to my wife, played with the kids, and maintained the place, there was disappointingly little get-up-and-go left for modeling!

As I had hoped, retirement was the solution to that problem, for a few years anyway. Without Boeing or traffic, and with the kids on their own, there was lots of time to design and build and fly models. Wonderful! Ten years later it is still wonderful, but I can see age taking its inevitable toll on the remaining energy. I don't build as many models as I used to, therefore destroying one in a crash is now more traumatic than it used to be. When I am working on a model it is getting more and more difficult to stay with it. I watch TV more than I used to. There is no doubt about it, I am getting old. But I'm going to fight it every inch of the way.

I truly believe that exercising the many mental and physical skills required in modeling is excellent for slowing the aging process. I was practicing low altitude square outside loops the other day. That tends to keep the heart pumping...if it doesn't do just the opposite.

## PARTING WORDS

"People don't wear out as much as they rust out from disuse"—Dr. James F. Fries, Stanford University.

"We don't stop playing because we get old. We get old because we stop playing"—Bill Warner in *Model Aviation*.

"I'd like to take up modeling, but it would probably take a couple of years to get started, and by that time I would be seventy." And, asked a friend, "How old will you be in a couple of years if you don't take up modeling but do nothing?"

Better a participant rather than a spectator. Don't just sit there, go design an

MATERIAL	DENSITY lb./in <sup>3</sup>	STRENGTH lb./ft <sup>2</sup>	STRENGTH kpsi *	STRENGTH TO WEIGHT RATIO
White bead foam	.0006	1.0	.011	19
Blue Styrofoam SM	.0014	2.5	.025	18
" " HI-115	.0020	3.5	.115	59
1/8 ABS foamboard	.0038	6.6		
.145 paper-face foamb'd	.0069	11.9		
Very soft balsa	.003	5.0	.28	93.
Medium balsa	.007	12.5	.70	100.
Very hard balsa	.011	20.0	1.12	102.
Sig Lite Ply	.013	22.9		
Spruce	.014	25.0	1.75	125.
Birch plywood	.024	41.6		
(water)	(.036)	(62.4)		
Nylon	.042	10.0	250.	
ABS & PVC	.045	4.0	100.	
Polycarbonate	.045	9.1	202.	
Polyester & polystyrene	.047	8.0	175.	
Mylar	.045	27.0	600.	
Glass-reinforced nylon	.049	22.0	450.	
Epoxy	.051	10.0	200.	
E-Glass fibers	.091	500.	5500.	
Kevlar fibers	.052	400.	7700.	
Graphite (carbon) fibers	.066	410.	6200.	
Spectra fibers	.030	540.	18000.	
Epoxy-Kevlar laminate	.052	192.	3700.	
Epoxy-graphite laminate	.057	200.	3500.	
Epoxy-fiberglass lamin.	.075	240.	3200.	
Magnesium (wrought alloy)	.066	45.	680.	
Aluminum (wrought alloy)	.100	75.	750.	
Tempered steel	.283	113.	400.	
Lead	.410			

\*Compression strength on foams, compression strength parallel to grain in woods, tensile strength on plastics and metals.



## PLUG SPARKS cont. from page 69

erally held in Don Wrench's machinery warehouse where you can make all the noise you want. There are generally two to four setups available where you simply mount your engine and hook up the ignition system provided.

This is an excellent way to check out those engines that have been unused for a long time and also to see if that new engine you just bought is truly a "jewel" or not! As Jim Persson says, "Bring your engines ready to run. We have all fixtures, props, fuels, test stands, etc."

### ELGIN COMMEMORATIVE

SAM 39 announces with considerable pride that they are creating a commemorative Old Timer meet named in honor of Joe Elgin. This meet will be held in conjunction with SAM 68.

The contest will be held at Donnellsville, Ohio on August 18, 19, and 20, and will feature 13 events ranging from 1/2A Texaco to Pure Antique. Contest Director will be Robert Raybourne, 6914 W. National Rd., Donnellsville, OH 45319, or call (513) 882-6775.

A most interesting award will be given for high time in Class C using a Joe Elgin design. This will be an old 1940's trophy won by Joe Elgin plus a cash prize. Sounds like some real fun!

For entry forms, write Contest Manager Bucky Walters, 5807 Cambridge Circle, Sandusky, OH 44870; or call (419) 625-9078.

### READERS WRITE

Photo No. 7 shows an Aeroneer 1-B as built and flown by Bill Brenchley, of Elkton, Maryland. Brenchley is no stranger to this column, as he has practically adopted the 1/2A Texaco Scale event as the only event really worth flying. Brenchley will be the RC Contest Director at the Lawrenceville, Illinois SAM Champs.

Bill reports the Aeroneer has turned out to be a fine flier with a two-channel radio, Cox Black Widow .049, and Micafilm covering. This combination came out at 18 ounces, giving a very respectable 9 oz./sq. ft. wing loading.

### AUSTRALIA

Latest correspondence on Australian activities comes from Albert Fisher of Sydney, New South Wales, wherein he sent in some interesting photos of what they are doing. Photo No. 8 shows Fisher's PB-2 which is covered on the wing center section and tailplane with Micafilm. The wing outer panels are covered with Solarfilm Solartex as is the fuselage.

Of interest is the change in carburetion for his O.S. 60 four-stroke engine, where the intake and tank have been raised to ensure better fuel draw. Note the muffler pressurized system, long intake venturi and the raised tank. No problems with this setup! **MB**

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## ELECTRIC continued from page 43

gear (taildragger) and Dave Brown Lite Flite 3-inch wheels was 13 ounces. The fuselage sides are made of Lite Ply. This is strong and not as heavy as it looks. I cut lightening holes in the ply and succeeded in removing only 20 grams. My conclusion was that hole cutting is not worth the trouble. The flying weight is 6 lbs. 6 oz. with 21 Gates 1400 mAH cells and an Astro 40 motor. Performance is very good, with a fast climbout and loops from level flight.

Many of the electric 40 planes weigh seven pounds and fly just fine, so why try to save weight? My reasons are that I get a pound that I can play around with. I can use larger packs for more power or duration, or I can fly light for easygoing flying. It gives the plane more versatility. It is also fun to see how light you can build. You can surprise yourself!

I saved motor mounting for last, because I have settled on a method that is exceptionally easy and versatile. It is easy to adjust thrust angles, it allows flow of cooling

air, it can be installed after the fuselage is completely built, and it is easily retrofitted to many RTF aircraft. It also weighs almost nothing. The sketch shows the system. The pine blocks are glued to the fuselage sides, then the Lite Ply strips are fastened to them with wood screws. The motor bolts to the strips from behind. If you are using a "gas conversion," the cheek plates that are so popular with gas planes are just right for the mounting blocks. There you have it, simple, handy, and light!

I use clear packaging tape for control surface hinges, an idea I got from Bob Kopski. Tape hinges are light, easy to install, and can be installed after all control surfaces are covered. They are also easy to seal. I have used several approaches to tape hinges. My favorite is to use three or four hinges per control surface, and then seal the hinge line with a one-inch wide strip the length of the control surface. Note that I use hinge tape on both the top and bottom of the control surface, and that the leading edge of the control surface is angled. Do not use just one side of the surface for hinging, as it will eventually pull up and loosen the covering.

As mentioned in earlier columns, I like to use standard six- or seven-cell packs that are popular for offroad car racing. They are fairly inexpensive, powerful, and readily available. I connect the packs in series with single connectors; any of the popular commercial connectors are ideal.

My usual setup for the 18- or 21-cell planes is three packs of six or seven cells each, one pack on the floor and two packs stuck to the fuselage sides with Velcro. There is an optimal lead length for this; I find it to be about 4-1/2 inches, so that connections are simple without having a lot of extra wire lying around. The throttle goes up front under the windshield or nose deck, secured with Velcro. This keeps it up high and out of the way. The disadvantage of this is that I have to use a very long lead to reach the receiver—about 14 inches long. I make up an extension cord for this, with plugs at both ends. The arming switch fuse and radio on-off switch go toward the back of the cabin. I usually use medium size servos in this size plane, such as the Futaba S148, which weighs about 1.6 ounces. The elevator and rudder servos go as far back as possible in the cabin and the



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aileron servo goes as far back as possible in the wing, in order to leave as much room as possible in the front of the cabin for the batteries, which are moved around for balance. That is the advantage of Velcro: it makes battery shifting really easy. The receiver is usually the farthest back of all, behind the servos. The receiver battery is in the same area in the cabin as the motor batteries.

That is the setup I am using now. It works quite well, but if you have ideas on other ways to do it, let me know! The 40 size planes are fun, but I have found that they require just as much care and time on layout as the six- and seven-cell planes.

I am using the TRC Impulse 6 charger for all of the charging on 18- and 21-cell packs. This charger is fully automatic and it has a very good peak detector. I do not know of any other charger in the USA that can peak detect packs of this size. The TRC does the job very well indeed. It runs quietly and does not heat up. It charges my 21-cell 1400 mAH Gates packs in 23 minutes, at an initial charge of 4.4 amps and a final charge of 3.7 amps. It only takes 15 minutes to charge an 18-cell Sanyo SCR 1200 mAH pack, at a constant 3.9 amps. I highly recommend this charger, as it can automatically charge from one to 32 cells from a 12-volt battery, and is of very high quality. It certainly makes charging the bigger airplanes much simpler—more like charging the six- and seven-cell packs.

Jon Svendsen delivered (in person!) some lovely photos taken during his vacation in Norway. Since they feature float flying and the Aqua Sport, I can't resist! Somehow a floatplane looks perfect in the northern wilds. Jon's plane uses an Astro 15, and has

flown everywhere from Colorado to Norway, since Jon also flies 747s for a living (or hobby?). Jon also included some photos that show the very simple add on battery pack used to convert a Goldberg Gentle Lady to electric. It saves having to rearrange the inside layout.

## UPCOMING MEETS

I got a notice from Charlie Spear that the sixth annual "Current News Challenge" electric fly-in will be held May 2 and 3, at Thrift Field in Advance, North Carolina. This meet has been held in August in the past, but May offers cooler weather. Charlie is contest director; his address is 288 Holly Lane, Mocksville, NC 27028. There will be prizes for Scale Beauty, Most Impressive, All Up/Last Down, and AMA events 610 and 618 (Class A Sailplane and Old Timer). Sounds like fun!

Bernard Cawley sent the announcement of the tenth annual Boeing Hawks Electric Fly-In, at the Boeing Kent Space Center Field, South 196th St. and 68th Ave. South (West Valley Rd.), Kent, Washington, June 27-28. Contact Bernard Cawley, 29838 48th Ave S., Auburn, WA 98001; telephone (206) 839-9157, if you need more information. The contest announcement has a nice little map that will show you how to get there. There is camping nearby. There will be prizes and trophies for Most Aerobatic, Best Scale, Longest Flight, Most Impressive, Special Achievement, Class A Sailplane (AMA 609), and Best Multimotor. Busy!

My address for letters with U.S. postage is: Mitch Poling, 7100 CSW/MC, Box 734 PSC 18, APO AE 09220. For international postage, use: Normannenweg 20 D-6200 Wiesbaden-Biebrich, Germany. **MB**

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## Products In Use cont. from page 71

how well the servos follow your input on the control sticks. We call these figures "uplink performance."

JR's standard low-cost 517 servo has a single ball bearing just under the case top. By contrast, the optional/extra set of 901

servos are virtually 100% different internally, have dual ball bearings, one at the top and one at the bottom of the output's shaft, and their uplink performance is measurably far superior—and their quality, like with the other RC manufacturers, costs more.

Uplink performance measures the percentage of servo displacements from neutral (displaced by moving a control stick on

the transmitter) that return the servo's output wheel to within 1/4 of a degree and within 1/2 of a degree of rotation. Higher percentages indicate better uplink performance.

The JR x-347 with four 517 sport servos, measured as follows:

CONTROL	% RETURN WITHIN 1/4 DEGREE	% RETURN WITHIN 1/2 DEGREE
elevator	32%	58%
rudder	37%	68%
throttle	49%	77%
aileron	41%	69%

The JR x-347 with four 901 contest-type servos, measured as follows:

elevator	73%	95%
rudder	61%	85%
throttle	59%	96%
aileron	48%	75%

We recommend the 517s for your sport models and the 901s for your performance models, depending on your hobby budget and need for servo speed. JR produces over fifteen different servos to meet our RC needs, so you see the value in talking with your local hobby dealer. I saw the first two x-347 sets sell as fast as they got to the local hobby shop and they're now averaging a set a week or better. This JR x-347 system, simply stated, has lots and lots of appeal. It even incorporates a totally unique programmable trainer system. The trainer cable and a low-cost JR Max FM set mates up readily. First you can give your student rudder or steering control alone, then you can add elevator control then you can add throttle control as learning progresses—pretty unique!

Hobby Dynamics Distributors imports the entire line of JR RC systems and distributes them to your local hobby shops nationwide. JR radios are serviced by JR Service Americas, 4105 Fieldstone Road, Champaign, IL 61821. Why not visit your local hobby shop, tell them you read about the JR x-347 system and that you'd like to handle one. I'll bet you'll love it! **MB**

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choose an electric motor, battery pack and gear ratio to achieve the required rpm at hover. This would require knowledge of the motor constants, rpm per volt and armature resistance.

### ELECTRIC MOTOR CHOICE

Although choosing the ideal electric motor can be a complicated procedure, the simplifications we have made will make the job easier. The initial approximations are: 20 amperes hover current; 70% motor efficiency; 20:1 main rotor gear ratio. We have determined the rotor speed to be 1189 rpm. Because we have decided to start with a gear ratio of 20:1 the electric motor at hover will be turning at: Motor rpm =  $20 \times 1189 = 23,780$  rpm.

We have already stated that the electric motor is 70% efficient. Therefore only 70% of the 9.6 battery voltage is available for driving the rotor: Eg (Armature Voltage) =  $9.6 \times .7 = 6.72$  volts.

### DETERMINING MOTOR CONSTANT

$K = \text{rpm/Eg}$

$K = 23,780/6.72 = 3,539$  rpm/volt

The motor constant K depends on the motor size, type of magnets and number of armature turns. Because the ferrite motors

are all approximately the same physical size it is possible to determine the approximate motor constant when the number of turns on the armature is known.

TABLE 1	
MOTOR TURNS (FERRITE MOTORS)	APPROXIMATE MOTOR K (RPM/VOLT)
19	3250
18	3425
17	3625
16	3850
15	4100
14	4400
13	4750
12	5125

For a 20:1 gear ratio the motor pinion for the Whisper would be 17 teeth. A motor constant of 3539 rpm/volt would be best achieved by a 17 or 18 turn motor. Changing the gear ratio will permit use of a different motor or a different battery voltage. In general, the fewer the motor turns the more efficient the system. Fewer motor turns, and hence a smaller motor pinion, results in higher efficiency at hover and, perhaps more importantly, a wider dynamic range when more thrust is needed. Advancing the motor timing by five degrees is roughly the equivalent of adding one tooth to the pinion gear or adding one extra cell to the battery pack. For those of you who require

rocketship vertical performance, choose a motor with fewer armature turns and also use a higher battery voltage.

The motor constant may be measured for any motor by putting a known voltage across it and measuring the unloaded rpm:

Motor K = rpm/voltage

Once this constant is known, the battery voltage may be determined and the appropriate pinion gear chosen for approximately 20 amps current drain at hover. From my analysis, it appears to be very difficult to achieve practical flight times longer than about six minutes when using NiCds as a power source.

To summarize:

- 1) Weigh helicopter plus batteries.
- 2) Calculate rotor rpm from equation (2) using five degrees pitch.
- 3) Calculate power required at this rpm from equation (3).
- 4) Determine approximate battery voltage required for this power by assuming 70% motor efficiency and 20 amperes hover current.
- 5) Choose a gear ratio and determine motor rpm.
- 6) Determine motor constant from Table 1, assuming 70% motor efficiency.

I would be interested in hearing from others who have done some electric conversions. Anyone want to try for a world record electric helicopter duration flight? **MB**

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## Airbrushing continued from page 49

depending on the type of pattern you choose. You may want to consider using lace over broad areas or over limited areas such as your name, AMA number or your airplane name.

Remember the shading technique covered earlier? You can enhance this look by laying a piece of lace over the masked stencil area and using the three-color shading technique sprayed through the lace. It gives a great effect that will dazzle your competitors.

The lace should be wet under a faucet first, wrung out until all the excess water is squeezed out and then stretched and taped to the surface. Why wet the lace? Because it has a lot of loose fibers that stick out at different angles. By wetting the lace, the fibers mat down and form a nice clean edge when you spray the paint through the cloth. Make sure you *lightly* spray the coats through lace or you'll wind up with a paint soaked rag on the surface of your plane. Not a pretty sight!

### CROSS-HATCH

Cross-hatch is a very simple procedure and gives a nice effect. Simply take a piece of cardboard and spray across the edge at regular intervals. For example, the photo shows that blue has been sprayed at about 1-3/4 inch intervals. Another technique is to turn the cardboard 90 degrees and spray the surface with another color at a contrasting angle. In this case I sprayed red and got some very nice magenta overtones.

### CLOUDS

Clouds are easy to do and require no practice at all. Simply tear a piece of paper towel in half. Tear an irregular edge into the paper. Now just lay the paper on the surface and lightly spray across the edge. Repeat the procedure as many times as needed to get the desired number of clouds. Don't lay the paint on too thick or you'll lose the wispy texture of the effect. Now move the airbrush back and darken the area as desired.

### MASKING TAPE

Proper masking can make the difference between a great paint job and a poor one. I stopped using paper masking tape years ago. The best tape I've found for masking is Scotch brand "Fine Line" masking tape. It comes in many widths and is plastic so it stretches around tight radius corners very nicely. This Fine Line tape is sold in any auto store that sells auto refinishing products. It's a little more expensive than paper tape, but is well worth the money. The paper tapes will often bleed paint under the tape edge, while the Fine Line gives a perfectly sharp edge to the paint separation line. Yes, I know about the trick of sealing the edge of the paper tape with a coat of

clear but that is such a pain, takes time and simply is not necessary if you use the plastic tape. I've also used black vinyl electrician's tape. It is not as flexible but still does a nice job.

### HOMEMADE STENCILS

If you don't care to go to a sign shop to get your stencils made, you can make your own from shelf paper with the adhesive backing. It takes a little longer but it's cheaper. This kind of paper has a very aggressive glue and will pull up the base layer of paint if you're not careful.

The glue can be partially neutralized by evenly sprinkling baby powder on the surface to kill the tack. One technique for doing this is to take an old sock and pour some baby powder in it. Bang it around a little to get the powder to leak through the sock and then let the powder coat the surface until the high tack is gone. You can tell how much powder to use by testing the surface. If it's still real sticky put more powder on until it's not. Practice on a scrap piece to get the feel for how much to use.

### FRISKET FILM

You can also buy frisket film in sheets and rolls from art supply stores. This product is a transparent self-adhering material that is used to create stencils and has a low tack adhesive that allows the mask to be easily lifted off the surface and reused. It's great stuff.

### LETTER OR NUMBER OUTLINES

Notice the contrasting outlining of the numbers and letters in the photos. This was done with a pen designed for India ink. I use a tip that is 1/32-inch wide. Simply dip the pen in the ink and trace the outline of the letters or numbers. Practice on a scrap first to develop the feel. This technique adds a nice touch to your plane and sets off the trim colors from the rest of the plane.

### ROBERT PASCHAL'S VIDEO ART INSTRUCTION

If all this has whet your appetite for more information on airbrushing, Badger has available a series of four videotapes by well known artist and author of many fine books on airbrushing, Robert Paschal. The tapes are well done, are nicely packaged in an attractive case and would be great viewing for anyone getting into airbrushing.

### CONCLUSION

Now that wasn't so bad, was it? I hope you enjoyed the article and picked up a few techniques you didn't know before. I'm glad it's done because I typed this article myself. No big deal, you say? Well, it is, because I don't type. I could have built an airplane in the time it's taken to peck out this piece. In fact, I think we've sent people to the moon faster.

So get out your airbrush, bring on the brewski and if it doesn't walk, talk, or crawl, then airbrush it. **MB**



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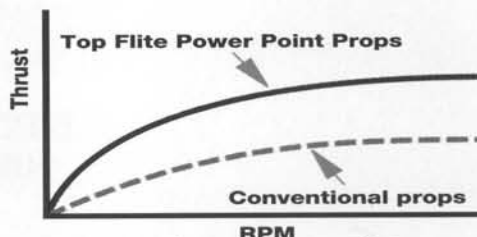
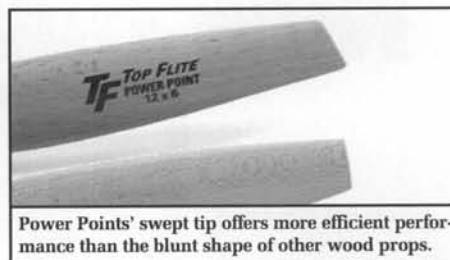
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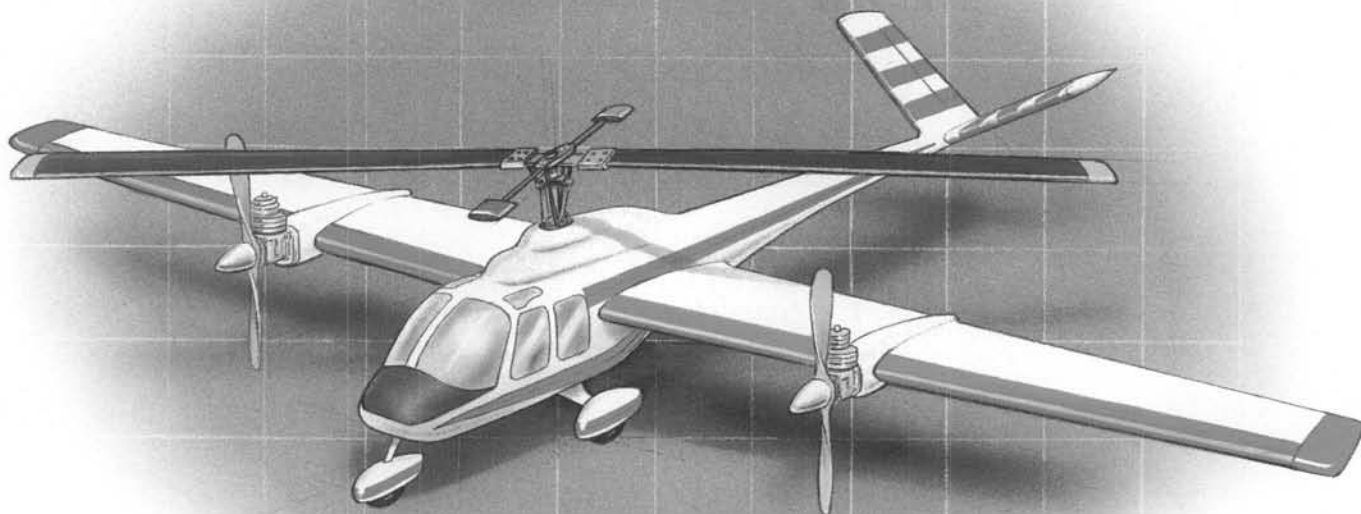
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Four model memory, sophisticated and powerful new features and flyer-friendly programming make the Supers the perfect choice for serious RC enthusiasts.

That also includes a choice no one else offers: Futaba's exclusive, high resolution PCM 1024(7UAPS) or economical FM(7UAFS).

## EVERYTHING AND MORE FOR THE HELICOPTER SPECIALIST.

Now all of the impressive features of the Super Sevens are incorporated into two systems designed specifically for the RC helicopter pilot.

Futaba's new 7UHPS and 7UHFS, like their aircraft twins, include ATV(7), Dual Rate(3), Exponential(4), servo reverse(7) and programmable mixing(2), timer, plug-in RF module, adjustable open gimbal control sticks and NiCd power packs.

But the Heli Super Sevens are configured specifically to the preferences of RC helicopter experts. All transmitter controls are positioned for ease of operation and invert switches are included for the adventurous.

What's more, in addition to the aircraft and glider programming, the 7UHPS and 7UHFS have the most advanced and complete helicopter functions ever, including CCPM mixing, Throttle Curve Adjustment(for normal throttle and Idle Up 1 and 2), Pitch curve Adjustment, Rudder Offset and Rudder Delay.



*The 7UHPS PCM 1024 Helicopter transmitter.*

## COMPLETE CHOPPER COMPONENTRY.

The Super Heli systems also have special equipment, standard. 1000mAh NiCd power packs and dual ball bearing S5101 servos(5) are all part of the package. And they're available in 50 or 72MHz and Mode 1 or 2.

Futaba's Super Sevens. No matter what you're flying, they can keep it under control.

**Futaba.**  
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